Georgetown Canyon Right Fork Mine Preliminary Assessment Report

Bear Lake County
State of Idaho

Department of Environmental Quality

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Submitted to:
U. S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

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List of Acronyms

Acronym	Definition
bgs	below ground surface
BLM	United States Bureau of Land Management
Cd	Cadmium
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFFC	Central Farmers Fertilizer Company
Co	Cobalt
Cr	Chromium
Cu	Copper
DEQ	Idaho Department of Environmental Quality
EPA	United States Environmental Protection Agency
GCRFM	Georgetown Canyon Right Fork Mine
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
Ni	Nickel
PA	Preliminary Assessment
RMP	Area Wide Risk Management Plan
SDWIS	Safe Drinking Water Information System
Se	Selenium
TDL	Target Distance Limit
UF&CMC	Utah Fertilizer and Chemical Manufacturing Company
USFS	United States Forest Service
USGS	United States Geological Survey
V	Vanadium
Zn	Zinc
APC	Agricultural Products Corporation

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Section 1. Introduction

The Department of Environmental Quality (DEQ) was contracted by Region 10 of the United States Environmental Protection Agency (EPA) to provide technical support for completion of preliminary assessments at various mines within Idaho.

The DEQ 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, 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.

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

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

This report presents the results of the preliminary assessment (PA) of the Georgetown Canyon Right Fork Mine and also documents the interagency PA and risk screening activities conducted for this *inactive mine site* located within the boundaries of the *Southeast Idaho Phosphate Mining Resource Area* (Figure 1; the green border outlines the resource area). The interagency PA was prepared by the DEQ, in collaboration with the United States Bureau of Land Management (BLM), the United States Forest Service (USFS), and the Idaho Department of Lands (IDL)—the primary mining administration agencies in southeast Idaho. Site descriptions, conditions, data, and photos are taken directly from the *Orphan Mine Site Preliminary Assessment Screening Report* published in 2004 (DEQ, 2004a). Recommendations from the earlier report have been expanded upon in this report, based on DEQ evaluation of the earlier screening report and any additional information DEQ was able to obtain through literature review. A site visit and sampling were not conducted as part of this PA process.

1.1 Background of the Inactive Mine Assessments

Inactive mine sites consist of those historic mining operations not previously scheduled for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site-specific investigations conducted under the ongoing selenium investigation activities (DEQ, 2007). This PA was conducted to ensure all historic mining sites within the Idaho Phosphate Mining Resource Area have been inspected and evaluated in accordance with the goals and objectives outlined in the *Area Wide Risk Management Plan* (DEQ, 2004b):

- Protecting southeast Idaho's surface water resources by reducing risks to existing aquatic life and sensitive species from selenium and related trace metal concentrations in regional subbasins and stream segments through (a) compliance

with the National Toxics Rule and State Water Quality Regulation numeric criteria (b) development and demonstration of Best Management Practices (BMPs) to prevent future mining releases and associated risks from selenium and related trace metals in receiving streams and water bodies, and (c) development of a long-term monitoring plan for regional surface water resources to ensure effectiveness of risk reduction measures.

- Protecting wildlife, habitat, and ecological resources in southeast Idaho by reducing subpopulation risks to local wildlife to acceptable levels as established by risk-based action levels and by minimizing wildlife risks through the development and demonstration of effective BMPs for future mines.
- Maintaining and protecting multiple beneficial uses of the Southeast Idaho Phosphate Mining Resource Area by reducing livestock grazing risks and associated losses from selenium exposures in forage and drinking water sources and by preventing potential future public health risks by prohibiting residential land use and development in the immediate vicinity of phosphate mining waste units and/or impacted areas.
- Protecting southeast Idaho's ground water resources by identifying, characterizing, and responding to groundwater contamination sources that may present potential public health or ecological risks and by developing and demonstrating BMPs to control future mining releases and associated risks from selenium and related trace metals in groundwater.

The earlier mine site screening effort (DEQ, 2004a) included preliminary assessment activities at fourteen historic mine sites identified through lease records and literature reviews of past mining activities. Preliminary site inspections and environmental sampling of potentially impacted media (surface water, soil, sediment, and vegetation) was conducted by interagency sampling teams in May and July of 2002. Risk evaluation consisted of reviewing site data in terms of site conditions, areas of impact, potential for continued releases, and regional risk-based action levels developed for the Area Wide Risk Management Plan.

1.2 Overview

The Georgetown Canyon Right Fork Mine is located in Bear Lake County in Section 12, Township 11 South Range 44 East, approximately 5.7 miles east of Georgetown, Idaho. The site is located on private land in Right Hand Fork, a south branch of Georgetown Canyon (Figure 2). The former mine can be reached from Georgetown by driving northeast-east along Georgetown Canyon Road, then southeast along Right Hand Fork Road. The public has access to the mine on roads. There are no locked gates or posted signs in proximity to the mine site.

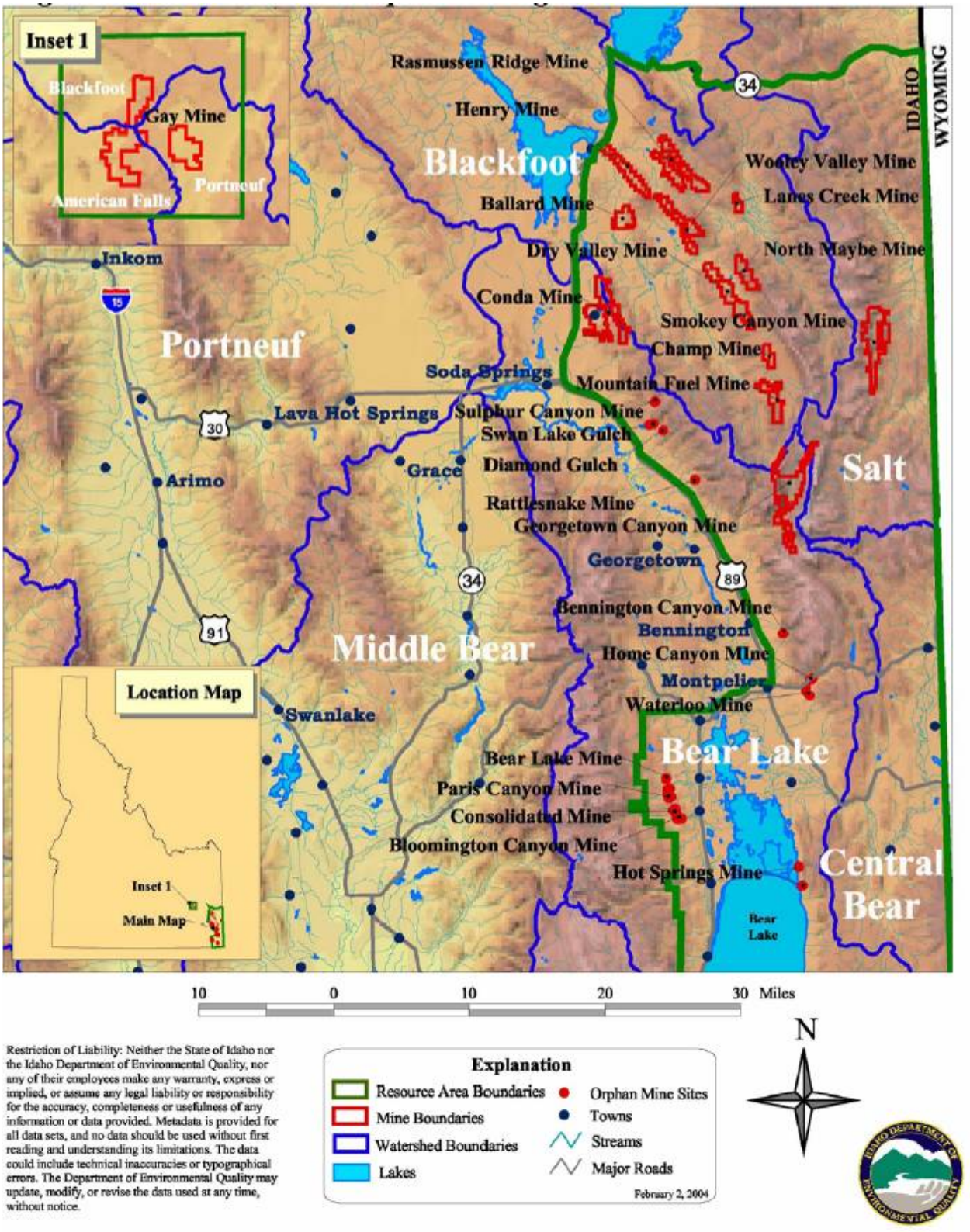

Figure 1. Location of the Georgetown Canyon Right Fork Mine within the state of Idaho and delineation of the Southeast Idaho Phosphate Mining Resource Area (green boundary).

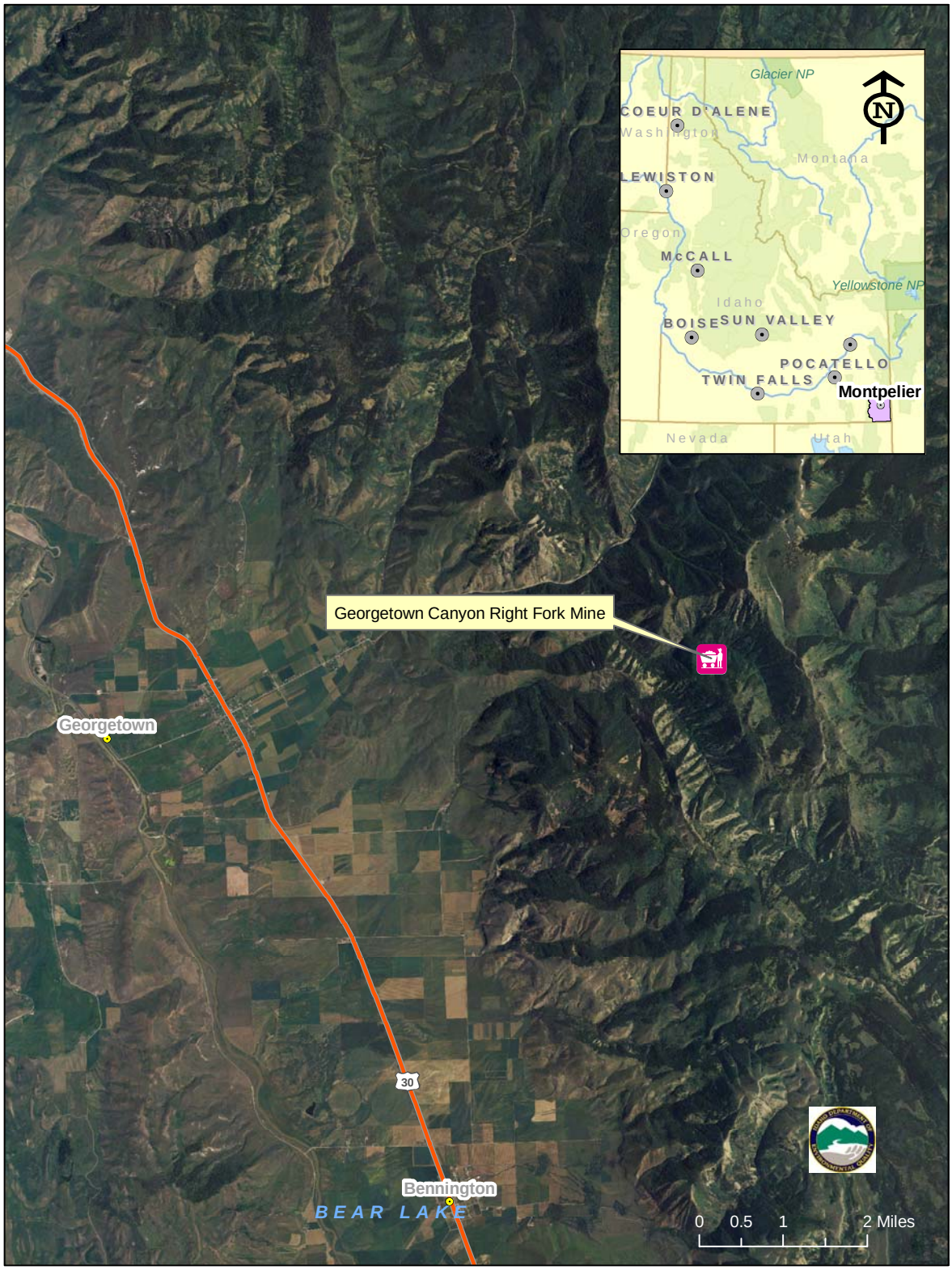

Figure 2. Aerial overview of the Georgetown Canyon Right Fork Mine area.

Section 2. Site Description, Operational History, and Waste Characteristics

Physical characteristics of the Georgetown Canyon Right Fork Mine site are presented in the following, along with the mine's operational histories and characteristics of the wastes that remain.

2.1 Ownership

The Georgetown Canyon Right Fork Mine (GCRFM) property is currently owned by Agrium, Inc. Unpublished records in the BLM show that 16 claims were purchased by the Utah Fertilizer and Chemical Manufacturing Company (UF&CMC) (USGS, 2000). Although the Georgetown Canyon Right Fork Mine was not one of the original 16 claims, the site was apparently developed in conjunction with the Georgetown Canyon Mine exploration activities. In 1928, the UF&CMC sold all of its interests in Georgetown Canyon (including GCRFM) to the Stockholders Syndicate of Los Angeles, California (Campbell, 1928). The Right Fork claim was then sold to Central Farmers Fertilizer Company (CFFC) in 1947 (Hansen, 1964).

In 1964 the El Paso Natural Gas Products Company bought the mine, and in May of 1972, sold the properties to Agricultural Products Corporation (APC). APC was dissolved in 1972 and the mine was assigned to the parent company, Beker Industries. In January of 1979, Beker Industries Corporation sold the Georgetown Canyon Mine to Western Co-operative Fertilizer, Ltd., USA and formed the Conda Partnership. In 1987 a financial group called Nu-West Industries, Inc. replaced the Beker Corporation in the Conda Partnership and subsequently bought out the Western Co-operative Fertilizer, Ltd. in 1992. Agrium, Inc. acquired Nu-West Industries in October of 1995 and is the current owner of the Georgetown Canyon Right Fork Mine (USGS, 2000).

2.2 Historical Perspective

The Georgetown Canyon Right Fork Mine is located in Bear Lake County, Idaho in Section 12 of Township 11 South, Range 44 East. There is little historic data and no record of lease operations on this site. However, there is some evidence that this site was developed in conjunction with exploration activities associated with the larger Georgetown Canyon Mine.

For a period from April, 1906 to October, 1907, 16 association placer mining claims were located on the phosphate deposits of Georgetown Canyon. Unpublished records in the BLM show that all of the claims were purchased by the Utah Fertilizer and Chemical Manufacturing Company (UF&CMC) (USGS, 2000).

The UF&CMC was incorporated January 29, 1908 specifically to purchase the mining claims at Georgetown Canyon and at other places and develop mines on the phosphate

property (Campbell, 1923). The UF&CMC applied for and received patent for all 16 placer mining claims in 1912, 1915, and in 1916. Robert J. Shields of the Salt Lake City law firm of Henderson, Pierce, Critchlow and Barrette was the agent and attorney-in-fact for the UF&CMC. Shields later became the mine manager of the Georgetown Canyon Mine (Campbell, 1921).

Although the Georgetown Canyon Right Fork Mine was not one of the original 16 claims, the site was apparently developed in conjunction with the Georgetown Canyon Mine exploration activities. According to a verbal recounting by Carl Stoddard to Boyd Cook of the Idaho Department of Lands,

> "In 1908, Robert Shields of Salt Lake City opened up the phosphate mine in the Righthand Fork of Georgetown Canyon for the Utah Fertilizer Company."
>
> DEQ, 2004a

The first known report of mining related activity in Georgetown Canyon was in 1909 (Gale and Richards, 1910). All in all, a total of approximately 800 feet of underground development in nine tunnels and two shafts was completed on the mining claims held by the UF&CMC. No production oriented underground mining was ever accomplished by the UF&CMC on these patented placer claims (USGS, 2000).

Bell (1919) reported that UF&CMC began sale negotiations in 1919 for the phosphate properties, and in 1928, the UF&CMC sold all of its interests in the 16 patented placer mining claims of Georgetown Canyon (including GCRFM) to the Stockholders Syndicate of Los Angeles, California (Campbell, 1928). It is of interest to note that the last president of record of the UF&MC was F. W. Braun of Los Angeles; at the time of sale, F. W. Braun of Los Angeles was also listed as the president of the Stockholders Syndicate.

From the time of the purchases in 1928 until 1953, Stockholders Syndicate did only upkeep on the properties with no mining of phosphate ore. Although an estimated total of 4,600 feet of underground workings were completed in 1953 and 1954, there was no reported production from the Georgetown Canyon area, and, by 1955, the properties were again idle.

The 16 patented placer mining claims of Stockholders Syndicate were sold to Central Farmers Fertilizer Company (CFFC) in 1955 (Hansen, 1964). The Right Fork claim was apparently sold to CFFC in 1947 (DEQ, 2004a). The Central Farmers Fertilizer Company was a large farm co-operative, made up of smaller farm co-ops throughout the south, midwest, and northwest United States and southern Canada (Emigh, 1959). In 1957, construction started on a processing plant with an electric furnace and kiln in the Canyon, and a railroad spur that was first conceived in 1916 was finally constructed up Georgetown Canyon to the site of the new processing facility (Cressman, 1964). Open pit mining was first reported in June of 1958, and, by late 1959, all underground mining had been abandoned. By 1960, the new open pit was approximately 3,000 feet long, 100 feet wide, and 100 feet deep (Fletcher, 1960).

Open pit mining in Georgetown Canyon continued until 1963, when the pit was reported to be approximately 10,000 feet long, 250 feet wide and 100 feet deep (Hansen, 1964). In 1964, production from the mine stopped, and the El Paso Natural Gas Products Company

bought the Georgetown Canyon phosphate properties from the Central Farmers Fertilizer Company (Hansen, 1965). The plant facility was closed that same year, and parts of it were moved to Conda, where the company was building a new phosphate processing plant (Service, 1967).

The Georgetown Canyon Mine has not produced phosphate ore since 1964; however, the mine ownership has changed hands several times since then:

- In May of 1972, Agricultural Products Corporation (APC) purchased the mine properties from El Paso. Agricultural Products Corporation was a wholly owned subsidiary of Beker Industries Corporation.
- In 1972, APC was dissolved and all of their property holdings, including the Georgetown Canyon mine were assigned to the parent company, Beker Industries.
- In January of 1979, Beker Industries Corporation sold the Georgetown Canyon Mine to Western Co-operative Fertilizer, Ltd., USA and formed the Conda Partnership.
- In 1987, the Beker Corporation filed for a Chapter 11 bankruptcy and a financial group called Nu-West Industries, Inc. replaced the Beker Corporation in the Conda Partnership.
- In 1992, Nu-West Industries, Inc. bought out the Western Co-operative Fertilizer, Ltd., and formed a wholly owned subsidiary named Nu-West Mining, Inc. to replace the co-op in Conda Partnership.
- In 1995, the Conda Partnership was dissolved and all of the mine properties were assigned to Nu-West Mining, Inc.
- In October of 1995, Nu-West Industries was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta (USGS, 2000; Sprague, 2006).

2.3 Regional Climate

Climate in southeast Idaho is influenced by major topographic features, including the Pacific coast, and local mountain ranges. The mountains affect local wind, precipitation, and temperature patterns.

Summer temperatures in the valleys are typically dry with average maximum temperatures in the low 80s (˚F) and average minimum temperatures in low to mid 40s (˚F). Summer precipitation is usually associated with thunderstorms. Fall and winter are dominated by cold, dry continental air and by cyclonic storms. The average maximum temperatures during February are in the low 30s (˚F) with the average minimums below 10 ˚F. Most precipitation during fall and winter falls as snow, accumulating in the valleys and on the surrounding mountains. Spring precipitation usually results from cool marine air flowing in from the south.

The average annual precipitation varies widely throughout the resource area and with elevation. Lifton pumping station, located at the north end of Bear Lake, has an average total annual precipitation of 10.62 inches based on a 1935 to 2007 period of record, while

on the north end of the resource area Conda reports an annual total average precipitation of 18.91 inches over a period of record from 1948 to 1978 (Western Regional Climate Center, 2007). Precipitation in the surrounding mountains range from 25 to 35 inches annually (BLM, 2000). The heaviest 1-day rainfall during the period of record at Montpelier was 2.50 inches on June 16, 1939. Thunderstorms occur on about 24 days each year, and most occur between May and August (Natural Resource Conservation Service, 2007).

> "The average seasonal snowfall is 58.3 inches. The greatest snow depth at any one time during the period of record at Montpelier was 31 inches recorded on March 4, 1952. On an average, 108 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 13.0 inches recorded on December 19, 1951".
>
> (Natural Resource Conservation Service, 2007)

The prevailing wind direction is from the west southwest, causing accumulation of snow on east and north facing ridges. Ralston et al. (1980) states that snow melt is the largest source of ground water recharge to the areas bedrock aquifers giving the east and north facing ridges the greatest potential for significant recharge.

2.4 General Geology

The Georgetown Canyon Right Fork Mine lies within the northern region of the Basin and Range physiographic province, which is characterized by linear, north-trending fault-bounded ranges and basins created by extensional tectonism initiated during the last 10 to 20 million years (Figure 3). Ranges in southeastern Idaho are generally composed of deformed Paleozoic and Mesozoic sedimentary rocks, including thick marine clastic units, comprising cherts and limestones. The valleys are largely in-filled with Quaternary alluvium and colluvium that overlie Pleistocene basalt flows. Middle Pleistocene rhyolite flows of the Snake River Plain regions cover much of the area and complete the geologic sequences in the region.

Massive accumulations of marine sediment occurred during the Paleozoic era over large areas of eastern Idaho. During the Permian Era, the Phosphoria Formation was deposited, forming the western phosphate field, part of which is located in the Idaho Phosphate Mining Resource Area.

2.5 Stratigraphy and Lithology

The stratigraphy of the area is characterized by Paleozoic and Mesozoic sediments overlain by Pleistocene igneous extrusions. The stratigraphy most encountered by mining activities in the area is generally limited to four principal rock units. The stratigraphy, approximate ages, and a description of each unit are summarized in Table 1.

Table 1. Generalized Stratigraphic Setting of Project Area[1].

Unit Name	Age	Description
Dinwoody Formation	Triassic	Interbedded claystone, limestone, and siltstone; ranges from 1,000 to 2,000 feet thick in project area
Phosphoria Formation	Permian	Composed of cherty mudstone, phosphatic mudstone, chert, phosphorite, limestone, and dolomite; phosphorite is the source of phosphate ore and is typically found in the lowermost portion of the formation.
Grandeur Limestone	Permian Pennsylvanian	Massive limestone that is discontinuous in the project area
Wells Formation	Pennsylvanian	Fine to very fine grain quartzitic to calcareous sandstone; approximately 1,500 to 2,000 feet thick in the project area.
Notes: 1. By convention, units are presented from top to bottom, as youngest to oldest.		

At the eastern edge of the resource area, the Phoshporia Formation corresponds to an ancient ocean shelf and is more calcareous and less argillaceous than Phosphoria Formation outcrops to the west.

The Phosphoria Formation includes four members: Meade Peak Phosphatic Shale, Rex Chert, Cherty Shale, and Retort Phosphatic Shale. The Meade Peak member, which ranges in thickness from about 55 to 200 feet, is the oldest and is either overlain by the Rex Chert or the Cherty Shale. The Retort member is discontinuous and is found in the north and eastern parts of the resource area. The Meade Peak member of the Phosphoria Formation is the source of the majority of the produced phosphate ore. Concentrations of phosphate minerals in the Meade Peak member are significantly higher than typical concentrations found in other marine sedimentary rock. (Montgomery Watson, 1998)

2.6 Structure

The Georgetown Canyon Right Fork Mine and the surrounding area are located in the Idaho-Wyoming-Utah Overthrust belt, which extends from the Snake River Plain to near Salt Lake City and is part of the Cordilleran Foreland thrust belt that extends from Alaska to Mexico. Folding and thrusting occurred during the late Jurassic to early Cretaceous when movement began on the Paris Thrust, the westernmost thrust plate.

Compressional tectonics ended in the Cretaceous Period. Subsequently, the resource area underwent a period of extensional tectonics in the Miocene Epoch during which high-angle normal faults cut across the older rocks and Mesozoic folds and thrusts. These large and extensive block fault systems formed the north-trending ranges and valleys of the Basin and Range province.

The major thrust plate in the study area is the Paris Overthrust. The ore bearing units at the mine consist of Pennsylvanian to Triassic age rock (Figure 3) within an overturned syncline. The strata in the mine area are overturned and dip 70˚ to 80˚ westward and strike approximately north.

2.7 Hydrogeology

The major ground water flow systems within the phosphate mining resource area exist in the valley fill sediments and in the Thaynes, Dinwoody, and Wells formations. The Phosphoria Formation has not been found to support any major ground water flow systems and generally acts as a confining unit between the Dinwoody and Wells formations.

Ground water flow in the valley sediments is generally from the valley margins towards the valley center and then down-valley towards lower elevations. Ground water flow within the bedrock aquifers is often controlled by stratigraphy and structural geology, flowing along the bedding in the direction of dip and/or plunge. Regional and localized faulting may form preferential flow paths or boundaries to ground water flow within the bedrock systems.

2.8 Current and Potential Future Land Uses

Current land uses in the area include a national wildlife refuge, a commercial business relying on the local hot spring(s), boating, fishing, swimming, biking, hiking, horseback riding, off-road vehicle touring, and grazing.

Future land uses is likely to remain consistent with current practices on public lands, water ways, and wet lands in the area. Future land use on private parcels of property could potentially include some year-round and/or seasonal homes as is typical else where around Bear Lake.

2.9 Area Fish Species

According to the Idaho Department of Fish and Game (IDFG) database, fish presence in Georgetown Canyon include; redband rainbow trout, rainbow (hatchery) trout, brown trout, and brook trout (IDFG, 2002). There is no information concerning potential fish population in Georgetown Canyon Right Fork.

2.10 Wetlands

Official wetland surveys for the area indicate that no wetlands are located within the 15-mile target distance limit (TDL) from the Georgetown Canyon Right Fork Mine.

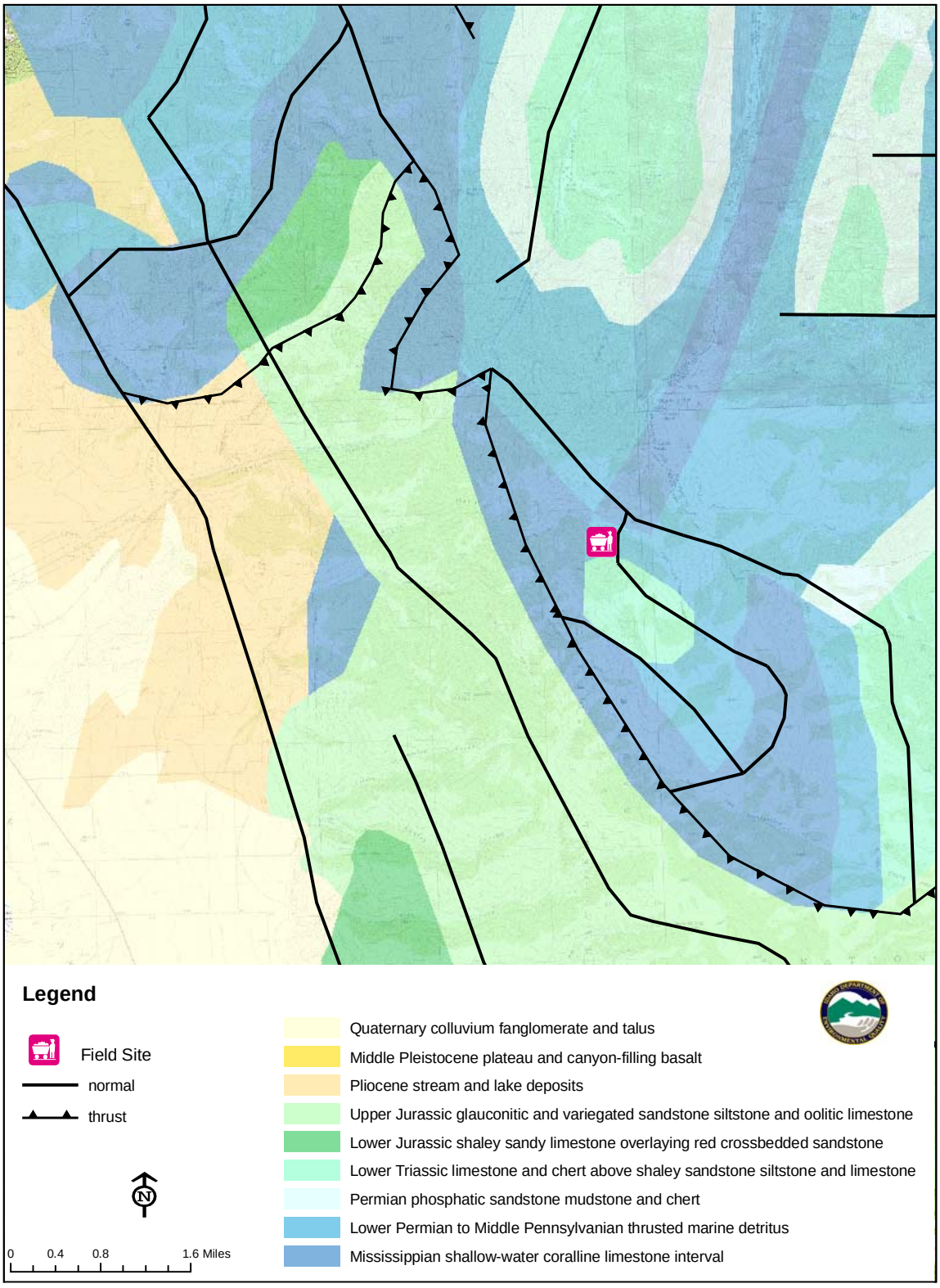

Figure 3. Geologic Map of Georgetown Canyon Right Fork Mine Area (Bond, 1978).

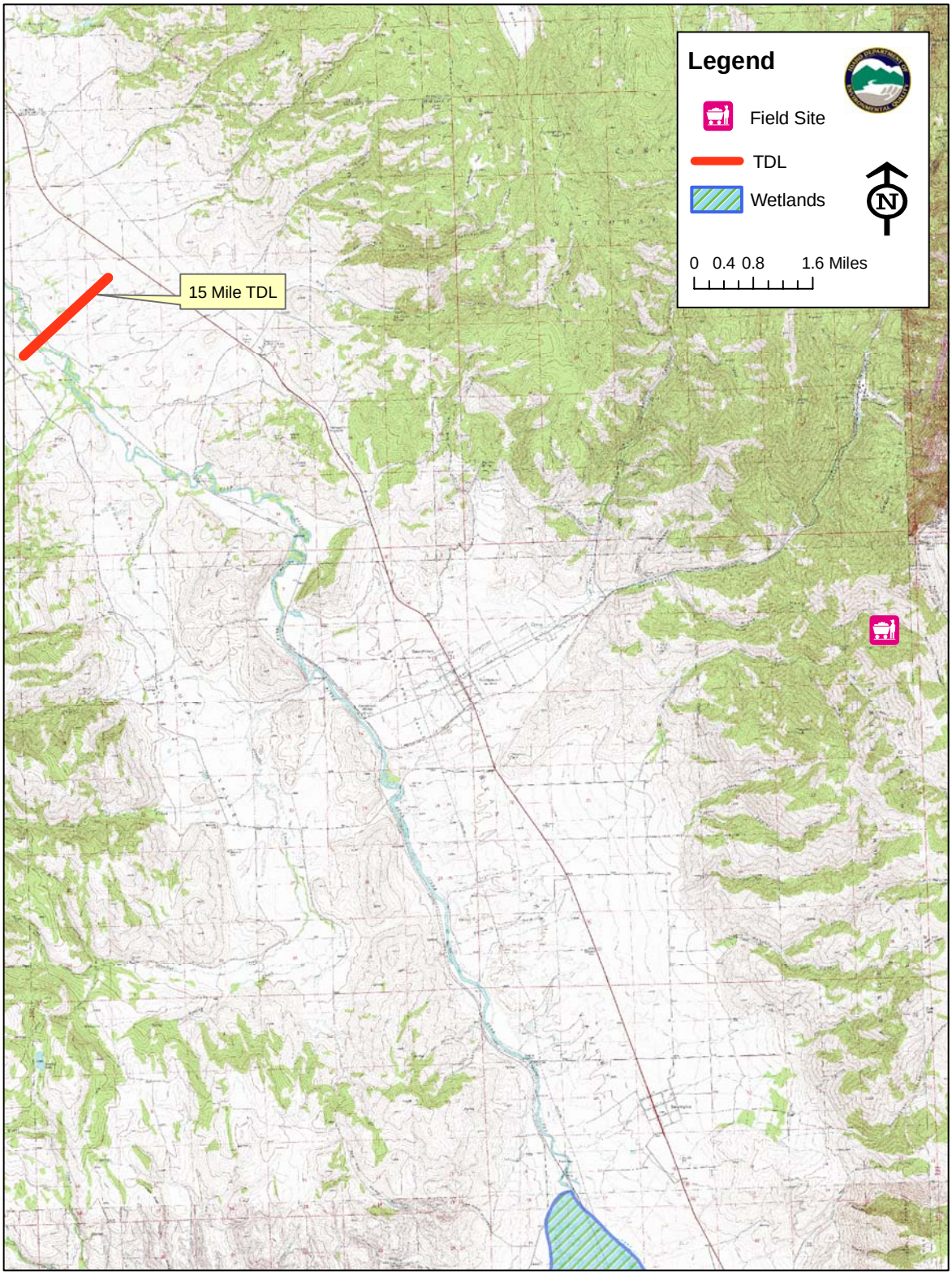

Figure 4. Wetlands in the Georgetown Canyon Right Fork Mine Area

Section 3. Site Overview, Sampling, and Waste Characterization

An interagency team conducted a site visit to the Georgetown Canyon Right Fork Mine during May 2002 (DEQ, 2004a) in accordance with the goals and objectives in the *Area Wide Risk Management Plan*. The visit included a visual inspection of the mine and the collection of one (1) vegetation sample (strawberry), and two (2) soil samples. Sampling locations are shown in Figure 5 and Photos 14.1-14.5 in the Appendix. Samples were analyzed for trace metals and compared to action levels developed for the Area Wide Rick Management Plan (DEQ, 2004b).

3.1 Area Wide Risk Management Plan Action Levels

The Area Wide Risk Management Plan (RMP) was written as a discretionary guidance document to assist Lead and Support Agency representatives with their mine-specific risk management decision-making responsibilities regarding historic mining operation releases and associated impacts from selenium and related trace metals in the Southeast Idaho Phosphate Mining Resource Area. The plan provides removal action goals, objectives, and action levels intended to assist in identifying site-specific areas of concern, focusing regulatory resources, and supporting consistent decision-making using a regional perspective.

The risk-based action levels were developed using deterministic single media dose proportions as the initial basis. These action levels were tested and validated using probabilistic methods that assume simultaneous exposure from all action level media to numerous limited home range surrogate species representing sensitive receptors from the various feeding guilds present in the Resource Area. Due to the limited area of impact and low likelihood of population-level effects, the action level development approach used by DEQ applied slightly less conservative assumptions regarding acceptable hazard quotient ranges than a typical population-level ecological risk assessment might. However, many of the receptor dose model parameters, such as site use, bioavailability and secondary media exposure point concentrations, remained conservatively-biased to represent receptors residing exclusively in impacted areas during toxicologically critical periods such as spawning, nesting, and breeding. The DEQ's risk management decisions focus resources in areas where efforts to minimize potential impacts to ecological subpopulations will provide the greatest benefit.

Action levels were established for the primary media that support sensitive habitats and are most amenable to standard industry measurement and mitigation techniques, which were surface water, groundwater, sediments, fluvial/riparian soils, and vegetation. Elevated contaminant concentrations in the selected action level media are also indicative of the presence of past and/or ongoing releases.

3.2 Sampling

Three samples were collected at the Georgetown Canyon Right Fork Mine, as shown in Table 2.through Table 4. Sample OS-GCM-SO-01-01 is a soil sample collected on the side surface of the waste dump and is composed of almost all black shale. The next two samples were taken at the same location, approximately 25 feet east of the waste dump. Sample OS-GCM-SO-02-01 is a soil sample composed of brown rocky soil, and sample OS-GCM-VE-03-01 is a vegetation sample of wild strawberry.

3.3 Sampling Results

Sample OS-GCM-SO-01-01 (Appendix Photo 14.4) was taken from the black shale waste dump below the collapsed adit. Analysis of the samples showed concentrations of cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se), vanadium (V), and zinc (Zn) 2.1 to 18 times greater than the action levels set by the RMP (DEQ 2004b).

Analysis of soil sample OS-GCM-SO-02-01 showed concentrations of Cd, Ni, V, and Zn 1.3 to 4.7 times greater than the action levels. The vegetation sample, OS-GCM-VE-03-01, collected from the same location had no analytes above the action levels.

3.4 Inspection Findings

The Georgetown Canyon Right Fork mine is located approximately three miles from the Forest Service boundary in the Righthand fork of Georgetown Canyon. Visual observations indicate that the site consists of a collapsed shaft/decline, a black shale waste dump and a wooden cabin with a metal roof (Figure 5). There is a small pile of metal cans located at the bottom of the waste pile on the east side.

The shaft is located in the access road at the base of a road-cut and is approximately 6 feet in diameter and possibly 6 to 8 feet deep. The shaft has collapsed, but may continue as a decline into the lower Phosphoria Formation.

The waste dump is located down the slope, approximately 50 feet southeast of the shaft, and is not easily seen from the access road. The dump is approximately 20 feet tall and 40 feet wide, and is composed primarily of black shale. Volunteer Douglas fir and aspen are revegetating the dump and appear to be approximately 20 years old.

The wooden cabin is located on top of the dump, and is not visible from the road. It appears the cabin is used occasionally, possibly during hunting season.

Figure 5. Georgetown Canyon Right Fork Mine Sample Locations from DEQ, 2004a.

Table 2. Georgetown Canyon Right Fork Mine Soil Sampling Analytical Results

Sample ID	Media	Metal Concentrations in Parts Per Million (ppm)								Species/Type
		Cd	Co	Cr	Cu	Ni	Se	V	Zn	
OS-GCM-SO-01-01	Soil	**110**	3.3	**670**	72	**130**	**16**	**1300**	**800**	Sample from black shale waste dump
OS-GCM-SO-02-01	Soil	**31**	4.2	**490**	45	**110**	**10**	**340**	**590**	Sample of brown soil below dump
Areawide Risk Criteria		**9.2**		**187.0**	**402**	**44**	**7.5**	**72**	**210**	

Table 3. Georgetown Canyon Right Fork Mine Vegetation Sampling Analytical Results

Sample ID	Media	Metal Concentrations in Parts Per Million (ppm)								Species/Type
		Cd	Co	Cr	Cu	Ni	Se	V	Zn	
OS-GCM-VE-03-01	Vegetation	3.7	0.13	12	8.7	6.0	4.1	4.5	180	Wild strawberry
Areawide Risk Criteria		**4.2**		**30.6**	**88.0**	**35.5**	**5.0**	**55.9**	**615.0**	

Section 4. Pathway and Environmental Hazard Assessment

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

4.1 Surface Water

No surface water was observed on the Georgetown Canyon Right Fork mine site. The Right Hand Fork Georgetown Canyon stream appeared to be dry during the site visit.

4.2 Soil/Air Exposure

Access to the mine site is not restricted or posted. The public has access to the site via Right Fork Road.

Due to the proximity of the mine to public roads and recreational areas, soil ingestion for occasional recreation is considered likely. Additionally, the presence of a recreational cabin on the waste pile increases the likelihood of exposure.

4.3 Groundwater

Idaho Department of Water Resources (IDWR) records show ground water flow in the area moves from the highlands toward the Bear Lake Valley floor. This flow is consistent with the topography of the area. It should be noted that the mine is located on or close to a fault (Figure 3), which may also affect local ground water flow patterns. No springs are known to exist near the site. Water levels from domestic wells nearest to the site are approximately 16 feet below ground surface (bgs).

According to IDWR records, 3 domestic water wells are reported to be located within a 4-mile radius of the site (Figure 6). All of these wells are located west of the nearest population center, which is the city of Georgetown. Two public water systems are located within a 4-mile radius of the site:

- Georgetown spring is located 1.9 miles east of the mine. According to Safe Drinking Water Information System (SDWIS) data (DEQ, 2006), this system is a non-community system, services 25 users, and has no water issues.
- Georgetown Well #1 is 2.9 miles east of the mine. According to SDWIS, the system services 30 users.

The public water wells shown in Figure 6 are likely down or cross-gradient from any of the mining activities; the blue hatching represents the 3 year travel time for groundwater to migrate from the perimeter of the hatching to the extraction well. This gives a relative groundwater travel time for the area east of the mine. Wells appear to be completed in the

alluvial materials associated with the Bear Lake Valley. Here groundwater is very shallow and would travel at a much faster rate than in the surrounding highlands.

4.3.1 Potential Receptors

Potential receptors include local residents, ranchers, hunters, anglers, trail riders (motorized and non-motorized), campers, and tourists. Cattle activity surrounding and within the mine site is unknown. Residents, outdoor enthusiasts, and wildlife remain the likeliest potential receptors, as they reside nearby or use surrounding land for recreational activities, forage, breeding, or bedding areas.

The land within a two-mile radius of the site is a mix of private, BLM, and US Fish and Wildlife land. The parcels of land occupied by the mine and waste dumps are owned by private parties.

4.3.2 Schools, Day-Care Facilities, Private Residences

There are no schools, day-care facilities, or private residences within 200 feet of the site, but BLM or U.S Fish and Wildlife workers, in addition to outdoor recreation enthusiasts, may occasionally be within 200 feet of the site.

4.3.3 Plant and Animal Species of Concern

Three animal species are listed as species of concern in the proximity of the site (F&G, 2002). The Great Gray Owl and the Lynx are the animal species within a four mile radius, and the Northern Leopard Frog is the species of concern within the 15 mile TDL of the mine. Figure 7 shows the status of these species.

4.3.4 Soil Sample Concentrations

Soil sample contained the following concentrations:

- Selenium (Se) from 10 to 16 mg/kg
- Copper (Cu) from 45 to 72 mg/kg
- Cobalt (Co) from 3.3 to 4.2 mg/kg
- Cadmium (Cd) from 31to 110 mg/kg
- Chromium (Cr) from 490 to 670 mg/kg
- Vanadium (V) from 340 to 1300 mg/kg
- Nickel (Ni) from 110 to 130 mg/kg
- Zinc (Zn) from 590 to 800 mg/kg

Complete analytical results are presented in Table 2. Arsenic was not analyzed for during this sampling event.

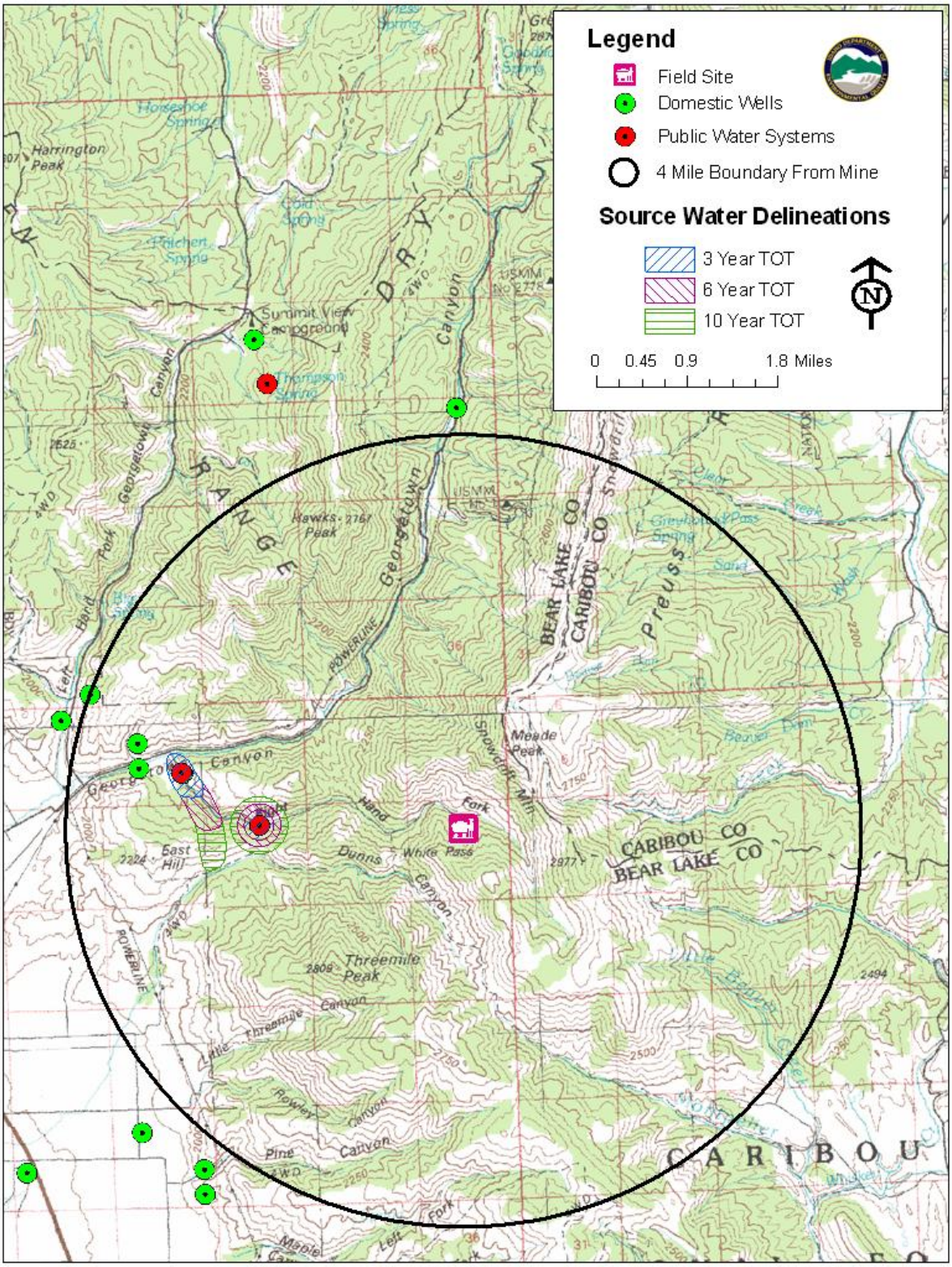

Figure 6. Domestic and Public Water System wells within a 4-mile radius of the Mine.

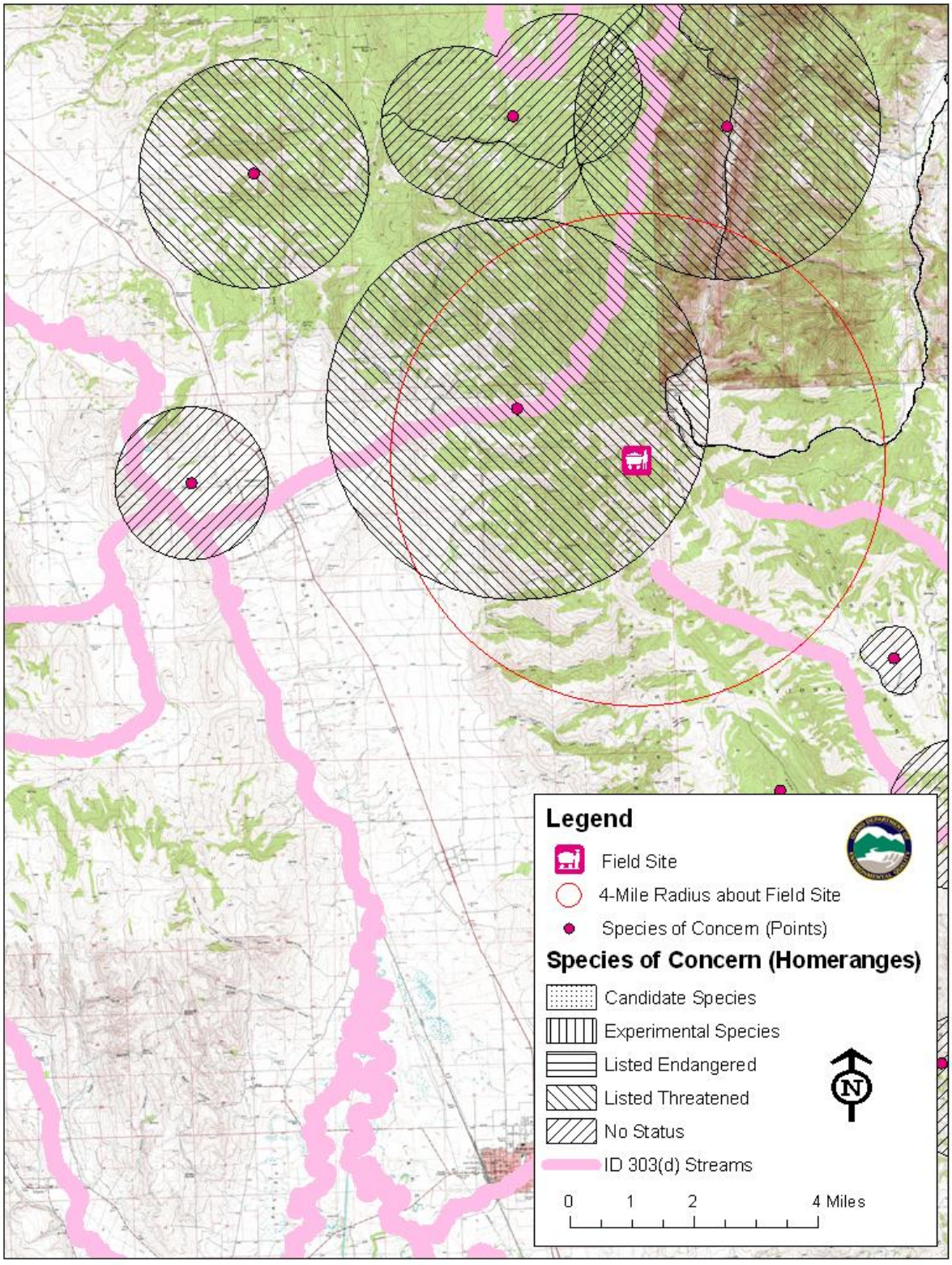

Figure 7. Species of Concern within the Georgetown Canyon Right Fork Mine Area.

Section 5. Conclusions and Recommendations

The recommendations contained herein address not only localized release pathways and associated ecological risks but also any public safety concerns regarding the presence of open adits, portals, or mine shafts. The Georgetown Canyon Right Fork Mine is recommended for site investigations, waste consolidation, potential erosion control, and reclamation improvements.

5.1 Presence of Wetlands

Based on official wetland surveys and aerial photographs of the area there are no wetlands that exist near the site or within the 15-mile TDL.

5.2 Impacts on Water Quality

Surface and ground water impacts related to the mine are currently unknown. Based on the distance to surface water sources and domestic wells, there is a low potential for the Georgetown Canyon Right Fork Mine to impact local water systems.

5.3 Potential Exposure for Wildlife and Vegetation

The vegetated waste rock pile presents potential exposure pathways for wildlife. Native plant species may bio-accumulate high concentrations of metals that may be consumed by the local wildlife. Wildlife, such as deer and elk, that may be exposed to elevated concentrations of metals (via water, soil, or plant material) may be harvested and consumed by humans.

5.4 Potential Exposure for Humans

The public has access to the mine via the roads. There are no reported locked gates or *posted* signs in proximity to the mine site (DEQ 2004a).

Commercial or subsistence fishing does not occur within the 15-mile downstream distance, but sport fishing does. According to the IDFG database, a large number of desirable game fish are native or are stocked in Bear Lake (IDFG, 2002).

Human activity around the mine site is believed to be minimal. Mountain bikers, hikers, hunters, snowmobile operators, off-road four wheeling enthusiasts, and various other outdoor recreation enthusiasts may potentially frequent the area because access is not restricted.

Fugitive dust and direct contact with the waste piles are the two main mechanisms through which humans could be exposed to the metal concentrations at the site. These sources do not appear to present any immediate threat. Although the waste piles have

been shown to have high metal concentrations, exposure for humans to elevated metal concentrations is moderate due to the remote location of the site.

5.5 Recommendations

Despite the small size of the site, the soil samples showed elevated metal concentrations with respect to the Area Wide Risk Management Plan criteria. As a result, the agencies performing the 2002 PA recommended additional actions at the Georgetown Canyon Right Fork Mine site, in the form of further site investigation and closing the partially open shaft on the site.

Additional recommendations based on DEQ's current evaluation of the data include the following:

- Evaluate the site as a component to DEQ's Administrative Order on Consent for the Georgetown Canyon site investigation.
- Re-contouring and re-vegetating those waste piles where natural vegetation has not established itself, and, if necessary, placement of clean soils and re-vegetation of these locations.
- Closure of the partially open shaft.

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Appendix: Photographs

The following photographs were taken during the Preliminary Assessment (DEQ, 2004a).

Photo 14.1: Partially collapsed shaft. View to north.

Photo 14.2: Partially collapsed shaft. View to north.

Photo 14.3: Black waste shale dump, cabin in background.

Photo 14.4: Sample location for OS-GCM-SO-01-01.

Photo 14.5: Sample location for OS-GCM-SO-02-01 and OS-GCM-VE-03-01. Waste dump in background. View to northwest.

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