

FINAL

SITE INSPECTION REPORT, KELLY CAMP MINE, COLVILLE NATIONAL FOREST

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Prepared for:
USDA Forest Service



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LIST OF ACRONYMS

AGP	acid generation potential
amsl	above mean sea level
ANP	acid neutralization potential
APA	abbreviated preliminary assessment
bcy	bank cubic yards
COI	chemical of interest
COPC	chemical of potential concern
CPEC	chemical of potential ecological concern
EE/CA	engineering evaluation/cost analysis
ERA	ecological risk assessment
F	Fahrenheit
GPS	global positioning system
MDC	maximum detected concentration
MRL	method reporting limit
NCP	National Contingency Plan
NFS	National Forest System
NNP	net neutralization potential
NPR	neutralization potential ratio
NTC	non-time critical
PRG	Preliminary Remediation Goal
QA/QC	quality assurance/quality control
RAO	removal action objective
SAP	sampling and analysis plan
SI	site inspection
TRV	toxicity reference value
URS	URS Corporation
USFS	United States Forest Service
XRF	X-ray fluorescence

EXECUTIVE SUMMARY

The Kelly Camp Mine site is an inactive tungsten and copper mine located within the Colville National Forest in northeast Washington State. The site is located approximately 11 miles north of the town of Republic, Washington. The primary objectives of the Kelly Camp SI were to (1) assess any immediate or potential threat that mining wastes pose to human health and/or the environment, and (2) collect sufficient information to support a decision regarding the need for further action. The results for the SI are summarized below by potential exposure pathway.

Groundwater Pathway

- Although URS did not sample groundwater at the Site, its completeness as an exposure pathway was considered and this pathway does **not** appear to be complete. Further assessment of this pathway is **not required**.

Surface Water Pathway

- The only surface water present at the mine site is accumulated water in the main working/stope. Although complete for both humans and ecological receptors, at the Site this pathway does not appear to pose a risk and further assessment of this pathway is **not required**.

Soil Pathway

- The **soil pathway is complete** for both human and ecological receptors and a source of hazardous substances has been documented in this SI.
- The investigation concluded that ecological exposure to soils **does appear** to result in an unacceptable risk, with the primary risk to soil biota from soil contact or ingestion of three metals (copper, lead, and silver).
- An area has been defined that encompasses the highest concentrations (the hot spot) and removal of this area would **result in a significant reduction** of potential risk to ecological receptors.
- The investigation concluded that human exposure to soils **does not appear** to result in an unacceptable risk.

Air Pathway

- The air pathway is **complete** for both human and ecological receptors and was assessed under the soil pathway.

Recommendations

URS Corporation (URS) recommends the following actions based on the SI:

- The scope and removal of the soil/waste rock hot spot should be evaluated in an EE/CA.
- The Forest Service should include the management of the hot spot soil and waste rock as part of the evaluation of how to mitigate the physical hazards.
- There are several areas at the Site that pose a physical hazard. The Forest Service should assess these to determine if they should be removed or mitigated to reduce the hazard.

Project Name: Kelly Camp Mine

Project Location: Section 9, Township 38 North, Range 32 East of the Willamette Meridian

Nearest Surface Water Body: North Fork Trout Creek, 4,000 feet

Latitude: N48° 48' 09"

Area of Disturbance: ~ 5 acres

Longitude: W118° 47' 20"

SUMMARY OF ANALYTICAL/DOCUMENTED CONTAMINATION

Media	Sample Location	Rate of Discharge/Volume (cfs or bcy)	Contaminant	Highest Concentration (mg/kg)	Lowest Criteria (mg/kg)	Background Concentration (90 th Percentile) (mg/kg)
Surface (Mine) Water						
	(no contaminants in mine water pose an unacceptable potential risk)					
Soil (within waste pile)						
	S-30	427 (within main working pile)	Copper	12,600	50 (MTCA--Soil Biota)	32.5
	S-33	427 (within main working pile)	Lead	448	50 (MTCA--Plants)	8.98
	S-33	427 (within main working pile)	Silver	26.6	2 (MTCA--Plants)	0.5 U
Waste Rock						
	WR-1 (main working/stope)	427	Copper	8760	50 (MTCA--Soil Biota)	32.5
	WR-1 (main working/stope)	427	Lead	43.2	50 (MTCA--Plants)	8.98
	WR-1 (main working/stope)	427	Silver	34.3	2 (MTCA--Plants)	0.5 U

Notes:

This table only lists contaminants that were considered a potential risk. These exceedances are considered the major contaminants of concern and not a complete list of all COCs.

Background soil concentrations are the 90th percentile of ten samples with an assumed lognormal distribution.

mg/kg = milligrams per kilograms

U = The analyte was analyzed for but not detected at or above the method reporting limit (MRL).

1.0 INTRODUCTION AND OBJECTIVES

URS Corporation (URS) has prepared this Site Inspection (SI) to provide information on past mining activities at the Kelly Camp Mine (Site) near Republic, Washington (Figure 1). The purpose of the SI is to evaluate the potential risks to human health and the environment stemming from issues identified in the Abbreviated Preliminary Assessment (APA) conducted by the United States Department of Agriculture, Forest Service (Forest Service) at the Site (USFS, 2004).

The SI field activities included sampling and analysis of soil, waste rock, and surface water from the Site and its vicinity. This SI was performed in accordance with the sampling and analysis plan (SAP) prepared by URS and approved by the Forest Service. The SAP was developed based on the scope of work in the request for pricing (R6-27-06-113) provided by the Forest Service and completed in accordance with EPA guidance for conducting PA/SIs (USEPA, 1992a).

The primary objectives of the SI were to:

- assess the immediate or potential threat that (mining) wastes pose to human health and/or the environment and,
- collect sufficient information to support a streamlined risk evaluation to facilitate the decision regarding the need for a removal action. This information was collected in general accordance with CERCLA protocols and documentation requirements for assessments involving hazardous substances.

2.0 SITE DESCRIPTION

2.1 Location

- The Site is an inactive mine located within the Colville National Forest, in Ferry County, Washington. It is located approximately 11 miles north of the town of Republic, in a forested area in the SW ¼ of Section 9, Township 38 North, Range 32 East.
- The Site is found on the USGS 7 ½ Minute Quadrangle Map - Bodie Mountain (USGS, 1992).
- As shown on the Site Vicinity Map (Figure 1), this site is situated approximately 8 miles west of Curlew Lake. The access road to the mine is approximately 0.5 mile on the 391 spur of Forest Service Road number 2148 (Figure 2).

The Site is comprised of four main areas (Figure 3). The latitude and longitude, legal description, and approximate elevation for each of these areas are summarized below. The elevation is presented as estimated using a global positioning system (GPS) derived benchmark elevation.

- Main Working/Stope (Appendix A, Photo Nos. 1-8),
 - 118° 47' 20.1"W/48° 48' 9.7"N
 - Willamette Meridian, Township 38 N, Range 32 E, Section 9, SW ¼
 - 4,665 feet above mean sea level (amsl).
- Lower adit (Appendix A, Photo Nos. 9-11),
 - 118° 47' 22.4"W/48° 48' 6.8"N
 - Willamette Meridian, Township 38 N, Range 32 E, Section 9, SW ¼
 - 4,650 feet amsl.
- Blast rock pile (Appendix A, Photo Nos. 12-14), and,
 - 118°47'23"W 48°48'9"N
 - Willamette Meridian, Township 38 N, Range 32 E, Section 9, SW ¼
 - located between elevation 4,635 and 4,660 feet amsl
- Miscellaneous workings – Seven open cuts and trenches (Appendix A, Photo Nos. 15-17) located to the west of the main working/stope (Figure 3).
 - 118°47'20"W 48°48'9.75"N
 - Willamette Meridian, Township 38 N, Range 32 E, Section 9, SW ¼
 - Located between 4,630 and 4,655 feet amsl

The entire mine site, including all shafts and associated buildings, is approximately 225,677 square feet or just over 5 acres. Additional photographs from the Site are included in Appendix A. A discussion of site geology is presented in Section 3.1.2.

Areas disturbed by mining related activities (e.g., waste rock and blast rock piles, mine openings, buildings, or other debris) are shown in Figure 4. Background samples are from an undisturbed area up gradient of mining impact. Undisturbed areas are commonly marked by the presence of large-diameter trees.

2.2 Operational History

The APA (USFS, 2004) summarizes the operational history of the Kelly Camp Mine. This summary is presented below:

- The earliest record is from Culver and Broughton (1945) who described a “Kelly property” located in Section 6. As of September of 1943, the authors reported that development work on the property consisted of a westward-trending adit, a shaft inclined to the south, and numerous open cuts.
- Huntting (1956) described the “Kelly Camp” in Section 4 with development comprising a 120-foot westward trending adit, several shafts, and numerous open cuts. Production was reported in 1951 (10 tons), 1954 and 1955 and a 25-ton mill was constructed on Lake Curlew in 1952
- Primary ore minerals were chalcopyrite, scheelite, magnetite, and molybdenite while gangue minerals include garnet, epidote, and calcite. The main commodities produced at the Site were tungsten, copper, and molybdenum (Derkey et al., 1990). Huntting (1956) reported that the deposit contained a considerable volume of low-grade ore.
- Host rock for the mineralization includes calc-silicate gneiss, schist, and quartzite.

Although there is limited available operational history beyond that which was previously presented in the APA, the following additional publications were reviewed and key information on the Site is summarized below:

- *Thor H. Kiilsgaard, 1998.* The report described the Site as the Kelly Camp Tungsten Mine with the owners as O. Aavestrud and C.J. Weller.
- *Boleneus, D.E. and R.E. Derkey, 2000.* The report lists the owners as Atlas Mine and Mill Supply, Inc. The listed commodities are copper, molybdenum, silver, and tungsten; exploration or testing was completed in the years between 1989 and 1992.
- *Minarik, R.J. et al., 1992.* The yearbook reports that Orvana Resources Corporation performed exploration work on the Site during 1992.

Based on the available operational history, it appears that **processing did not take place** at the mine site. Therefore, the primary sources of contamination expected at the Site would be waste rock piles or soil that has been impacted by the waste rock piles.

2.3 Waste Characteristics

The waste characteristics of the four main areas are summarized below. The physical hazards associated with each area are also provided.

Main Working/Stope

- The principle mine working consists of four openings into a large, irregularly-shaped underground excavation or stope. The primary opening is an inclined shaft located at the head of a north-trending surface cut; secondary openings are inclined or vertical shafts located nearby to the west and east.
- The average depth of the stope is about 12 feet below the surface. A winze excavated within the stope extends deeper but is flooded below its collar (Appendix A, Photo Nos. 3, 4, 5, and 7).
- Pools of standing water occupy low basins and excavations within the stope. There is no surface pathway that allows this standing water to migrate from the stope. (Appendix A, Photo Nos. 2, 3, and 5).
- There are several physical hazards associated with the main working/stope. These include:
 - o Open shafts that could result of a fall of 10-20 feet.
 - o Slips or trips when standing at the shaft openings.

- o Unstable rock within the shaft and stopes could give way and cause someone to fall into the water ponds.
- The volume of the waste rock pile associated with the main workings is estimated (using prismatic formula) to be 427 bank cubic yards (bcy). The waste rock is poorly sorted and composed of sand- to cobble-sized fragments (Appendix A, Photo No. 8).
- There are no structures associated with the main working/stope.

Lower Adit

- The lower adit portal is located at 4,560 feet amsl and extends into the rock approximately 300 feet to the northeast. The portal is approximately 5 to 6 feet in diameter (Appendix A, Photo No. 9). The physical hazards associated with the lower adit include tripping or falling when within the adit or the collapse of mine timbers used to support the opening.
- The waste rock pile associated with the adit is located 25 feet to the southwest of the adit portal and is approximately 156 bcy in volume. The waste rock pile is comprised of gravel- to cobble-sized rock fragments (Appendix A, Photo No. 10).
- At the time of the site visit there were puddles of water (less than 1 inch) on the sill of the adit that appear to have originated from the overhead rock. There does not appear to be any pathway for the water to migrate from the adit.
- A 10-foot-square, collapsed wooden structure is located 15-20 feet south of the adit portal on a portion of the waste rock pile (Appendix A, Photo Nos. 10 and 11).

Blast Rock Pile

- The blast rock pile is bounded on the uphill side by a head cut or blasting face that strikes approximately east-west along the 4,665-ft amsl contour. It is located approximately 200 feet to the west of the main working/stope (Appendix A, Photo Nos. 12 and 13).
- Several bore holes and blasting wire were observed within the rocks of the pile (Appendix A, Photo No. 14).
- The volume of the blast rock pile is approximately 718 bcy.
- The size of the material within the pile ranged from cobble-sized (near the southern end of the pile) to 4- to 5-foot diameter blocks (Appendix A, Photo Nos. 12 and 13).
- The physical hazards associated with the blast rock include unstable rock that could give way and cause an injury.
- The blasting explosives were likely stored in a small excavation 80 feet to the northwest of the pile (Appendix A, Photo No. 17).
- The access road leading to the main working/stope runs just below the tip of the blast rock pile (Appendix A, Photo 18).

Miscellaneous Workings and Structures

- Seven other lesser exploration cuts, trenches, or pits are located between elevation 4,630 and 4,660, approximately 50-200 feet to the west of the blast rock pile (Appendix A, Photo Nos. 15 and 16).
- The workings are fairly small in size, ranging from a 10-foot-deep shaft to a 15-foot-long trench that is approximately 3 feet deep. There was no observed water in the workings.
- The physical hazards associated with these workings include:

- Falling, as several of these explorations were covered with vegetation during the time of the site visit and were only visible once standing on the side of the exploration,
 - Loose rock on the sides of the workings could cause trips or falls.
- The total estimated volume of waste rock associated with the workings is on the order of 10 bcy.
- There is a shaft located at elevation 4,610 feet amsl, approximately 200 feet to the east of the lower adit portal. The shaft extends 10-15 feet vertically into bedrock and was dry at the time of the site visit. No evidence was observed that standing water is periodically present in the shaft.
- A powder magazine (with an approximate 10' x 7' footprint) is located at elevation 4,535 feet amsl, approximately 525 feet south of the main working/stope and 325 feet southwest of the lower adit. Since the wooden magazine is unstable and may collapse, it is considered a physical hazard.

2.4 Site Description

2.4.1 Topography and Climate

- The area surrounding the mine is characterized by hilly to mountainous topography and narrow stream valleys. The stream valleys are generally oriented in a north-south direction.
- The mine is located at an approximate elevation of 4,600 feet amsl on the south side of Kelly Mountain.
- The climate of the area is temperate, characterized by warm to hot summers and cold winters. Winter precipitation falls predominantly as snow.
- A summary of the climate indicators is provided below and is based on data from the Western Regional Climate Center's Desert Research Institute (WRCC DRI, 2007) for Republic, Washington.
 - The mean annual precipitation is 16.47 inches.
 - The mean maximum temperature for Republic is 55.8 degrees Fahrenheit (F), with an average maximum temperature of 81.5 F in July.
 - The mean minimum temperature is 30.7 F with the average minimum of 15.0 F occurring December.

2.4.2 Ecological Setting

- Under the eco-region classification system (Bailey, 1995), the Site is within the Northern Rocky Mountain Forest Province of the Dry Domain. This area is dominated by mixed evergreen-deciduous forests with most precipitation occurring in the fall, winter, and spring.
- The Site is primarily covered with mature forest canopy, but is interrupted by the mine workings (e.g., openings, waste piles, etc.) and several small meadows.
- At the time of the Site visit, site soils were very dry and with the exception of ants and a few spiders, no soil invertebrates were observed.
- Several species of flying invertebrates were present including representatives of the insect orders Hymenoptera (bees, wasps, and ants) and Diptera (flies).
- No insects or other aquatic life were observed in the mine water from the main working/stope.

- Evidence of mammal use of the Site included observations of chipmunks (probably least chipmunks, *Tamias minimus*), bushy-tailed wood rats (*Neotoma cinerea*), and the scat of cows, deer, and rodents.
 - One wood rat and one midden were observed in the upper mine working above the mine water (Appendix A, Photo Nos. 19 and 20), and two wood rats and six middens were observed in the lower adit.
- Various passerine birds were also observed, predominantly in the forested areas of the Site.

2.4.3 Sensitive Environments

No sensitive environments (as defined in WAC 173-340-200) were observed on site or in its immediate vicinity such as:

- Wetlands, critical habitat for endangered or threatened species, national or state national wildlife refuge, wild or scenic river, rookery, riparian area, big game winter range, and critical habitat, breeding, or feeding area for fish or shellfish.
- A search by the Washington Department of Fish and Wildlife found no priority habitat near the Site.
- There is no grizzly bear or deer winter range habitat within at least 4 aerial miles of the Site (Colville National Forests GIS Data Dictionary).
- The nearest known sensitive environments are National Wetland Inventory wetlands located 1 mile east and west of the Site.
- The nearest winter caribou habitat is located 1 mile away, coincident with the wetlands (Colville National Forests GIS Data Dictionary).
- The nearest pine marten/pileated woodpecker habitat is located 0.21 miles southwest of the Site, near Trout Creek (Colville National Forests GIS Data Dictionary).

2.4.4 Threatened, Endangered and Special Status Species

The Washington Department of Fish and Wildlife conducted a database search of threatened, endangered, and special status species in the vicinity of the Kelly Camp Mine site.

- This search found no records of any threatened, endangered, or special status species within 1.5 to 2 miles of the Site. As wildlife are mobile, this finding does not absolutely ensure that these species are never exposed to the Site, but it does suggest that the Site does not provide especially valuable habitat or support permanent populations of threatened, endangered, or special status species.
- Since the nearest aquatic habitat is approximately 1,700 feet away, fish or aquatic species are unlikely to be affected by site contaminants.

County-level information on threatened, endangered, or special status species was collected from:

- Washington Department of Natural Resources, Natural Heritage Program and
- Upper Columbia Office of Fish and Wildlife

Table 1 summarizes the terrestrial threatened, endangered, and special status species known to be present within Ferry County.

2.4.5 Population and Land Use

Located within the Colville National Forest, the Kelly Camp Mine site is surrounded by rural properties that are primarily in agricultural use; the nearest approximately five miles away.

- Access to the abandoned mine site is unrestricted and accessible by public roads.
- Human land use of the Site and its vicinity is consistent with national forest uses and includes:
 - recreational use (e.g., camping, hiking, hunting),
 - logging, and
 - cattle grazing/management.
- Human use of the Site is apparently periodic and consistent with recreational use. No workers are routinely present on the Site and the nearest known residence is approximately five miles away.
- Indications of human use included:
 - Litter observed on the Site included scrap metal, mechanical parts, spark plugs, a vehicle tire, empty motor oil containers, beer and soda cans, part of a metal barrel, and shotgun and rifle shells.
 - Metal wire with plastic coating was frequently found around the mine debris piles and was possibly used for blasting operations.
 - Several pieces of debris were marked by bullet holes, indicating that the Site has been used for target shooting.
 - Some of the litter was relatively recent (one soda can dated 2005) although much of the metal debris was rusted and appeared quite old.
 - Fresh sawdust was observed on several areas of the Site and on the second day of field work, two men were encountered cutting trees and loading firewood into a truck.

3.0 PATHWAY AND ENVIRONMENTAL HAZARD ASSESSMENT

This section describes plausible chemical migration pathways and exposure routes present at the Site and potentially exposed receptor populations.

3.1 Groundwater Exposure Pathway

Although groundwater was not sampled at the Site, its completeness as an exposure pathway was considered.

3.1.1 Targets

- According to the Department of Ecology's Water Resources Program Well Log records, there are 14 drinking water wells located within the target distance of 4 miles. These wells are identified on Figure 5.
- The closest well is located approximately 2 miles to the south of the Site.
- There are no wells located within the Site's watershed boundaries.
- There is only one well located within a 4-mile radius that may be impacted by site activities since it is located within a watershed downstream from the Site's watershed (well no. 189702).
- The remaining wells within a 4-mile radius are either located up- or cross-gradient from the Site and not likely to be impacted by site activities.
- **Human receptors** are not likely to be exposed to groundwater by ingestion. Although at least one well is located in a watershed down-gradient from the Site, the well's watershed occupies an area of approximately 4 square miles.
- Groundwater is considered to be an insignificant exposure media for **ecological receptors** since it does not daylight outside of the mine near the Site. The nearest natural surface water to the Site is the North Fork Trout Creek, approximately 1,700 feet to the south.

3.1.2 Geologic Setting

The site is part of the Republic mining district which is located within the western portion of the Okanogan Highlands province. The Republic mining district has the second largest producing lode gold mine in the United States and in addition to gold, a number of the mountains in the area contain deposits of copper, iron, silver, lead, and other ores.

- A detailed geology of the Republic area is presented in several papers including: Cheney, 1994, Cheney et al., 1994, Rasmussen, 1983, and Tschauder, 1989. Cheney and Rasmussen used these and several other papers to develop their discussion of the Republic mining district in the June 1996 edition of Washington Geology (WDNR, 1996).
- Kelly Camp mine lies on the northeastern edge of the Okanogan Metamorphic Core Complex, a mass of Paleocene to Eocene granitic plutons that intruded older rocks of the Quesnellia terrain. Quesnellia accreted to the North American continent in the mid-Jurassic.
- Quesnellian rocks consist of a series of formations including the Knob Hill Group (a Permian Ophiolitic suite and chert), the Attwood Group (a succession of argillites and limestones), the Brooklyn Formation (a Triassic chert meta-conglomerate), clastic limestone, and argillite. These are overlain unconformably by a succession of oceanic volcanic and sedimentary rocks.
- The Kelly Camp deposit resulted from contact metamorphism of a roof pendant of the pre-tertiary rocks, probably Quesnellian limestone and siltstone, by Eocene, Herron Creek quartz monzonite.

The ore minerals formed by the contact metamorphism include chalcopyrite (CuFeS_2), scheelite (CaWO_4), magnetite (Fe_3O_4), and molybdenite (MoS_2).

- Late Pleistocene glaciation circa 13,000 years ago has resulted in the deposition of glacial drift deposits across the area. The site area was overridden several times during the most recent regional ice advance, depositing poorly sorted silt, sand, gravel, and cobbles. These deposits are now evident at the mine.

3.1.3 Hydrogeology

- The nearest stream is the North Fork Trout Creek, which is located approximately 1,700 feet to the southwest of site at an elevation of about 4,200 feet amsl, or about 400 feet lower in elevation than the Site. North Fork Trout Creek flows to the east and is a tributary of Trout Creek. Trout Creek flows to the east and empties into 885-acre Curlew Lake.
- Groundwater aquifers likely are present beneath the Site within near surface alluvium and/or glacial deposits and bedrock. A subsurface groundwater study was not conducted as part of this SI.
- The bedrock in the area is expected to contain confined or semi-confined aquifers of low permeability.
- Seeps and springs were not observed at the Site during the site reconnaissance. However, seeps were observed along road cuts located approximately 900 feet southwest and below the mine area and 1,200 feet west and cross gradient from the mine area.
- The groundwater beneath the Site is highly unlikely to reach surface water since there were no observed seeps with overland transport pathways. Moreover, attenuation of many contaminants would occur between the mine and the nearest surface water.
- Depth to groundwater beneath the Site is unknown, although a shallow groundwater aquifer likely contributes mine water to the main working/stope and lower adit. The depth to groundwater beneath the Site likely varies seasonally.
- Groundwater flow direction likely follows topography within near surface alluvium and glacial deposit aquifers. Groundwater flow direction in bedrock aquifers likely flows toward downgradient discharge areas.
- Recharge of aquifers near the Site likely occurs through infiltration of precipitation.

3.1.4 Groundwater Pathway Summary

- With the possible exception of future workers excavating the area, no human or ecological exposures to groundwater are anticipated. For this reason, the groundwater pathway was considered to be incomplete for potential human and ecological receptors.

3.2 Surface Water Exposure Pathway

The only surface water present at the mine site is accumulated water in the main working/stope. This water is present in two small ponds and one vertical shaft. Each pond is several feet deep and the water within the vertical shaft is approximately 10-15 feet deep.

3.2.1 Targets

- **Human exposure** to the ponded mine water present within the main working/stope is unlikely, although humans have used the ponds for incidental litter disposal (primarily wood debris). The Site does not appear to be a dumping ground. Since the ponds appear to only be a few feet deep,

swimming is unlikely. Although unlikely to occur based on the location and appearance of the mine water, human consumption of ponded mine water is possible.

- **Human exposure to ponded mine water is considered to be an insignificant exposure pathway** and is likely limited to incidental and infrequent dermal contact and possible periodic human consumption.
- There are surface water rights within the target distance of 15 miles downstream of the probable point of entry to North Fork of Trout Creek. The Spokane office of the Washington Department of Ecology conducted a search for surface water rights in the following areas:
 - Sections 9, 14, 15, 16, 21, 22, 23, 25, 26, 27, 28, 33, 34, 35, and 36 of Township 38 North, Range 32 East and
 - Sections 5, 6, 7, 8, 9, 16, 17, and 18 of Township 37 North, Range 33 East.
- This search identified 75 surface water rights in the sections specified. Of these, 54 surface water rights had the potential to be hydrologically down-gradient of the Site and thus potentially impacted by site-related contaminants.
 - Surface water rights were considered to be relevant if they were located in an area down-gradient of the Site, including those in North Fork Trout Creek, in Trout Creek, and in Curlew Lake downgradient of the input of Trout Creek.
 - Surface water rights were considered to be irrelevant to the Site if they were up-gradient of the Site or were in waterbodies that were not hydrologically connected to the Site (e.g., by being located in different watershed than the Site). These waterbodies included Bacon Creek, Barrett Creek, Mires Creek, Romies Spring, and West Fork Trout Creek.
 - Surface water rights were considered to have unknown but potential connection to the Site if they were located in Curlew Lake upstream of where Trout Creek enters, or in an unlocated spring, stream, creek, or lake.
- The 28 relevant and 27 potentially relevant surface water rights include the following:
 - 24 rights on Curlew Lake, which is located approximately 9.7 miles down-gradient of the Site,
 - 10 rights on Trout Creek, which is located approximately 1.5 miles down-gradient of the Site,
 - 1 right on North Fork Trout Creek, which is located approximately 0.3 miles down-gradient of the Site, and
 - 16 rights on unlocated and unnamed springs, streams, or creeks.
 - The remaining 3 rights are on two unlocated waterbodies, Lake Roberta and Lawrence Spring.
- The relevant and potentially relevant surface water rights are used for irrigation, stock watering, and domestic uses.
- The only signs of **ecological receptors** in the vicinity of this surface water were the presence of a bushy-tailed woodrat (*Neotoma cinerea*), its midden, and scat within the main working. No other tracks, scat, or observations of animals were observed within the mine workings. No plants or aquatic animals were observed within or adjacent to the mine water.
- **Ecological exposure** through the food web is very unlikely as the ponds seem to support no aquatic life and the use of the mine by other wildlife appears limited.

3.2.2 *Hydrologic Setting*

- The Site is located 1,700 feet from the nearest surface water (North Fork Trout Creek) (Figure 5).
- There does not appear to be any evidence (e.g., erosion gullies) that suggests that site precipitation flows overland between the Site and the nearest creek.
- The site is located within the Ferry Subbasin, which in turn is within the Kettle River watershed.
- There have been limited stream flow studies within the Ferry Sub-basin (GeoEngineers, 2004). Consequently, the closest downstream gauge location from the Site is on the Kettle River after it re-enters the United States approximately 30 miles downstream of the Site.
- Ponded mine water within the main working may contain mining-related chemicals that have leached from the mine walls or been deposited by surface runoff.
- The ponded mine water is located within the main working/stope, approximately 12 feet below ground surface level.
- Water in the main working/stope is static and is likely a result of infiltration and precipitation.
- No evidence of overland flow of water was observed during the Site visit.
- Water was observed in the lower adit. This water appears to have seeped from the host rock. The volume of the water in the lower adit was insignificant at the time of the visit.

3.2.3 *Analytical Results for Mine Water*

This section presents the mine water analytical results. Since the nearest creek is 1,700 feet to the south, surface water samples were not collected from the creek. Two water samples were collected from the ponded mine water in the main working/stope. The results are presented in Table 2. The laboratory analytical report and quality assurance-quality control (QA/QC) discussion is provided in Appendix C. The samples were collected in accordance with the sampling and analysis plan (SAP) for this project (URS, 2007).

- The field pH of the mine water was collected with a pH strip and was approximately 6.5.
- Only 12 of the 33 chemicals analyzed in mine water were present at detectable concentrations.
- Of the 33 chemicals tested, the maximum detected concentration (MDC) or method reporting limit (MRL) of six chemicals exceeded at least one human health screening criterion. These six chemicals were aluminum, antimony, iron, manganese, phosphorus, and thallium.
 - The exceedances of antimony, phosphorus, and thallium were caused by MRLs that were greater than the screening criteria.
 - Antimony was not detected at an MRL of 0.020U mg/L which exceeds its lowest screening criterion of 0.006 mg/L (WDOH and EPA MCLS).
 - Phosphorus was not detected at an MRL of 0.05U mg/L which exceeds its lowest screening criterion of 0.00016 mg/L (WDOE Method B).
 - Thallium was not detected at an MRL of 0.015U mg/L which exceeds its lowest screening criterion of 0.0011 mg/L (WDOE Method B).
 - The analytical method selected for site mine water employed standard MRLs capable of providing detections in the range of ug/L while also allowing analysis of a broad set of metals at a reasonable cost.

- Of the 33 chemicals analyzed, only three had screening levels that were below these standard MRLs. Although it is technically possible to obtain lower MRLs, the additional cost would be disproportionately high compared to the likely potential additional risk posed by these three chemicals.
 - Although the precise amount of potential risk contributed by these chemicals is unknown, these three undetected chemicals are considered unlikely to present significant unacceptable risks to human receptors.
- The remaining three exceedances (aluminum, iron, and manganese), exceeded “secondary drinking water standards” which are not human health-based criteria, but are instead protective of aesthetic effects (e.g., taste, odor, or color).
 - The MDC of aluminum was 0.12 mg/L which exceeded the EPA MCL secondary criteria of 0.05 to 0.2 mg/L.
 - The MDC of iron was 0.34 mg/L which exceeded the WDOH and EPA MCL secondary criteria of 0.3 mg/L.
 - The MDC of manganese was 0.117 mg/L exceeded the WDOH and EPA MCL secondary criteria of 0.05 mg/L.
- Since samples of mine water did not exceed any health-based criteria, mine water was not assessed further for human health risk.
- Three chemicals detected in mine water exceeded conservative aquatic screening criteria for ecological receptors and are considered chemicals of potential ecological concern (CPECs) for mine water: aluminum, barium, and copper.
- Nine chemicals in mine water exceeded conservative screening criteria protective of aquatic life and are considered CPECs. These nine chemicals were not detected in mine water but had MRLs that were greater than the screening criteria (Table 2).
 - Beryllium was not detected at an MRL of 0.0020U mg/L which exceeded its lowest screening criterion of 0.00066 mg/L (ORNL PRGs).
 - Boron was not detected at an MRL of 0.040U mg/L which exceeded its lowest screening criterion of 0.0016 mg/L (ORNL PRGs).
 - Total cadmium was not detected at an MRL of 0.0020U mg/L which exceeded its lowest screening criterion of 0.0011 mg/L (ORNL PRGs).
 - Total lead was not detected at an MRL of 0.0075U mg/L which exceeded its lowest screening criterion of 0.0032 mg/L (ORNL PRGs).
 - Lithium was not detected at an MRL of 0.02U mg/L which exceeded its lowest screening criterion of 0.014 mg/L (ORNL PRGs).
 - Mercury was not detected at an MRL of 0.00020U mg/L which exceeded its lowest screening criterion of 0.000012 mg/L (WDOE Aquatic Life).
 - Selenium was not detected at an MRL of 0.04U mg/L which exceeded its lowest screening criterion of 0.00039 mg/L (ORNL PRGs).
 - Silver was not detected at an MRL of 0.005U mg/L which exceeded its lowest screening criterion of 0.00036 mg/L (ORNL PRGs).
 - Thallium was not detected at an MRL of 0.015U mg/L which exceeded its lowest screening criterion of 0.009 mg/L (ORNL PRGs).

- o The analytical method selected for site mine water employed standard MRLs capable of providing detections in the range of ug/L while also allowing analysis of a broad set of metals at a reasonable cost. Screening criteria are risk-based and developed without consideration of cost constraints.
- o Of the 33 chemicals analyzed, nine had screening levels that were below these standard MRLs. Although it is technically possible to obtain lower MRLs for many of these chemicals, the additional cost would be disproportionately high compared to the likely potential additional risk posed by these three chemicals.
- o Although the precise amount of risk contributed by these chemicals is unknown, these undetected chemicals are considered unlikely to present risks to the populations of ecological receptors that may contact the Site.
- The hardness value of the water was 82.89 CaCO₃/L.

3.2.4 Surface Water Pathway Summary

Human Health

- Mine water is unlikely to be used as a drinking water source by people. Contact with mine water is most likely to be incidental and infrequent dermal contact.
- Mine water does not pose a risk to human health and no chemicals of potential concern (COPCs) were identified.

Ecological

- The ponded mine water is located within the main working and does not provide aquatic habitat. Mine water is most likely only used as a drinking water source for the wood rat living in the main working/stope.
- Aluminum, barium, and copper detected in mine water exceeded conservative screening criteria for aquatic life and are considered CPECs.
- Nine chemicals in mine water exceeded conservative screening criteria protective of aquatic life and are considered CPECs. These nine chemicals were not detected in mine water but had MRLs that were greater than the screening criteria.

3.3 Soil Exposure Pathway

The ground surface of Kelly Camp Mine is primarily covered by grasses, shrubs, and rocks. Most exposed soil on the Site is limited to the access roads and waste rock piles.

3.3.1 Targets

- **Human receptors** potentially exposed to site soils include adults and children present on the Site for recreational uses. These human receptors may potentially be exposed to site soil through dermal contact or ingestion of impacted surface soil or dust.
- There are no residences present within a target distance of 200 feet, and no known resident, student, worker, or subsistence gatherer populations located within a target distance of 1 mile of the Site.
- **Ecological receptors** may be exposed to site soil through dust inhalation, dermal exposure, incidental ingestion, and food web exposure. Ecological receptors at the Site are considered to be plants, soil biota, birds, and mammals.

3.3.2 Previous Investigations

- The only documented soil investigation at the Site was the APA completed in 2004 by the Forest Service.
- During the APA the Forest Service collected and analyzed two samples of waste rock using a Niton X-ray fluorescence (XRF) model XL-722S.
- Based on XRF results of arsenic and chromium that exceeded either MTCA (WDOE, 2005) cleanup goals or EPA Preliminary Remediation Goals (PRGs), the Forest Service recommended that an SI be performed on the Site (USFS, 2004).

3.3.3 Analytical Results for Soil

A total of 40 soil and waste rock samples were collected in and around the mine and waste rock piles (Figure 6).

- Sample locations were selected for the following reasons:
 - Soil sample locations were selected to characterize the soil concentrations of chemicals within and downgradient of areas of disturbance.
 - Samples were also located along the road in order to identify any distinct chemical characteristics that may have been associated with transportation. Since the road would be expected to receive more use by human and ecological receptors than the rest of the Site, identifying high concentrations along the road may have affected exposure concentrations.
 - Since sample locations were not randomly placed throughout the Site, but were targeted near or within areas of disturbance, sample concentrations are likely to be higher on average than site concentrations.
- Soil and waste rock samples consisted of the following:
 - o Ten soil samples collected from a background area (Figure 7). These samples were designated SB-1 through SB-10.
 - o Five soil samples collected from within waste rock piles (Figure 6). These samples were designated S-30, S-31, S-32, S-33 and RS-13.
 - o Twenty-one soil samples collected from outside waste rock piles (Figure 6). These samples were designated RS-11, RS-12, RS-14, S-10 through S-29 and samples S-34 through S-36.
 - o Four samples were collected of larger grain-sized material from the waste rock or blast rock piles (Figure 6). These samples were designated as WR-1 through WR-4.
- Screening was conducted using an XRF unit to help select final soil sampling locations (Figure 8). The results are summarized in Table 3.
- The analytical soil results are summarized in Table 4 and Table 5. Table 6 presents site soil data sub-divided by areas within the Site.
- The analytical waste rock results are summarized in Table 7 (Acid Base Accounting), Table 8 (total metals), and Table 9 (TCLP/SPLP).
- To conserve project resources, laboratory analysis of site soil samples was performed in two parts.

- o First, three samples were selected to undergo a full metals analysis. This analysis included analyzing for 33 metals (Table 4).
- o Second, after these results became available, the remaining 23 site soil samples, 10 background soil samples, and waste rock/blast rock samples were analyzed for a focused subset of 12 metals. These 12 metals were selected based on the characteristics of the full screen results, especially the magnitude of chemical concentrations.
- o Four site and one background soil sample were also analyzed for arsenic (As^{+3} and As^{+5}), and cadmium (Cr^{+3} and Cr^{+6}), speciation (Table 10).

3.3.3.1 Background Soil Results

- Two metals (selenium and silver) of the 12 analyzed were not detected above MRLs (Table 11).
- The background results were used to evaluate the relative enrichment the Site activities have had on natural occurring metals.

3.3.3.2 Waste Rock/Blast Rock Results

Waste rock samples were collected to estimate the acid leachate generation potential and determine if metals leaching from the waste rock could impact surface water or groundwater quality. The results of the waste rock samples were not used in the risk assessment since the size of the rock would prevent uptake by humans or ecological receptors. The waste rock samples were collected from the following locations:

- WR-1 – main working/stope waste rock pile,
- WR-2 – waste rock generated from the various workings west of the blast rock pile,
- WR-3 – lower adit waste rock pile, and
- WR-4 – blast rock pile.

Metals

- Waste rock metals results are summarized on Table 8.
- The metal results from waste rock indicate significantly elevated concentrations of copper and manganese in WR-1. Other metals exceeding one or more screening criterion include: arsenic, cadmium, chromium, lead, selenium, silver, and zinc.
- Copper is likely associated with the sulfide mineral chalcopyrite and was likely released or is being released from waste rock associated with sulfide oxidation. Copper may also be stored as secondary copper oxyhydroxide minerals in the waste rock.
- Waste rock sample WR-2 contained concentrations of arsenic, cadmium, chromium, copper, lead, manganese, selenium, and zinc above one or more screening criteria.
- In waste rock sample WR-3, chromium, copper, manganese, selenium, and zinc exceeded one or more screening criteria.
- In waste rock sample WR-4, arsenic, chromium, copper, manganese and zinc were elevated above one or more screening criteria.

Acid Base Accounting

- The waste rock samples WR-1 through WR-3 were analyzed for their acid base accounting properties.

- The Modified Sobek –Acid Neutralization Potential (ANP) indicates that the neutralization capacity of the waste rock is variable, ranging from 22.5 to 296.4 kg CaCO₃/ton.
- The sulfur speciation results indicate that the total sulfur concentrations in waste rock samples are relatively low (i.e., <0.20 weight %).
 - In sample WR-1, the sulfate sulfur concentration was 0.11 weight % suggesting that sulfide oxidation has occurred and/or is occurring within the waste rock dump.
 - Sample WR-2 has negligible sulfide (<0.1 weight %) and sulfate sulfur (0 weight %) present.
 - Sample WR-3 has minimal sulfate present (0.03 weight %) suggesting that sulfide oxidation has been minimal or sulfide oxidation by products have been flushed from and not stored in waste rock.
- Net Neutralization Potential (NNP) values for these three waste rock samples range from 17.2 to 296.4 kg CaCO₃/ton, indicating ANP is greater than the Acid Generation Potential (AGP). Similarly, the Neutralization Potential Ratio (NPR) (or ratio of ANP to AGP) of the three samples ranged from 4.2 to 9,486.1, indicating the ANP is greater than the AGP.
- Applying conservative criteria of 0.3 weight % total sulfur and an NPR of 4, the three samples collected indicate a very low to no potential for AMD. This prediction is supported by the neutral pH of the mine water.
- However, the results for sample WR-1 indicate that sulfide oxidation has occurred and stored oxidation byproducts are present that may be released into the receiving environment under site-specific geochemical conditions in the future.
- With the highest sulfide sulfur content and the lowest ANP, sample WR-3 has the greatest acid generating potential of the three waste rock samples.
- WR-1 Summary – Although the sample has a no potential for generating AMD, sulfate concentrations suggest that some sulfide oxidation has occurred and secondary byproducts are stored in the upper adit pile.
- WR-2 Summary – This sample has no potential for generating AMD. The concentrations of copper and manganese, in particular, are elevated.
- WR-3 Summary – This sample has no to a low potential for generating AMD.

TCLP/SPLP

Waste rock TCLP and SPLP results are summarized in Table 9. A summary of its key findings follows:

- None of the rock samples exhibit the characteristic of toxicity as defined by 40 CFR 261.24 since the TCLP leachate concentrations do not exceed the maximum concentrations laid out in Table 1 of Section 261.24.
- Metal concentrations in TCLP leachate were generally higher than those in SPLP leachate.
- Two chemicals (cobalt and lead) were detected in TCLP leachate but not in SPLP leachate.
- The Synthetic Precipitation Leaching Procedure (SPLP) was developed to characterize leachate from soil or rocks exposed to acidic rains. This test is applicable to wastes left in situ, a reasonable scenario for this site. SPLP results can be used to describe the potential for chemicals to leach from soil to groundwater.
- The MDCs of the SPLP results were compared to leachate screening criteria.
 - No detected concentrations in SPLP leachate exceeded these screening criteria.

- o Only the MRL of arsenic at 0.02U mg/L exceeded the screening criteria of 0.005, 0.0048, 0.010, and 0.010 mg/L of MTCA Method A, MTCA Method B, WDOH MCLs and EPA MCLs, respectively.
- These results suggest that groundwater is unlikely to be impaired by leachate from waste rock and blast rock piles.

3.3.3.3 Soil Results

Site soil samples were divided into separate categories: soil collected from within each waste rock pile and soil collected outside of waste rock piles (Table 6). When separated in this manner, differences in soil characteristics emerge, more specifically:

- Soil from within the main working/stope waste rock pile generally showing higher concentrations of arsenic, cobalt, copper, lead, manganese, and silver than soil samples from outside of waste piles.
- The soil sample from the lower adit waste rock area has a low concentration of copper compared to the main working/stope waste rock area, but has the highest concentration of chromium on the Site.

Since human health and ecological receptors will be assumed to randomly access soils across the entire site, all site soil will be combined for purposes of the streamlined risk assessment.

- **Human Exposure** – Two of the 12 metals screened exceeded at least one generic screening criterion protective of human health. These two metals (arsenic and cadmium) were considered COPCs and are quantitatively assessed in the streamlined human health risk assessment.
- **Ecological Exposure** – To assess potential risk to ecological receptors stemming from exposure to site soils, 95% UCL concentrations of chemicals in site soils were compared to generic screening criteria protective wildlife and MDCs were compared to generic screening criteria protective of immobile receptors (plants and soil biota). MTCA Table 749-3 was the primary source of ecological screening criteria. All receptors were considered to use the Site exclusively (i.e., an area use factor of unity) which is a conservative assumption for species such as large mammals and birds.
- **Ecological Exposure** – All 12 metals screened exceeded at least one generic screening criterion protective of ecological receptors. These 12 metals (arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc) were considered CPECs and were quantitatively considered in the streamlined ecological risk assessment.

3.3.4 Soil Pathway Summary

Human Health

- Potentially significant **human exposure** to site-related contaminants is most likely to occur through dermal contact or ingestion of impacted soil or dust. Site soil concentrations of arsenic and cadmium exceeded conservative generic screening criteria for human receptors. The streamlined human health risk assessment, will quantify the potential risk to human health.
- **Ecological exposure** may occur through food web uptake of impacted food sources or direct exposure to site soils. Site soil concentrations of arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc exceeded conservative screening criteria for ecological receptors. The streamlined risk assessment quantifies the potential risk to ecological receptors.

3.4 Air Exposure Pathway

3.4.1 Targets

- The target distance for air has been defined as 4 miles from the Site.
- Dominant wind direction in this area was not considered during the SI.
- Based on a review of well logs in the area, there could be up to 13 residences located within 4 miles of the Site (Figure 5). It is not known if these are year-round residences or seasonal homes.
- Based on the forested nature of the Site and the distance of the nearest residences from the Site, local residents are unlikely to be affected by historical Site activities.

3.4.2 Air Exposure Pathway Summary

- Air samples were not collected as part of the field activities.
- Metals were likely released to the air during the mining and blasting processes as dust and particulate matter.
- The air pathway is complete because metal impacted soil is concentrated at the surface where human and ecological receptors could be exposed to particulate matter by inhalation.
- Since inhalation risk stems from particulates released from contaminated soil, this pathway will be addressed in the risk assessment as part of the soil exposure pathway. In the risk assessment, risk from inhalation of contaminated soils was calculated through the receptor-specific modeling.

4.0 STREAMLINED RISK EVALUATION AND ASSESSMENT

A summary of the streamlined risk evaluation is presented in this section. Appendix B contains the detailed risk evaluation.

4.1 Streamlined Human Health Risk Assessment

- A human health risk assessment is used to quantitatively evaluate carcinogenic risks and non-carcinogenic hazards to human health that are attributable to exposure to site-related chemicals in exposure media.
- Mine water and soil comprise the media of interest for human health. To determine which metals should be evaluated further in the risk assessment, the water and soil results were compared to generic screening criteria developed for industrial and unrestricted land uses and background concentrations.
 - Since samples of mine water did not exceed any health-based criteria, no mine water chemicals of interest (COIs) were considered to be human health COPCs.
 - Of the 12 chemicals measured for in soil, only arsenic and cadmium exceeded human health generic screening criteria.
 - These two metals in soil (arsenic and cadmium) were considered contaminants of potential concern (COPCs) and evaluated further in the risk assessment.
- Appendix B contains the streamlined human health risk assessment. The following sections summarize the risk assessment.

4.1.1 Risk and Hazard Estimates

- Given the site use, the likelihood of long-term exposure to site contaminants by any human receptors is considered low.
- Based on its remote location, evidence of site use, and road access, adult and child recreational users are the most likely human receptor populations to be exposed to site media.
- Carcinogenic risk and non-carcinogenic hazard was calculated for adult and child recreational users exposed to site soils. Appendix B contains the receptor-specific exposure calculations used to estimate risk.
- Human health risks are considered to be potentially unacceptable if the risk estimates for carcinogenic endpoints are greater than 1E-06.
 - Since the carcinogenic risk estimate did not exceed 1E-06, the findings suggest that no unacceptable carcinogenic risks to recreational users are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways.
- Human health risks are considered to be potentially unacceptable if the hazard indices for non-carcinogenic endpoints are greater than 1.
 - Since the hazard index for non-carcinogenic endpoints did not exceed one, the findings suggest that no unacceptable non-carcinogenic risks to recreational users are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways.

4.1.2 Determination of Hotspots

- The results of the human health risk assessment do not suggest that site concentrations pose unacceptable risk to current and probable future human receptors.

- There are no hot spots for potential risk of exposure to human receptors to site media.

4.1.3 *Determination of Clean-up Level*

- As evaluated during this streamlined risk assessment, clean up is not required for the protection of human receptors.
- Concentrations of cadmium at the Site, however, did exceed MTCA Method A soil cleanup criteria for unrestricted land use. These criteria are protective of both human and ecological uses, including uses of the Site such as residential use. Due to the nature and remoteness of this Site and its presence on Forest Service land, residential exposure is considered to be an unlikely scenario and these criteria are considered to be overly conservative.

4.1.4 *Summary*

- Initial screening of mine water using conservative generic screening criteria found that potential human health risk from contact with mine water was negligible.
- Initial screening of soil using conservative generic screening criteria found that potential human health risk from contact with site soil was limited to arsenic and cadmium.
- Potential human health risk from arsenic and cadmium was then quantified using recreational user-specific models which found no potentially unacceptable risks to child and adult receptors periodically using the Site. However, MTCA Method A soil cleanup levels for unrestricted use are exceeded at the Site for cadmium concentrations.
- The findings of this receptor-specific recreational user model suggest that no potentially unacceptable risks are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways under either the RME or CTE scenarios.
- Since no COPCs in mine water and soil were present at concentrations that produced potentially unacceptable health risks, no human health COCs were identified.

4.2 *Streamlined Ecological Risk Evaluation and Assessment*

- The purpose of an ecological risk assessment (ERA) is to determine if chemical concentrations in site media cause potential unacceptable risks to ecological receptors.
- Appendix B contains a detailed discussion of the ecological risk assessment. The following sections summarize the risk assessment.

4.2.1 *Conceptual Ecological Exposure Model*

- Potentially contaminated exposure media for ecological receptors include site soils and mine waste, and site mine water.
- A summary of the complete, incomplete, and insignificant pathways is depicted in the conceptual site model (Figure 9).
 - Potentially complete pathways for immobile receptors (e.g., plants and soil biota) include direct exposure to site surface soils and mine wastes.
 - Potentially complete pathways for mobile receptors (e.g., birds and mammals) include incidental ingestion of surface water, food web exposure to surface water, incidental ingestion of surface soil and mine wastes, and food web exposure to surface soil and mine waste.

4.2.2 Risk and Hazard Estimates

- Mine water results were initially compared to readily available generic screening criteria developed for protection of aquatic life (WDOE aquatic life criteria (WAC, 2006) and PRGs for ecological endpoints (Efroymson et al., 1997)).
- Soil concentrations were initially compared to generic screening criteria developed for protection of terrestrial plants, soil biota, and wildlife (MTCA Table 749-3).
- Ecological COIs in soil and mine water with MDCs or MRLs that exceeded generic screening criteria became chemicals of potential ecological concern (CPECs). These CPECs are summarized below:
 - CPECs in mine water included aluminium, barium, and copper as well as beryllium, boron, cadmium, lead, lithium, mercury, selenium, silver, and thallium.
 - CPECs in soil included arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc.

The CPECs identified in the generic screening were further assessed through an evaluation of risk ratios.

- If the risk ratio is greater than 1, then the exposure point concentration exceeds the screening criterion. Risk ratios greater than 1 indicate the potential presence of an unacceptable risk to threatened and endangered species, which are protected at the individual level.
- Risk ratios greater than 5 indicate the potential presence of an unacceptable risk to populations of ecological receptors. This level of protection is considered most appropriate for non-threatened and endangered species.
- Multiple risk ratios may occur for a single chemical when an exposure point concentration is compared to more than one generic screening criterion.
- Evaluation of Risk Ratios in Mine Water
 - One chemical in mine water (copper) had a risk ratio greater than five. This chemical was further assessed by locating a toxicity reference value (TRV) specific for mammal ingestion of water containing copper. Copper concentrations did not exceed this TRV, suggesting that there is no potential unacceptable risk to ecological receptors exposed to the mine water.
 - For this reason, **potential ecological risk** from ingestion of mine water **is considered to be low**.
- Evaluation of Risk Ratios in Soil
 - Twelve chemicals detected in soil had at least one risk ratio greater than 1 and are considered to be CPECs in soil.
 - These 12 chemicals, (arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc), had risk ratios ranging from below one to 252.
 - In soil, risk ratios greater than five occurred for copper, lead, selenium, and silver, with the greatest risk ratios associated with copper concentrations.
 - Since the Site sample concentrations for selenium are similar to background concentrations, only the risk ratios of copper, lead, and silver were considered to be indicative of potential ecological risk.

- o The highest risk ratio for each of these three metals was 252 for copper, 9.0 for lead, and 14 for silver.
 - o For this reason, **potential ecological risk** from ingestion of site soil is **considered to be present**.
- Appendix B contains a detailed discussion of how the ecological risk estimates were developed for the ecological risk assessment.

4.2.3 Determination of Hotspots

- Hot spots in soil were determined for ecological receptors by comparing each soil sample concentration of copper, lead, and silver to its lowest MTCA Table 749-3 screening criterion.
- A site soil sample was considered to have an elevated concentration if it exceeded the higher of five times the most conservative screening criterion or twice the background concentration.
- Nine samples met this criterion (RS-12, RS-13, S-18, S-21, and S-30 through S-34). These samples were collected near the main working/stope and associated waste rock pile.
- If just the five samples with the highest copper concentrations were removed from the Site, this change would reduce the copper risk ratios for wildlife and for soil biota significantly.
- Since samples with the highest copper concentrations also have high concentrations of lead and silver, removing soil from the areas around the five samples with the highest concentrations of copper would reduce risk from lead and silver as well.

4.2.4 Determination of Clean-up Level

- Although soil concentrations of copper, lead, and silver at the Site appear to have the potential to cause unacceptable ecological risk, the determination of a final soil clean-up level associated with a removal action should occur only after considering methods to further narrow the uncertainty surrounding this estimate of ecological risk.
- A very conservative clean-up level for ecological receptors could be generated by taking the lowest of either the Site background or five times the MTCA screening values for copper, silver and lead. Limiting COPEC concentrations to 5 times ecological screening values would create risk ratios of 5 or less, levels which would be protective of populations of non-threatened and endangered species.
- If followed, this results in the following cleanup levels:
 - o Copper – 250 mg/kg
 - o Lead – 250 mg/kg
 - o Silver – 10 mg/kg

4.2.5 Summary

- The only CPEC in mine water with a risk ratio greater than five was copper, with a risk ratio of 10.
 - o The ecological risk from ingestion of mine water is considered to be low since the most likely receptor (mammal) did not have a potentially unacceptable ecological risk.
- In soil, risk ratios greater than five occurred for copper, lead, selenium, and zinc.

- o Based on the rationale presented above, only the risk ratios of copper, lead, and silver were considered to be indicative of potential ecological risk.
- o The highest risk ratio for each of these metals was 252 for copper, 9.0 for lead, and 14 for silver.
- o A very conservative cleanup level could be generated by taking the lowest of either the Site background or five times the MTCA screening values for copper, silver and lead.
- o If followed, this results in the following cleanup levels:
 - Copper – 250 mg/kg
 - Lead – 250 mg/kg
 - Silver – 10 mg/kg

4.3 Summary and Recommendation

- The streamlined human health risk assessment found that potential human health risk from consumption of mine water was negligible and that potential human health risk from contact with site soil was limited to arsenic and cadmium.
- Human health risk from arsenic and cadmium was then quantified using recreational user-specific models which found no potentially unacceptable risks to child and adult receptors periodically using the Site.
- The only CPEC in mine water with a risk ratio greater than five was copper. Further assessment of copper concentrations using a TRV for mammals ingesting water found no potential unacceptable risk.
- In soil, risk ratios indicated the potential presence of unacceptable risk for ecological receptors exposed to copper, lead, and zinc.
- Potential soil clean-up levels could be:
 - o Copper – 250 mg/kg
 - o Lead – 250 mg/kg
 - o Silver – 10 mg/kg
- Nine individual sample locations exceed one or more of these concentrations.
 - o Five of these sample locations are within the bounds of the main working/stope waste rock pile and were therefore designated as a hot spot.

5.0 REMOVAL ACTION JUSTIFICATION

CERCLA and the National Contingency Plan (NCP) authorize two types of responses to releases of hazardous substances: remedial and removal actions.

- Based on the results of the SI, an emergency or time-critical removal action is not warranted at this site. Therefore, if a removal action is performed it should be a non-time critical removal action.
- Non-time critical (NTC) removals generally attempt to control the source of contamination and are sometimes followed by a remedial action to complete site response, but could be used as a final action.
- The need for a NTC removal action is based on the following factors:
 1. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
 2. Actual or potential contamination of drinking water supplies or sensitive ecosystems;
 3. Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release;
 4. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
- Based on the streamlined risk assessment, the factors #1 and #4 above are considered complete; therefore, a removal action may be appropriate for the Site.
- The primary chemical concern at this site is the ecological exposure to soil and waste rock, specifically related to copper concentrations, with lead and silver contributing a smaller amount of risk.
- Estimated volumes of waste rock are summarized on Figure 10.
- A discussion of the hot spot evaluation is presented in Section 4. If the entire hot spot area were included in the potential removal action area, this would result in a volume of 560 bcy (Figure 11).
- Potential removal actions could include the following alternatives:
 - Hot spot removal by the excavation of the entire 427 bcy,
 - Placement of a impermeable cap over the possible removal action area, or,
 - A combination of hot spot removal and impermeable cap placement.
- Any removal action should also include an evaluation of how to mitigate the physical hazards at the Site.
- The objectives for and selection of a removal action alternative would be completed in an Engineering Evaluation/Cost Analysis (EE/CA). The EE/CA would be used to develop removal action objectives (RAOs), select removal action alternatives and analyze the effectiveness, implementability, and cost of the alternatives that may satisfy these RAOs.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Groundwater Pathway

- Although URS did not sample groundwater at the Site, its completeness as an exposure pathway was considered and this pathway does **not** appear to be complete. Further assessment of this pathway is **not required**.

Surface Water Pathway

- The only surface water present at the mine site is accumulated water in the main working. Although complete for both humans and ecological receptors at the Site, this pathway does not appear to pose a risk and further assessment of this pathway is **not required**.

Soil Pathway

- The **soil pathway is complete** for both human and ecological receptors and a source of hazardous substances has been documented in this SI.
- The investigation concluded that human exposure to soils **does not appear** to result in an unacceptable risk.
- The investigation concluded that ecological exposure to soils **does appear** to result in an unacceptable risk, with the primary risk to soil biota from soil contact or ingestion of three metals (copper, lead, and silver).
- An area has been defined that encompasses the highest concentrations (the hot spot) and removal of this area would **result in a significant reduction** of potential risk to ecological receptors.

Air Pathway

- The air pathway is **complete** for both human and ecological receptors and was assessed under the soil pathway.

6.2 Recommendations

URS recommends the following actions based on the SI:

- There are several areas at the Site that pose a physical hazard. The Forest Service should evaluate these to determine if they should be removed or mitigated to reduce the hazard.
- The Forest Service should include the management of the soil and waste rock of the hot spot as part of the evaluation of how to mitigate the physical hazards.
- The scope and removal of the hot spot should be evaluated in an EE/CA.

7.0 FOREST SERVICE DISCLAIMER

This abandoned mine/mill site was created under the General Mining Law of 1872 and is located solely on National Forest System (NFS) lands administered by the USDA Forest Service. The United States has taken the position and courts have held that the United States is not liable as “owner” under CERCLA Section 107 for mine contamination left behind on NFS lands by miners operating under the 1872 Mining Law. Therefore, USDA Forest Service believes that this site should not be considered a “federal facility” within the meaning of CERCLA Section 120 and should not be listed on the Federal Agency Hazardous Waste Compliance Docket. Instead, this site should be included on EPA’s CERCLIS database. Consistent with the June 24, 2003 OECA/FFEO “Policy on Listing Mixed Agency Hazardous Waste Compliance Docket,” we respectfully request that EPA Regional Docket Coordinator consult with the Forest Service and EPA Headquarters before making a determination to include this site on the Federal Agency Hazardous Waste Compliance Docket.

8.0 REFERENCES

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TABLES

**Table 1. Threatened Endangered and Special Status Species in Ferry County
Kelly Camp Mine, Republic, Washington**

Scientific Name	Common Name	State Status	Federal Status	Source(s)
Mammals				
<i>Canis Lupis</i>	Gray wolf	E	E	USFWS, WDFW
<i>Corynorhinus townsendii pallascens</i>	Pallid Townsend's big-eared bat	SC	SC	USFWS, WDFW
<i>Gulo gulo</i>	Wolverine	SC	SC	USFWS, WDFW
<i>Lynx canadensis</i>	Canada lynx	E	T	USFWS, WDFW
<i>Martes pennanti</i>	Fisher	E	SC	USFWS, WDFW
<i>Myotis evotis</i>	Long-eared myotis	--	SC	USFWS
<i>Ursus arctos horribilis</i>	Grizzly bear	E	T	USFWS, WDFW
Birds				
<i>Accipiter gentilis</i>	Northern goshawk	SC	SC	USFWS, WDFW
<i>Athene cunicularia</i>	Burrowing owl	SC	SC	USFWS, WDFW
<i>Contopus cooperi</i>	Olive-sided flycatcher	--	SC	USFWS, WDFW
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	Delisted, monitored	USFWS, WDFW
<i>Lanius ludovicianus</i>	Loggerhead shrike	SC	SC	USFWS, WDFW
<i>Tympanuchus phasianellus columbianus</i>	Columbian sharp-tailed grouse	T	SC	USFWS, WDFW
Reptiles				
<i>Sceloporus graciosus</i>	Sagebrush lizard	SC	SC	USFWS, WDFW
Plants				
<i>Antennaria parvifolia</i>	Nuttall's pussy-toes	S	--	WNHP
<i>Botrychium ascendens</i>	Triangular-lobed moonwort	S	SC	WNHP, USFWS
<i>Botrychium crenulatum</i>	Crenulate moonwort	S	SC	WNHP, USFWS
<i>Botrychium hesperium</i>	Western moonwort	T	--	WNHP
<i>Botrychium lineare</i>	Skinny moonwort	T	C	WNHP, USFWS
<i>Botrychium paradoxum</i>	Two-spiked moonwort	T	SC	WNHP, USFWS
<i>Botrychium pedunculatum</i>	Stalked moonwort	S	SC	WNHP, USFWS
<i>Carex flava</i>	Yellow sedge	S	--	WNHP
<i>Carex rostrata</i>	Beaked sedge	S	--	WNHP
<i>Carex sychnocephala</i>	Many-headed sedge	S	--	WNHP
<i>Cypripedium parviflorum</i>	Yellow lady's-slipper	T	--	WNHP
<i>Eriophorum viridicarinatum</i>	Green keeled cotton-grass	S	--	WNHP
<i>Geum rivale</i>	Water avens	S	--	WNHP
<i>Impatiens aurella</i>	Orange balsam	R1, H	--	WNHP
<i>Oxytropis campestris var. columbiana</i>	Columbia crazyweed	E	--	WNHP
<i>Pinus albicaulis</i>	Whitebark pine	--	SC	USFWS
<i>Platanthera obtusata</i>	Small northern bog-orchid	S	--	WNHP
<i>Ribes oxycanthoides ssp. irriguum</i>	Idaho gooseberry	T	--	WNHP
<i>Sanicula marilandica</i>	Black snake-root	S	--	WNHP
<i>Scutellaria angustifolia ssp. micrantha</i>	Narrowleaf skullcap	R1	--	WNHP
<i>Sisyrinchium septentrionale</i>	Blue-eyed grass	S	--	WNHP
<i>Spiranthes diluvialis</i>	Ute lady's tresses	--	T	USFWS
<i>Thelypodium sagittatum ssp. sagittatum</i>	Arrow Thelypody	S, H	--	WNHP
<i>Utricularia minor</i>	Lesser bladderwort	R1	--	WNHP
<i>Viola renifolia</i>	Kidney-leaved violet	S	--	WNHP

Notes:

Fish and aquatic invertebrate species were excluded from this list due to the lack of aquatic habitat on site.

-- = information not available. Species may have no special status.

C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.

E = Endangered. In danger of becoming extinct or extirpated from Washington

H = indicates that most recent sighting in the county is before 1977

R1 = Review group 1. Of potential concern but needs more field work to assign another rank

S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state

SC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but there is insufficient information to support listing.

T = Threatened. Likely to become Endangered in Washington

Sources:

USFWS = Data from Upper Columbia Fish & Wildlife Office. Threatened, Endangered, and Special Status Species By County.

Data for Ferry County. <http://www.fws.gov/easternwashington/county%20species%20lists.htm>

WDFW. = Data from Washington Department of Fish and Wildlife.

<http://wdfw.wa.gov/wlm/diversty/soc/concern.htm>

WNHP = Data from Washington Natural Heritage Program. Rare Plant List by County. Data for Ferry County.

<http://www.dnr.wa.gov/nhp/refdesk/lists/plantsxco/countyindex.html>

Table 2. Mine Water Analytical Data Summary and Screening
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Metals Analysis (mg/L)																																					
		Aluminum		Antimony		Arsenic		Arsenic +3		Arsenic +5		Barium		Beryllium		Bismuth		Boron		Cadmium		Calcium		Chromium		Chromium +6		Cobalt		Copper		Gallium		Iron		Lanthanum			
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved		
MW-1	7/26/2007	0.12	0.08 U	0.020 U	0.020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0056	0.0043	0.0020 U	0.0020 U	0.06 U	0.06 U	0.040 U	0.040 U	0.0020 U	0.0020 U	26.5	26	0.006 U	0.006 U	0.01 U	0.01 U	0.006 U	0.006 U	0.211	0.099	0.020 U	0.020 U	0.34	0.34 U	0.0079	0.0074		
MW-2	7/26/2007	0.08 U	0.08 U	0.020 U	0.020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.0049	0.0044	0.0020 U	0.0020 U	0.06 U	0.06 U	0.040 U	0.040 U	0.0020 U	0.0020 U	27.9	27.4	0.006 U	0.006 U	0.01 U	0.01 U	0.006 U	0.006 U	0.131	0.082	0.020 U	0.020 U	0.23	0.06 U	0.0081	0.0078		
Maximum Concentration		0.12	0.08 U	0.020 U	0.020 U	0.0030 U	0.0030 U	0.0030 U	0.0030 U	0.003 U	0.003 U	0.0056	0.0044	0.0020 U	0.0020 U	0.06 U	0.06 U	0.040 U	0.040 U	0.0020 U	0.0020 U	27.9	27.4	0.006 U	0.006 U	0.010 U	0.010 U	0.006 U	0.006 U	0.211	0.099	0.020 U	0.020 U	0.34	0.34 U	0.0081	0.0078		
Human Health Water Screening Criteria																																							
WDOE Method A Cleanup Levels for Groundwater ¹		--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
WDOE Method B Cleanup Levels for Groundwater ¹		--	--	0.0064	--	4.80E-03	--	--	--	--	--	3.2	--	0.032	--	--	--	3.2	--	0.008	--	--	--	24(Cr ³⁺)	--	0.048	--	--	--	--	0.592	--	--	--	--	--	--	--	
WDOH MCLs ²		--	--	0.006	--	0.010	--	--	--	--	--	2	--	0.004	--	--	--	--	--	0.005	--	--	--	0.1	--	--	--	--	--	1.3 ^a	--	--	--	0.3 ^b	--	--	--	--	
EPA Drinking Water MCLs ³		0.05 to 0.2 ^b	--	0.006	--	0.010	--	--	--	--	--	2	--	0.004	--	--	--	--	--	0.005	--	--	--	0.1	--	--	--	--	--	1 ^b	--	--	--	0.3 ^b	--	--	--	--	
Ecological Water Screening Criteria																																							
WDOE Aquatic Life (Table 240(3)) ⁴		--	--	--	--	--	0.19	--	--	--	--	--	--	--	--	--	--	--	--	--	0.000897	--	--	0.15265	--	--	0.01	--	--	--	0.0097	--	--	--	--	--	--	--	
ORNL PRGs for Ecological Endpoints ⁵		0.087	--	0.03	--	--	--	0.19	--	0.0031	--	0.004	--	0.00066	--	--	--	0.0016	--	0.0011	--	--	--	0.21 (Cr III)	--	0.011	--	0.023	--	0.012	--	--	--	--	1.0	--	--	--	--

Notes:

Underlined criterion is not exceeded but detection limits are higher than the criteria.

Bolded screening criterion is exceeded

Hardness = 82.89 CaCO₃/L. Hardness was calculated as hardness = 2.497 (Ca, mg/L) + 4.118 (Mg, mg/L). The average of dissolved Ca and Mg sample concentrations were used.

^a = action level
^b = secondary criteria
mg/L = milligrams per liter water
U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).
-- = no screening criterion was available for this analyte

Sources:
¹ WDOE. 2005. Model Toxics Control Act Chapter 70.05D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised October 2005. Publication No. 94-06
² WAC 2004. Washington Administrative Code 246-290-310. Maximum Contaminant Levels (MCLs)
³ EPA Drinking Water MCLs. EPA. 2006 National Recommended Water Quality Criteria. Office of Water, Office of Science and Technology.
⁴ WAC, 2006. Washington Administrative Code 173-201A-240. Water Quality Standards for Surface Waters of the State of Washington.
⁵ Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. August. ES/ER/TM-162/R2

Table 2. Mine Water Analytical Data Summary and Screening
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Metals Analysis (mg/L)																																			
		Lead		Lithium		Magnesium		Manganese		Mercury		Molybdenum		Nickel		Phosphorus		Scandium		Selenium		Silver		Sodium		Strontium		Thallium		Tin		Titanium		Vanadium		Zinc	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved		
MW-1	7/26/2007	0.0075 U	0.0075 U	0.02 U	0.02 U	3.92	3.83	0.0723	0.0607	0.00020 U	0.00020 U	0.008 U	0.008 U	0.010 U	0.010 U	0.05 U	0.05 U	0.0020 U	0.0020 U	0.04 U	0.04 U	0.005 U	0.005 U	2.89	2.84	0.103	0.1	0.015 U	0.015 U	0.050 U	0.050 U	0.006	0.005 U	0.0050 U	0.0050 U	0.036	0.03
MW-2	7/26/2007	0.0075 U	0.0075 U	0.02 U	0.02 U	4.14	4.05	0.117	0.115	0.00020 U	0.00020 U	0.008	0.008	0.010 U	0.010 U	0.05 U	0.05 U	0.0020 U	0.0020 U	0.04 U	0.04 U	0.005 U	0.005 U	2.98	2.95	0.11	0.109	0.015 U	0.015 U	0.050 U	0.050 U	0.005 U	0.005 U	0.0050 U	0.0050 U	0.032	0.029
Maximum Concentration		0.0075 U	0.0075 U	0.02 U	0.02 U	4.14	4.05	0.117	0.115	0.00020 U	0.00020 U	0.008	0.008	0.010 U	0.010 U	0.05 U	0.05 U	0.0020 U	0.0020 U	0.04 U	0.04 U	0.005 U	0.005 U	2.98	2.95	0.11	0.109	0.015 U	0.015 U	0.050 U	0.050 U	0.005 U	0.005 U	0.0050 U	0.0050 U	0.036	0.03
Human Health Water Screening Criteria																																					
WDOE Method A Cleanup Levels for Groundwater ¹		0.015	--	--	--	--	--	--	--	0.002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WDOE Method B Cleanup Levels for Groundwater ¹		--	--		--	--	--	2.2	--	0.0048	--	0.080	--	0.32	--	1.6E-04	--	--	--	0.08	--	0.08	--	--	--	9.6	--	0.0011	--	9.6	--	--	--	0.11	--	4.8	--
WDOH MCLs ²		0.015 ^a	--	--	--	--	--	0.05 ^b	--	0.002	--	--	--	0.1	--	--	--	--	--	0.05	--	0.1 ^b	--	--	--	--	--	0.002	--	--	--	--	--	--	--	5 ^b	--
EPA Drinking Water MCLs ³		0.015	--	--	--	--	--	0.05 ^b	--	0.002	--	--	--	--	--	--	--	--	--	0.05	--	0.1 ^b	--	--	--	--	--	0.002	--	--	--	--	--	--	--	5 ^b	--
Ecological Water Screening Criteria																																					
WDOE Aquatic Life (Table 240(3)) ⁴		--	0.00205	--	--	--	--	--	--	0.000012	--	--	--	--	0.112099	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.089145	
ORNL PRGs for Ecological Endpoints ⁵		0.0032	--	0.014	--	--	--	0.12	--	0.0013	--	0.37	--	0.16	--	--	--	--	0.00039	--	0.00036	--	--	--	1.5	--	0.009	--	0.073	--	--	--	0.02	--	0.11	--	

Notes:

Underlined criterion is not exceeded but detection limits are higher than the criteria.

Bolded screening criterion is exceeded by 95% UCL

Hardness = 82.89 CaCO₃/L. Hardness was calculated as hardness = 2.497 (Ca, mg/L) + 4.118 (Mg, mg/L). The average of dissolved Ca and Mg sample concentrations were used.

^a = action level
^b = secondary criteria
mg/L = milligrams per liter water
U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).
-- = no screening criterion was available for this analyte

Sources:
¹ WDOE. 2005. Model Toxics Control Act Chapter 70.05D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised October 2005. Publication No. 94-06
² WAC 2004. Washington Administrative Code 246-290-310. Maximum Contaminant Levels (MCLs)
³ EPA Drinking Water MCLs. EPA. 2006 National Recommended Water Quality Criteria. Office of Water, Office of Science and Technology.
⁴ WAC, 2006. Washington Administrative Code 173-201A-240. Waster Quality Standards for Surface Waters of the State of Washington.
⁵ Efroymsen, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. August. ES/ER/TM-162/R2

Table 3. XRF Measurements
Kelly Camp Mine, Republic, Washington

XRF Location	Analysis of Metals (mg/kg)														
	Arsenic	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Molybdenum	Nickel	Lead	Rubidium	Selenium	Strontium	Zinc	Zirconium
Site Samples															
X1A	16.8	258.9	82.9	1666	28,300	1.6	1622	13.8	BDL	51.8	51.2	0.7	301.7	132.3	161.0
X2	4.3	136.8	93.5	405.4	18,300	BDL	749.5	11.1	BDL	24.4	63.8	4.0	439.2	48.0	252.2
X3	2.6	87.9	502.3	475.9	21,300	0.2	491.1	15.0	23.9	24.3	77.4	BDL	430.4	37.2	237.8
X4	14	160.2	46.2	107.4	21,900	BDL	536.7	9.9	52	17.6	65.8	BDL	505.2	68.5	273.4
X5	9.6	134.5	31.9	184.6	15,000	BDL	811.6	18.2	0.7	16.1	38.7	BDL	254.0	66.7	164.8
X6	2.1	101.4	37.8	311.9	20,500	BDL	731.6	11.1	5.5	32.2	65.8	BDL	437.7	80.8	250.5
X7	BDL	489.8	43.4	621.3	21,400	1.6	640.2	13.0	BDL	18.9	65.6	BDL	493.1	49.3	255.5
X8	BDL	127.8	BDL	31.3	22,300	BDL	756.6	13.2	BDL	23.6	73.8	BDL	458.1	24.2	273.0
X9	0.5	213.8	44.0	50.0	26,500	0.1	543.1	9.7	8.3	16.1	87.4	2.1	527.4	65.4	316.9
X10	8.6	358.2	BDL	52.6	26,400	BDL	713.5	11.2	13.6	14.5	81.5	BDL	483.2	44.5	332.5
X10A	BDL	274.8	137.8	61.8	26,700	BDL	705.8	9.1	BDL	28.5	98.0	0.2	519.6	38.6	422.7
X10B	BDL	162.3	BDL	72.4	25,000	BDL	668.9	7.3	BDL	21.8	83.1	1	474.8	59.5	337.1
X11	3.9	305.9	78.1	72.5	23,700	BDL	889.6	7.2	3.7	16.4	68.2	1.7	401.8	83.4	298.5
X12	3.9	335.4	26.9	58.7	25,300	0.7	916.8	6.9	BDL	18.6	76.8	BDL	460.5	65	294.2
X13	BDL	158.4	77.9	53.8	20,200	0.2	606.6	9.5	BDL	20.4	81	BDL	471.8	63.5	292.1
X14	4.2	295.2	197.4	450.4	49,400	BDL	906.3	2.2	BDL	23.6	66	BDL	317.7	88.8	194
X15	BDL	152.6	25.9	28.7	21,400	BDL	1,100	4.6	BDL	35.9	59.1	BDL	336.2	137.6	252.7
X16	10.1	174.4	30.6	29.6	21,800	1.8	419.6	6.8	13	18.6	103.8	BDL	603.2	50.9	389.6
X17	6.2	227.6	46	33.6	19,800	1.8	416.2	7.0	BDL	13.1	69.7	BDL	456.2	80	340.1
X18	4.8	157.4	37.5	64.3	14,300	BDL	923.2	11.0	BDL	28.7	46.8	BDL	340	52.5	221.8
X18A	8.8	170.4	BDL	49.2	14,200	BDL	1,100	11.8	15.6	18.3	48.2	BDL	339.1	68.3	220.1
Max	16.8	489.8	502.3	1,666	49,400	1.8	1622	18.2	52	51.8	103.8	4	603.2	137.6	422.7
Mean	5.09	215.3	77.9	261.0	23,211	0.4	765.2	10.1	6.7	23.0	69.0	0.5	428.7	68.8	266.7
Background Samples															
XB19	3.8	362.2	3.2	58.4	16,500	BDL	829.3	9.2	BDL	14.8	64.4	1.6	460	40.5	238.5
XB20	1.6	168.5	31.7	31.0	19,800	1.5	697.7	8	BDL	13.9	62.1	BDL	459.4	57.8	308.3
XB21	5.1	168.9	15.3	43.6	22,100	BDL	794.3	9.2	BDL	12	69.2	BDL	367.3	37.2	332.1
XB21A	0.6	282.8	754.6	19.3	22,000	BDL	879.6	9.3	BDL	22.7	72.5	BDL	390.2	44.4	322.4
Max	5.1	362.2	754.6	58.4	22,100	1.5	879.6	9.3	BDL	22.7	72.5	1.6	460	57.8	332.1
Mean	3.5	233.2	16.7	44.3	19,467	0.5	773.8	8.8	BDL	13.6	65.2	0.5	428.9	45.2	293.0

Notes:

mg/kg = milligrams per kilogram soil

BDL = below detection limit

Calculation of means did not include duplicate samples (A, B)

Results that were below the detection limit (BDL) were considered to be concentrations of zero for the purpose of calculating the mean

Table 4. Full Metals Data Set for Initial Soil Samples
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Analytes (mg/kg)																																
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Gallium	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Scandium	Selenium	Silver	Sodium	Strontium	Thallium	Tin	Titanium	Vanadium	Zinc
RS-13	7/27/2007	9,330	3.43	7.55	107	1.18	196 J	4.00 U	3.06	7,550 J	12.5	7.22	2,740	2.00 U	21,200	40.5	9.38 J	3,260 J	816	0.042	8.01	3.23	798	1,210	1.94 J	4.00 U	11.7 J	94.5	32.6 J	1.50 U	77.2	535	27.1	73.7
S-21	7/27/2007	22,800	5.58	8.01	428	4.36	35.6	4.00 U	8.27	4,800	35.1	14.5	636	11.7	51,100	12.2	43.6 J	15,600	770	0.252	3.81	1.26	707	10,600	16.7 J	4.00 U	3.26	111	15.6 J	1.50 U	5.00 U	3540	157	117
S-30	7/27/2007	10,700	3.09	7.21	59.7	1.41	242	4.00 U	2.79	3,510	13.5	8.38	12,600	2.00 U	20,700	17.8	9.31 J	3,500	746	0.037	6.23	3.73	1,240	1,180	2.55 J	6.67	20.5	76.6	40.5 J	1.50 U	38.6	637	29.6	69.9
Minimum		9,330	3.09	7.21	59.7	1.18	35.6	1.00 U	2.79	3,510	13	7	636	12	20,700	12	9	3,260	746	0	4	1	707	1,180	2	6.67	3.26	76.6	16	0	39	535	27	70
Maximum		22,800	5.58	8.01	428	4.36	242	4.00 U	8.27	7,550	35.1	15	12,600	11.7	51,100	40.5	43.6	15,600	816	0.252	8.01	3.73	1,240	10,600	16.7	6.67	20.5	111	40.5	1.5 U	77.2	3,540	157	117
WA Natural Background Soil Metals Concentration ¹		28,299	--	7.61	--	1.3	--	--	0.8	--	31.9	--	28.4	--	36,644	13.1	--	--	836.0	0.04	--	24.5	--	--	--	--	--	--	--	--	--	--	--	80.9

Notes:
-- = data not available
mg/kg = milligrams per kilogram soil
U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
Highlighting represents analytes that were further considered in the risk assessment.

¹ = data from East (all) region, found in Ecology, 1994. Natural Background Soil Metals Concentrations in Washington State, Toxics Cleanup Program. Department of Ecology. October.

Table 5. Soil Metals Summary Data and Screening
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Total Metals by Method 6010B (mg/kg)											
		Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc
RS-11	7/27/2007	2.5 UJ	128	0.97	17.2	6.47	117	8.26	321	0.033 U	4 U	0.50 U	36.1
RS-12	7/27/2007	2.7 J	87.4	1.08	11.1	7.25	711	13.6	370	0.033 U	4 U	1.53	50.5
RS-13	7/27/2007	7.55 J	107	3.06	12.5	7.22	2,740	40.5	816	0.042	4 U	11.7 J	73.7
RS-14	7/27/2007	2.5 UJ	124	0.87	19.0	6.21	42.6	6.70	284	0.033 U	4 U	0.50 U	35.0
S-15	7/27/2007	2.5 UJ	159	1.03	13.9	5.96	22.7	9.52	642	0.033 U	4 U	0.50 U	48.3
S-16	7/27/2007	2.7 J	168	1.37	17.1	6.43	36.3	10.60	534	0.033 U	4 U	0.50 U	59.2
S-17	7/27/2007	4.4 J	234	2.75	11.1	13.8	240	13.60	1450	0.050	4 U	0.90	177
S-18	7/27/2007	2.5 UJ	146	1.22	17.2	7.85	839	17.10	673	0.033 U	4 U	0.50 U	64.7
S-19	7/27/2007	2.5 UJ	231	1.14	23.5	7.45	105	8.51	802	0.033 U	4 U	0.50 U	68.8
S-20	7/27/2007	2.5 UJ	201	1.54	32.2	9.81	20.6	7.96	585	0.033 U	4 U	0.50 U	62.3
S-21	7/27/2007	8.01 J	428	8.27	35.1	14.5	636	12.2	770	0.252	4 U	3.26	117
S-22	7/27/2007	2.5 UJ	136	1.37	20.8	6.84	25.9	26.40	779	0.033 U	4 U	0.50 U	111
S-23	7/27/2007	2.5 UJ	134	1.34	23.0	6.80	15.7	17.90	688	0.033 U	4 U	0.50 U	88.6
S-24	7/27/2007	2.6 J	89.1	1.00	28.9	7.72	16.0	12.10	277	0.033 U	4 U	0.50 U	39.1
S-25	7/27/2007	2.5 UJ	195	1.79	21.2	6.89	11.4	45.40	921	0.033 U	4 U	0.50 U	214
S-26	7/27/2007	2.5 UJ	152	1.73	25.0	7.64	43.5	135	370	0.043	4 U	1.78	129
S-27	7/27/2007	2.5 UJ	128	1.02	20.5	6.85	16.9	12.40	529	0.033 U	4 U	0.50 U	66.5
S-28	7/27/2007	2.5 UJ	148	1.01	25.5	8.88	56	8.38	513	0.033 U	4 U	0.50 U	50.6
S-29	7/27/2007	2.5 UJ	176	0.93	17.9	7.26	225	7.50	482	0.033 U	4 U	0.61	53.6
S-30	7/27/2007	7.21 J	59.7	2.79	13.5	8.38	12,600	17.8	746	0.037	6.67	20.5	69.9
S-31	7/27/2007	2.8 J	49.1	2.05	12.7	9.9	11,600	17.9	850	0.033 U	8.00	27.4 J	103 J
S-32	7/27/2007	7.3 J	88.5	1.64	21.4	10.2	4,110	82.4	1100	0.033 U	4 U	14.8	106
S-33	7/27/2007	14.2 J	82.3	4.35	13	34	4,940	448	2760	0.033 U	4 U	26.6	213
S-34	7/27/2007	4.8 J	138	1.52	18	8.5	389	127	807	0.033 U	4 U	3.93	133
S-35	7/27/2007	3 J	151	1.34	46.7	7.47	57.8	34.6	755	0.033 U	4 U	0.50 U	95.1
S-36	7/27/2007	12.2 J	85.3	1.59	47.5	9	81.6	10.9	339	0.033 U	4 U	0.50 U	72.8
Minimum Concentration		2.5 UJ	49.1	0.97	11.1	6.21	11.4	7	277	0.033 U	4 U	0.50 U	35.0
Mean		6.11	147	1.88	21.8	9.2	1,527	44.3	737	0.046	6.7	4.7	89.9
95% UCL		7.89	172	3.19	25.1	11.2	8,097	219	890	0.0665	8.00	7.5	108
Maximum Concentration		14.2 J	428	8.27	47.5	34	12,600	448	2,760	0.252	8.00	27	214

90th Percentile of Background Samples	2.1	228	0.97	26.2	6.01	32.5	8.98	693	0.026	4 U	0.50 U	60.7
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Human Health Soil Screening Criteria													
WDOE MTCA Method A Industrial Soil Cleanup Levels (Table 745-1) ¹	20	--	2	19 (Cr VI) 2,000 (Cr III)	--	--	1,000	--	2	--	--	--	--
MTCA A Soil Cleanup Levels for Unrestricted Land Uses (Table 740-1) ¹	20	--	2	19 (Cr VI) 2,000 (Cr III)	--	--	250	--	2	--	--	--	--
USEPA Region VI Industrial Outdoor Worker Soil HHSLS ²	1.8	100,000	560	500	2,100	42,000	800	35,000	340	5,700	5,700	100,000	

Ecological Soil Screening Criteria													
WDOE MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (Table 749-3) ¹													
plants	10 (As V)	500	4	42 ^b	20	100	50	1100 ^b	0.3	1	2	86 ^b	
soil biota	60 (As V)	--	20	42 ^b	--	50	500	--	0.1	70	--	200	
wildlife	132 (As V) 7 (As III)	102	14	67	--	217	118	1500 ^b	5.5	0.3	--	360	

Notes:

All chromium is present as Cr III, not as Cr VI, based on the findings of Table 10.

All arsenic is present in soil as As V, not as As III, based on the findings of Table 10.

Bolded screening criteria is exceeded by 95% UCL.

^a = Eco-SSL value derived for avian wildlife

^b = benchmark replaced by Washington state natural background concentration.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

mg/kg = milligrams per kilogram soil

U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).

-- = no screening criterion was available for this analyte

Sources:

¹ WDOE. 2005. Model Toxics Control Act Chapter 70.05D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised October 2005. Publication No. 94-06

² USEPA. 2007. Region VI Human Health Medium-Specific Screening Levels 2007. U.S. Environmental Protection Agency, Region 6. Revised May 4, 2007.

Table 6. Soil Metals Summary Data by Sub-site Location
Kelly Camp Mine, Republic, Washington

Sample ID Sample Date		Total Metals by Method 6010B (mg/kg)											
		Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc
Site Soil Samples in Upper Shaft Waste Rock Area													
RS-13	7/27/2007	7.55 J	107	3.06	12.5	7.22	2,740	40.5	816	0.042	4 U	11.7 J	73.7
S-30	7/27/2007	7.21 J	59.7	2.79	13.5	8.38	12,600	17.8	746	0.037	6.67	20.5	69.9
S-31	7/27/2007	2.8 J	49.1	2.05	12.7	9.9	11,600	17.9	850	0.033 U	8.00	27.4	103 J
S-32	7/27/2007	7.3 J	88.5	1.64	21.4	10.2	4,110	82.4	1,100	0.033 U	4 U	14.8	106
S-33	7/27/2007	14.2 J	82.3	4.35	13	34	4,940	448	2760	0.033 U	4 U	26.6	213
95% UCL		11.7	99.4	3.78	18.5	35.9	11,543	615 ^a	2,480	0.042	8.00	26.8	169
Site Soil Samples in Lower Adit Waste Rock Area													
S-36	7/27/2007	12.2	85.3	1.59	47.5	9	81.6	10.9	339	0.033 U	4 U	0.50 U	72.8
Site Soil Samples Outside of Waste Rock Areas													
RS-11	7/27/2007	2.5 UJ	128	0.97	17.2	6.47	117	8.26	321	0.033 U	4 U	0.50 U	36.1
RS-12	7/27/2007	2.7 J	87.4	1.08	11.1	7.25	711	13.6	370	0.033 U	4 U	1.53	50.5
RS-14	7/27/2007	2.5 UJ	124	0.87	19.0	6.21	42.6	6.70	284	0.033 U	4 U	0.50 U	35.0
S-15	7/27/2007	2.5 UJ	159	1.03	13.9	5.96	22.7	9.52	642	0.033 U	4 U	0.50 U	48.3
S-16	7/27/2007	2.7 J	168	1.37	17.1	6.43	36.3	10.60	534	0.033 U	4 U	0.50 U	59.2
S-17	7/27/2007	4.4 J	234	2.75	11.1	13.8	240	13.60	1450	0.050	4 U	0.90	177
S-18	7/27/2007	2.5 UJ	146	1.22	17.2	7.85	839	17.10	673	0.033 U	4 U	0.50 U	64.7
S-19	7/27/2007	2.5 UJ	231	1.14	23.5	7.45	105	8.51	802	0.033 U	4 U	0.50 U	68.8
S-20	7/27/2007	2.5 UJ	201	1.54	32.2	9.81	20.6	7.96	585	0.033 U	4 U	0.50 U	62.3
S-21	7/27/2007	8.01 J	428	8.27	35.1	14.5	636	12.2	770	0.252	4 U	3.26	117
S-22	7/27/2007	2.5 UJ	136	1.37	20.8	6.84	25.9	26.40	779	0.033 U	4 U	0.50 U	111
S-23	7/27/2007	2.5 UJ	134	1.34	23.0	6.80	15.7	17.90	688	0.033 U	4 U	0.50 U	88.6
S-24	7/27/2007	2.6 J	89.1	1.00	28.9	7.72	16.0	12.10	277	0.033 U	4 U	0.50 U	39.1
S-25	7/27/2007	2.5 UJ	195	1.79	21.2	6.89	11.4	45.40	921	0.033 U	4 U	0.50 U	214
S-26	7/27/2007	2.5 UJ	152	1.73	25.0	7.64	43.5	135	370	0.043	4 U	1.78	129
S-27	7/27/2007	2.5 UJ	128	1.02	20.5	6.85	16.9	12.40	529	0.033 U	4 U	0.50 U	66.5
S-28	7/27/2007	2.5 UJ	148	1.01	25.5	8.88	56	8.38	513	0.033 U	4 U	0.50 U	50.6
S-29	7/27/2007	2.5 UJ	176	0.93	17.9	7.26	225	7.50	482	0.033 U	4 U	0.61	53.6
S-34	7/27/2007	4.8 J	138	1.52	18	8.5	389	127	807	0.033 U	4 U	3.93	133
S-35	7/27/2007	3 J	151	1.34	46.7	7.47	57.8	34.6	755	0.033 U	4 U	0.50 U	95.1
95% UCL		3.6	194	3.24	25.7	9.0	456	62.8	744	0.252	ND	1.89	105
90th Percentile of Background Samples		2.1	228	0.97	26.2	6.01	32.5	8.98	693	0.026	4 U	0.50 U	60.7
Human Health Soil Screening Criteria													
WDOE MTCA Method A Industrial Soil Cleanup Levels (Table 745-1) ¹		20	--	2	19 (Cr VI) 2,000 (Cr III)	--	--	1,000	--	2	--	--	--
MTCA A Soil Cleanup Levels for Unrestricted Land Uses (Table 740-1) ¹		20	--	2	19 (Cr VI) 2,000 (Cr III)	--	--	250	--	2	--	--	--
Ecological Soil Screening Criteria													
WDOE MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (Table 749-3) ¹													
plants		10 (As V)	500	4	42 ^b	20	100	50	1100 ^b	0.3	1	2	86 ^b
soil biota		60 (As V)	--	20	42 ^b	--	50	500	--	0.1	70	--	200
wildlife		132 (As V) 7 (As III)	102	14	67	--	217	118	1500 ^b	5.5	0.3	--	360

Notes:

All chromium is present as Cr III, not as Cr VI, based on the findings of Table 10.

All arsenic is present in soil as As V, not as As III, based on the findings of Table 10.

Bolded screening criteria is exceeded by 95% UCL.

^a = 95% UCL exceeds maximum detected concentration

^b = benchmark replaced by Washington state natural background concentration.

mg/kg = milligrams per kilogram soil

U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ = The analyte was analyzed for, but was not detected. The reported concentration is an approximate quantitation limit.

-- = no screening criterion was available for this analyte

Sources:

¹ WDOE, 2005. Model Toxics Control Act Chapter 70.05D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised October 2005. Publication No. 94-06

Table 7. Waste Rock ABA Data Summary
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Total Sulfur (wt%)	Sulphate Sulfur (wt%)	Sulfide Sulfur (wt%)*	Insoluble Sulphur (wt%)*	Acid Generation Potential** (kg CaCO ₃ /ton)	Modified Sobek Acid Neutralization Potential (kg CaCO ₃ /ton)	Modified Sobek Net Neutralization Potential (kg CaCO ₃ /ton)	Modified Sobek NPR (NP/MPA)
WR-1	7/27/2007	0.20	0.11	0.04	0.05	1.3	41.7	40.4	33.3
WR-2	7/27/2007	0.01 U	0.00	0.00	0.01 U	0.03	296.4	296.4	9,486.1
WR-3	7/27/2007	0.20	0.03	0.17	0.01 U	5.3	22.5	17.2	4.2
Minimum		0.20	0	0.001	0.05	0.03	22.5	17.2	4.2
Maximum		0.20	0.11	0.17	0.05	5.3	296.4	296.4	9,486.1
Mean		0.20	0.05	0.07	0.05	2.2	120.2	118.0	3,174.6

Notes:

U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).

* Based on difference between total sulfur and sulfate-sulfur

** Based on sulfide-sulfur

AGP = Acid Generating Potential in tons CaCO₃ equivalent per 1,000 tons of material.

ANP = Modified Sobek Neutralization Potential in tons CaCO₃ equivalent per 1,000 tons of material.

NNP=ANP-AGP

NPR = ANP / AGP

Table 8. Waste and Blast Rock Metal Analysis
Kelly Camp Mine, Republic, Washington

Sample	Waste and Blast Rock Metals Analysis (mg/kg)											
	Arsenic	Barium	Cadmium	Cobalt	Chromium	Copper	Mercury	Manganese	Lead	Selenium	Silver	Zinc
WR-1	13 U	4.8	7.5	3.8	66.2	8760	0.033 U	2,760	43.2	35	34.3	66
WR-2	13 U	26.6	4.5	5.0	33.8	904	0.033 U	622	10.9	57	2.5 U	48
WR-3	2.5 U	56.5	1.55	7.88	133	87.8	0.033 U	386	6.1	4.0 U	0.67	61.2
Blast Rock WR-4	204	21.3	2.24	12.7	63.0	1450	0.033 U	1920	21.2	4.0 U	4.85	63.6

Notes:

mg/kg = milligrams per kilogram soil

U = The analyte was analyzed for but not detected at or above the method reporting limit (MRL).

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Table 9. TCLP and SPLP Results and SPLP Screening
Kelly Camp Mine, Republic, Washington

	Analysis of Metals (mg/L)											
	Arsenic	Barium	Cadimium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc
TCLP												
WR-1	0.05U	1.00U	0.010U	0.050U	0.014	124	0.0818	7.51	0.0002U	0.05U	0.05U	0.33
WR-2	0.05U	1.00U	0.010U	0.050U	0.016	2.07	0.0500U	1.44	0.0002U	0.05U	0.050U	0.029
WR-3	0.05U	1.00U	0.010U	0.050U	0.006U	0.297	0.0500U	1.91	0.0002U	0.05U	0.050U	0.100
Blast Rock WR-4	0.05U	1.00U	0.010U	0.050U	0.017	6.7	0.176	10.3	0.0002U	0.05U	0.050U	0.112
SPLP												
WR-1	0.02U	0.002U	0.002U	0.006U	0.006U	0.01	0.0075U	0.004U	0.0002U	0.040U	0.005U	0.01U
WR-2	0.02U	0.002	0.002U	0.006U	0.006U	0.01	0.0075U	0.004U	0.0002U	0.040U	0.005U	0.01U
WR-3	0.02U	0.003	0.002U	0.006U	0.006U	0.01U	0.0075U	0.004U	0.0002U	0.040U	0.005U	0.01U
Blast Rock WR-4	0.02U	0.007	0.002U	0.006U	0.006U	0.01	0.0075U	0.004U	0.0002U	0.040U	0.005U	0.01U
Maximum Detected Concentrations												
MDC in Mine Water	0.0030 U	0.0056	0.0020 U	0.006 U	0.006 U	0.211	0.0075 U	0.117	0.00020 U	0.04 U	0.005 U	0.036
MDC in TCLP Leachate	0.05U	1.00U	0.010U	0.050U	0.017	124	0.176	10.3	0.0002U	0.05U	0.050U	0.33
MDC in SPLP Leachate	0.02U	0.007	0.002U	0.006U	0.006U	0.01	0.0075U	0.004U	0.0002U	0.040U	0.005U	0.01U
TCLP Regulatory Levels ^{a,1}												
	5	100	1	5	--	--	5	--	0.2	1	5	--
Leachate Screening Criteria												
WDOE Method A Cleanup Levels for Groundwater ^{b,2} (modified for comparison to leachate)	<u>0.005</u>	--	0.05	0.05	--	--	0.150	--	0.002	--	--	--
WDOE Method B Cleanup Levels for Groundwater ^{b,2} (modified for comparison to leachate)	<u>4.80E-03</u>	3.2	0.08	24 (Cr ³⁺)	--	0.592	--	2.2	0.0048	0.08	0.08	48
WDOH MCLs ³	<u>0.010</u>	2	0.005	0.1	--	1.3 ^c	0.015 ^c	0.05 ^d	0.002	0.05	0.1 ^d	5 ^d
EPA Drinking Water MCLs ⁴	<u>0.010</u>	2	0.005	0.1	--	1 ^d	0.015	0.05 ^d	0.002	0.05	0.1 ^d	5 ^d

Notes:

 Underlined criterion is not exceeded but detection limits are higher than the criteria.

Only MDCs of SPLP results were compared to leachate screening criteria.

Ecological screening criteria for water are presented in Table 2.

MDC = maximum detected concentration

SPLP = Synthetic Precipitation Leaching Procedure

TCLP = Toxicity Characteristics Leaching Procedure

-- = no screening criterion was available for this analyte

^a = TCLP results exceeding TCLP Regulatory Levels suggest that the material is a hazardous waste due to its toxicity.

^b = Modification to WDOE screening criteria: cadimium, lead, and zinc concentrations were multiplied by 10 per WAC 173-340-747(7).

^c = action level

^d = secondary criteria

Sources:

¹ 40 CFR 261.24 Toxicity Characteristics

² WDOE. 2005. Model Toxics Control Act Chapter 70.05D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Department of Ecology, Toxics Cleanup Program. Revised October 2005. Publication No. 94-06

³ WAC 2004. Washington Administrative Code 246-290-310. Maximum Contaminant Levels (MCLs)

⁴ EPA Drinking Water MCLs. EPA. 2006 National Recommended Water Quality Criteria. Office of Water, Office of Science and Technology.

Table 10. Speciation Data for Selected Soil Samples
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Metal Speciation in Soil (mg/kg)						
		Arsenic				Chromium		
		Total As (Method 6010B)	Total As (Method 7010)	As ⁺³	As ⁺⁵	Total Cr (Method 6010B)	Cr ⁺³	Cr ⁺⁶
S-21	7/27/2007	2.5 U	3.34 J	0.300 U	3.34 J	27.7	27.7	0.05 U
S-29	7/27/2007	2.5 U	3.15 J	0.300 U	3.15 J	17.9	17.9	0.05 U
S-31	7/28/2007	2.8	3.91 J	0.300 U	3.91 J	12.7	12.7	0.05 U
S-36	7/27/2007	12.2	18 J	0.300 U	18 J	47.5	47.5	0.083 U
SB-1	7/27/2007	2.5 U	3.12 J	0.300 U	3.12 J	19.3	19.3	0.083 U
Minimum		2.5 U	3.12	0.300 U	3.12	17.9	17.9	0.05 U
Maximum		12	18	0.300 U	18	47.5	47.5	0.083 U
Proportion of Total		NA	NA	0%	100%	NA	100%	0%

Notes:

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

mg/kg = milligrams per kilogram soil

U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).

Table 11. Background Soils Metals Data
Kelly Camp Mine, Republic, Washington

Sample ID	Sample Date	Total Metals by Method 6010B (mg/kg)											
		Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Selenium	Silver	Zinc
SB-1	7/27/2007	2.5 U	194	0.69	19.3	4.63	10.7	7.19	500	0.033 U	4 U	0.50 U	51
SB-2	7/27/2007	2.5 U	179	0.8	22	5	11.3	8.41	552	0.033 U	4 U	0.50 U	43.7
SB-3	7/27/2007	2.5 U	174	0.71	16.8	4.49	11.1	7.17	538	0.033 U	4 U	0.50 U	41.4
SB-4	7/27/2007	2.5 U	177	0.75	19.3	4.91	11.6	7.86	573	0.033 U	4 U	0.50 U	49.4
SB-5	7/27/2007	2.5 U	180	0.94	26.4	5.91	80.9	9.27	518	0.033 U	4 U	0.50 U	54.3
SB-6	7/27/2007	3.5	205	1.09	29.9	6.83	17.5	8.85	630	0.033 U	4 U	0.50 U	59
SB-7	7/27/2007	2.5 U	181	0.72	19	5.01	11.8	7.27	584	0.033 U	4 U	0.50 U	49.5
SB-8	7/27/2007	2.5 U	226	0.83	17.3	4.73	12.6	7.96	686	0.033 U	4 U	0.50 U	54.2
SB-9	7/27/2007	2.5 U	253	0.86	17.3	5.19	12.1	6.92	768	0.033 U	4 U	0.50 U	65
SB-10	7/27/2007	2.5 U	162	0.71	13.9	4.5	13.2	8.46	526	0.04	4 U	0.50 U	48.1
Minimum Concentration		2.5 U	162	0.69	13.9	4.49	10.7	6.92	500	0.033 U	4 U	0.50 U	41.4
Maximum Concentration		3.5	253	1.09	29.9	6.83	80.9	9.27	768	0.04	4 U	0.50 U	65
90th Percentile		2.1	228	0.97	26.2	6.01	32.5	8.98	693	0.026	2	0.25	60.7

Notes:

All chromium is present as Cr III, not as Cr VI, based on the findings of Table 5.

All arsenic is present in soil as As V, not as As III, based on the findings of Table 5.

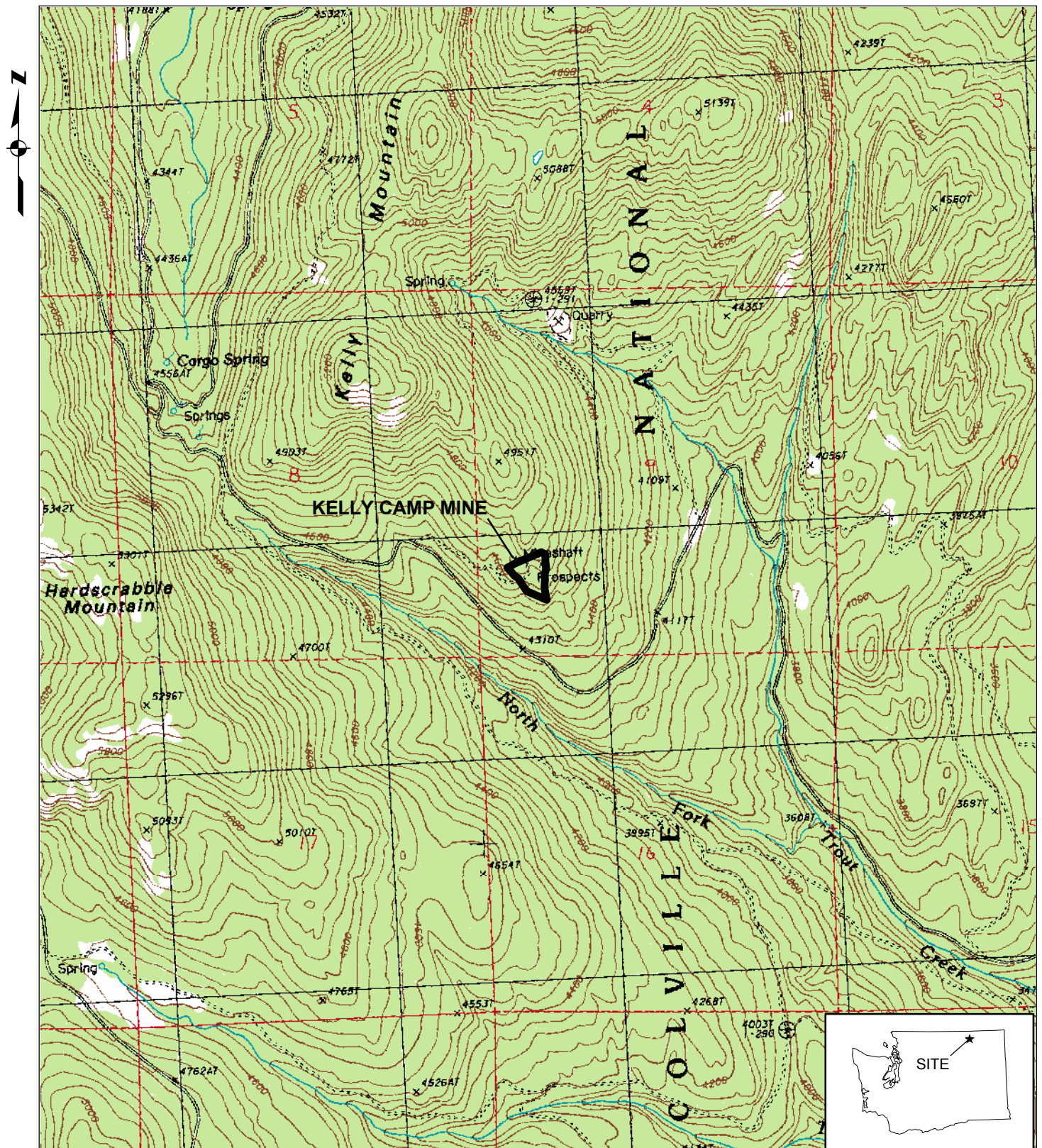
mg/kg = milligrams per kilogram soil

U = The analyte was analyzed for but not detected at or above the reported method reporting limit (MRL).

Background data were assumed to be lognormally distributed per WAC-173-340-708.

FIGURES

O:\25696513 Kelly Camp Mine\5000 Technical\GIS\MXD\Fig 1 Vicinity Map.mxd



Source: Bodie Mountain, Washington USGS 7.5' Topographic Quadrangle, 1992.

0 0.25 0.5
Miles

URS

JANUARY 2008
25696513

VICINITY MAP

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 1

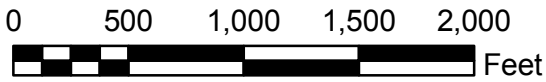
S:\public\bergeson\Kelly_Mine\GIS\MXD\Fig 2 Site Area.mxd



SOURCE: WASHINGTON FMA NAIP IMAGERY, 2005.
COLEVILLE NATIONAL FOREST GIS.

Explanation

- Road
- ▭ Kelly_Mine_Area
- Stream



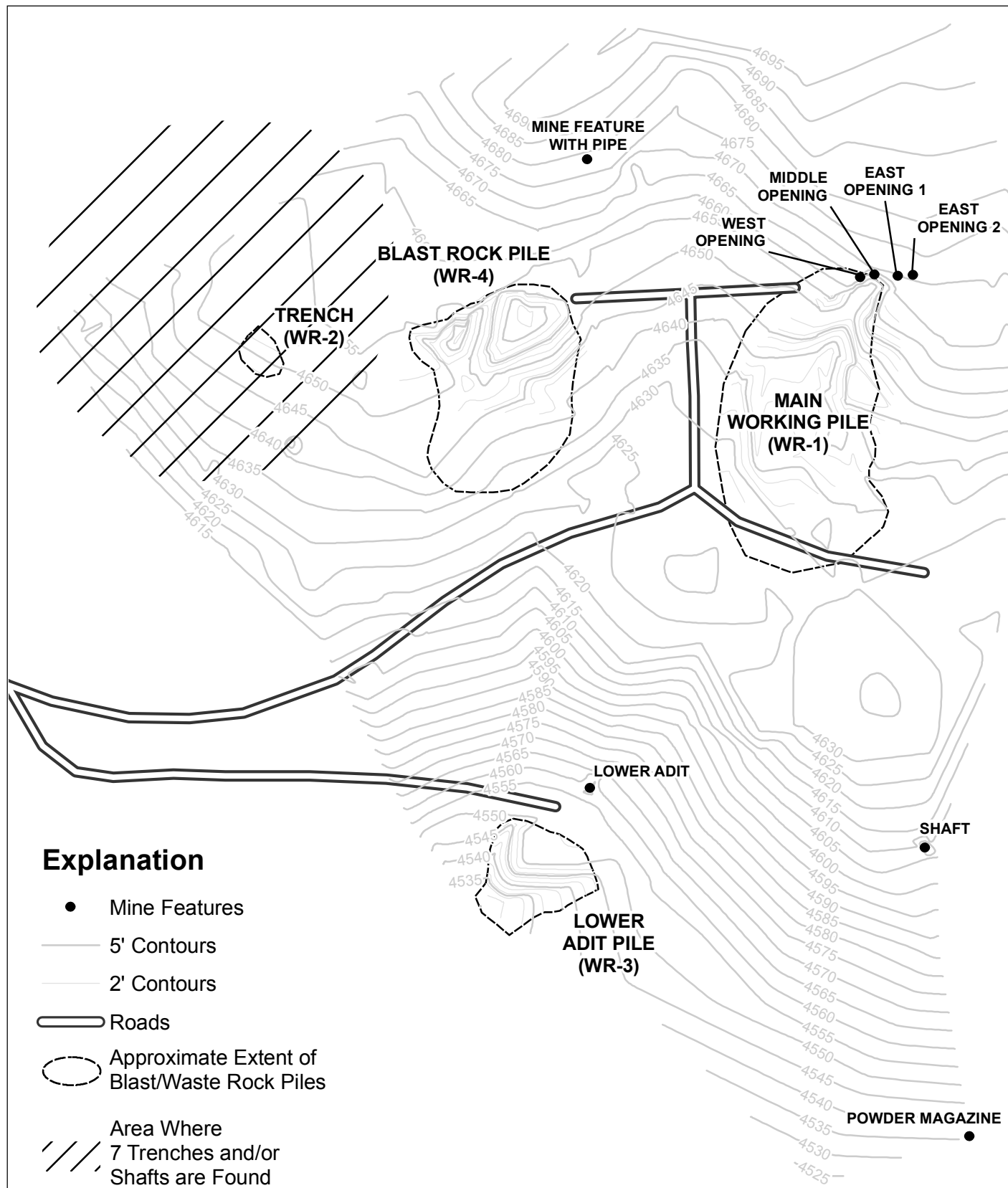
SITE AREA

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25696513

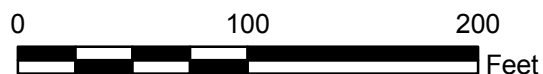
UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 2

O:\25696513 Kelly Camp Mine\5000 Technical\GIS\MXD\Fig 3 Mine Site Map.mxd



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007



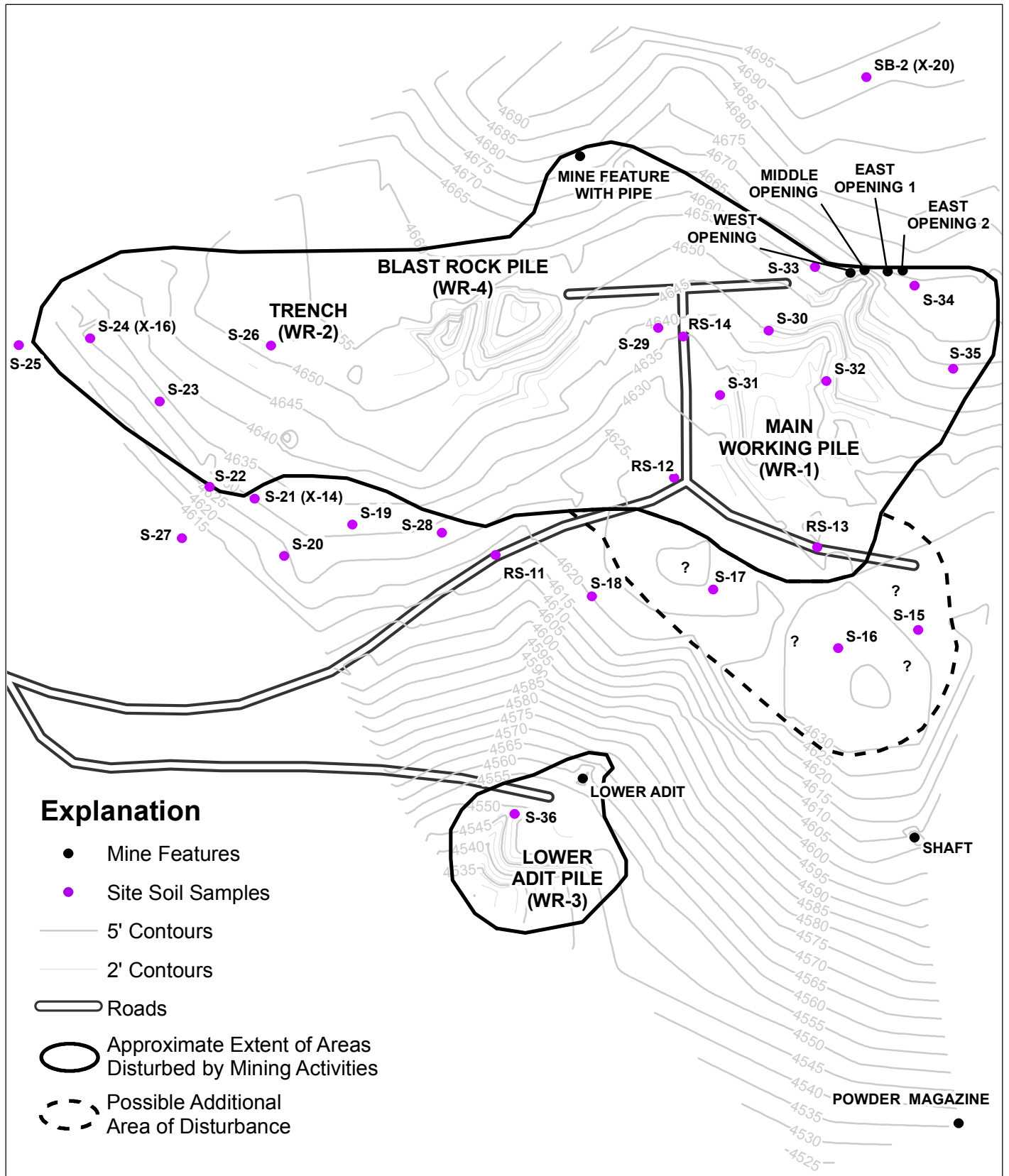
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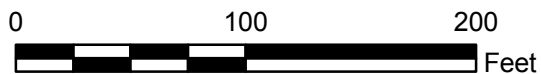
MINE SITE MAP

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KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 3



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007



AREAS DISTURBED BY MINING ACTIVITIES

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25696513

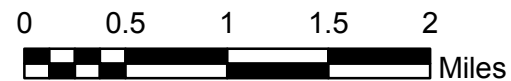
UNITED STATES FOREST SERVICE
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REPUBLIC, WASHINGTON

FIGURE 4

C:\25696513_Kelly_Camp_Mine\5000_Technical\GIS\Map\Fig 5 Well Locations.mxd



SOURCES: WASHINGTON FMA NAIP IMAGERY, 2005.
COLEVILLE NATIONAL FOREST GIS.
WELL DATA FROM STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY



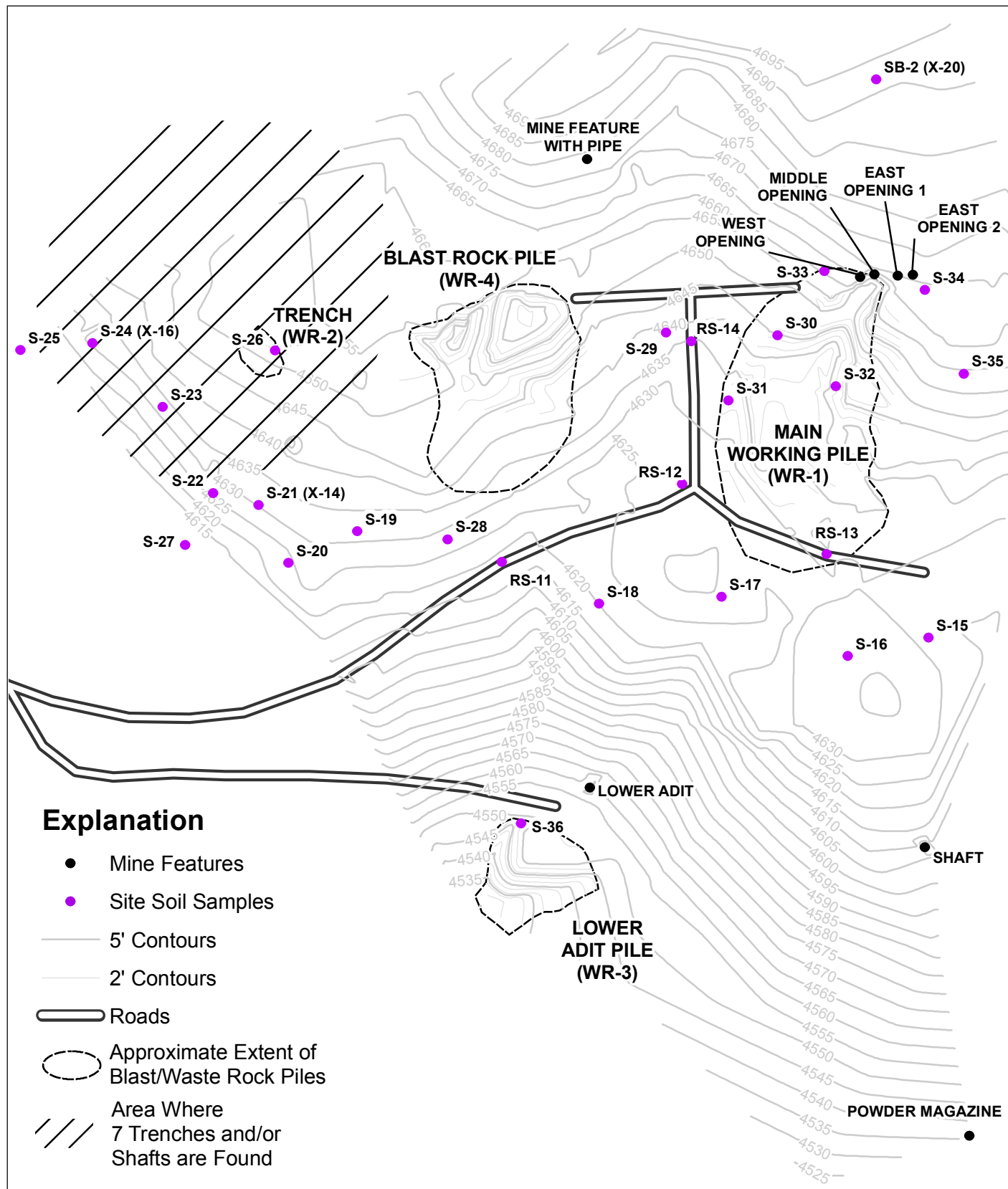
URS

WELL LOCATIONS

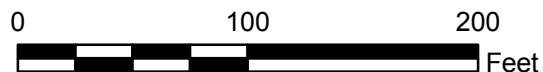
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FIGURE 5



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007

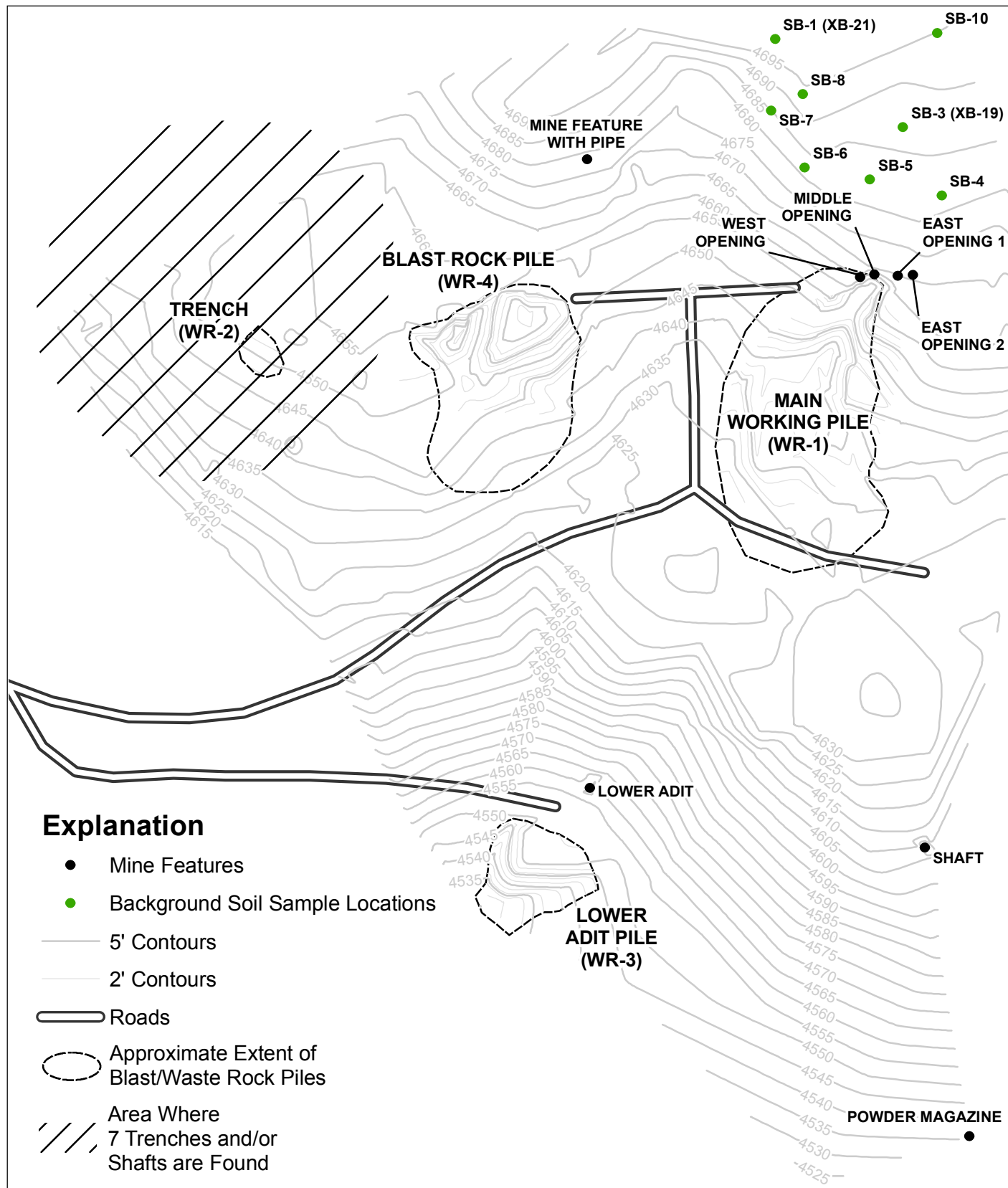


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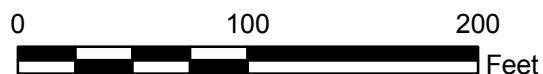
SITE SOIL SAMPLE LOCATIONS

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 6



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007



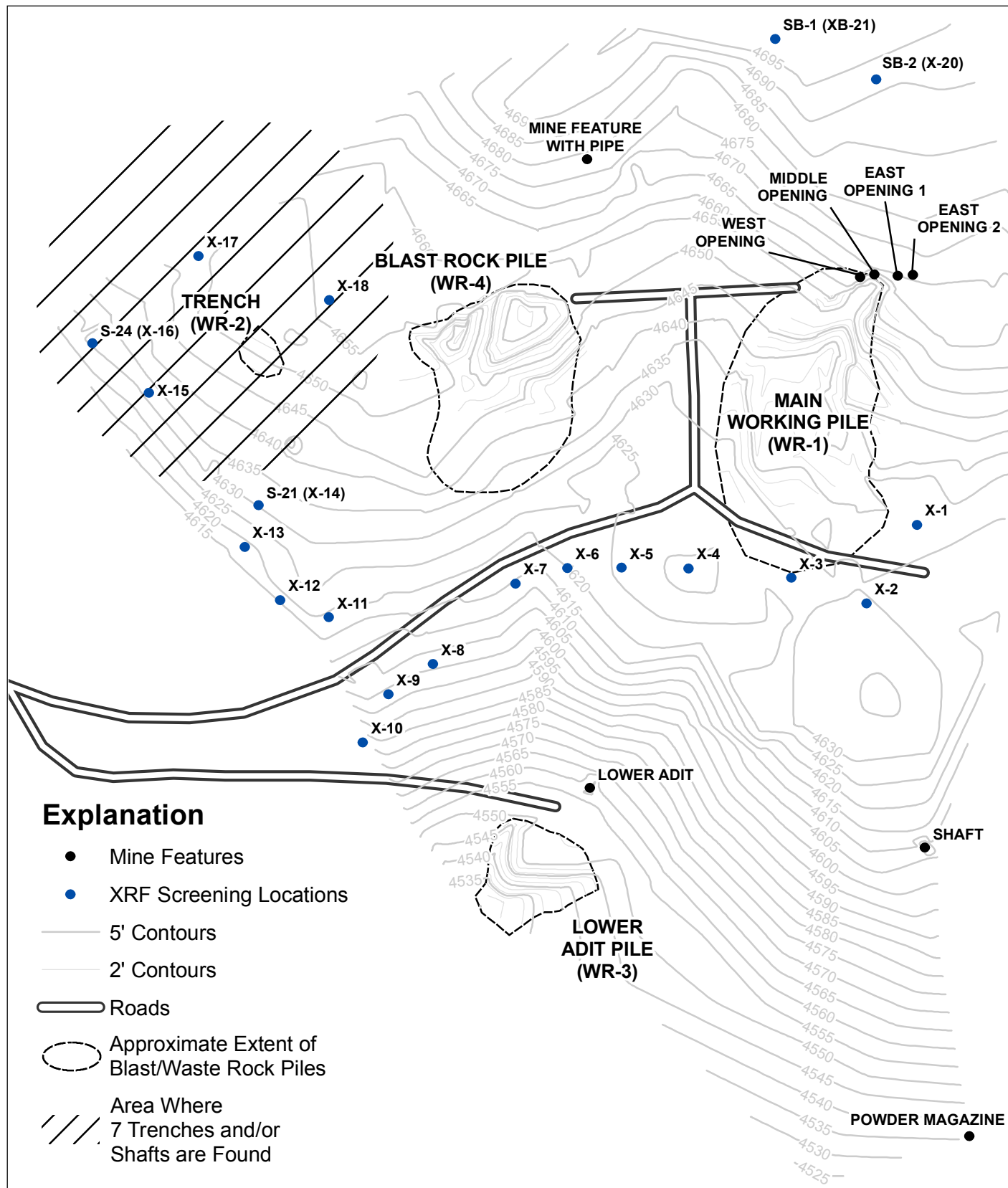
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BACKGROUND SOIL SAMPLE LOCATIONS

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KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 7

O:\25696513 Kelly Camp Mine\5000 Technical\GIS\MXD\Fig 8 XRF Screening Locations.mxd



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007

0 100 200
Feet

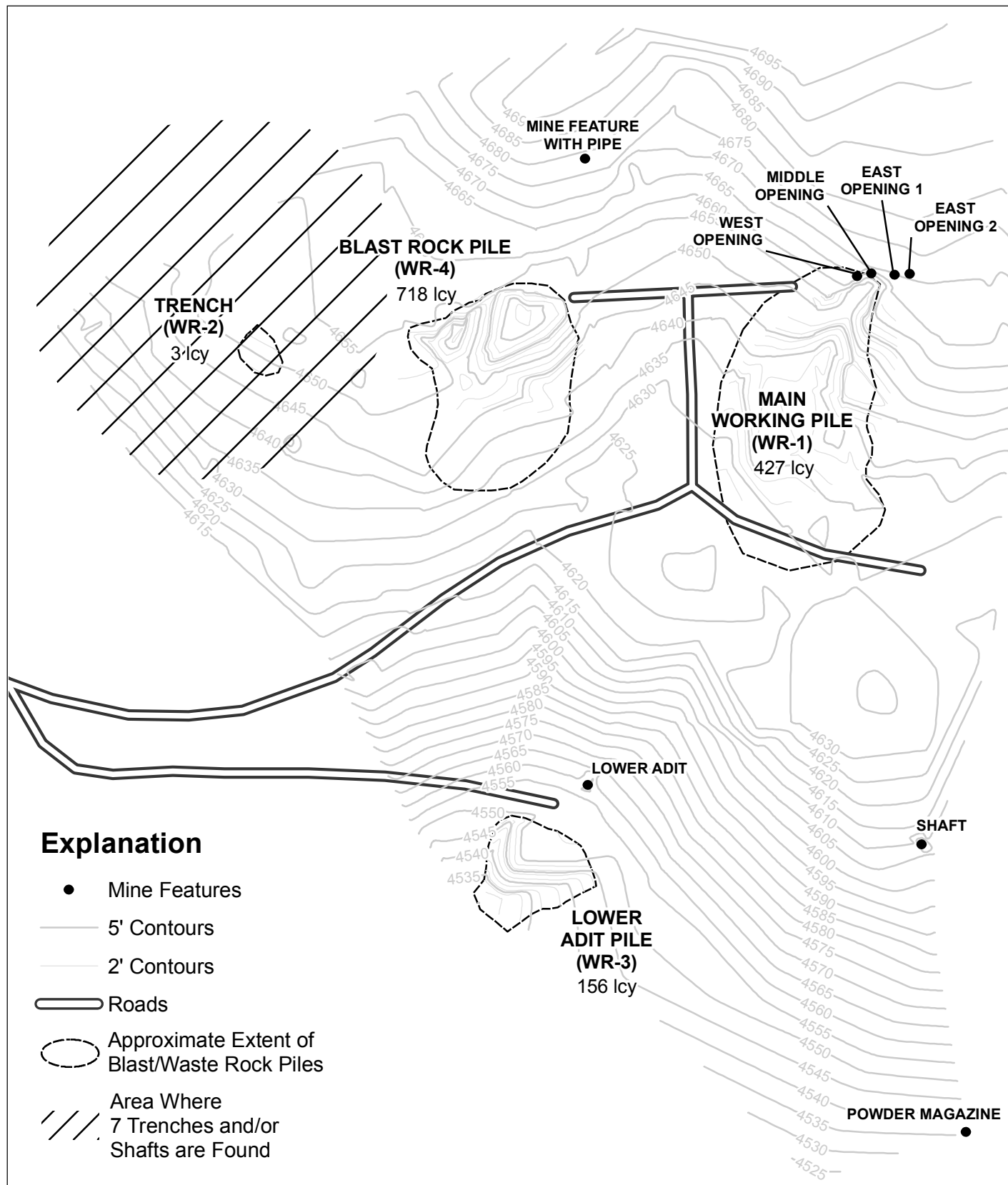
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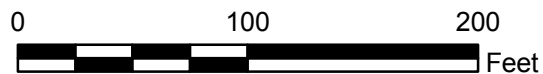
XRF SCREENING LOCATIONS

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 8



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007



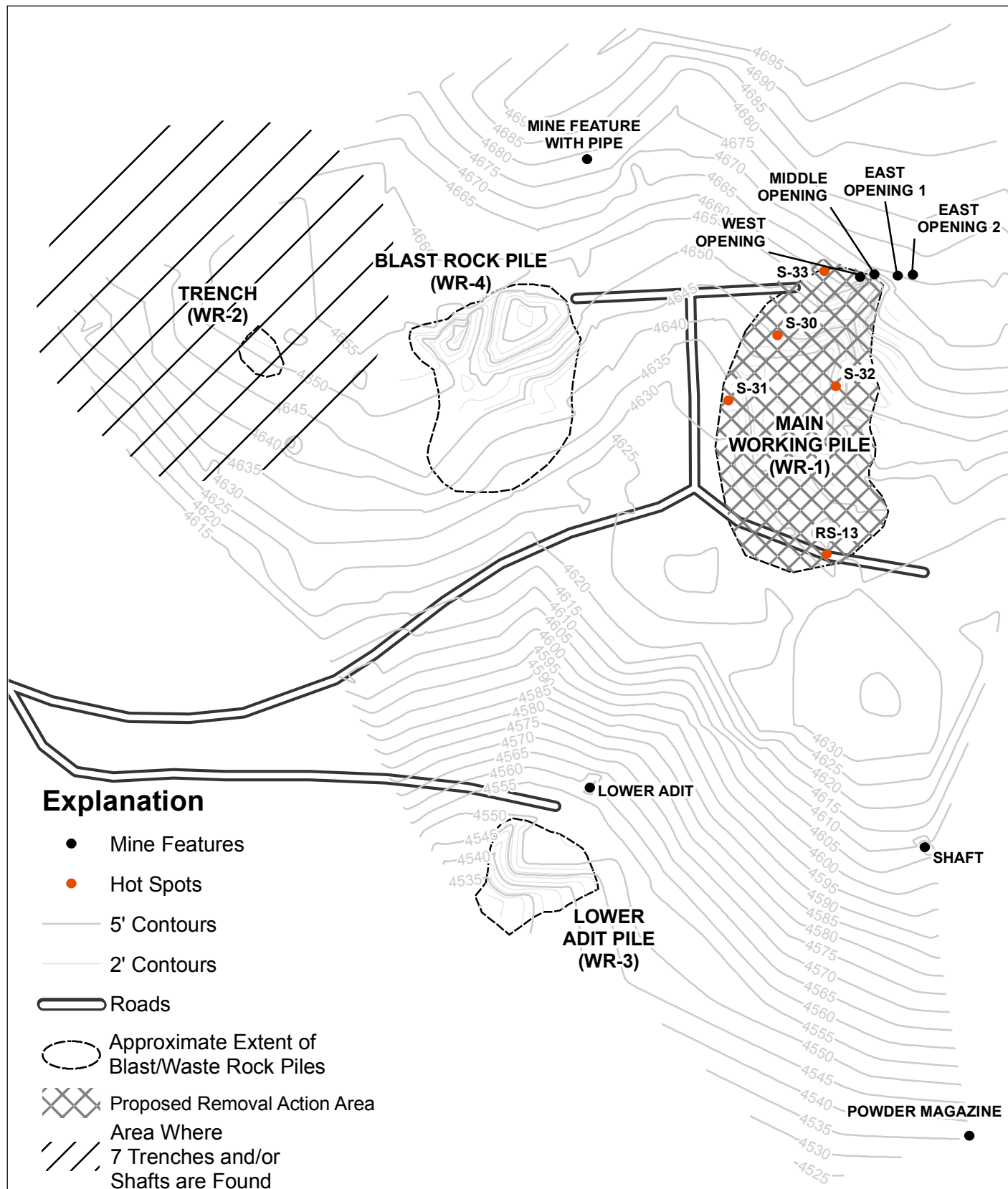
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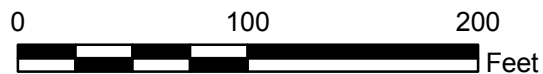
ESTIMATED VOLUMES FOR SITE FEATURES

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KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 10



SOURCE: ROADS - COLEVILLE NATIONAL FOREST GIS.
CONTOURS - THOMAS, DEAN, & HOSKINS, INC., 2007



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HOT SPOTS AND PROPOSED REMOVAL ACTION AREA

JANUARY 2008
25696513

UNITED STATES FOREST SERVICE
KELLY CAMP MINE
REPUBLIC, WASHINGTON

FIGURE 11

APPENDIX A
PHOTOGRAPHIC LOG

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 1	Date: July-07		
Direction Photo Taken: View to north.			
Description: Photo of entrance to main working/stope (right). A supplemental shaft (left) also accesses the stope. Note copper carbonate (blue-green mineral coating) between openings.			

Photo No. 2	Date: July-07	
Direction Photo Taken: View to north.		
Description: Photo of western opening (shaft) to main working/stope.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 3	Date: July-07		
Direction Photo Taken: View to north.			
Description: Photo of middle (primary) opening to main working/stope.			

Photo No. 4	Date: July-07	
Direction Photo Taken: View to west, from opening in ground surface		
Description: Photo of main working/stope; note wood debris in upper center of photo.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 5	Date: July-07		
Direction Photo Taken: View to west.			
Description: Photo of standing water within main working/stope.			

Photo No. 6	Date: July-07	
Direction Photo Taken: View of ground surface		
Description: Photo of one of the smaller shafts to the west of the primary opening to the main working/stope.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 7	Date: July-07		
Direction Photo Taken: View to north.			
Description: Photo of winze within main working/stope (note ladder accessing the winze).			

Photo No. 8	Date: July-07	
Direction Photo Taken: View to north.		
Description: Center of main working/stope waste rock pile. The primary entry is directly in front of where the person is standing. It appears that a portion of the waste rock pile has been removed (the area under the red line). The finer grained soil within the piles has also been pointed out.		

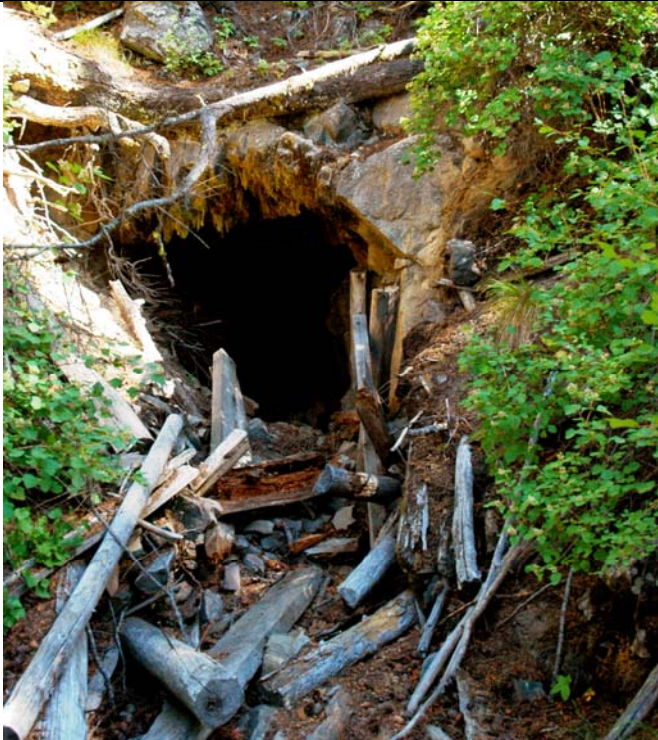
Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 9	Date: July-07		
Direction Photo Taken: View to north.			
Description: Photo of lower adit portal.			

Photo No. 10	Date: July-07	
Direction Photo Taken: View to southwest.		
Description: Photo of former wood structure adjacent to lower adit. Lower adit waste rock pile is located partially beneath former structure. Photo taken from above and from the direction of main workings area.		

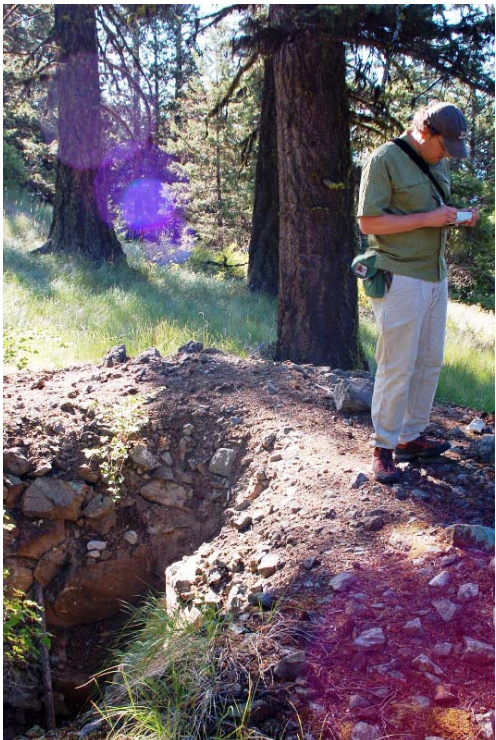
Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 11	Date: July-07		
Direction Photo Taken: View to southeast.			
Description: Photo of wood structure remnants near lower adit.			

Photo No. 12	Date: July-07	
Direction Photo Taken: View to the west, northwest.		
Description: Photo of blast rock pile.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 13	Date: July-07		
Direction Photo Taken: View to the west.			
Description: Photo of the north face of the blast rock and rock face where blasting likely occurred.			

Photo No. 14	Date: July-07	
Direction Photo Taken: View of ground surface		
Description: Photo of example bore in blast rock pile.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 15	Date: July-07		
Direction Photo Taken: View to north.			
Description: Photo showing example trench work at the site.			

Photo No. 16	Date: July-07	
Direction Photo Taken: View of ground surface.		
Description: Photo of an additional example trench at the site.		

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 17	Date: July-07		
Direction Photo Taken: View to north.			
Description: Close up of mine feature with pipe that is a suspected storage area for explosives.			

Photo No. 18	Date: July-07	
Direction Photo Taken: View to north.		
Description: Photo of road leading to main working/stope and blast rock pile.		

Toe of Blast Rock Pile

Road

Client Name: United States Forest Service		Site Location: Kelly Camp Mine – Republic, Washington	Project No. 25696513
Photo No. 19	Date: July-07		
Direction Photo Taken: View to northeast			
Description: Close-up of winze in main working/stope. Note woodrat midden.			

Photo No. 20	Date: July-07	
Direction Photo Taken: View to north within main working/stope.		
Description: Photo of woodrat midden.		

APPENDIX B
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

FINAL

STREAMLINED HUMAN HEALTH AND ECOLOGICAL RISK EVALUATION AND ASSESSMENT

FEBRUARY 2008

Prepared for:
USDA Forest Service



Prepared by:

URS

111 SW Columbia, Suite 1500
Portland, Oregon 97201-5850
25696513

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ATTACHMENT

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LIST OF ACRONYMS

ADD	average daily dose
AE	assessment endpoint
BAF	bioaccumulation factors
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
COC	chain-of-custody
COI	chemical of interest
COPC	chemical of potential concern
CPEC	chemical of potential ecological concern
CTE	central tendency exposure
EPC	exposure point calculation
ERA	ecological risk assessment
HHRA	human health risk assessment
HHSL	human health medium-specific screening level
HI	hazard index
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
LADD	lifetime average daily dose
MCL	maximum contaminant level
MDC	maximum detected concentration
ME	measurement endpoint
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MRL	method reporting limit
NFS	National Forest System
ORNL	Oakridge National Laboratory
PECR	potential excess cancer risk
PRG	Preliminary Remediation Goal
QA/QC	quality assurance/quality control
RfD	reference dose
RME	reasonable maximum exposure
SACM	Superfund Accelerated Cleanup Model
SF	slope factor
TRV	toxicity reference value
UCL	upper confidence limit of the mean

1.0 INTRODUCTION

The EPA has developed the Superfund Accelerated Cleanup Model (SACM) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to promote increased efficiency and shorter response times for remediation of contaminated sites (USEPA, 1992). The SACM approach requires a reduction of risk through removal actions or presumptive remedies. Since any actions are required to be driven by risk reduction, risk assessments under the SACM model need to be streamlined to support a removal action, if warranted. The Streamlined Risk Evaluation and Assessment presented for the Kelly Camp Mine (Site) serves this purpose by assessing risk qualitatively; utilizing site-specific hazard and exposure information, incident reports, and health advisory data; and/or comparing site soil, water and waste rock results data to screening levels. The benefit of streamlining the risk evaluation is that the process facilitates the completion of removal actions, if warranted.

2.0 RISK ASSESSMENT DATA AND INITIAL SCREENING

A total of 26 soil samples were collected from throughout the Site with a special emphasis on collecting soil from locations that appeared disturbed by mine workings. In addition to the soil samples, four samples of waste and blast rock were obtained. Although not random, this sampling methodology was selected to determine the range of chemical concentrations present on the Site, especially in potentially highly contaminated areas. For this reason, the population of soil samples generally over-represents contaminated areas in relation to their coverage of the Site. This conservative sampling method is appropriate for screening level assessments where the gross level of contamination is the focus of interest, rather than a detailed understanding of extent.

Although waste and blast rock samples were collected, the human health and ecological risk assessments did not directly consider the laboratory results of these samples. Instead, the streamlined risk assessments were limited to exposure to Site soil within and adjacent to the waste and blast rock piles as well as from the remainder of the Site. Due to the large size of the waste and blast rock, human and ecological receptors are unlikely to ingest, inhale, or have significant dermal contact with the rocks on site. The soil collected from within and adjacent to the waste piles is considered to represent the current and likely future exposure from these piles. The waste rock analytical tests were used to assess leaching potential from this waste source.

In addition to the 26 soil samples collected from the Site, 10 background soil samples were collected from an area above the mine workings that appeared to be undisturbed by mine workings due to the presence of mature trees and intact ground surface.

Two water samples were collected from inside of the mine workings. Since the two small ponds in the mine workings were the only significant water on site, these two samples of mine water well represented the composition of this media.

Since the Kelly Camp Mine Site was mined for metals, these constituents were the key chemicals of interest (COIs) in the risk assessment. Soil samples were analyzed for total concentrations of metals, and select samples were further analyzed for arsenic and cadmium speciation. Mine water samples were analyzed for total and dissolved metals concentrations.

URS conducted a quality assurance/quality control (QA/QC) review (SI Report, Appendix C) for the analytical results which included an evaluation of representativeness, accuracy, field and analytical precision, comparability, and completeness as outlined in the SAP. With the exception of J flags added to select sample results, all laboratory quality control criteria were within laboratory control limits indicating that the analytical system was “in control.” Once appropriate flags were applied, all reported concentrations were considered suitable for risk assessment use.

Chemical results were initially screened for detection frequency and reporting limits. Chemicals that were detected in fewer than 5% of the samples or were detected below screening criteria were removed from further consideration. Those chemicals that passed the initial screening were further considered in the risk assessment.

ProUCL Version 4.0 (USEPA, 2007a) was used to calculate 95% upper confidence limit of the mean (95% UCL) concentrations for each COI in all Site soil samples. The 95% UCL is a value that is equal to or higher than the true mean of all concentrations on the Site, 95% of the time. It is used as a conservative approximation of the average concentration that a mobile receptor would be exposed to if the receptor randomly accessed the Site. Since the 95% UCLs in this assessment were calculated using samples that were not randomly collected, but rather were focused on contaminated areas, the UCL results should overestimate the concentrations that

receptors would actually be exposed to. The 95% UCL concentrations were used as exposure point concentrations for human receptors and mobile ecological receptors (i.e., wildlife).

Although the 95% UCL is a useful estimate of average exposure concentrations, it cannot be used when sample sizes are small. When fewer than five detected samples in a media are available, it is generally better to approximate exposure concentrations using the maximum detected concentration (MDC). The MDC was used as the exposure point concentration for mine water. Since individual immobile receptors (i.e., plants and terrestrial invertebrates) would not be exposed to the entire Site, but rather a localized area, the MDC was also used as the exposure point concentration for immobile ecological receptors exposed to soil.

The background soil concentration of each COI was defined as the 90th percentile of the 10 background soil sample concentrations assuming lognormal distribution (WAC 173-340-709).

3.0 STREAMLINED HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment (HHRA) is used to quantitatively evaluate carcinogenic risks and non-carcinogenic hazards to human health that are attributable to exposure to Site-related chemicals in soil and groundwater. This section describes the data set, explains the exposure assessment, screens data to identify chemicals of potential concern (COPCs), calculates exposure point concentrations (EPCs), and evaluates human health risks.

3.1 Hazard Identification and Selection of COPCs

Soil and mine water comprise the media of interest for human health. To conservatively assess potential risk to human health from exposure to Site soils, generic screening criteria developed for industrial and unrestricted land uses were compared to 95% UCL concentrations. The 95% UCL concentrations of soil were screened against MTCA Method A Industrial Soil Cleanup Levels (Table 745-1) (WDOE, 2005), MTCA A Soil Cleanup Levels for Unrestricted Land Uses (Table 740-1), and EPA Region VI Industrial Outdoor Worker Human Health Medium-Specific Screening Levels (HHSLs) (USEPA, 2007b)

To conservatively assess risks to human receptors exposed to mine water, mine water concentrations were screened against generic criteria protective of human ingestion (SI Report, Table 2). Maximum concentrations of mine water were screened against WDOE Method A and Method B Cleanup Levels for Groundwater, Washington Department of Health maximum contaminant levels (MCLs), and EPA drinking water MCLs. Although people are very unlikely to use the mine water as source of drinking water, the drinking water pathway was considered to be conservative for human receptors and appropriate as screening criteria for mine water.

Site Soil

The evaluation of Site soil focused on 12 chemical concentrations: arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc. Of these 12 chemicals, only arsenic and cadmium exceeded human health generic screening criteria for soil (Table 3-1).

- The Site arsenic 95% UCL concentration of 7.9 milligrams per kilogram (mg/kg) exceeded the EPA HHSLs for industrial use (1.8 mg/kg). Half of the soil samples did not contain detected concentrations of arsenic.
- The Site cadmium 95% UCL concentration of 3.19 mg/kg exceeded the MTCA Method A soil cleanup criteria for unrestricted use of 2 mg/kg for cadmium.

Mine Water

Only 12 of the 33 chemicals analyzed in mine water were present in detectable concentrations. Of the 33 chemicals tested, either the method reporting limit (MRL) or maximum detected concentration (MDC) exceeded at least one screening criterion for six chemicals (aluminum, antimony, iron, manganese, phosphorus, and thallium).

The exceedances of antimony, phosphorus, and thallium were caused by MRLs that were greater than the screening criteria. The analytical method selected for Site mine water employed standard MRLs capable of providing detections in the range of ug/L while also allowing analysis of a broad set of metals at a reasonable cost. Of the 33 chemicals analyzed, only three had screening criteria below these standard MRLs. Although it is technically possible to obtain lower MRLs, the additional cost would be disproportionately high compared to the likely potential additional risk posed by these three chemicals.

The precise amount of potential risk contributed by these chemicals is unknown, however, these undetected chemicals are considered unlikely to present significant unacceptable risks to human receptors. This data gap could be eliminated in subsequent, more focused, risk assessments.

The remaining three exceedances (aluminum, iron, and manganese), exceeded “secondary drinking water standards” which are not human health-based criteria, but are instead protective of aesthetic effects (e.g., taste, odor, or color). Since samples of mine water did not exceed any health-based criteria, no mine water chemicals of interest (COIs) were considered to be human health COPCs.

Based on this screening, arsenic and cadmium in soil were identified as human health COPCs.

Table 3-1. Human Health Chemicals of Potential Concern (COPCs)

COPC	Media	
	Soil	Mine Water
Arsenic	X	--
Cadmium	X	--

Notes:

-- = No exceedance

3.2 Exposure Assessment

The exposure assessment identifies COIs, describes the results of screening to identify COPCs, identifies likely current and future human receptors, identifies potentially complete exposure pathways, and calculates exposure intake amounts related to both carcinogenic and non-carcinogenic COPCs.

3.2.1 Potentially Exposed Population

The entire mine Site, including all shafts and associated buildings, encompasses an area of just over 5 acres. Located within the Colville National Forest, the Kelly Camp Mine Site is surrounded by rural properties that are primarily in agricultural use. The nearest of these properties is approximately five miles away. Although unmarked by signs, access to the abandoned mine site is unrestricted and accessible by public roads.

Human land use of the Site and its vicinity includes recreational use (e.g., camping, hiking, and hunting), logging, and cattle grazing/management. Litter, tracks, and personal observations indicate current and historical human use of the Site. Human use of the Site is apparently periodic and consistent with recreational use. No workers are routinely present on the Site and the nearest known residence is approximately five miles away.

3.2.2 Identification of Potential Exposure Pathways

The exposure assessment identifies potential exposure pathways. The following four components define exposure pathways:

1. Source and mechanism of chemical release (e.g., accidental spills).
2. Retention or transport medium (e.g., contaminated soil).
3. Point of potential human contact with the contaminated medium, referred to as the exposure point (e.g., a site worker in an excavation).
4. Exposure route (i.e., physiological mechanism of exposure such as dermal contact with contaminated soil).

If any component is missing, the pathway is incomplete and no exposure or risk would be associated with the pathway. The HHRA exposure assessment is based on current and reasonably likely future use of land and water.

Given the types of site uses, the likelihood of long term exposure to the Site by any human receptors is considered to be low. The most potentially significant human exposure to Site-related contaminants is most likely dermal contact or ingestion of impacted soil or dust. Potentially complete but insignificant pathways include dermal contact with surface soil, and incidental ingestion and dermal contact with surface water. Fish consumption was not considered to be a complete pathway since the nearest potentially fish-bearing surface water is located in North Fork Trout Creek, at least 1,700 away. A summary of receptors, media, and exposure pathways for human receptors is presented in a conceptual site model (SI Report, Figure 9).

3.2.3 Current and Potential Future Receptors

Based on its remote location, evidence of site use, and road access, the most likely human receptor populations exposed to site media are adult and child recreational users.

3.2.4 Exposure Assumptions

Receptor-specific exposure calculations were used to more accurately estimate potential risk to adult and child recreational users stemming from on site exposure to arsenic and cadmium in soils than is possible using generic criteria. These carcinogenic and non-carcinogenic calculations use standard equations and established EPA exposure parameters combined with exposure parameters specific to recreational users. Since EPA has no standard parameters for recreational receptors, professional judgment was used when standard parameters were unavailable. The exposure factors and risk equations for the human health risk assessment are presented in Attachment 1.

3.2.5 Exposure Point Concentrations

An exposure point concentration (EPC) represents the concentration of a chemical with which human receptors are reasonably likely to be exposed at a point of contact. Quantitative human health risk calculations use two types of exposure concentrations to quantify potential risk: the reasonable maximum exposure (RME), and the central tendency exposure (CTE). RME is a higher, more conservative, estimate of exposure and is typically the 95% UCL of the mean of sample concentrations. The CTE is the arithmetic mean of the sample concentrations and is a more moderate value. Human health risk calculated using each estimate of exposure concentration yields a range of risk values relevant to a specific human receptor. The EPCs in Site soil selected for each scenario are presented below:

Table 3-2. Human Health Exposure Point Concentrations (EPCs) in Soil

COPC	CAS Number	EPC (mg/kg)	
		CTE	RME
Arsenic	7440-38-2	6.11	7.89
Cadmium	7440-43-9	1.88	3.19

Notes:

EPC = Exposure Point Concentration in soil

CTE = Central Tendency Exposure, mean

RME = Reasonable Maximum Exposure, 95% UCL

3.3 Toxicity Assessment

The toxicity assessment identifies toxicological information that is relevant to Site-related COPCs. This information is used to quantify the relationship between chemical exposure and adverse effects.

Carcinogenic and non-carcinogenic toxicity factors were obtained from the Integrated Risk Information System (IRIS) database (USEPA, 2007c). Both carcinogenic and non-carcinogenic effects were quantitatively evaluated.

3.3.1 Categorization of Chemicals as Non-carcinogens or Carcinogen

Carcinogenic compounds can induce cancer, while non-carcinogenic compounds can have health effects that may damage organs or organ systems, but do not cause cancer. All chemicals are likely to have both carcinogenic and non-carcinogenic effects to some degree, but some compounds, such as Aroclor 1254, have documented toxicity factors for both carcinogenic and non-carcinogenic effects. In these cases, the compound will have both carcinogenic and non-carcinogenic risks that can be quantified.

The USEPA Carcinogen Assessment Group has developed weight-of-evidence categories for carcinogenic compounds by defining them as known, potential, or possible human carcinogens. First, available information is evaluated to determine whether or not a particular compound has any carcinogenic effects; this evidence is characterized for human studies and animal studies as sufficient, limited, inadequate, no data, or evidence of no effect. The results from the two types of studies are used to assign a preliminary overall human carcinogenic weight-of-evidence classification to the compound, which may be modified as EPA scientists review supporting information. The weight-of-evidence classification for each COPC is listed in Table 3-3.

3.3.1.1 Potential Carcinogenic Effects

Carcinogenic toxicity factors are referred to as slope factors (SFs). SFs estimate the theoretical, upper-bound excess lifetime cancer risks associated with exposure to potential carcinogens. For a carcinogen, a higher SF indicates a greater carcinogenic potency. Carcinogenic toxicity values for Site COPCs are listed in Table 3-3.

Table 3-3. Critical Toxicity Values for Carcinogenic COPCs

COPC	CAS Number	Slope Factor (mg/kg-day)		Weight of Evidence Classification	Type of Cancer	Source
		Oral	Inhalation			
Arsenic	7440-38-2	1.5E+00	4.30E-03	A	Skin	Epidemiologic studies
Cadmium	7440-43-9	--	1.80E-03	B1	Lung	Occupational epidemiologic studies

Notes:

A = human carcinogen

B1 = probable human carcinogen

Source: EPA Integrated Risk Information System (IRIS). www.epa.gov/iris/

3.3.1.2 Potential Non-carcinogenic Effects

Non-carcinogenic toxicity factors are referred to as reference doses (RfDs). For non-carcinogens, a lower RfD value indicates increased potency. Non-carcinogenic toxicity values for Site COPCs are listed in Table 3-4.

Table 3-4. Critical Toxicity Values for Non-Carcinogenic COPCs

COPC	CAS Number	Chronic RfD (mg/kg-day)		Confidence in RfD	Endpoint
		Oral	Inhalation		
Arsenic	7440-38-2	3.00E-04	--	Medium	Skin lesions
Cadmium	7440-43-9	1.00E-03	--	High	Highest Cd conc. in human renal cortex

Notes:

RfD = reference dose

Source: EPA Integrated Risk Information System (IRIS). www.epa.gov/iris/

3.4 Risk Characterization

USEPA defines the acceptable risk level for exposure of humans to individual carcinogens as a lifetime potential excess cancer risk (PECR) of one per one million (10^{-6}) people exposed, and the acceptable risk level for exposure of humans to individual non-carcinogens as resulting in a hazard quotient (HQ) equal to or less than one (1.0) (USEPA, 1989). An acceptable lifetime excess cancer risk of one per one hundred thousand (10^{-5}) applies to exposure of humans to multiple carcinogens. An acceptable risk level for exposure of humans to multiple non-carcinogens is defined as resulting in a hazard index (HI) equal to or less than 1.0. Although non-carcinogenic risk is also a concern, carcinogenic risk is usually the “driver” at a site.

Site-specific carcinogenic and non-carcinogenic risks for both current and future scenarios can be calculated using values obtained in the exposure and toxicity assessments, resulting in unitless risk values for both. Typically, this process is a forward-calculation of risk. In other words, chemical concentrations, chronic daily exposure intake values, and toxicity factors are used in risk formulas to calculate a particular site-specific risk value for a particular chemical and receptor.

In the case of non-carcinogenic risk, calculation of multiple-chemical risk is based on the summation of HQ values for individual non-carcinogens with the same target organ or critical effect. In other words, HQs of non-carcinogens that affect the liver would be added together to obtain an HI value, while HQs of non-carcinogens that affect the blood system would be summed separately from the HQs related to liver effects. This is consistent with recommendations made by EPA (USEPA, 1989).

Any COPC present at concentrations that produce unacceptable health risks is referred to as a chemical of concern (COC).

3.4.1 Excess Cancer Risk Assessment

Table 3-5 summarizes the risk estimates for adult and child recreational users at the Kelly Camp Mine Site. Human health risks are considered to be potentially unacceptable if the risk estimates for carcinogenic endpoints are greater than $1E-06$.

Table 3-5. Summary of Risk Estimates

Receptor Group	Carcinogenic Risk Estimate	
	CTE	RME
Child Recreational User	7.06E-08	5.77E-07
Adult Recreational User	2.02E-08	3.25E-07

Notes:

CTE = Central Tendency Exposure, mean

RME = Reasonable Maximum Exposure, 95% UCL

Since no risk estimate exceeds 1E-06, the findings of this receptor-specific recreational user model suggest that no potentially unacceptable carcinogenic risks are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways under either the RME or CTE scenarios.

3.4.2 Non-Carcinogenic Hazard Assessment

Human health risks are considered to be potentially unacceptable if the hazard indices for non-carcinogenic endpoints are greater than 1. Although HQs may be separated by target endpoints and summed separately, arsenic and cadmium HQs were added together in this assessment even though their endpoints are different. Even with this conservative generalization, no hazard index is greater than 1. The findings of this receptor-specific recreational user model suggest that no potentially unacceptable non-carcinogenic risks are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways under either the RME or CTE scenarios at the Kelly Camp Mine Site.

Table 3-6 Summary of Hazard Indices

Receptor Group	Non-carcinogenic Hazard Indices	
	CTE	RME
Child Recreational User	2.00E-03	1.68E-02
Adult Recreational User	3.1E-04	1.88E-03

Notes:

CTE = Central Tendency Exposure, mean

RME = Reasonable Maximum Exposure, 95% UCL

3.4.3 Uncertainty Evaluation

Evaluating areas of uncertainty in a risk assessment is extremely important to understanding the overall reliability of the assessment's conclusions. Areas of uncertainty are associated with data evaluation, exposure assessment, toxicity assessment, and risk characterization. These concerns do not invalidate the results of the risk assessment, but they should be taken into consideration in the overall context of how the results are used.

The generic screening of Site chemical concentrations in mine water and surface soil (Section 3.1) used screening criteria developed for highly exposed receptors. Screening using such conservative criteria

generally overestimates risk and is expected to be protective of less exposed human receptors with lower exposures, such as recreational users.

No generic human health screening criteria were available for comparison with concentrations of 20 chemicals in mine water. The amount of risk contributed by these chemicals could be better defined in risk assessment more detailed than a streamlined risk assessment. The amount of risk contributed by these chemicals is unknown, but is thought to constitute a relatively minor proportion of the overall risk from the Site.

3.5 Determination of Potential Hotspots

The results of the HHRA do not suggest that Site concentrations pose unacceptable risk to human receptors. There are no hot spots for potential risk of exposure to human receptors to Site media.

3.6 Calculation of Clean-up Goals

As evaluated during this streamlined risk assessment, clean-up is not required for the protection of human receptors. Concentrations of cadmium at the Site, however, did exceed MTCA Method A soil clean-up criteria for unrestricted land use. This scenario includes receptors and pathways that are not currently present at the Site. If these pathways or receptors, i.e. residential use, become appropriate, the MTCA Method A criteria would be useful to evaluate potential risks.

3.7 Summary of Potential Human Health Risks

Initial screening using generic and conservative screening criteria found that potential human health risk from contact with mine water was negligible.

Initial screening using generic and conservative criteria found that potential human health risk from contact with Site soil was limited to arsenic and cadmium. Human health risk from arsenic and cadmium was then quantified using recreational user-specific models which found no unacceptable risks to child and adult receptors periodically using the Site. However, MTCA Method A soil clean-up levels for unrestricted use are exceeded at the Site for cadmium 95% UCL concentrations. The findings of this receptor-specific recreational user model suggest that no unacceptable risks are likely to occur from dermal exposure, inhalation, and incidental ingestion pathways under either the RME or CTE scenarios.

Since no COPCs in mine water or soil were present at concentrations that produced unacceptable health risks, no human health COCs were identified.

4.0 STREAMLINED ECOLOGICAL RISK ASSESSMENT

The purpose of an ecological risk assessment (ERA) is to determine if chemical concentrations in Site media cause potentially unacceptable risks to ecological receptors. Although the chemicals that pose ecological risk may be similar to those that drive human health risk, chemicals driving human health and ecological risk are not necessarily the same due to differing exposures and sensitivities. For this reason, the risks must be calculated separately. This streamlined ecological risk assessment compares Site concentrations in soil and mine water to screening level values to develop a quantitative characterization of the potential for risk.

4.1 Problem Formulation

The ERA screening process initiates the problem formulation step of ecological risk assessment, as described in more detail in EPA guidance (USEPA 1997, USEPA 1998). Problem formulation involves identifying and understanding the relationships between Site characteristics and habitat, ecologically important receptors, potentially complete exposure pathways, the toxic effects of Site-related chemicals, and ecological assessment endpoints. The streamlined ERA results in the identification of chemicals of potential ecological concern (CPECs), and describes whether or not they are likely to cause adverse effects to ecological receptors under real site conditions.

4.1.1 Ecological Setting

This site is located in the Republic Ranger District of the Colville National Forest. Under the eco-region classification system (Bailey, 1995), it is within the Northern Rocky Mountain Forest Province of the Dry Domain. This area is dominated by mixed evergreen-deciduous forests with most precipitation occurring in the fall, winter, and spring. The Site is primarily covered with mature forest canopy, but is interrupted by the mine workings (e.g., openings, waste piles, etc.) and several small meadows.

At the time of the site visit, Site soils were very dry and with the exception of ants and a few spiders, no soil invertebrates were observed. Several species of flying invertebrates were present including representatives of the insect orders Hymenoptera (bees, wasps, and ants) and Diptera (flies). No naturally occurring surface water is present on the Site and the only nearby water is present within the main mine working/stope. No insects or other aquatic life were observed in the mine water.

Evidence of mammal use of the Site included observations of chipmunks (probably least chipmunks, *Tamias minimus*), bushy-tailed wood rats (*Neotoma cinerea*), and the scat of cows, deer, and rodents. One wood rat and one midden were observed in the upper mine working above the mine water, and two wood rats and six middens were observed in the lower adit. Various passerine birds were also observed, predominantly in the forested areas of the Site.

As discussed in the SI report, there are no known sensitive environments, or threatened or endangered species on the Site or in its immediate vicinity.

4.1.2 Conceptual Ecological Exposure Model

Potentially contaminated exposure media include Site mine water and Site soils and mine waste. Potentially complete pathways for immobile receptors (e.g., plants and soil biota) include direct exposure to Site surface soils. Potentially complete pathways for mobile receptors (e.g., birds and mammals) include incidental ingestion of surface water, food web exposure to surface water, incidental ingestion of surface soil, and food web exposure to surface soil. A summary of the complete, incomplete, and insignificant pathways is depicted in the conceptual site model (SI Report, Figure 9).

4.1.3 Assessment Endpoints and Measures

4.1.3.1 Assessment Endpoints

In a streamlined ERA, assessment endpoints are generalized to reflect the risk-based screening process and protective ecological risk-based screening concentrations. USEPA defines an assessment endpoint (AE) as an “explicit expression of an environmental value to be protected” (USEPA, 1997). AEs define both the valued ecological entity at the Site and a characteristic of the entity to protect, such as individual survival, population success, production per unit area, or changes in species distribution in an ecosystem community. Generally, each AE includes a guild or a functional group within an ecosystem, rather than one particular species. The assessment endpoints for this ERA are:

- Protection of the reproduction and survival of birds and mammals that may ingest mine water.
- Protection of the reproduction and survival of plants, soil biota, and wildlife exposed to COIs in surface soil at the Site.

4.1.3.2 Measurement Endpoints

USEPA defines a measurement endpoint (ME) as “a measurable ecological characteristic that is related to the valued characteristic chosen as the AE and is a measure of biological effects (e.g., mortality, reproduction, growth)” (USEPA, 1997). MEs can include measures of exposure or effect and are frequently quantified observations that can be compared statistically to a control such as a reference site or scientific study to predict adverse responses to Site-specific CPECs (e.g., exposure point concentrations [EPCs]). Each ME relates to a particular toxicity reference value (TRV) and correlates directly with one of the defined AEs. The measurement endpoints for this ERA include:

- Measured MDCs mine water compared to ecological risk-based screening criteria protective of mammals ingesting water.
- Measured 95% UCL concentrations of soil compared to ecological risk-based screening criteria protective of plants, soil biota, and wildlife exposed to COIs in site surface soil.

4.2 Ecological Risk-Based Screening

To conservatively assess risks to ecological receptors exposed to mine water, chemical concentrations in mine water were compared to screening criteria protective of aquatic life. The primary screening criteria used was the Washington Department of Ecology Aquatic Life criteria found in Table 240(3) (WAC 2006). When no Table 240(3) criterion was available for a chemical, Oakridge National Laboratory Preliminary Remediation Goals (PRGs) (Efroymson et al., 1997) were selected as secondary criteria. Comparison to aquatic life screening criteria is highly conservative since the mine water present on the Site does not provide aquatic habitat.

This conservative comparison with aquatic life criteria is useful because these criteria are standardized and readily available for many chemicals. If mine water concentrations do not present a risk to aquatic life as a whole, they are very unlikely to pose a risk to mammalian receptors ingesting mine water. As an isolated water source within a mine working, the ponded mine water is most likely only used by the wood rat living in the mine workings as a drinking water source. Potential ecological risks in mine water identified using the conservative aquatic life criteria can be further evaluated using literature-derived TRVs protective of mammals ingesting water.

Following the preliminary screening for detection frequency and MRLs (described in Section 2.0), ecological COIs in soil were screened against Washington Department of Ecology MTCA Table 749-3 criteria. These generic criteria represent soil concentrations that are expected to be protective of terrestrial plants and animals. Exceedances of these criteria do not necessarily mean that a significant

ecological risk is present, only that additional Site-specific analysis will be necessary to determine if a potential ecological risk is actually present on the Site.

Ecological COIs in soil and mine water that exceeded generic screening criteria became chemicals of potential ecological concern (CPECs). These CPECs are listed in Table 4-1.

Table 4-1. Chemicals of Potential Ecological Concern (CPECs)

CPECs	Screening Criteria Exceeded		Bioaccumulative?
	Soil	Mine Water	
Aluminum	--	AL	No
Arsenic	P	--	Yes
Barium	W	AL	No
Cadmium	P	--	Yes
Chromium	P, S	--	No
Cobalt	P	--	No
Copper	P, S, W	AL	No
Lead	P, W	--	Yes
Manganese	P	--	No
Mercury	S	--	Yes
Selenium	P, W	--	Yes
Silver	P	--	No
Zinc	P, S	--	No

Notes:

-- = No exceedance of screening criteria

Screening criteria protective of P-Plants, S-Soil Biota, W –Wildlife, AL- Aquatic Life

Five of these CPECs (i.e., arsenic, cadmium, lead, mercury, and selenium) have the potential to be bioaccumulate in the environment. Bioaccumulation is defined as the accumulation of substances in an organism, involving the biological sequestering of substances that enter the organism through respiration, food intake, skin contact, and/or other means. Generally, the more hydrophobic/lipophilic a chemical is, the more likely it is to bioaccumulate in the tissues of organisms. The degree to which bioaccumulation occurs is described through the use of chemical-specific bioaccumulation factors (BAFs). The higher a BAF, the more a chemical will tend to bioaccumulate in an organism.

4.3 Ecological Risk Characterization

The CPECs identified in the generic screening were further assessed through the calculation of risk ratios. The magnitude of potential ecological risk associated with each chemical can be quantified using risk ratios. Risk ratios are calculated by dividing exposure point concentrations by relevant screening criteria. If the risk ratio is greater than 1, then the exposure point concentration exceeds the screening criterion and this indicates the potential presence of an ecological risk on the Site. Multiple risk ratios may be calculated for a single chemical by comparing an exposure point concentration to multiple screening criteria.

For most species, an acceptable risk is one that does not pose a threat to the continued success of populations of ecological receptors. Population level effects are generally considered to occur when risk ratios are much greater than five. Threatened or endangered species are protected more conservatively at

the individual level. For these special status species, risk ratios greater than one suggests that chemical concentrations pose potential risks to individual members of a species. As no special status species are likely to be present at the Kelly Camp Mine Site, population-level protection of ecological receptors is most appropriate.

4.3.1 Mine Water

Three detected chemicals (aluminum, barium, and copper) in mine water had risk ratios greater than 1.0. Nine other chemicals were not present in detectable concentrations, but their MRLs exceeded their relevant screening criteria. These chemicals were beryllium, boron, cadmium, lead, lithium, mercury, selenium, silver, and thallium. Due to their high MRLs, these chemicals could be present in mine water at concentrations below their MRLs but greater than their relevant screening criteria. For this reason, they were retained as CPECs in mine water and are further considered in the Uncertainty Section. A summary of the risk ratios for Site CPECs in mine water is presented in Table 4-2.

Table 4-2. Ecological Risk Ratios for Mine Water

CPECs	Risk Ratios for Mine Water		Source	Significant?
	Aquatic Life	n*		
Aluminum	1.4	1	ORNL PRGs	No, risk ratios are less than 5.
Arsenic	0.01	0	WDOE	No, risk ratio is less than 1.
Barium	1.4	2	ORNL PRGs	No, risk ratios are less than 5.
Beryllium	ND ^a	NA	ORNL PRGs	Will discuss in Uncertainty Section
Boron	ND ^a	NA	ORNL PRGs	Will discuss in Uncertainty Section
Cadmium	ND ^a	NA	WDOE	Will discuss in Uncertainty Section
Chromium	0.1	0	WDOE	No, risk ratio is less than 1.
Copper	10.2	2	WDOE	Yes, potentially significant.
Lead	ND ^a	NA	WDOE	Will discuss in Uncertainty Section
Lithium	ND ^a	NA	ORNL PRGs	Will discuss in Uncertainty Section
Mercury	ND ^a	NA	WDOE	Will discuss in Uncertainty Section
Selenium	ND ^a	NA	WDOE	Will discuss in Uncertainty Section
Silver	ND ^a	NA	ORNL PRGs	Will discuss in Uncertainty Section
Thallium	ND ^a	NA	ORNL PRGs	Will discuss in Uncertainty Section
Zinc	0.3	0	WDOE	No, risk ratio is less than 1.
Total Receptor Group Risk	13.4			

Notes:

NA = not available.

ND ^a = analyte was not detected but method reporting limits are higher than screening criteria.

Risk ratio = maximum concentration in mine water/lowest screening criterion
Bolded text indicate risk ratios > 1.0 (protective cut-off for special status species)
Underlined text indicates risk ratios > 5 (protective cutoff for non-special status populations)
n* = number of exceedances of an ERBSC

The MDCs of aluminum, barium, and zinc in mine water slightly exceeded generic screening criteria for surface water with risk ratios less than 1.5. The MDC of copper exceeded the Washington Department of Ecology Table 720-1 generic screening criterion protective of aquatic life with a risk ratio of 10. This suggests that copper is the most significant CPEC in mine water.

Risk ratios were initially generated using criteria protective of aquatic life. Although this strategy is conservative, aquatic habitat is not present within the mine and criteria protective of mammals drinking mine water are more appropriate. A search for TRVs specifically protective of mammals drinking water (LANL, 2005) found TRVs for copper ranging from 22 milligrams per liter (mg/L) (protective of the montane shrew) to 59 mg/L (protective of the red fox). As these concentrations are well above the maximum total copper concentrations found in the mine water (0.211 mg/L), the potential risk from mammals drinking the mine water is considered low and is not further considered.

4.3.2 Soil

Twelve chemicals detected in soil had at least one risk ratio greater than 1 and are considered to be CPECs in soil. These chemicals, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, and zinc, had risk ratios ranging from below one to 252. The greatest risk ratios were associated with copper concentrations. A summary of the risk ratios for Site CPECs in soil is presented in Table 4-3.

Table 4-3. Ecological Risk Ratios for Soil

CPECs	Risk Ratios for Soil						Source	Significant?
	Terrestrial Plants	n*	Soil Biota	n*	Wildlife	n*		
Arsenic	1.4	2	0.2	0	0.1	0	MTCA Table 749-3	No, risk ratios are less than 5.
Barium	0.9	0	No ERBSC	NA	1.7	19	MTCA Table 749-3	No, risk ratios are less than 5.
Cadmium	2.1	2	0.4	0	0.2	0	MTCA Table 749-3	No, risk ratios are less than 5.
Chromium	1.1	2	1.1	2	0.4	0	MTCA Table 749-3	No, Site concentrations are very near background levels and criteria are below background concentrations.
Cobalt	1.7	1	No ERBSC	NA	No ERBSC	NA	MTCA Table 749-3	No, risk ratio is less than 5.
<u>Copper</u>	<u>126</u>	13	<u>252</u>	16	<u>37</u>	11	MTCA Table 749-3	Yes, potentially significant.
<u>Lead</u>	<u>9.0</u>	3	0.9	0	1.9	2	MTCA Table 749-3	Yes, potentially significant.
Manganese	2.5	2	No ERBSC	NA	0.6	1	MTCA Table 749-3	No, risk ratios are less than 5.
Mercury	0.8	0	2.5	1	0.01	0	MTCA Table 749-3	No, risk ratios are less than 5. Only a single sample exceeds criteria.
Selenium	<u>8.0</u>	2	0.1	0	<u>6.7</u>	2	MTCA Table 749-3	No, Site concentrations are similar to background concentration. Only two detections among 26 samples.
<u>Silver</u>	<u>14</u>	7	No ERBSC	NA	No ERBSC	NA	MTCA Table 749-3	Yes, potentially significant.
Zinc	2.5	11	1.1	2	0.3	0	MTCA Table 749-3	No, risk ratios are less than 5.
Total Receptor Group Risk	169		258		49			

Notes:

NA = not available.

Risk ratio = maximum concentration in mine water/lowest screening criterion

Highlighted cells indicate risk ratios > 1.0 (protective cut-off for special status species)
Underlined text indicates risk ratios > 5 (protective cut-off for non-special status populations)
n* = number of exceedances of an ERBSC

Eight metals (barium, cadmium, chromium, cobalt, manganese, mercury, selenium, and zinc) have Site concentrations that are likely to pose negligible risks to ecological receptors at the Site. These metals have Site concentrations that are similar to background concentrations (within the same order of magnitude), have risk ratios that are driven by screening criteria below background concentrations, and/or have risk ratios less than 5.

- Although risk ratios for **barium** are slightly above one, Site concentrations of barium are essentially indistinguishable from background concentrations. The 95% UCL concentration of barium for the Site is 172 mg/kg, a concentration lower than the background 90th percentile of 228 mg/kg. For this reason, barium is not further considered in the risk assessment.
- The only **cadmium** risk ratio that was greater than one is the risk ratio for terrestrial plants of 2.1. Since this value is less than 5, Site cadmium concentrations are unlikely to pose risk to populations of species. For this reason, cadmium is unlikely to play a significant role in ecological risk and is not further considered in the risk assessment.
- Site concentrations of **chromium** are very near background levels. The Site 95% UCL of 25.07 mg/kg is lower than the background 90th percentile of 26.2 mg/kg. Five of the 26 Site samples are greater than the background 90th percentile, but the highest, 47.5 mg/kg is less than twice background. Also, since risk ratios for chromium only slightly exceed 1 and are less than 5, these concentrations unlikely to pose unacceptable risks to ecological populations. For these reasons chromium seems unlikely to pose ecological risk significantly above background and this chemical is not further considered in the risk assessment.
- Risk ratios for **manganese** are slightly above one and Site concentrations of manganese are slightly higher than background concentrations. Although the Site 95% UCL concentration of manganese of 890 mg/kg is higher than the background 90th percentile of 693 mg/kg, the Site 95% UCL concentration is below the Washington State natural background concentration of 1,100 mg/kg. Less than 5, the risk ratio for manganese of 2.5 is unlikely to cause significant adverse impacts on ecological populations. For these reasons, manganese is not further considered in the risk assessment.
- The only **mercury** risk ratio to exceed one was the risk ratio of 2.5, protective of soil biota. Since only five of the 26 samples detected mercury and the MDC lead to a risk ratio of less than 5, Site mercury concentrations are considered unlikely to result in significant ecological risk at this site. For these reasons, mercury is not considered further in the risk assessment.
- Although **selenium** exceeded screening criteria, Site sample concentrations are similar to background concentrations. Only two of 26 Site samples had detected concentrations of selenium. Since selenium was so rarely detected and its MDC is only twice the reporting limit, it is not considered further in the risk assessment.
- The risk ratios for **zinc** that exceeded one were protective of immobile receptors (i.e., terrestrial plants and soil biota). These risk ratios used the MDC as the EPC. When 95% UCL concentrations are considered, however, the Site 95% UCL concentration of 107.5 mg/kg is less than twice that of the background 90th percentile of 60.7 mg/kg. Although the risk ratios for immobile receptors slightly exceed 1, they are less than 5 and thus are unlikely to result in significant ecological risk at the Site. For these reasons, zinc is not considered further in the risk assessment.

4.3.3 Risk Description

The only CPEC in mine water with a risk ratio greater than five was copper, with a risk ratio of 10. When TRVs specific to mammal ingestion of surface water were considered, however, the MDC of total copper in mine water fell below all potentially relevant TRVs, indicating that mammals would not experience undue adverse effects from this concentration of copper. For this reason, potential ecological risk from ingestion of mine water is considered to be low.

In soil, risk ratios greater than five occurred for copper, lead, selenium, and silver. Based on the rationale presented in Section 4.3.2, however, only the risk ratios of copper, lead, and silver were considered to be indicative of potential ecological risk. The highest risk ratio for each of these three metals was 252 for copper, 9.0 for lead, and 14 for silver.

4.3.4 Ecological Hotspots

A hot spot in soil is defined as an area where the contamination is “highly contaminated,” highly mobile, or cannot be reliably contained. Hot spots in soil were determined for ecological receptors by comparing each soil sample concentration to the lowest MTCA Table 749-3 screening criterion for copper, lead, and silver. A Site soil sample was considered to have elevated concentrations if one or more CPEC concentrations exceeded the higher of five times the most conservative screening criterion or twice the background concentration. Nine samples met this criterion (RS-12, RS-13, S-18, S-21, and S-30 through S-34). The spatial distribution of samples with elevated concentrations was assessed to determine if the samples with elevated concentrations clustered together and formed hot spots.

If just the five samples with the highest copper concentrations (i.e., RS-13 and S-30 through S-33; see SI Report, Figure 11) were removed from the Site, this would reduce the 95% UCL for remaining Site copper concentrations from 8,097 mg/kg to 428 mg/kg. This assumes that the soil remaining after hot spot removal would have a composition similar to that of the rest of the Site sample concentrations. This change would reduce the copper risk ratios for wildlife from a high of 37 to 2.0 and for soil biota (immobile receptors with the highest risk ratio on the Site) from a high of 252 to 17.

Since samples with the highest copper concentrations also have high concentrations of lead and silver, removing soil from the areas around the five samples with the highest concentrations of copper would risk from these metals as well. More specifically:

- The 95% UCL of lead would decline from 218.5 mg/kg to 60.5 mg/kg, leading to a decline in risk ratio from 1.9 to 0.5 for mobile receptors. Risk ratios for immobile receptors would fall from 9.0 to 2.5.
- The removal of these five samples would lead to a decline in risk ratios for silver from 14 for terrestrial plants to 2.0.

Removing the five samples with the highest copper values would result in acceptable risk ratios (i.e., below 5) for all ecological receptors except for soil biota exposed to copper. Removing the most highly contaminated soil areas drives down Site-wide 95% UCL concentrations and clearly reduces risk to mobile receptors. Immobile receptors, however, are exposed to the MDC in the ecological screening and so only show declines in risk ratios when the Site MDC is reduced. For example, to achieve a risk ratio below five for soil biota exposed to copper (or a maximum soil concentration of 250 mg/kg) the remaining four samples with elevated concentrations would need to be removed. Since several of these sample locations are not located adjacent to the top five copper values, it is not appropriate to include these in the area defined as the hot spot.

4.3.5 Uncertainty Analysis

Ecological risks are likely to be intentionally overestimated due to the conservative approach used to perform the screening and the use of generic screening criteria. The use of Site-specific parameters and TRVs for target ecological receptors would likely be less stringent than generic criteria while still remaining adequately protective of ecological receptors. Site-specific ecological exposure modeling, however, is generally not used at the screening level, but is typically part of more in-depth ecological risk assessments.

Generic ecological screening criteria were compared to Site concentrations of metals in soil. This comparison is expected to be overly conservative because:

- The bioavailability of metals in the soil was not determined. If metals were tested for bioavailability, ecological risk may drop significantly.
- Site-specific exposure parameters and TRVs were not used. The generic screening criteria used in this assessment may have been developed using species that were especially sensitive to the effects of metals. If these sensitive species do not have the potential to be present at this site, the use of these generic criteria would add uncertainty into the ecological risk assessment.

This streamlined ecological risk assessment assumed that all receptors would inhabit and forage exclusively within the Kelly Camp Mine Site (area use factor assumed to be 1). This is a conservative assumption that would tend to overestimate risks to ecological receptors. Even for immobile species or species with small home ranges (e.g., plants, invertebrates, small mammals) it is very unlikely that entire populations of these species would reside exclusively within the 5-acre Kelly Camp Mine Site. In addition, the moderately disturbed Site does not provide especially valuable habitat that would be significantly more attractive to ecological receptors than the surrounding areas.

Although only a limited number of Site samples were collected, these 26 samples are thought to be reasonably representative of Site conditions. Further characterization of the lower adit mine workings would help provide additional information about that area. Although the lower adit pile does not currently appear to cause unacceptable risk to ecological receptors, additional data could be useful to increase certainty.

Nine chemicals potentially present in mine water (i.e., beryllium, boron, cadmium, lead, lithium, mercury, selenium, silver, and thallium) were included as CPECs solely because their MRLs exceeded applicable generic screening criteria. It is possible that these chemicals are not present in mine water and pose no potential ecological risk. It is also possible, however, that the chemicals are present at concentrations below the MRL but above the screening criteria and potentially pose risk. The analytical method selected for mine water employed standard MRLs capable of providing detections in the range of ug/L while also allowing analysis of a broad set of metals at a reasonable cost. This breadth is useful in a screening level risk assessment but since risk-based screening criteria are typically developed without consideration of cost constraints, screening criteria sometimes fall below analytical standards. Although the amount of potential risk contributed by these chemicals is unknown, these undetected chemicals are considered unlikely to present unacceptable risks to the populations of ecological receptors that may contact the Site. This data gap could be eliminated in a subsequent, more focused risk assessment.

No generic screening criteria were available for comparison with concentrations of 21 chemicals in mine water. The amount of potential risk contributed by these chemicals is unknown, but is thought to constitute a relatively minor proportion of the overall potential risk from the Site.

Five CPECs were identified as having the potential to bioaccumulate in the food web. Lower trophic level organisms (e.g., plants and soil biota) typically experience few adverse effects due to the toxicity associated with bioaccumulative compounds. Upper trophic level receptors, however, such as foxes and hawks, will be more vulnerable to these chemicals as they continue to be exposed through the food web.

Since there is no streamlined method to quantify the effects of bioaccumulation to upper trophic level receptors, bioaccumulation remains an uncertainty in the risk assessment. A more detailed, Site-specific risk assessment would help reduce the uncertainty associated with bioaccumulation potential.

4.3.6 Determination of Clean-up Level

Although soil concentrations of copper, lead, and silver at the Kelly Camp Mine Site appear to have the potential to cause unacceptable ecological risk, the determination of a soil clean-up level should occur only after considering methods to further narrow the uncertainty surrounding this estimate of ecological risk. Strategies to reduce estimated ecological risk without removing soil exceeding a defined clean-up level include:

- Assessing the bioavailability of metals in Site soils. If a substantial fraction of metals measured in soils are not bioavailable to ecological receptors, they are unlikely to cause adverse ecological impacts.
- As described in the previous section, reducing the exposure of ecological receptors to the areas of the Site with the highest soil concentrations of copper and lead is likely to substantially reduce ecological risk. This could be achieved without soil removal by capping the main working/stope waste rock area.
- Develop an ecological risk assessment with greater specificity and relevancy to the ecological receptors present on the Site. This may include selection of species-specific TRVs, estimates of dietary composition and chemical concentrations, and species-specific uptake models.

Although soil concentrations of copper, lead, and silver at the Site appear to have the potential to cause unacceptable ecological risk, the determination of a final soil clean-up level associated with a removal action should occur only after considering methods to further narrow the uncertainty surrounding this estimate of ecological risk.

This notwithstanding, a clean-up level for ecological receptors could be generated by taking the lowest of either the Site background or five times the MTCA screening values for copper, lead, and silver.

- If followed, this results in the following cleanup levels:
 - Copper – 250 mg/kg
 - Lead – 250 mg/kg
 - Silver – 10 mg/kg

As this would result in a large clean-up footprint, this does not appear to be an appropriate strategy for determining a clean-up value for a removal action.

4.4 Summary of Ecological Risks

The only CPEC in mine water with a risk ratio greater than five was copper, with a risk ratio of 10. When TRVs specific to mammal ingestion of surface water were considered, however, the MDC of total copper in mine water was below the TRVs, indicating that mammals would not experience undue adverse effects from this concentration of copper. For this reason, ecological risk from ingestion of mine water is considered to be low.

In soil, risk ratios greater than five occurred for copper, lead, selenium, and silver. Based on the rationale presented earlier in Section 4.3.2, however, only the risk ratios of copper, lead, and silver were considered to be indicative of potential ecological risk. The highest risk ratio for each of these three metals was 252 for copper, 9.0 for lead, and 14 for silver.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Exposure Assessment

- The combination of XRF, soil, and mine water samples provided reasonably good coverage and characterization of the Site. The combined 36 soil samples (26 Site and 10 background) were a sufficient number of samples to calculate averaging statistics.
- Two areas on the southern portion of the Site, the lower adit and powder magazine, were less well characterized by the sample coverage. Based on a review of Site history and aerial photographs, observations in the field, and our general understanding of Site characteristics, no information was collected to indicate that significant data gaps exist at these locations. In addition, these areas are limited in extent relative to the rest of the mine Site. Uncertainty surrounding the extent and concentrations of environmental contaminants at these locations remains, however, and additional sampling would be necessary to fully characterize this portion of the Site.
- Background soil was sampled and concentrations were compared with Site soil concentrations. Although background soil had concentrations of metals that were generally lower than those of Site soil, background soil concentrations of barium exceeded the most conservative ecological screening criterion.
- Contaminants were considered to have the potential to cause risk only if they significantly exceeded the background 90th percentile concentrations.

Risk Evaluation

Human Health Risk

- Although water is present within the main mine workings/stope, this mine water is unlikely to be consumed by human receptors. Mine water did not exceed screening criteria protective of human ingestion and is considered to have a low potential for risk.
- While soil did not pose an unacceptable risk to child and adult recreational receptors, soil concentrations of cadmium did exceed MTCA Method A soil clean-up levels for unrestricted land use. Since unrestricted land use includes residential use, this scenario is not currently appropriate for use at the Site.

Ecological Risk

- Although water is present within the main mine workings/stope, this mine water is unlikely to be consumed by most ecological receptors. Mine water exceeded screening criteria for aluminum, barium, and copper. Further evaluation of screening criteria concluded that the mine water exposure to ecological receptors is considered to have a low potential for risk.
- Site-related soil and mine waste contained higher concentrations of copper, lead, and silver compared to background concentrations. In some areas, these Site soil concentrations may pose potentially unacceptable risks for some ecological receptors.
- Site copper concentrations are most enriched over background soil concentrations (249 times higher), and these concentrations contribute the most to potential ecological risk at the Site with lead and silver contributing lesser amounts of potential risk.
- Entire populations of ecological receptors are unlikely to be limited to the relatively small Site, especially since the Site does not provide high quality habitat.

- Although there are no known threatened, endangered, or special status species present on the Site, these species may occasionally access the Site. Such short-term use is unlikely to cause significant adverse effects.

Five bioaccumulative chemicals were identified among CPECs. These chemicals, arsenic, cadmium, lead, mercury, and selenium, may cause adverse effects to ecological receptors as they accumulate in the food web. The ecological risk posed by bioaccumulative chemicals can be further defined in a Site-specific risk assessment and through modeling using BAFs.

No bioavailability assessment was performed on the CPECs. The completion of a bioavailability assessment may indicate a reduced potential for ecological risk.

6.0 FOREST SERVICE DISCLAIMER

This abandoned mine/mill site was created under the General Mining Law of 1872 and is located solely on National Forest System (NFS) lands administered by the USDA Forest Service. The United States has taken the position and courts have held that the United States is not liable as “owner” under CERCLA Section 107 for mine contamination left behind on NFS lands by miners operating under the 1872 Mining Law. Therefore, USDA Forest Service believes that this site should not be considered a “federal facility” within the meaning of CERCLA Section 120 and should not be listed on the Federal Agency Hazardous Waste Compliance Docket. Instead, this site should be included on EPA’s CERCLIS database. Consistent with the June 24, 2003 OECA/FFEO “Policy on Listing Mixed Agency Hazardous Waste Compliance Docket,” we respectfully request that EPA Regional Docket Coordinator consult with the Forest Service and EPA Headquarters before making a determination to include this site on the Federal Agency Hazardous Waste Compliance Docket.

7.0 REFERENCES

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ATTACHMENT 1
RISK ASSESSMENT CALCULATION TABLES

Attachment 1, Table 1. Toxicological Reference Values
Kelly Camp Mine, Republic, Washington

Chemical	Is this Chemical a Carcinogen?		Carcinogen		Non-Carcinogen	
	Oral	Inhalation	Oral SF mg/kg-d	Inhalation Unit Risk ($\mu\text{g}/\text{m}^3$) ⁻¹	RfD _o mg/kg-d	RfC mg/m ³
Arsenic	Yes	Yes	1.50E+00	4.30E-03	3.00E-04	---
Cadmium	No	Yes	---	1.80E-03	1.00E-03	---

Notes:

SF = Slope factor

RfDo = Oral reference dose

RfC = Reference concentration

Attachment 1, Table 2. Estimated Chemical Intake (CTE) Child Recreational User
Kelly Camp Mine, Republic, Washington

Child (6-11 years) Recreational Receptor Characteristics (CTE)

Cs	Concentration of COPC in soil (mg/kg)	chemical-specific data	Site-Specific Data
F	Fraction of contacted soil from site (unitless)	0.5	Professional
RAFo	Relative absorption factor (oral) (unitless)	1	Professional
IRs	Soil ingestion rate (mg/day)	100	USEPA 1997, USEPA 1996
IRa	Inhalation Rate (m ³ /day)	8.3	EPA 1997
ED	Exposure duration (years)	6	Professional
EF	Exposure frequency (days/year)	7	Professional
PEF	Particulate emission factor (m ³ /kg)	1.31E+09	EPA 2000
M	Soil to skin adherence (mg/cm ²)	0.3	USEPA 1997, USEPA 2003
SA	Skin surface area for soil contact (cm ² /day)	4,500	EPA 2004
RAFd	Relative absorption factor (dermal) (unitless)	0.03	USEPA 2003
BW	Body weight (kg)	15	Richardson 1997
ATc	Averaging time for carcinogens (days)	25,550	EPA 1989
ATn	Averaging time for non-carcinogens (days)	2,190	ED x 365 days

Intake Calculations

Carcinogens		Non-Carcinogens	
Inhalation of Soil Particles			
Lifetime Average Daily Dose (LADD) LADD = $\frac{Cs*IRa*EF*ED*(PEF)^1}{BW * ATc}$		Average Daily Dose (ADD) ADD = $\frac{Cs*IRa*EF*ED*(PEF)^1}{BW * ATn}$	
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	4.24E-12		4.95E-11
Cadmium	1.31E-12		1.52E-11
Ingestion of Soil			
LADD = $\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATc}$		ADD = $\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATn}$	
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	3.35E-08		3.91E-07
Cadmium	1.03E-08		1.20E-07
Dermal Contact with Soil			
LADD = $\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATc}$		ADD = $\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATn}$	
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	1.36E-08		1.58E-07
Cadmium	4.17E-09		4.87E-08

Attachment 1, Table 3. CTE Risk Estimates Child Recreational User
Kelly Camp Mine, Republic, Washington

Child (6-11) Recreational User Risk Calculations (CTE)

Carcinogenic Risk		Non-Carcinogen Risk	
Incremental Lifetime Cancer Risk (ILCR) ILCR = LADD * SF		Hazard Quotient (HQ) HQ = $\frac{ADD}{TDI \text{ or } TC \text{ or } RfDo}$	
Inhalation of Soil Particles			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	1.82E-14	---	
Cadmium	2.35E-15	---	
Total Risks Due to Soil Inhalation			
2.06E-14		0.00E+00	
Ingestion of Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	5.02E-08	1.30E-03	
Cadmium	---	1.20E-04	
Total Risks Due to Soil Ingestion			
5.02E-08		1.42E-03	
Dermal Contact with Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	2.03E-08	5.27E-04	
Cadmium	---	4.87E-05	
Total Risks Due to Dermal Contact with Soil			
2.03E-08		5.76E-04	
Total Multiple Pathway Risks			
Carcinogenic		Non-Carcinogenic	
7.06E-08		2.00E-03	

Attachment 1, Table 4. Estimated Chemical Intake (CTE) Adult Recreational User
Kelly Camp Mine, Republic, Washington

Adult (20 years+) Recreational Receptor Characteristics (CTE)

		chemical-specific data	Site-Specific Data
Cs	Concentration of COPC in soil (mg/kg)		
F	Fraction of contacted soil from site (unitless)	1	Professional
RAFo	Relative absorption factor (oral) (unitless)	1	Professional
IRs	Soil ingestion rate (mg/day)	50	EPA 1993
IRa	Inhalation Rate (m ³ /day)	15.2	EPA 1997
ED	Exposure duration (years)	9	Professional
EF	Exposure frequency (days/year)	7	Professional
PEF	Particulate emission factor (m ³ /kg)	1.31E+09	CARB 2002
M	Soil to skin adherence (mg/cm ²)	0.08	EPA 2004
SA	Skin surface area for soil contact (cm ² /day)	5,200	EPA 2004
RAFd	Relative absorption factor (dermal) (unitless)	0.03	USEPA 2003
BW	Body weight (kg)	70	EPA 1997
ATc	Averaging time for carcinogens (days)	25,550	EPA 1989
ATn	Averaging time for non-carcinogens (days)	3,285	ED x 365 d

Intake Calculations

Carcinogens		Non-Carcinogens	
Inhalation of Soil Particles			
Lifetime Average Daily Dose (LADD)		Average Daily Dose (ADD)	
LADD =	$\frac{Cs*IRa*EF*ED*(PEF)^1}{BW * ATc}$	ADD =	$\frac{Cs*IRa*EF*ED*(PEF)^1}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	2.50E-12		1.94E-11
Cadmium	7.68E-13		5.98E-12
Ingestion of Soil			
LADD =	$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATc}$	ADD =	$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	1.08E-08		8.37E-08
Cadmium	3.31E-09		2.58E-08
Dermal Contact with Soil			
LADD =	$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATc}$	ADD =	$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	2.69E-09		2.09E-08
Cadmium	8.26E-10		6.43E-09

Attachment 1, Table 5. CTE Risk Estimates Adult Recreational User
Kelly Camp Mine, Republic, Washington

Adult (20 years+) Recreational Risk Calculations (CTE)

Carcinogenic Risk		Non-Carcinogen Risk	
Incremental Lifetime Cancer Risk (ILCR) ILCR = LADD * SF		Hazard Quotient (HQ) HQ = $\frac{\text{ADD}}{\text{TDI or TC or RfDo}}$	
Inhalation of Soil Particles			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	1.07E-14	---	
Cadmium	1.38E-15	---	
Total Risks Due to Soil Inhalation			
1.21E-14		0.00E+00	
Ingestion of Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	1.61E-08	2.79E-04	
Cadmium	---	2.58E-05	
Total Risks Due to Soil Ingestion			
1.61E-08		3.05E-04	
Dermal Contact with Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	4.03E-09	6.96E-05	
Cadmium	---	6.43E-06	
Total Risks Due to Dermal Contact with Soil			
4.03E-09		7.61E-05	
Total Multiple Pathway Risks			
Carcinogenic		Non-Carcinogenic	
2.02E-08		3.81E-04	

Attachment 1, Table 6. Estimated Chemical Intake (RME) Child Recreational User
Kelly Camp Mine, Republic, Washington

Child (6-11 years) Recreational Receptor Characteristics (RME)

		chemical-specific data	Site-Specific Data
Cs	Concentration of COPC in soil (mg/kg)		
F	Fraction of contacted soil from site (unitless)	0.5	Professional
RAFo	Relative absorption factor (oral) (unitless)	1	Professional
IRs	Soil ingestion rate (mg/day)	400	EPA 1997
IRa	Inhalation Rate (m ³ /day)	8.3	EPA 1997
ED	Exposure duration (years)	6	Professional
EF	Exposure frequency (days/year)	14	Professional
PEF	Particulate emission factor (m ³ /kg)	1.31E+09	EPA 2000
M	Soil to skin adherence (mg/cm ²)	0.3	USEPA 1997, USEPA 2003
SA	Skin surface area for soil contact (cm ² /day)	5,000	EPA 2004
RAFd	Relative absorption factor (dermal) (unitless)	0.03	USEPA 2003
BW	Body weight (kg)	15	Richardson 1997
ATc	Averaging time for carcinogens (days)	25,550	EPA 1989
ATn	Averaging time for non-carcinogens (days)	2,190	ED x 365 d

Intake Calculations

Carcinogens		Non-Carcinogens	
Inhalation of Soil Particles			
Lifetime Average Daily Dose (LADD)		Average Daily Dose (ADD)	
LADD =	$\frac{Cs*IRa*EF*ED*(PEF)^{-1}}{BW * ATc}$	ADD =	$\frac{Cs*IRa*EF*ED*(PEF)^{-1}}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	1.10E-11		9.90E-11
Cadmium	4.43E-12		5.17E-11
Ingestion of Soil			
LADD =		ADD =	
	$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATc}$		$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	3.46E-07		4.04E-06
Cadmium	1.40E-07		1.63E-06
Dermal Contact with Soil			
LADD =		ADD =	
	$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATc}$		$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	3.89E-08		4.54E-07
Cadmium	1.57E-08		1.84E-07

Attachment 1, Table 7. RME Risk Estimates Child Recreational User
Kelly Camp Mine, Republic, Washington

Child (6-11) Recreational User Risk Calculations (RME)

Carcinogenic Risk		Non-Carcinogen Risk
Incremental Lifetime Cancer Risk (ILCR) ILCR = LADD * SF		Hazard Quotient (HQ) HQ = $\frac{\text{ADD}}{\text{TDI or TC or RfDo}}$
Inhalation of Soil Particles		
Chemical	ILCR (unitless)	HQ (unitless)
Arsenic	4.71E-14	---
Cadmium	7.97E-15	---
Total Risks Due to Soil Inhalation		
5.51E-14		0.00E+00
Ingestion of Soil		
Chemical	ILCR (unitless)	HQ (unitless)
Arsenic	5.19E-07	1.35E-02
Cadmium	---	1.63E-03
Total Risks Due to Soil Ingestion		
5.19E-07		1.51E-02
Dermal Contact with Soil		
Chemical	ILCR (unitless)	HQ (unitless)
Arsenic	5.84E-08	1.51E-03
Cadmium	---	1.84E-04
Total Risks Due to Dermal Contact with Soil		
5.84E-08		1.70E-03
Total Multiple Pathway Risks		
	Carcinogenic 5.77E-07	Non-Carcinogenic 1.68E-02

Attachment 1, Table 8. Estimated Chemical Intake (RME) Adult Recreational User
Kelly Camp Mine, Republic, Washington

Adult (20 years+) Recreational Receptor Characteristics (RME)

Cs	Concentration of COPC in soil (mg/kg)	chemical-specific data	Site-Specific Data
F	Fraction of contacted soil from site (unitless)	1	Professional
RAFo	Relative absorption factor (oral) (unitless)	1	Professional
IRs	Soil ingestion rate (mg/day)	100	EPA 1993
IRa	Inhalation Rate (m ³ /day)	15.2	EPA 1997
ED	Exposure duration (years)	30	Professional
EF	Exposure frequency (days/year)	14	Professional
PEF	Particulate emission factor (m ³ /kg)	1.31E+09	EPA 2000
M	Soil to skin adherence (mg/cm ²)	0.08	EPA 2004
SA	Skin surface area for soil contact (cm ² /day)	6,900	EPA 2004
RAFd	Relative absorption factor (dermal) (unitless)	0.03	USEPA 2003
BW	Body weight (kg)	70	EPA 1997
ATc	Averaging time for carcinogens (days)	25,550	EPA 1989
ATn	Averaging time for non-carcinogens (days)	10,950	ED x 365 d

Intake Calculations

Carcinogens		Non-Carcinogens	
Inhalation of Soil Particles			
Lifetime Average Daily Dose (LADD)		Average Daily Dose (ADD)	
LADD =	$\frac{Cs*IRa*EF*ED*(PEF)^{-1}}{BW * ATc}$	ADD =	$\frac{Cs*IRa*EF*ED*(PEF)^{-1}}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	2.15E-11		5.02E-11
Cadmium	8.69E-12		2.03E-11
Ingestion of Soil			
LADD =		ADD =	
	$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATc}$		$\frac{Cs*F*IRs*RAFo*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	1.85E-07		4.32E-07
Cadmium	7.49E-08		1.75E-07
Dermal Contact with Soil			
LADD =		ADD =	
	$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATc}$		$\frac{Cs*F*SA*M*RAFd*EF*ED*10^6}{BW * ATn}$
Chemical	LADD (mg/kg-day)		ADD (mg/kg-day)
Arsenic	3.07E-08		7.16E-08
Cadmium	1.24E-08		2.89E-08

Attachment 1, Table 9. RME Risk Estimates Adult Recreational User
Kelly Camp Mine, Republic, Washington

Adult (20 years+) Recreational User Risk Calculations (RME)

Carcinogenic Risk		Non-Carcinogen Risk	
Incremental Lifetime Cancer Risk (ILCR) ILCR = LADD * SF		Hazard Quotient (HQ) HQ = $\frac{\text{ADD}}{\text{TDI or TC or RfDo}}$	
Inhalation of Soil Particles			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	9.24E-14	---	
Cadmium	1.56E-14	---	
Total Risks Due to Soil Inhalation			
1.08E-13		0.00E+00	
Ingestion of Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	2.78E-07	1.44E-03	
Cadmium	---	1.75E-04	
Total Risks Due to Soil Ingestion			
2.78E-07		1.62E-03	
Dermal Contact with Soil			
Chemical	ILCR (unitless)	HQ (unitless)	
Arsenic	4.60E-08	2.39E-04	
Cadmium	---	2.89E-05	
Total Risks Due to Dermal Contact with Soil			
4.60E-08		2.68E-04	
Total Multiple Pathway Risks			
Carcinogenic		Non-Carcinogenic	
3.24E-07		1.88E-03	

APPENDIX C
ANALYTICAL LABORATORY REPORTS



Case Narrative
Job 130782
August 28, 2007

URS Corporation

Analyses Performed: 200.7, 200.8, 245.1, 3500Cr and As Speciation on two samples

ICPMS(200.8): A 4x dilution was utilized on both samples.

QC Highlights:

Blank recoveries were acceptable.

LCS recoveries were acceptable.

Duplicate RPDs were acceptable.

Spike recoveries were acceptable.

A handwritten signature in black ink, reading "Kirby Gray". The signature is written in a cursive, flowing style.

Kirby Gray
Technical Director

A HUBZone Company

SVL ANALYTICAL, INC.

One Government Gulch ■ PO Box 929

Kellogg, Idaho 83837-0929

REPORT OF ANALYTICAL RESULTS

Phone: (208)784-1258 ■ Fax: (208)783-0891

Client: URS Corporation

Job No: 130782

Report Date: 8/28/07

Sample ID: MW-1

Collected: 7/26/07 15:55 By: CM

SVL Sample: 592092 | 592094

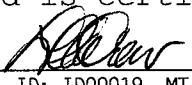
Matrix: WATERS

Received: 7/27/07

PHYSICAL PROPERTIES	TOTAL	DISSOLVED	METALS (cont'd)	TOTAL	DISSOLVED
pH			Chromium	<0.006	<0.006
TDS, mg/L			Cobalt	<0.006	<0.006
TSS, mg/L			Copper	0.211	0.099
Conductivity			Gallium	<0.020	<0.020
			Iron	0.34	<0.06
NONMETALS (mg/L)	TOTAL	DISSOLVED	Lanthanum	0.0079	0.0074
Alkalinity as CaCO3			Lead	<0.0075	<0.0075
Bicarbonate			Lithium	<0.02	<0.02
Carbonate			Magnesium	3.92	3.83
Hydroxide			Manganese	0.0723	0.0607
Chloride			Mercury	<0.00020	<0.00020
Fluoride			Molybdenum	<0.008	<0.008
Nitrate-N			Nickel	<0.010	<0.010
Orthophosphate			Phosphorus	<0.05	<0.05
Sulfate			Potassium	1.43	1.39
METALS (mg/L)	TOTAL	DISSOLVED	Scandium	<0.0020	<0.0020
Aluminum	0.12	<0.08	Selenium	<0.04	<0.04
Antimony	<0.020	<0.020	Silica		
Arsenic	<0.0030	<0.0030	Silver	<0.005	<0.005
Barium	0.0056	0.0043	Sodium	2.89	2.84
Beryllium	<0.0020	<0.0020	Strontium	0.103	0.100
Bismuth	<0.06	<0.06	Thallium	<0.015	<0.015
Boron	<0.040	<0.040	Tin	<0.050	<0.050
Cadmium	<0.0020	<0.0020	Titanium	0.006	<0.005
Calcium	26.5	26.0	Vanadium	<0.0050	<0.0050
			Zinc	0.036	0.030
ADDITIONAL TESTS	TOTAL	DISSOLVED	As+5 Speciation mg/L	TOTAL	DISSOLVED
As+3 Speciation mg/L	<0.003	<0.003		<0.003	<0.003
Chromium+6 mg/L	<0.01	<0.01			

SCAN

This report has been checked and is certified to be accurate.

Signed: 

Date: 8/28/07

8/28/07 16:43

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ PO Box 929 ■

Kellogg, Idaho 83837-0929 ■

REPORT OF ANALYTICAL RESULTS

Phone: (208)784-1258 ■ Fax: (208)783-0891

Client: **URS Corporation**Job No: **130782**Report Date: **8/28/07**Sample ID: **MW-2**Collected: **7/26/07 16:15** By: **CM**SVL Sample: **592093 | 592095**Matrix: **WATERS**Received: **7/27/07**

PHYSICAL PROPERTIES			TOTAL	DISSOLVED	METALS (cont'd)		TOTAL	DISSOLVED
pH					Chromium		<0.006	<0.006
TDS, mg/L					Cobalt		<0.006	<0.006
TSS, mg/L					Copper		0.131	0.082
Conductivity					Gallium		<0.020	<0.020
					Iron		0.23	<0.06
NONMETALS (mg/L)			TOTAL	DISSOLVED	Lanthanum		0.0081	0.0078
Alkalinity as CaCO3					Lead		<0.0075	<0.0075
Bicarbonate					Lithium		<0.02	<0.02
Carbonate					Magnesium		4.14	4.05
Hydroxide					Manganese		0.117	0.115
Chloride					Mercury		<0.00020	<0.00020
Fluoride					Molybdenum		0.008	0.008
Nitrate-N					Nickel		<0.010	<0.010
Orthophosphate					Phosphorus		<0.05	<0.05
Sulfate					Potassium		1.39	1.35
					Scandium		<0.0020	<0.0020
					Selenium		<0.04	<0.04
METALS (mg/L)			TOTAL	DISSOLVED	Silica			
Aluminum			<0.08	<0.08	Silver		<0.005	<0.005
Antimony			<0.020	<0.020	Sodium		2.98	2.95
Arsenic			<0.0030	<0.0030	Strontium		0.110	0.109
Barium			0.0049	0.0044	Thallium		<0.015	<0.015
Beryllium			<0.0020	<0.0020	Tin		<0.050	<0.050
Bismuth			<0.06	<0.06	Titanium		<0.005	<0.005
Boron			<0.040	<0.040	Vanadium		<0.0050	<0.0050
Cadmium			<0.0020	<0.0020	Zinc		0.032	0.029
Calcium			27.9	27.4				
ADDITIONAL TESTS			TOTAL	DISSOLVED			TOTAL	DISSOLVED
As+3 Speciation mg/L			<0.003	<0.003	As+5 Speciation mg/L		<0.003	<0.003
Chromium+6 mg/L			<0.01	<0.01				

SCAN

This report has been checked and is certified to be accurate.

Signed: _____

Date: 8/28/07

8/28/07 16:43

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

Client :URS Corporation					SVL JOB No: 130782			Analysis
Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found	LCS %R	Date	
Silver	200.7	WATER	mg/L	<0.005	0.050	0.053	106.0	8/19/07
Aluminum	200.7	WATER	mg/L	<0.08	1.00	1.04	104.0	8/19/07
Arsenic	200.8	WATER	mg/L	<0.0030	0.0250	0.0273	109.2	8/16/07
Boron	200.7	WATER	mg/L	<0.040	1.00	1.05	105.0	8/19/07
Barium	200.7	WATER	mg/L	<0.0020	1.00	1.03	103.0	8/19/07
Beryllium	200.7	WATER	mg/L	<0.0020	1.00	1.03	103.0	8/19/07
Bismuth	200.7	WATER	mg/L	<0.06	1.00	0.97	97.0	8/19/07
Calcium	200.7	WATER	mg/L	<0.040	20.0	20.5	102.5	8/19/07
Cadmium	200.7	WATER	mg/L	<0.0020	1.00	0.997	99.7	8/19/07
Cobalt	200.7	WATER	mg/L	<0.006	1.00	0.958	95.8	8/19/07
Chromium	200.7	WATER	mg/L	<0.006	1.00	1.04	104.0	8/19/07
Copper	200.7	WATER	mg/L	<0.010	1.00	1.02	102.0	8/19/07
Iron	200.7	WATER	mg/L	<0.06	10.0	10.2	102.0	8/19/07
Gallium	200.7	WATER	mg/L	<0.020	1.00	1.08	108.0	8/19/07
Potassium	200.7	WATER	mg/L	<0.50	20.0	21.1	105.5	8/19/07
Lanthanum	200.7	WATER	mg/L	<0.0050	1.00	1.04	104.0	8/19/07
Lithium	200.7	WATER	mg/L	<0.02	1.00	1.08	108.0	8/19/07
Magnesium	200.7	WATER	mg/L	<0.06	20.0	19.9	99.5	8/19/07
Manganese	200.7	WATER	mg/L	<0.0040	1.00	1.01	101.0	8/19/07
Molybdenum	200.7	WATER	mg/L	<0.008	1.00	1.01	101.0	8/19/07
Sodium	200.7	WATER	mg/L	<0.50	19.0	20.4	107.4	8/19/07
Nickel	200.7	WATER	mg/L	<0.010	1.00	0.987	98.7	8/19/07
Phosphorus	200.7	WATER	mg/L	<0.05	1.00	1.00	100.0	8/19/07
Lead	200.7	WATER	mg/L	<0.0075	1.00	1.01	101.0	8/19/07
Antimony	200.7	WATER	mg/L	<0.020	1.00	0.991	99.1	8/19/07
Scandium	200.7	WATER	mg/L	<0.0020	0.500	0.500	100.0	8/19/07
Selenium	200.7	WATER	mg/L	<0.04	1.00	1.10	110.0	8/19/07
Tin	200.7	WATER	mg/L	<0.050	1.00	0.993	99.3	8/19/07
Strontium	200.7	WATER	mg/L	<0.0050	1.00	1.05	105.0	8/19/07
Titanium	200.7	WATER	mg/L	<0.005	1.00	1.02	102.0	8/19/07
Thallium	200.7	WATER	mg/L	<0.015	1.00	1.02	102.0	8/19/07
Vanadium	200.7	WATER	mg/L	<0.0050	1.00	1.03	103.0	8/19/07
Zinc	200.7	WATER	mg/L	<0.010	1.00	1.01	101.0	8/19/07
Mercury	245.1	WATER	mg/L	<0.00020	0.00500	0.00489	97.8	8/08/07
Chromium+6	3500Cr	WATER	mg/L	<0.010	0.293	0.290	99.0	7/27/07
As+3 Speciation	APDC	WATER	mg/L	<0.003	0.025	0.027	108.0	8/14/07

LEGEND:

LCS = Laboratory Control Sample

LCS %R = LCS Percent Recovery

N/A = Not Applicable

Client :URS Corporation					SVL JOB No: 130782				
Test Method	Mtx	QC SAMPLE ID	Result	Duplicate or	MSD	Matrix Spike	Analysis		
		Units		Found	RPD%	Result	SPK ADD	%R	Date
Ag	200.7 W	1 mg/L	<0.005	<0.005	UDL	0.053	0.0500	106.0	8/19/07
Ag	200.7 W	2 mg/L	<0.005	<0.005	UDL	0.052	0.0500	104.0	8/19/07
Al	200.7 W	1 mg/L	0.12	0.12	0.0	1.20	1.00	108.0	8/19/07
Al	200.7 W	2 mg/L	<0.08	<0.08	UDL	1.04	1.00	104.0	8/19/07
As	200.8 W	1 mg/L	<0.0030	<0.0030	UDL	0.0282	0.0250	112.8	8/16/07
As	200.8 W	2 mg/L	<0.0030	<0.0030	UDL	0.0264	0.0250	105.6	8/16/07
B	200.7 W	1 mg/L	<0.040	<0.040	UDL	1.07	1.00	107.0	8/19/07
B	200.7 W	2 mg/L	<0.040	<0.040	UDL	1.07	1.00	107.0	8/19/07
Ba	200.7 W	1 mg/L	0.0056	0.0053	5.5	1.02	1.00	101.4	8/19/07
Ba	200.7 W	2 mg/L	0.0043	0.0043	0.0	1.03	1.00	102.6	8/19/07
Be	200.7 W	1 mg/L	<0.0020	<0.0020	UDL	1.04	1.00	104.0	8/19/07
Be	200.7 W	2 mg/L	<0.0020	<0.0020	UDL	1.03	1.00	103.0	8/19/07
Bi	200.7 W	1 mg/L	<0.06	<0.06	UDL	0.97	1.00	97.0	8/19/07
Bi	200.7 W	2 mg/L	<0.06	<0.06	UDL	0.92	1.00	92.0	8/19/07
Ca	200.7 W	1 mg/L	26.5	25.9	2.3	46.1	20.0	98.0	8/19/07
Ca	200.7 W	2 mg/L	26.0	26.0	0.0	46.1	20.0	100.5	8/19/07
Cd	200.7 W	1 mg/L	<0.0020	<0.0020	UDL	0.980	1.00	98.0	8/19/07
Cd	200.7 W	2 mg/L	<0.0020	<0.0020	UDL	0.994	1.00	99.4	8/19/07
Co	200.7 W	1 mg/L	<0.006	<0.006	UDL	0.961	1.00	96.1	8/19/07
Co	200.7 W	2 mg/L	<0.006	<0.006	UDL	0.949	1.00	94.9	8/19/07
Cr	200.7 W	1 mg/L	<0.006	<0.006	UDL	1.03	1.00	103.0	8/19/07
Cr	200.7 W	2 mg/L	<0.006	<0.006	UDL	1.03	1.00	103.0	8/19/07
Cu	200.7 W	1 mg/L	0.211	0.207	1.9	1.22	1.00	100.9	8/19/07
Cu	200.7 W	2 mg/L	0.099	0.101	2.0	1.09	1.00	99.1	8/19/07
Fe	200.7 W	1 mg/L	0.34	0.34	0.0	10.5	10.0	101.6	8/19/07
Fe	200.7 W	2 mg/L	<0.06	<0.06	UDL	10.2	10.0	102.0	8/19/07
Ga	200.7 W	1 mg/L	<0.020	<0.020	UDL	1.08	1.00	108.0	8/19/07
Ga	200.7 W	2 mg/L	<0.020	<0.020	UDL	1.07	1.00	107.0	8/19/07
K	200.7 W	1 mg/L	1.43	1.41	1.4	22.4	20.0	104.9	8/19/07
K	200.7 W	2 mg/L	1.39	1.38	0.7	22.5	20.0	105.6	8/19/07
La	200.7 W	1 mg/L	0.0079	0.0077	2.6	1.03	1.00	102.2	8/19/07
La	200.7 W	2 mg/L	0.0074	0.0076	2.7	1.03	1.00	102.3	8/19/07
Li	200.7 W	1 mg/L	<0.02	<0.02	UDL	1.09	1.00	109.0	8/19/07
Li	200.7 W	2 mg/L	<0.02	<0.02	UDL	1.08	1.00	108.0	8/19/07
Mg	200.7 W	1 mg/L	3.92	3.87	1.3	23.7	20.0	98.9	8/19/07
Mg	200.7 W	2 mg/L	3.83	3.80	0.8	23.8	20.0	99.9	8/19/07
Mn	200.7 W	1 mg/L	0.0723	0.0718	0.7	1.08	1.00	100.8	8/19/07
Mn	200.7 W	2 mg/L	0.0607	0.0599	1.3	1.07	1.00	100.9	8/19/07
Mo	200.7 W	1 mg/L	<0.008	<0.008	UDL	1.01	1.00	101.0	8/19/07
Mo	200.7 W	2 mg/L	<0.008	<0.008	UDL	1.00	1.00	100.0	8/19/07
Na	200.7 W	1 mg/L	2.89	2.83	2.1	23.1	19.0	106.4	8/19/07
Na	200.7 W	2 mg/L	2.84	2.82	0.7	23.2	19.0	107.2	8/19/07
Ni	200.7 W	1 mg/L	<0.010	<0.010	UDL	0.991	1.00	99.1	8/19/07
Ni	200.7 W	2 mg/L	<0.010	<0.010	UDL	1.02	1.00	102.0	8/19/07
P	200.7 W	1 mg/L	<0.05	<0.05	UDL	1.04	1.00	104.0	8/19/07
P	200.7 W	2 mg/L	<0.05	<0.05	UDL	1.04	1.00	104.0	8/19/07
Pb	200.7 W	1 mg/L	<0.0075	<0.0075	UDL	1.01	1.00	101.0	8/19/07
Pb	200.7 W	2 mg/L	<0.0075	<0.0075	UDL	1.01	1.00	101.0	8/19/07

LEGEND:

RPD% = $(|SAM - DUP| / ((SAM + DUP)/2)) * 100$ UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.RPD% = $(|SPK - MSD| / ((SPK + MSD)/2)) * 100$ M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 592092 Client Sample ID: MW-1

^T

QC Sample 2: SVL SAM No.: 592094 Client Sample ID: MW-1

^D

Client :URS Corporation						SVL JOB No: 130782			
Test Method Mtx		QC SAMPLE ID	Duplicate or MSD	Matrix Spike	Analysis				
		Units	Found	RPD%	Result	SPK ADD	%R	Date	
Sb	200.7 W	1 mg/L	<0.020	UDL	1.01	1.00	101.0	8/19/07	
Sb	200.7 W	2 mg/L	<0.020	UDL	0.916	1.00	91.6	8/19/07	
Sc	200.7 W	1 mg/L	<0.0020	UDL	0.499	0.500	99.8	8/19/07	
Sc	200.7 W	2 mg/L	<0.0020	UDL	0.497	0.500	99.4	8/19/07	
Se	200.7 W	1 mg/L	<0.04	UDL	1.07	1.00	107.0	8/19/07	
Se	200.7 W	2 mg/L	<0.04	UDL	1.13	1.00	113.0	8/19/07	
Sn	200.7 W	1 mg/L	<0.050	UDL	0.978	1.00	97.8	8/19/07	
Sn	200.7 W	2 mg/L	<0.050	UDL	0.972	1.00	97.2	8/19/07	
Sr	200.7 W	1 mg/L	0.103	2.0	1.16	1.00	105.7	8/19/07	
Sr	200.7 W	2 mg/L	0.100	0.0	1.15	1.00	105.0	8/19/07	
Ti	200.7 W	1 mg/L	0.006	0.0	1.01	1.00	100.4	8/19/07	
Ti	200.7 W	2 mg/L	<0.005	UDL	1.00	1.00	100.0	8/19/07	
Tl	200.7 W	1 mg/L	<0.015	UDL	1.02	1.00	102.0	8/19/07	
Tl	200.7 W	2 mg/L	<0.015	UDL	1.02	1.00	102.0	8/19/07	
V	200.7 W	1 mg/L	<0.0050	UDL	1.02	1.00	102.0	8/19/07	
V	200.7 W	2 mg/L	<0.0050	UDL	1.02	1.00	102.0	8/19/07	
Zn	200.7 W	1 mg/L	0.036	2.8	1.02	1.00	98.4	8/19/07	
Zn	200.7 W	2 mg/L	0.030	3.3	1.04	1.00	101.0	8/19/07	
Hg	245.1 W	1 mg/L	<0.00020	UDL	0.00104	0.0010	104.0	8/08/07	
Hg	245.1 W	2 mg/L	<0.00020	UDL	0.00111	0.0010	111.0	8/08/07	
Cr+6	3500Cr W	1 mg/L	<0.01	UDL	0.100	0.100	100.0	7/27/07	
Cr+6	3500Cr W	2 mg/L	<0.01	UDL	0.100	0.100	100.0	7/27/07	
As+3	APDC W	1 mg/L	<0.003	UDL	0.031	0.0250	124.0	8/14/07	
As+3	APDC W	2 mg/L	<0.003	UDL	0.029	0.0250	116.0	8/14/07	
As+5	DIFF W	1 mg/L	<0.003	UDL	N/A	N/A	N/A	8/14/07	
As+5	DIFF W	2 mg/L	<0.003	UDL	N/A	N/A	N/A	8/14/07	

LEGEND:

RPD% = $\left(\frac{|SAM - DUP|}{((SAM + DUP)/2)} \right) * 100$ UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = $\left(\frac{|SPK - MSD|}{((SPK + MSD)/2)} \right) * 100$ M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 592092 Client Sample ID: MW-1 ^T

QC Sample 2: SVL SAM No.: 592094 Client Sample ID: MW-1 ^D



CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Page 2 of 2

#130782

FOR SVL USE ONLY
SVL JOB #

1°C

TEMP on Receipt:

Table 1. -- Matrix Type

1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St, #607
Portland OR 97201
Phone Number: 503-222-7200
FAX Number: _____
E-mail: christina_wheeler@urscorp.com

Invoice Sent To: URS - Spokane
Contact: Dave Gross
Address: _____
Phone Number: 509 928 4413
FAX Number: 928 4415
PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Indicate State of sample origination: WA

USACE? ☐ Yes ☒ No

Sample ID		Collection		Misc.	Preservative(s)								Analyses Required								Rush Instructions (Days)	Comments
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O Thanks!		Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	As Speciated (H+V) Total	As Speciated (H+V) Dis	Cr VI Total	Cr VI Dis	Hg - Total	Hg - Dis	Total Metals - Total		
1	MW-1	7/26/07	1555	CM	1	10	6	1	1	2				X	X	X	X	X	X	X	X	
2	MW-2	7/26/07	1615	CM	1	10	6	1	1	2				X	X	X	X	X	X	X	X	
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

Relinquished by: Chris Moody Date: 7/27/07 Time: 19:20 Received by: Jacqueline D. Halms Date: 7-26-07 Time: 7:20 PM
Relinquished by: Jacqueline D. Halms Date: 7-26-07 Time: 9:15 PM Received by: [Signature] Date: 7/26/07 Time: 9:15 PM

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Richard Allinger 7-27-07 0745 Red' Johann 7/27/07 0845 transport Hg New 7/27 045
Rec@Klg SVL by: J. Sieg 7/27/07 0930



Case Narrative
Job 131005
August 28, 2007

URS Corporation

Analyses Performed: 6010B, 7010 and 7471A on 16 samples, and As Speciation and Cr Speciation on three samples

ICP (6010B): Four samples (S31, S32, S33 and S34) required a 10x dilution for cobalt and copper due to the concentration of the analyte.

GFAA (7010): Samples S31 and SB-1 required a 5x dilution and sample S-36 required a 20x dilution due to the concentration of the analyte.

QC Highlights:

Blank recoveries were acceptable.

LCS recoveries were acceptable.

Duplicate RPDs were acceptable.

Spike recoveries were acceptable except for copper and manganese for which the accuracy of the spike recoveries was reduced as the analyte concentration in the sample was disproportionate to the spike level; except for zinc for which the spike recovery was below laboratory acceptance limits (LCS recovery was acceptable); and except for arsenic +3 for which the spike recovery was above laboratory acceptance limits (LCS recovery was acceptable).

A handwritten signature in black ink, appearing to read "Larry A. Drew".

Larry A. Drew
Deputy Technical Director

A HUBZone Company

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594796

CLIENT SAMPLE ID: S-31

Sample Collected:

% Solids: 86.2%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	27.4	mg/kg		6010B	8/21/07
Arsenic	2.8	mg/kg		6010B	8/21/07
Arsenic	3.91 <i>J</i>	mg/kg	5	7010	8/14/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	3.91	mg/kg		DIFF	8/21/07
Barium	49.1	mg/kg		6010B	8/21/07
Cadmium	2.05	mg/kg		6010B	8/21/07
Cobalt	9.9	mg/kg	10	6010B	8/22/07
Chromium	12.7	mg/kg		6010B	8/21/07
Chromium+3	12.7	mg/kg		calc.	8/21/07
Chromium+6	<0.050	mg/kg		ASA #9	8/24/07
Copper	11600	mg/kg	10	6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	850	mg/kg		6010B	8/21/07
Lead	17.90	mg/kg		6010B	8/21/07
Selenium	8	mg/kg		6010B	8/21/07
Zinc	103 <i>J</i>	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By: NSL Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594797

CLIENT SAMPLE ID: S-32

Sample Collected:

% Solids: 91.3%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	14.8	mg/kg		6010B	8/21/07
Arsenic	7.3	mg/kg		6010B	8/21/07
Barium	88.5	mg/kg		6010B	8/21/07
Cadmium	1.64	mg/kg		6010B	8/21/07
Cobalt	10.2	mg/kg	10	6010B	8/22/07
Chromium	21.4	mg/kg		6010B	8/21/07
Copper	4110	mg/kg	10	6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	1100	mg/kg		6010B	8/21/07
Lead	82.4	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	106	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

*NBui*Date **8/27/07**

8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594798

CLIENT SAMPLE ID: S-33

Sample Collected:

% Solids: 93.2%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	26.6	mg/kg		6010B	8/21/07
Arsenic	14.2	mg/kg		6010B	8/21/07
Barium	82.3	mg/kg		6010B	8/21/07
Cadmium	4.35	mg/kg		6010B	8/21/07
Cobalt	34.0	mg/kg	10	6010B	8/22/07
Chromium	13.0	mg/kg		6010B	8/21/07
Copper	4940	mg/kg	10	6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	2760	mg/kg		6010B	8/21/07
Lead	448	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	213	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

*NSL*Date 8/27/07

8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594799

CLIENT SAMPLE ID: S-34

Sample Collected:

% Solids: 94.4%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	3.93	mg/kg		6010B	8/21/07
Arsenic	4.8	mg/kg		6010B	8/21/07
Barium	138	mg/kg		6010B	8/21/07
Cadmium	1.52	mg/kg		6010B	8/21/07
Cobalt	8.5	mg/kg	10	6010B	8/22/07
Chromium	18.0	mg/kg		6010B	8/21/07
Copper	389	mg/kg	10	6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	807	mg/kg		6010B	8/21/07
Lead	127	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	133	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSuni Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594800

CLIENT SAMPLE ID: S-35

Sample Collected:

% Solids: 88.3%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	3.0	mg/kg		6010B	8/21/07
Barium	151	mg/kg		6010B	8/21/07
Cadmium	1.34	mg/kg		6010B	8/21/07
Cobalt	7.47	mg/kg		6010B	8/22/07
Chromium	46.7	mg/kg		6010B	8/21/07
Copper	57.8	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	755	mg/kg		6010B	8/21/07
Lead	34.60	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	95.1	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSA Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594801

CLIENT SAMPLE ID: S-36

Sample Collected:

% Solids: 83.3%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	12.2	mg/kg		6010B	8/21/07
Arsenic	18.0	mg/kg	20	7010	8/14/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	18.0	mg/kg		DIFF	8/21/07
Barium	85.3	mg/kg		6010B	8/21/07
Cadmium	1.59	mg/kg		6010B	8/21/07
Cobalt	9.00	mg/kg		6010B	8/22/07
Chromium	47.5	mg/kg		6010B	8/21/07
Chromium+3	47.5	mg/kg		calc.	8/21/07
Chromium+6	<0.050	mg/kg		ASA #9	8/24/07
Copper	81.6	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	339	mg/kg		6010B	8/21/07
Lead	10.90	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	72.8	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By: NGlen Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594802

CLIENT SAMPLE ID: SB-1

Sample Collected:

% Solids: 93.3%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Arsenic	3.12 <i>T</i>	mg/kg	5	7010	8/14/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	3.12 <i>T</i>	mg/kg		DIFF	8/21/07
Barium	194	mg/kg		6010B	8/21/07
Cadmium	0.69	mg/kg		6010B	8/21/07
Cobalt	4.63	mg/kg		6010B	8/22/07
Chromium	19.3	mg/kg		6010B	8/21/07
Chromium+3	19.3	mg/kg		calc.	8/21/07
Chromium+6	<0.050	mg/kg		ASA #9	8/24/07
Copper	10.7	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	500	mg/kg		6010B	8/21/07
Lead	7.19	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	51.0	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By: *NSL* Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594803

CLIENT SAMPLE ID: SB-2

Sample Collected:

% Solids: 94.8%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	179	mg/kg		6010B	8/21/07
Cadmium	0.80	mg/kg		6010B	8/21/07
Cobalt	5.00	mg/kg		6010B	8/22/07
Chromium	22.0	mg/kg		6010B	8/21/07
Copper	11.3	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	552	mg/kg		6010B	8/21/07
Lead	8.41	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	43.7	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NEC Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594804

CLIENT SAMPLE ID: SB-3

Sample Collected:

% Solids: 93.2%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	174	mg/kg		6010B	8/21/07
Cadmium	0.71	mg/kg		6010B	8/21/07
Cobalt	4.49	mg/kg		6010B	8/22/07
Chromium	16.8	mg/kg		6010B	8/21/07
Copper	11.1	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	538	mg/kg		6010B	8/21/07
Lead	7.17	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	41.4	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSL Date 8/27/07
8/27/07 12:51

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594805

CLIENT SAMPLE ID: SB-4

Sample Collected:

% Solids: 95.1%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	177	mg/kg		6010B	8/21/07
Cadmium	0.75	mg/kg		6010B	8/21/07
Cobalt	4.91	mg/kg		6010B	8/22/07
Chromium	19.3	mg/kg		6010B	8/21/07
Copper	11.6	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	573	mg/kg		6010B	8/21/07
Lead	7.86	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	49.4	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSG Date 8/27/07
8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594806

CLIENT SAMPLE ID: SB-5

Sample Collected:

% Solids: 95.5%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	180	mg/kg		6010B	8/21/07
Cadmium	0.94	mg/kg		6010B	8/21/07
Cobalt	5.91	mg/kg		6010B	8/22/07
Chromium	26.4	mg/kg		6010B	8/21/07
Copper	80.9	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	518	mg/kg		6010B	8/21/07
Lead	9.27	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	54.3	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSL Date 8/27/07
8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594807

CLIENT SAMPLE ID: SB-6

Sample Collected:

% Solids: 94.7%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	3.5	mg/kg		6010B	8/21/07
Barium	205	mg/kg		6010B	8/21/07
Cadmium	1.09	mg/kg		6010B	8/21/07
Cobalt	6.83	mg/kg		6010B	8/22/07
Chromium	29.9	mg/kg		6010B	8/21/07
Copper	17.5	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	630	mg/kg		6010B	8/21/07
Lead	8.85	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	59.0	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: NSH Date 8/27/07
8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594808

CLIENT SAMPLE ID: SB-7

Sample Collected:

% Solids: 95.8%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/22/07
Arsenic	<2.5	mg/kg		6010B	8/22/07
Barium	181	mg/kg		6010B	8/22/07
Cadmium	0.72	mg/kg		6010B	8/22/07
Cobalt	5.01	mg/kg		6010B	8/22/07
Chromium	19.0	mg/kg		6010B	8/22/07
Copper	11.8	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	584	mg/kg		6010B	8/22/07
Lead	7.27	mg/kg		6010B	8/22/07
Selenium	<4	mg/kg		6010B	8/22/07
Zinc	49.5	mg/kg		6010B	8/22/07

Tests:URS KELLY SOIL|

Reviewed By:_____

N. Blum

Date

8/27/07

8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594809

CLIENT SAMPLE ID: SB-8

Sample Collected:

% Solids: 93.4%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/22/07
Arsenic	<2.5	mg/kg		6010B	8/22/07
Barium	226	mg/kg		6010B	8/22/07
Cadmium	0.83	mg/kg		6010B	8/22/07
Cobalt	4.73	mg/kg		6010B	8/22/07
Chromium	17.3	mg/kg		6010B	8/22/07
Copper	12.6	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	686	mg/kg		6010B	8/22/07
Lead	7.96	mg/kg		6010B	8/22/07
Selenium	<4	mg/kg		6010B	8/22/07
Zinc	54.2	mg/kg		6010B	8/22/07

Tests:URS KELLY SOIL|

Reviewed By: USL Date 8/27/07
8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594810

CLIENT SAMPLE ID: SB-9

Sample Collected:

% Solids: 93.8%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/22/07
Arsenic	<2.5	mg/kg		6010B	8/22/07
Barium	253	mg/kg		6010B	8/22/07
Cadmium	0.86	mg/kg		6010B	8/22/07
Cobalt	5.19	mg/kg		6010B	8/22/07
Chromium	17.3	mg/kg		6010B	8/22/07
Copper	12.1	mg/kg		6010B	8/22/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	768	mg/kg		6010B	8/22/07
Lead	6.92	mg/kg		6010B	8/22/07
Selenium	<4	mg/kg		6010B	8/22/07
Zinc	65.0	mg/kg		6010B	8/22/07

Tests:URS KELLY SOIL|

Reviewed By: NSZ Date 8/27/07
8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

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Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131005

PROJECT:

SAMPLE: 594811

CLIENT SAMPLE ID: SB-10

Sample Collected:

% Solids: 95.0%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/27/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/22/07
Arsenic	<2.5	mg/kg		6010B	8/22/07
Barium	162	mg/kg		6010B	8/22/07
Cadmium	0.71	mg/kg		6010B	8/22/07
Cobalt	4.50	mg/kg		6010B	8/22/07
Chromium	13.9	mg/kg		6010B	8/22/07
Copper	13.2	mg/kg		6010B	8/22/07
Mercury	0.040	mg/kg		7471A	8/15/07
Manganese	526	mg/kg		6010B	8/22/07
Lead	8.46	mg/kg		6010B	8/22/07
Selenium	<4	mg/kg		6010B	8/22/07
Zinc	48.1	mg/kg		6010B	8/22/07

Tests:URS KELLY SOIL|

Reviewed By:_____

*NSM*Date 8/27/07

8/27/07 12:52

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

Client :URS Corporation					SVL JOB No: 131005			
Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found	LCS %R	Analysis Date	
Silver	6010B	SOIL	mg/kg	<0.50	5.00	5.01	100.2 ✓	8/21/07
Arsenic	6010B	SOIL	mg/kg	<2.5	100	93.9	93.9 ✓	8/21/07
Barium	6010B	SOIL	mg/kg	<0.20	100	98.8	98.8 ✓	8/21/07
Cadmium	6010B	SOIL	mg/kg	<0.20	100	96.1	96.1 ✓	8/21/07
Cobalt	6010B	SOIL	mg/kg	<0.60	100	94.9	94.9 ✓	8/22/07
Chromium	6010B	SOIL	mg/kg	<0.60	100	98.5	98.5 ✓	8/21/07
Copper	6010B	SOIL	mg/kg	<1.0	100	101	101.0 ✓	8/22/07
Manganese	6010B	SOIL	mg/kg	<0.40	100	94.7	94.7 ✓	8/21/07
Lead	6010B	SOIL	mg/kg	<0.75	100	94.2	94.2 ✓	8/21/07
Selenium	6010B	SOIL	mg/kg	<4	100	88	88.0 ✓	8/21/07
Zinc	6010B	SOIL	mg/kg	<1.0	100	96.9	96.9 ✓	8/21/07
Arsenic	7010	SOIL	mg/kg	<0.300	2.50	2.57	102.8	8/14/07
Mercury	7471A	SOIL	mg/kg	<0.033	0.834	0.835	100.1 ✓	8/15/07
As+3 Speciation	APDC	SOIL	mg/kg	<0.300	2.50	2.71	108.4 ✓	8/21/07
Chromium+6	ASA #9	SOIL	mg/kg	<0.01	0.293	0.300	102.4 ✓	8/24/07

LEGEND:

LCS = Laboratory Control Sample

LCS %R = LCS Percent Recovery

N/A = Not Applicable

Client :URS Corporation						SVL JOB No: 131005				
Test Method Mtx		QC SAMPLE ID		Duplicate or MSD		Matrix Spike			Analysis	
		Units	Result	Found		RPD%	Result	SPK ADD	%R	Date
Ag	6010B S	1 mg/kg	27.4	30.3	M	27.8	22.9	5.00	R >4S	8/21/07
As	6010B S	1 mg/kg	2.8	102	M	2.3	99.7	100	96.9	8/21/07
Ba	6010B S	1 mg/kg	49.1	177	M	12.6	156	100	106.9	8/21/07
Cd	6010B S	1 mg/kg	2.05	98.6	M	0.5	98.1	100	96.1	8/21/07
Co	6010B S	1 mg/kg	9.9	105	M	1.9	107	100	97.1	8/22/07
Cr	6010B S	1 mg/kg	12.7	111	M	0.9	112	100	99.3	8/21/07
Cu	6010B S	1 mg/kg	11600	10900	M	14.9	9390	100	R >4S	8/22/07
Mn	6010B S	1 mg/kg	850	838	M	12.0	945	100	95.0	8/21/07
Pb	6010B S	1 mg/kg	17.90	116	M	0.0	116	100	98.1	8/21/07
Se	6010B S	1 mg/kg	8	99	M	2.0	97	100	89.0	8/21/07
Zn	6010B S	1 mg/kg	103	178	M	2.3	174	100	71.0	8/21/07
Zn	6010B S	1 mg/kg	103	N/A	N/A	187	100	A	84.0	8/21/07
As	7010 S	1 mg/kg	3.91	5.88	M	7.0	5.48	2.50	62.8	8/14/07
Hg	7471A S	1 mg/kg	<0.033	0.172	M	13.6	0.197	0.167	118.0	8/15/07
As+3	APDC S	1 mg/kg	<0.300	3.26	M	11.6	3.66	2.50	146.4	8/21/07
Cr+6	ASA #9 S	1 mg/kg	<0.05	<0.05	UDL	0.510	0.500		102.0	8/24/07

LEGEND:

RPD% = $(|SAM - DUP| / ((SAM + DUP)/2)) * 100$ UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.RPD% = $(|SPK - MSD| / ((SPK + MSD)/2)) * 100$ M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 594796 Client Sample ID: S-31

project - sample ✓

Limits { % R = 75 - 125

RSD = 30

Addendum to Original COCs (See Attached Originals)

PAGE 05/05



CHAIN OF CUSTODY RECORD

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Page ____ of ____

FOR SVL USE ONLY
SVL JOB # 131005
TEMP on Receipt: 10700712

Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christine Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503 222 7200
FAX Number: _____
E-mail: Christina.Wheeler@URS.COM PO#: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection	Misc.	Preservative(s)								Analyses Required	Comments				
			Date	Time	Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered			HCl	H ₂ SO ₄	NaOH	Other (Specify)
1 RS-11														X	X	<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2 RS-12														X	X	
3 RS-13														X	X	
4 RS-14														X	X	
5 S-15														X	X	
6 S-16														X	X	
7 S-17														X	X	
8 S-18														X	X	
9 S-19														X	X	
10 S-20														X	X	

Requisitioned by: _____ Date: _____ Time: _____ Received by: R. Strubling Date: 8/10/07 Time: 1:30

Requisitioned by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C. Wheeler 8/9/07

1 of 5

SVL ANALYT

08/09/2007 11:44 2087830891

Addendum to Original COCs (see Attached originals)

PAGE 05/05



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Page ____ of ____

FOR SVL USE ONLY
SVL JOB #

130 131005

TEMP on Receipt: 10700713

Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Riosite, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS

Contact: Christine Wheeler

Address: 111 SW Columbia St #1500
Portland OR 97201

Phone Number: 503 222 7200

FAX Number: _____

E-mail: Christina-wheeler@URS.com PO#: _____

Invoice Sent To: _____

Contact: _____

Address: _____

Phone Number: _____

FAX Number: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments	
	Date	Time		Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O															
Thanks!															
1	S-21														<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>RCLA 8 + more</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2	S-22														
3	S-23														
4	S-24														
5	S-25														
6	S-26														
7	S-27														
8	S-28														
9	S-29														
10	S-30														

Relinquished by: _____ Date: _____ Time: _____ Received by: R. Stuebeling Date: 8/10/07 Time: 1:30

Requisitioned by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C. Wheeler 8/9/07

2 of 5

SVL ANALYT

2087830891

08/09/2007 11:44

Addendum to original CCR (see Attachment 1-10)



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Page ____ of ____

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SVL JOB #

131005
W700713RS

TEMP on Receipt: _____

Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Sludge, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS

Contact: Christina Wheeler

Address: 111 SW Columbia St #1500
Portland OR 97201

Phone Number: 503 222 7200

FAX Number: _____

E-mail: Christina-Wheeler@URS.COM PO#: _____

Invoice Sent To: _____

Contact: _____

Address: _____

Phone Number: _____

FAX Number: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments				
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH	Other (Specify)		
1 S-31														X	X	X	X	<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2 S-32														X	X			
3 S-33														X	X			
4 S-34														X	X			
5 S-35														X	X			
6 S-36														X	X	X		
7 WR-1																		
8 WR-2																		
9 WR-3																		
10																		

Please take care to distinguish between:
1 and I
2 and Z
5 and S
0 and O

Thanks!

See ORIGINAL CCR

Relinquished by: _____ Date: _____ Time: _____

Received by: R. Strubling Date: 8/10/07 Time: 1:30

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

• Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Wheeler 8/9/07

3 of 5

Addendum to Original COCs (See Attached Originals)

PAGE 05/05



CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Page ____ of ____

FOR SVL USE ONLY:
SVL JOB # 31005
TEMP on Receipt: W40013 RS

Table 1 -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503 222 7200
FAX Number: _____
E-mail: Christina.Wheeler@URS.COM PO#: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection	Misc.	Preservative(s)	Analyses Required		Rush Instructions (Days)	Comments
				Matrix Type (From Table 1)	No. of Containers		
1 and I							<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2 and Z							
5 and S							
6 and O							
SB-1							
SB-2							
SB-3							
SB-4							
SB-5							
SB-6							
SB-7							
SB-8							
SB-9							
SB-10							

Metals (6010B) (see list)
Mercury (7471.1)
As Speciation
Cr Speciation

See ORIGINAL COC

Relinquished by: _____ Date: _____ Time: _____
Received by: R. Strabbing Date: 8/10/07 Time: 1:30

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Wheeler 8/9/07

4 of 5

SVL ANALYT

2087830891

08/09/2007 11:44

Addendum to original CUS (see Attached ...)



CHAIN OF CUSTODY RECORD

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Page ____ of ____

FOR SVL USE ONLY:
SVL JOB # 130 131005
TEMP on Receipt: 6700413

Table 1. - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Riosite, 5 = Oil
6 = Waste, 7 = Other

Project Name: Kelly Camp Mine
Sampler's Signature: _____

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503 222 7200
FAX Number: _____
E-mail: Christina-Wheeler@URS.com PO#: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____

Indicate State of sample origination: WAUSACE? ☐ Yes ☒ No

Sample ID	Collection	Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments		
			No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)					
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O															
Thanks!															
1	MW-1														* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn Need data reports by 8/24/07 (10 business days) Please contact Christina Wheeler if you can not meet this date
2	MW-2														
3															
4															
5															
6															
7															
8															
9															
10															

Requisitioned by: _____ Date: _____ Time: _____ Received by: R. Strubling Date: 8/10/07 Time: 1:30

Requisitioned by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C Wheeler 8/9/07

5 of 5



ORIGINAL COC
CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 764-1258 • FAX: (208) 763-0591

Page 1 of 2

Report to Company:	URS Corp	Invoice Sent To:	URS - Spokane
Contact:	Christina Wheeler	Contact:	Dave Enos
Address:	111 Sh Columbia St #1500 Portland OR 97201	Address:	
Phone Number:	503-222-7200	Phone Number:	509 928 4413
FAX Number:		FAX Number:	928-4415
E-mail:	christina_wheeler@urscorp.com	PO#:	

FOR SVL USE
SVL JOB #

1°C 131005
~~W700713~~

TEMP on Receipt:

Table 1. — Matrix Type

1 = Surface Water, 2 = Ground Water

3 = Soil/Sediment, 4 = Rinseate, 5 = Oil

6 = Waste, 7 = Other

Project Name: Kelly Camp Mine

Sampler's Signature:

Indicate State of sample origination: USA

USACE? ☐ Yes ☒ No

Analyses Required

Comments

Sample ID		Collection		Misc.	Preservative(s)								Rush Instructions (Days)		
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O		Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH		Other (Specify)	
1	SB-1	7/26/07	1446	CM	S	1	X							AS Speciation (III + V) C.C. VI Hg 7471A Total Metals 6010B	
2	SB-2	7/26/07	1454	CM	S	1	X								
3	SB-3	7/26/07	1459	CM	S	1	X								
4	SB-4	7/26/07	1504	CM	S	1	X								
5	SB-5	7/26/07	1509	CM	S	1	X								
6	SB-6	7/26/07	1512	CM	S	1	X								
7	SB-7	7/26/07	1516	CM	S	1	X								
8	SB-8	7/26/07	1520	CM	S	1	X								
9	SB-9	7/26/07	1522	CM	S	1	X								
10	SB-10	7/26/07	1525	CM	S	1	X								

Relinquished by: Chris Moore, CM
Relinquished by: Deborah H. Hulsman
Date: 7/26/07 Time: 9:20 AM
Received by: Deborah H. Hulsman
Date: 7/26/07 Time: 9:15 PM

* Sample Rejected: ☐ Return ☐ Dispose ☐ Store (30 Days)

ALL on hold per phone call

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SYL-COC 905

Richard Allinger 7-27-07 0745 rec. DA 7/27/07 0745 Okeechobee transport Klg New HAS 7/27
Rec. by R. Stubling



ORIGINAL COC

CHAIN OF CUSTODY RECORD

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Page 2 of 2

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>Christina Wheeler</u>	Contact: <u>Dave Erus</u>
Address: <u>111 SW Columbia St, #617</u>	Address: _____
<u>Portland OR 97201</u>	Phone Number: <u>509 928 4413</u>
Phone Number: <u>503-222-7200</u>	FAX Number: <u>928 4415</u>
FAX Number: _____	PO#: _____
E-mail: <u>christina_wheeler@urscorp.com</u>	

TEMP on Receipt: 1°C

131005
#700413 RS

Table 1 - Matrix Type

1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Indicate State of sample origination: WA

USACE? ☒ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required								Rush Instructions (Days)	Comments		
	Date	Time		Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	As Specified (H+V) Total	As Specified (H+V) Dis	Cr VI Total	Cr VI Dis	Hg - Total	Hg - Dis			Total Metals - Total	Total Metals - Dis
1 MW-1	7/26/07	555	CM	1	10	6	1	1	2					X	X	X	X	X	X	X	X		
2 MW-2	7/26/07	1615	CM	1	10	6	1	1	2					X	X	X	X	X	X	X	X		
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

Relinquished by: Chris Moody

Relinquished by: [Signature]

Date: 7/26/07

Date: 7/26/07

Time: 19:20

Time: 9:15 PM

Received by: [Signature]

Received by: [Signature]

Date: 7/26/07

Date: 7/26/07

Time: 7:20 PM

Time: 9:15 PM

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY

Yellow: CUSTOMER COPY

SVL-COC 9/05

→ Richard Allinger 7-27-07 0745 Fred Johann 7/27/07 0845 transport Wg New 7/27 EAS
Rec@KLG SVL by: J. Sico 7/27/07 0930



ORIGINAL COC

CHAIN OF CUSTODY RECORD

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Page 1 of 3

#130799 RS

FOR SVL USE ONLY
SVL JOB #

1°C 131005
to 700713 RS

TEMP on Receipt:

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>Christina Wheeler</u>	Contact: <u>Dave Enos</u>
Address: <u>111 SW Columbia St #1500</u>	Address: <u>920 N Argonne</u>
<u>Portland OR 97201</u>	<u>Spokane WA</u>
Phone Number: <u>503-222-7200</u>	Phone Number:
FAX Number:	FAX Number:
E-mail: <u>christina-wheeler@urscorp.com</u>	PO#:

Project Name: Kelly Camp Mine

Sampler's Signature: Chris Moody

Table 1. - Matrix Type

1 = Surface Water, 2 = Ground Water

3 = Soil/Sediment, 4 = Runoff, 5 = Oil

6 = Waste, 7 = Other

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)							Analyses Required		Rush Instructions (Days)	Comments			
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH			Other (Specify)	Total Metals	Held for further inst.
1 RS-11	7/27/07	0740	C	3	1	X									X		
2 RS-12	7/27/07	0744	C	3	1	X									X		
3 RS-13	7/27/07	0746	C	3	1	X								X			
4 RS-14	7/27/07	0750	C	3	1	X									X		
5 S-15	7/27/07	0759	C	3	1	X									X		
6 S-16	7/27/07	0802	C	3	1	X									X		
7 S-17	7/27/07	0806	C	3	1	X									X		
8 S-18	7/27/07	0815	C	3	1	X									X		
9 S-19	7/27/07	0822	C	3	1	X									X		
10 S-20	7/27/07	0826	C	3	1	X									X		

Relinquished by: Chris Moody Date: 7/27/07 Time: 1637

Received by: Spokane Date: 7/27/07 Time: 0750

Relinquished by: Spokane Date: 7/30/07 Time: 0925

Received by: Spokane Date: 7/30/07 Time: 0926

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Rec@KL9SVL by: J. Sieg 7/30/07 @ 10:30



ORIGINAL COC CHAIN OF CUSTODY RECORD

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Page 2 of 3

#130799 RS

FOR SVL USE ONLY
SVL JOB #

1°C 131003
66700713 RS

TEMP on Receipt:

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>111 SW Columbia St #1500</u>	Contact: <u>DAVE ENES</u>
Address: <u>Portland OR 97201</u>	Address:
<u>Christina Wheeler</u>	
Phone Number: <u>503-222-7200</u>	Phone Number:
FAX Number:	FAX Number:
E-mail: <u>christina.wheeler@urscorp.com</u>	PO#: _____

Table I. - Matrix Type

1 = Surface Water, 2 = Ground Water

3 = Soil/Sediment, 4 = Rinseate, 5 = Oil

6 = Waste, 7 = Other _____

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Indicate State of sample origination: _____ USACE? ☐ Yes ☐ No

Indicate State of sample origination: _____				USACE? ☐ Yes ☐ No		Analyses Required										Comments
Sample ID		Collection		Misc.		Preservative(s)						Total Metals Hold for further info.		Rush Instructions (Days)		
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O		Date	Time	Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄					
Thanks!																
1	S-21	7/27/07	0831	C	3	1	X							X		
2	S-22	7/27/07	0836	C	3	1	X							X		
3	S-23	7/27/07	0844	C	3	1	X							X		
4	S-24	7/27/07	0846	C	3	1	X							X		
5	S-25	7/27/07	0850	C	3	1	X							X		
6	S-26	7/27/07	0859	C	3	1	X							X		
7	S-27	7/27/07	0902	C	3	1	X							X		
8	S-28	7/27/07	0908	C	3	1	X							X		
9	S-29	7/27/07	0915	C	3	1	X							X		
10	S-30	7/27/07	0920	C	3	1	X							X		

Relinquished by: [Signature] Date: 7/27/07 Time: 1637

Received by: [Signature] Date: 7/27/07 Time: 0750

Sample Report: [Signature] ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

7-3-07 0925

7-30-07 1030

1030



Case Narrative
Job 131007
August 28, 2007

URS Corporation

Analyses Performed: 6010B, 7010 and 7471A on 17 samples, and As Speciation and Cr Speciation on two samples

GFAA (7010): Sample S-21 required a 3x dilution and sample S-29 required a 4x dilution due to the concentration of the analyte.

QC Highlights:

Blank recoveries were acceptable.

LCS recoveries were acceptable.

Duplicate RPDs were acceptable except for manganese; the MS/MSD RPD exceeded laboratory control limits (the MS recovery met acceptance limits).

Spike recoveries were acceptable except for arsenic +3 for which the spike recovery was above laboratory acceptance limits (LCS recovery was acceptable).

A handwritten signature in black ink, appearing to read "Larry A. Drew". The signature is fluid and cursive, with the first and last names being more prominent.

Larry A. Drew
Deputy Technical Director

A HUBZone Company

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho 83837-0929

Phone: (208)784-1258

Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: RS-11

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594821

% Solids: 84.4%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	128	mg/kg		6010B	8/20/07
Cadmium	0.97	mg/kg		6010B	8/20/07
Cobalt	6.47	mg/kg		6010B	8/20/07
Chromium	17.2	mg/kg		6010B	8/20/07
Copper	117	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	321	mg/kg		6010B	8/20/07
Lead	8.26	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	36.1	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date

 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho 83837-0929

Phone: (208)784-1258

Certificate: ID ID00019

Fax: (208)783-0891

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: RS-12

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594822

% Solids: 79.7%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	1.53	mg/kg		6010B	8/20/07
Arsenic	2.7	mg/kg		6010B	8/20/07
Barium	87.4	mg/kg		6010B	8/20/07
Cadmium	1.08	mg/kg		6010B	8/20/07
Cobalt	7.25	mg/kg		6010B	8/20/07
Chromium	11.1	mg/kg		6010B	8/20/07
Copper	711	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	370	mg/kg		6010B	8/20/07
Lead	13.60	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	50.5	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594824

CLIENT SAMPLE ID: RS-14

Sample Collected:

% Solids: 90.4%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	124	mg/kg		6010B	8/20/07
Cadmium	0.87	mg/kg		6010B	8/20/07
Cobalt	6.21	mg/kg		6010B	8/20/07
Chromium	19.0	mg/kg		6010B	8/20/07
Copper	42.6	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	284	mg/kg		6010B	8/20/07
Lead	6.70	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	35.0	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-15

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594825

% Solids: 90.7%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	159	mg/kg		6010B	8/20/07
Cadmium	1.03	mg/kg		6010B	8/20/07
Cobalt	5.96	mg/kg		6010B	8/20/07
Chromium	13.9	mg/kg		6010B	8/20/07
Copper	22.7	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	642	mg/kg		6010B	8/20/07
Lead	9.52	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	48.3	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594826

CLIENT SAMPLE ID: S-16

Sample Collected:

% Solids: 90.5%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	2.7	mg/kg		6010B	8/20/07
Barium	168	mg/kg		6010B	8/20/07
Cadmium	1.37	mg/kg		6010B	8/20/07
Cobalt	6.43	mg/kg		6010B	8/20/07
Chromium	17.1	mg/kg		6010B	8/20/07
Copper	36.3	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	534	mg/kg		6010B	8/20/07
Lead	10.60	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	59.2	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date

8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho 83837-0929

Phone: (208)784-1258

Certificate: ID ID00019

Fax: (208)783-0891

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-17

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594827

% Solids: 94.2%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	0.90	mg/kg		6010B	8/20/07
Arsenic	4.4	mg/kg		6010B	8/20/07
Barium	234	mg/kg		6010B	8/20/07
Cadmium	2.75	mg/kg		6010B	8/20/07
Cobalt	13.8	mg/kg		6010B	8/20/07
Chromium	11.1	mg/kg		6010B	8/20/07
Copper	240	mg/kg		6010B	8/20/07
Mercury	0.050	mg/kg		7471A	8/15/07
Manganese	1450	mg/kg		6010B	8/20/07
Lead	13.60	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	177	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date

8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho

83837-0929

Phone: (208)784-1258

Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-18

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594828

% Solids: 91.2%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	146	mg/kg		6010B	8/20/07
Cadmium	1.22	mg/kg		6010B	8/20/07
Cobalt	7.85	mg/kg		6010B	8/20/07
Chromium	17.2	mg/kg		6010B	8/20/07
Copper	839	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	673	mg/kg		6010B	8/20/07
Lead	17.10	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	64.7	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date

8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho 83837-0929

Phone: (208)784-1258

Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-19

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594829

% Solids: 96.4%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	231	mg/kg		6010B	8/20/07
Cadmium	1.14	mg/kg		6010B	8/20/07
Cobalt	7.45	mg/kg		6010B	8/20/07
Chromium	23.5	mg/kg		6010B	8/20/07
Copper	105	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	802	mg/kg		6010B	8/20/07
Lead	8.51	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	68.8	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By:_____

Date

8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594830

CLIENT SAMPLE ID: S-20

Sample Collected:

% Solids: 96.9%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/20/07
Arsenic	<2.5	mg/kg		6010B	8/20/07
Barium	201	mg/kg		6010B	8/20/07
Cadmium	1.54	mg/kg		6010B	8/20/07
Cobalt	9.81	mg/kg		6010B	8/20/07
Chromium	32.2	mg/kg		6010B	8/20/07
Copper	20.6	mg/kg		6010B	8/20/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	585	mg/kg		6010B	8/20/07
Lead	7.96	mg/kg		6010B	8/20/07
Selenium	<4	mg/kg		6010B	8/20/07
Zinc	62.3	mg/kg		6010B	8/20/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

Certificate: ID ID00019

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594831

CLIENT SAMPLE ID: S-21

Sample Collected:

% Solids: 97.7%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Arsenic	<2.5	mg/kg		6010B	8/21/07
Arsenic	3.34	mg/kg	3	7010	8/17/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	3.34	mg/kg		DIFF	8/21/07
Chromium	27.7	mg/kg		6010B	8/21/07
Chromium+3	27.7	mg/kg		calc.	8/28/07
Chromium+6	<0.05	mg/kg	5	ASA #9	8/28/07

Tests:As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By:  Date 8/28/07
8/28/07 15:12

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594832

CLIENT SAMPLE ID: S-22

Sample Collected:

% Solids: 92.3%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	136	mg/kg		6010B	8/21/07
Cadmium	1.37	mg/kg		6010B	8/21/07
Cobalt	6.84	mg/kg		6010B	8/21/07
Chromium	20.8	mg/kg		6010B	8/21/07
Copper	25.9	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	779	mg/kg		6010B	8/21/07
Lead	26.40	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	111	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date

 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-23

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594833

% Solids: 95.4%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	134	mg/kg		6010B	8/21/07
Cadmium	1.34	mg/kg		6010B	8/21/07
Cobalt	6.80	mg/kg		6010B	8/21/07
Chromium	23.0	mg/kg		6010B	8/21/07
Copper	15.7	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		6010B	8/21/07
Manganese	688	mg/kg		7471A	8/15/07
Lead	17.90	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	88.6	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

8/28/07 15:34

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594834

CLIENT SAMPLE ID: S-24

Sample Collected:

% Solids: 97.9%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	2.6	mg/kg		6010B	8/21/07
Barium	89.1	mg/kg		6010B	8/21/07
Cadmium	1.00	mg/kg		6010B	8/21/07
Cobalt	7.72	mg/kg		6010B	8/21/07
Chromium	28.9	mg/kg		6010B	8/21/07
Copper	16.0	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	277	mg/kg		6010B	8/21/07
Lead	12.10	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	39.1	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07
8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594835

CLIENT SAMPLE ID: S-25

Sample Collected:

% Solids: 90.9%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07

As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	195	mg/kg		6010B	8/21/07
Cadmium	1.79	mg/kg		6010B	8/21/07
Cobalt	6.89	mg/kg		6010B	8/21/07
Chromium	21.2	mg/kg		6010B	8/21/07
Copper	11.4	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	921	mg/kg		6010B	8/21/07
Lead	45.40	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	214	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By:_____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594836

CLIENT SAMPLE ID: S-26

Sample Collected:

% Solids: 91.6%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	1.78	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	152	mg/kg		6010B	8/21/07
Cadmium	1.73	mg/kg		6010B	8/21/07
Cobalt	7.64	mg/kg		6010B	8/21/07
Chromium	25.0	mg/kg		6010B	8/21/07
Copper	43.5	mg/kg		6010B	8/21/07
Mercury	0.043	mg/kg		7471A	8/15/07
Manganese	370	mg/kg		6010B	8/21/07
Lead	135	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	129	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-27

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594837

% Solids: 91.2%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	128	mg/kg		6010B	8/21/07
Cadmium	1.02	mg/kg		6010B	8/21/07
Cobalt	6.85	mg/kg		6010B	8/21/07
Chromium	20.5	mg/kg		6010B	8/21/07
Copper	16.9	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	529	mg/kg		6010B	8/21/07
Lead	12.40	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	66.5	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-28

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594838

% Solids: 93.9%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<0.50	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Barium	148	mg/kg		6010B	8/21/07
Cadmium	1.01	mg/kg		6010B	8/21/07
Cobalt	8.88	mg/kg		6010B	8/21/07
Chromium	25.5	mg/kg		6010B	8/21/07
Copper	56.0	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		6010B	8/21/07
Manganese	513	mg/kg		7471A	8/15/07
Lead	8.38	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	50.6	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 8/28/07

8/28/07 15:34

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

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83837-0929

Phone: (208)784-1258

Certificate: ID ID00019

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CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: S-29

Sample Collected:

Sample Receipt : 8/10/07

Date of Report : 8/28/07

As Received Basis

SVL JOB: 131007

SAMPLE: 594839

% Solids: 92.6%

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	0.61	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Arsenic	3.15	mg/kg	4	7010	8/17/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	3.15	mg/kg		DIFF	8/21/07
Barium	176	mg/kg		6010B	8/21/07
Cadmium	0.93	mg/kg		6010B	8/21/07
Cobalt	7.26	mg/kg		6010B	8/21/07
Chromium	17.9	mg/kg		6010B	8/21/07
Chromium+3	17.9	mg/kg		calc.	8/28/07
Chromium+6	<0.05	mg/kg	5	ASA #9	8/28/07
Copper	225	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	482	mg/kg		6010B	8/21/07
Lead	7.50	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	53.6	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By: _____

Date

8/28/07

8/28/07 15:12

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131007

PROJECT:

SAMPLE: 594839

CLIENT SAMPLE ID: S-29

Sample Collected:

% Solids: 92.6%

Sample Receipt : 8/10/07

Matrix: SOIL

Date of Report : 8/28/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	0.61	mg/kg		6010B	8/21/07
Arsenic	<2.5	mg/kg		6010B	8/21/07
Arsenic	3.15	mg/kg	4	7010	8/17/07
As+3 Speciation	<0.300	mg/kg		APDC	8/21/07
As+5 Speciation	3.15	mg/kg		DIFF	8/21/07
Barium	176	mg/kg		6010B	8/21/07
Cadmium	0.93	mg/kg		6010B	8/21/07
Cobalt	7.26	mg/kg		6010B	8/21/07
Chromium	17.9	mg/kg		6010B	8/21/07
Chromium+3	17.9	mg/kg		calc.	8/28/07
Chromium+6	0.02	mg/kg	5	ASA #9	8/28/07
Copper	225	mg/kg		6010B	8/21/07
Mercury	<0.033	mg/kg		7471A	8/15/07
Manganese	482	mg/kg		6010B	8/21/07
Lead	7.50	mg/kg		6010B	8/21/07
Selenium	<4	mg/kg		6010B	8/21/07
Zinc	53.6	mg/kg		6010B	8/21/07

Tests:URS KELLY SOIL|As SPECIATION SOILS|Cr SPECIATION SOILS|

Reviewed By: _____

Date 8/28/07

8/28/07 15:06

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

Client :URS Corporation					SVL JOB No: 131007			Analysis Date
Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found	LCS %R		
Silver	6010B	SOIL	mg/kg	<0.50	5.00	4.96	99.2	8/20/07
Arsenic	6010B	SOIL	mg/kg	<2.5	100	90.3	90.3	8/20/07
Barium	6010B	SOIL	mg/kg	<0.20	100	94.7	94.7	8/20/07
Cadmium	6010B	SOIL	mg/kg	<0.20	100	91.4	91.4	8/20/07
Cobalt	6010B	SOIL	mg/kg	<0.60	100	92.3	92.3	8/20/07
Chromium	6010B	SOIL	mg/kg	<0.60	100	95.7	95.7	8/20/07
Copper	6010B	SOIL	mg/kg	<1.0	100	101	101.0	8/20/07
Manganese	6010B	SOIL	mg/kg	<0.40	100	94.1	94.1	8/20/07
Lead	6010B	SOIL	mg/kg	<0.75	100	89.5	89.5	8/20/07
Selenium	6010B	SOIL	mg/kg	<4	100	85	85.0	8/20/07
Zinc	6010B	SOIL	mg/kg	<1.0	100	89.4	89.4	8/20/07
Arsenic	7010	SOIL	mg/kg	<0.300	2.50	2.57	102.8	8/17/07
Mercury	7471A	SOIL	mg/kg	<0.033	0.834	0.847	101.6	8/15/07
As+3 Speciation	APDC	SOIL	mg/kg	<0.300	2.50	2.71	108.4	8/21/07
Chromium+6	ASA #9	SOIL	mg/kg	<0.01	0.293	0.280	95.6	8/28/07

LEGEND:

LCS = Laboratory Control Sample

LCS %R = LCS Percent Recovery

N/A = Not Applicable

Client :URS Corporation				SVL JOB No: 131007						
Test Method Mtx		QC SAMPLE ID	Result	Duplicate or Found	MSD RPD%	Matrix Spike			Analysis	Date
		Units				Result	SPK ADD	%R		
Ag	6010B S	1 mg/kg	<0.50	5.78	M	4.9	6.07	5.00	121.4	8/20/07
As	6010B S	1 mg/kg	<2.5	95.0	M	2.5	92.7	100	92.7	8/20/07
Ba	6010B S	1 mg/kg	128	250	M	4.5	239	100	111.0	8/20/07
Cd	6010B S	1 mg/kg	0.97	92.2	M	2.7	89.7	100	88.7	8/20/07
Co	6010B S	1 mg/kg	6.47	99.8	M	4.3	95.6	100	89.1	8/20/07
Cr	6010B S	1 mg/kg	17.2	118	M	5.2	112	100	94.8	8/20/07
Cu	6010B S	1 mg/kg	117	253	M	5.7	239	100	122.0	8/20/07
Mn	6010B S	1 mg/kg	321	512	M	25.3	397	100	76.0	8/20/07
Pb	6010B S	1 mg/kg	8.26	99.2	M	2.3	96.9	100	88.6	8/20/07
Se	6010B S	1 mg/kg	<4	85	M	0.0	85	100	85.0	8/20/07
Zn	6010B S	1 mg/kg	36.1	138	M	9.9	125	100	88.9	8/20/07
As	7010 S	2 mg/kg	3.34	5.52	M	18.7	6.66	2.50	132.8	8/17/07
Hg	7471A S	1 mg/kg	<0.033	0.207	M	1.0	0.205	0.167	122.8	8/15/07
As+3	APDC S	2 mg/kg	<0.300	3.92	M	8.8	3.59	2.50	143.6	8/21/07
Cr+6	ASA #9 S	2 mg/kg	<0.05	0.470	M	2.2	0.460	0.500	88.0	8/28/07

LEGEND:

RPD% = $(|SAM - DUP| / ((SAM + DUP)/2)) * 100$ UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = $(|SPK - MSD| / ((SPK + MSD)/2)) * 100$ M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 594821 Client Sample ID: RS-11

QC Sample 2: SVL SAM No.: 594831 Client Sample ID: S-21

Addendum to Original COCs (See Attached Originals)

PAGE 05/05

SVL ANALYT

2087830891

08/09/2007 11:44



CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Page ____ of ____

FOR SVL USE ONLY
SVL JOB #
131007
10700712 PS
TEMP on Receipt
Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christine Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503 222 7200
FAX Number: _____
E-mail: Christina.Wheeler@URS.com PO#: _____
Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____

Project Name: Kelly Camp Meie
Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection	Misc.	Preservative(s)	Analyses Required		Rush Instructions (Days)	Comments
				Matrix Type (From Table 1)	No. of Containers		
1 RS-11							<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2 RS-12							
3 RS-13							
4 RS-14							
5 S-15							
6 S-16							
7 S-17							
8 S-18							
9 S-19							
10 S-20							

Please take care to distinguish between:
1 and I
2 and Z
5 and S
0 and O

Thanks!

Unpreserved
HNO₃ Filtered
HNO₃ Unfiltered
HCl
H₂SO₄
NaOH
Other (Specify)

Metals (6010B) (see lab)
Mercury (7471.4)
As Speciation
Cr Speciation

Relinquished by: _____ Date: _____ Time: _____
Requisitioned by: _____ Date: _____ Time: _____
Received by: R. Strubling Date: 8/10/07 Time: 1:30

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C. Wheeler 8/9/07

1 of 5

Addendum to Original COCs (see Attached originals)

PAGE 05/05



CHAIN OF CUSTODY RECORD

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Page ____ of ____

FOR SVL USE ONLY: SVL JOB #
131007
TEMP on Receipt: W700712 RS
Table 1 - Matrix Type 1 = Surface Water, 2 = Ground Water 3 = Soil/Sediment, 4 = Rocks, 5 = Oil 6 = Waste, 7 = Other

Report to Company: <u>URS</u>	Invoice Sent To: _____
Contact: <u>Christina Wheeler</u>	Contact: _____
Address: <u>111 SW Columbia St #1500</u>	Address: _____
<u>Portland OR 97201</u>	Address: _____
Phone Number: <u>503 222-7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>Christina.Wheeler@URS.com</u>	PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)							Analyses Required	Rush Instructions (Days)	Comments		
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl				H ₂ SO ₄	NaOH
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O															
Thanks!															
1 S-21															* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn RCRA 8 + more Need data reports by 8/24/07 (10 business days) Please contact Christina Wheeler if you can not meet this date
2 S-22														X X	
3 S-23														X X	
4 S-24														X X	
5 S-25														X X	
6 S-26														X X	
7 S-27														X X	
8 S-28														X X	
9 S-29														X X X X	
10 S-30														X X X X	

Relinquished by: _____ Date: _____ Time: _____ Received by: R. Strubling Date: 8/10/07 Time: 1:30

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C. Wheeler 8/9/07

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SVL ANALYT

2087830891

08/09/2007 11:44



CHAIN OF CUSTODY RECORD

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SVL JOB #

2 131007

TEMP on Receipt: W7007187S

Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rocks, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503 222 7200
FAX Number: _____
E-mail: Christina.Wheeler@URScom PO#: _____

Invoice Sent To: _____
Contact: _____
Address: _____
Phone Number: _____
FAX Number: _____

Project Name: Kelly Camp Mine
Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection	Misc.	Preservative(s)	Analyses Required										Rush Instructions (Days)	Comments		
				Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	Metals (6010B) (see list)			Mercury (7471.1)	As Speciation
1 S-31																	* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn Need data reports by 8/24/07 (10 business days) Please contact Christina Wheeler if you can not meet this date
2 S-32																	
3 S-33																	
4 S-34																	
5 S-35																	
6 S-36																	
7 WR-1																	
8 WR-2																	
9 WR-3																	
10																	

Relinquished by: _____ Date: _____ Time: _____ Received by: R. Stabbing Date: 8/10/07 Time: 1:30
Requisitioned by: _____ Date: _____ Time: _____ Reached by: _____ Date: _____ Time: _____

• Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Ch Wheeler 8/9/07

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Addendum to Original COCs (See Attached Originals)

PAGE 05/05



CHAIN OF CUSTODY RECORD

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Page ____ of ____

FOR SVL USE ONLY	
SVL JOB #	
2 131007	
TEMP on Receipt: 12700713 RS.	
Table 1 - Matrix Type	
1 = Surface Water, 2 = Ground Water	
3 = Soil/Sediment, 4 = Biosolids, 5 = Oil	
6 = Waste, 7 = Other	

Report to Company: <u>URS</u>	Lawrence Sent To: _____
Contact: <u>Christina Wheeler</u>	Contact: _____
Address: <u>111 SW Columbia St #1500</u>	Address: _____
<u>Portland OR 97201</u>	_____
Phone Number: <u>503 222 7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>Christina.Wheeler@URS.com</u>	PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA

USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments		
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH	Other (Specify)
1 SB-1																<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>
2 SB-2																
3 SB-3																
4 SB-4																
5 SB-5																
6 SB-6																
7 SB-7																
8 SB-8																
9 SB-9																
10 SB-10																

Relinquished by: _____

Requisitioned by: _____

Date: _____

Date: _____

Time: _____

Time: _____

Received by: R. Stabbing

Received by: _____

Date: 8/10/07

Date: _____

Time: 1:30

Time: _____

* Sample Reject:

☐ Return

☐ Dispose

☐ Store (30 Days)

White: LAB COPY

Yellow: CUSTOMER COPY

SVL-COC 9/05

Ch Wheeler 8/9/07

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SVL ANALYT

08/09/2007 11:44 2087830891

Addendum to original CCR (see Attachment ...)

PAGE 05/05



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Page ____ of ____

FOR SVL USE ONLY
SVL JOB #

131007

TEMP on Receipt: W700712 RS

Table 1 - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: <u>URS</u>	Invoice Sent To: _____
Contact: <u>Christine Wheeler</u>	Contact: _____
Address: <u>111 SW Columbia St #1500</u>	Address: _____
<u>Portland OR 97201</u>	_____
Phone Number: <u>503 222 7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>Christina.Wheeler@URScorp.com</u>	PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)		Analyses Required	Rush Instructions (Days)	Comments			
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)				No. of Containers	Unpreserved	HNO ₃ Filtered
1 and 1								<p>* Metal list. Ag As Ba Cd Co Cr Cu Mn Pb Se Zn</p> <p>Need data reports by 8/24/07 (10 business days)</p> <p>Please contact Christina Wheeler if you can not meet this date</p>			
2 and 2											
5 and 5											
0 and 0											
Thanks!											
MW-1											
MW-2											

See ORIGINAL CCR

Metals (6010B) (see list)
Mercury (7471.1)
As Speciation
Cr Speciation

Relinquished by: _____ Date: _____ Time: _____ Received by: R. Stabbing Date: 8/10/07 Time: 1:30

Requisitioned by: _____ Date: _____ Time: _____ Reached by: _____ Date: _____ Time: _____

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

C Wheeler 8/9/07

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SVL ANALYT

2087830891

11:44

08/09/2007



ORIGINAL COC CHAIN OF CUSTODY RECORD

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#130799 RS

FOR SVL USE ONLY
SVL JOB #

1°C 13100h
100712 RS

TEMP on Receipt:

Table 1. - Matrix Type

1 - Surface Water, 2 - Ground Water
3 - Soil/Sediment, 4 - Rinsate, 5 - Oil
6 - Waste, 7 - Other

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>111 SW Columbia St #1500</u>	Contact: <u>DAVE ENES</u>
Address: <u>Portland OR 97201</u>	Address: _____
Phone Number: <u>503-222-7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>christina.wheeler@urscorp.com</u>	PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Indicate State of sample origination: _____ USACE? ☐ yes ☐ no

Indicate State of sample origination: _____										USACE? ☐ Yes ☐ No		Comments _____									
Sample ID		Collection		Misc.	Preservative(s)								Analyses Required				Rush Instructions (Days)				
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O		Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	Total Metals	Hold for further info.						
1	S-21	7/27/07	0831	C	3	1	X								X						
2	S-22	7/27/07	0836	C	3	1	X								X						
3	S-23	7/27/07	0844	C	3	1	X								X						
4	S-24	7/27/07	0846	C	3	1	X								X						
5	S-25	7/27/07	0850	C	3	1	X								X						
6	S-26	7/27/07	0855	C	3	1	X								X						
7	S-27	7/27/07	0902	C	3	1	X								X						
8	S-28	7/27/07	0908	C	3	1	X								X						
9	S-29	7/27/07	0915	C	3	1	X								X						
10	S-30	7/27/07	0920	C	3	1	X								X						

Relinquished by: <u>[Signature]</u>	Date: <u>7/27/07</u>	Time: <u>16:37</u>	Received by: <u>[Signature]</u>	Date: <u>7-27-07</u>	Time: <u>1637</u>
Relinquished by: <u>[Signature]</u>	Date: <u>7/30/07</u>	Time: <u>0712</u>	Received by: <u>[Signature]</u>	Date: <u>7/27/07</u>	Time: <u>0750</u>

Sample Rejected: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

30/07 0925

7-3-07 0925 SVL-COC 9/0

J. Sieg

7-30-07 1030



ORIGINAL COC

CHAIN OF CUSTODY RECORD

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#130799 RS

FOR SVL USE ONLY
SVL JOB #

10C 131007

TEMP on Receipt

10700912

Table 1. - Matrix Type

1 = Surface Water, 2 = Ground Water

3 = Soil/Sediment, 4 = Residue, 5 = Oil

6 = Waste, 7 = Other rock

Report to Company: URS
 Contact: Christina Wheeler
 Address: 111 SW Columbia St #500
Portland OR 97201
 Phone Number: 503-222-7200
 FAX Number: _____
 E-mail: Christina_wheeler@urscorp.com

Invoice Sent To: URS - Spokane
 Contact: Dave Enos
 Address: _____
 Phone Number: _____
 FAX Number: _____
 PO#: _____

Project Name: Kelly Camp MineSampler's Signature: [Signature] 7/27/07

Indicate State of sample origination: _____

USACE? ☐ Yes ☐ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments				
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH	Other (Specify)		
1 S-31	7/27/07	0925	3	1	X													
2 S-32	7/27/07	0930	3	1	X													
3 S-33	7/27/07	0937	3	1	X													
4 S-34	7/27/07	0945	3	1	X													
5 S-35	7/27/07	0950	3	1	X													
6 S-36	7/27/07	1255	3	1	X													
7 WR-1	7/27/07	1020	6	1	X													
8 WR-2	7/27/07	1030	6	1	X													
9 WR-3	7/27/07	1255	6	1	X													
10																		

Please take care to distinguish between:
 1 and I
 2 and Z
 5 and S
 0 and O

Thanks!

Relinquished by: [Signature] Date: 7/27/07 Time: 1657
 Relinquished for: Chris Moody Date: 7/30/07 Time: 7:47
 Received by: [Signature] Date: 7/27/07 Time: 1657
 Received by: [Signature] Date: 7/27/07 Time: 0750

Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

7/30/07 0925 Robert S. J. Shea 7-30-07 0926 7-30-07 1030

NO DATE OR TIME
ON Sample ID

SVL-COC 9/01



ORIGINAL COC CHAIN OF CUSTODY RECORD

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Page 1 of 3

#130799 RS
FOR SVL USE ONLY
SVL JOB #
131007
1°C W100712 RS

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>Christina Wheeler</u>	Contact: <u>Dave Enos</u>
Address: <u>111 SW Columbia St #1500</u>	Address: <u>920 N Argonne</u>
<u>Portland OR 97201</u>	<u>Spokane WA</u>
Phone Number: <u>503-222-7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>christina-wheeler@urscorp.com</u>	PO#: _____

Table 1. - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Project Name: Kelly Camp Mine
Sampler's Signature: Chris Moody

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)							Analyses Required		Rush Instructions (Days)	Comments			
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH			Other (Specify)	Total Metals	Held for further inst.
1 RS-11	7/27/07	0740	C	3	1	X									X		
2 RS-12	7/27/07	0744	C	3	1	X									X		
3 RS-13	7/27/07	0746	C	3	1	X								X			
4 RS-14	7/27/07	0750	C	3	1	X									X		
5 S-15	7/27/07	0759	C	3	1	X									X		
6 S-16	7/27/07	0802	C	3	1	X									X		
7 S-17	7/27/07	0806	C	3	1	X									X		
8 S-18	7/27/07	0815	C	3	1	X									X		
9 S-19	7/27/07	0822	C	3	1	X									X		
10 S-20	7/27/07	0826	C	3	1	X									X		

Relinquished by: Chris Moody Date: 7/27/07 Time: 1637 Received by: [Signature] Date: 7/27/07 Time: 1637
Relinquished by: [Signature] Date: 7/27/07 Time: 0148 Received by: [Signature] Date: 7/27/07 Time: 0750

Sample Retention: ☐ Return ☐ Dispose ☐ Store (30 Days) ☒ 7/30/07 0925
White: LAB COPY Yellow: CUSTOMER COPY SVL-COC 9/01

Rec'd @ KL9SVL by: J. Sieg 7/30/07 @ 10:30



ORIGINAL COC

CHAIN OF CUSTODY RECORD

Page 2 of 2

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Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>Christina Wheeler</u>	Contact: <u>Dave Erus</u>
Address: <u>111 SW Columbia St, #627</u>	Address: _____
<u>Portland OR 97201</u>	Phone Number: <u>509 928 4413</u>
Phone Number: <u>503-222-7200</u>	FAX Number: <u>928 4415</u>
FAX Number: _____	PO#: _____
E-mail: <u>christina_wheeler@urscorp.com</u>	

TEMP on Receipt: 1°C

Table 1. - Matrix Type

1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Sample ID		Collection		Misc.	Preservative(s)								Analyses Required								Rush Instructions (Days)	Comments	
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O		Date	Time	Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	As specified (H+V) Total	As specified (H+V) Dis	Cr VI Total	Cr VI Dis	Hg - Total	Hg - Dis	Total Metals - Total			Total Metals - Dis
1	MW-1	7/26/07	1555	CM	1	10	6	1	1	2				X	X	X	X	X	X	X	X		
2	MW-2	7/26/07	1615	CM	1	10	6	1	1	2				X	X	X	X	X	X	X	X		
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

Relinquished by: Chris Moody

Date: 7/27/07

Time: 14:20

Received by: Jaroslav D. Halusa

Date: 7/26/07

Time: 9:05 PM

Received by: [Signature]

Date: 7/26/07

Time: 7:20 PM

Date: 7/26/07

Time: 9:15 PM

* Sample Rejected: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY

Yellow: CUSTOMER COPY

SVL-COC 9/05

→ Richard Allinger 7-27-07 0745 → Red Graham 7/27/07 0845 transport 4g New 7/27 045
Rec@KLG SVL by: J. Sico 7/27/07 0930



ORIGINAL COC

CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0391

Page 1 of 2

#1c

FOR SVL USE
SVL JOB #

131007
1C 10700412

TEMP on Receipt:

Table 1. - Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinse, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS Corp
Contact: Christina Wheeler
Address: 111 Sh' Columbia St #1520
Portland OR 97201
Phone Number: 503-222-7200
FAX Number: _____
E-mail: christina-wheeler@urscorp.com

Invoice Sent To: URS - Spokane
Contact: Dave Enos
Address: _____
Phone Number: 509 928 4413
FAX Number: 928 4415
POB: _____

 Project Name: Kelly Camp Mine
Sampler's Signature: [Signature]

 Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc. (M)	Preservative(s)								Analyses Required				Rush Instructions (Days)	Comments		
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)	AS Speciation (III + V)	Cr VI			Hg	Total Metals
1 SB-1	7/26/07	1446	CM	S	1	X								X	X	X	X		
2 SB-2	7/26/07	1454	CM	S	1	X								X	X	X	X		
3 SB-3	7/26/07	1459	CM	S	1	X								X	X	X	X		
4 SB-4	7/26/07	1504	CM	S	1	X								X	X	X	X		
5 SB-5	7/26/07	1509	CM	S	1	X								X	X	X	X		
6 SB-6	7/26/07	1512	CM	S	1	X								X	X	X	X		
7 SB-7	7/26/07	1516	CM	S	1	X								X	X	X	X		
8 SB-8	7/26/07	1520	CM	S	1	X								X	X	X	X		
9 SB-9	7/26/07	1523	CM	S	1	X								X	X	X	X		
10 SB-10	7/26/07	1525	CM	S	1	X								X	X	X	X		

Thanks!

Please take care to distinguish between:
1 and I
2 and Z
5 and S
0 and O

Refrigerated by: Chris Moore Date: 7/26/07 Time: 19:20
Received by: [Signature] Date: 7/26/07 Time: 9:15 PM

Refrigerated by: [Signature] Date: 7/26/07 Time: 9:15 PM
Received by: [Signature] Date: 7/26/07 Time: 9:15 PM

• Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

Richard Allinger 7-27-07 0745
Roc@klo.sil hirt Pion 7/27

Spokane transport kg New BAS 7/27

SVL-COC 9/05

SVL ANALYTICAL, INC.

One Government Gulch

P.O. Box 929

Kellogg, Idaho 83837-0929

Phone: (208)784-1258

Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

PROJECT:

CLIENT SAMPLE ID: WR-1

Sample Collected:

Sample Receipt : 9/13/07

Date of Report : 9/20/07

SVL JOB: 131431

SAMPLE: 600987

Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
Silver	34.3	mg/kg	5	6010B	9/19/07
Arsenic	<13	*mg/kg	5	6010B	9/19/07
Barium	4.8	mg/kg	5	6010B	9/19/07
Cadmium	7.5	mg/kg	5	6010B	9/19/07
Cobalt	3.8	mg/kg	5	6010B	9/19/07
Chromium	66.2	mg/kg	5	6010B	9/19/07
Copper	8760	mg/kg	5	6010B	9/19/07
Mercury	<0.033	mg/kg		7471A	9/18/07
Manganese	2760	mg/kg	5	6010B	9/19/07
Lead	43.2	mg/kg	5	6010B	9/19/07
Selenium	35	mg/kg	5	6010B	9/19/07
Zinc	66	mg/kg	5	6010B	9/19/07

Tests:URS KELLY SOIL|

*Elevated detection limit due to matrix interference.

Reviewed By: _____

Date 9/20/07

9/20/07 15:33

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131431

PROJECT:

SAMPLE: 600988

CLIENT SAMPLE ID: WR-2

Sample Collected:

Sample Receipt : 9/13/07

Matrix: SOIL

Date of Report : 9/20/07

Determination	Result	Units	Dilution	Method	Analyzed
Silver	<2.5	*mg/kg	5	6010B	9/19/07
Arsenic	<13	*mg/kg	5	6010B	9/19/07
Barium	26.6	mg/kg	5	6010B	9/19/07
Cadmium	4.5	mg/kg	5	6010B	9/19/07
Cobalt	5.0	mg/kg	5	6010B	9/19/07
Chromium	33.8	mg/kg	5	6010B	9/19/07
Copper	904	mg/kg	5	6010B	9/19/07
Mercury	<0.033	mg/kg		7471A	9/18/07
Manganese	622	mg/kg	5	6010B	9/19/07
Lead	10.9	mg/kg	5	6010B	9/19/07
Selenium	57	mg/kg	5	6010B	9/19/07
Zinc	48	mg/kg	5	6010B	9/19/07

Tests:URS KELLY SOIL|

*Elevated detection limit due to matrix interference.

Reviewed By: _____

Date 9/20/07

9/20/07 15:33

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

SVL ANALYTICAL, INC.

One Government Gulch ■ P.O. Box 929 ■ Kellogg, Idaho 83837-0929 ■ Phone: (208)784-1258 ■ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : URS Corporation

SVL JOB: 131431

PROJECT:

SAMPLE: 600989

CLIENT SAMPLE ID: WR-3

Sample Collected:

Sample Receipt : 9/13/07

Matrix: SOIL

Date of Report : 9/20/07 As Received Basis

Determination	Result	Units	Dilution	Method	Analyzed
Silver	0.67	mg/kg		6010B	9/19/07
Arsenic	<2.5	mg/kg		6010B	9/19/07
Barium	56.5	mg/kg		6010B	9/19/07
Cadmium	1.55	mg/kg		6010B	9/19/07
Cobalt	7.88	mg/kg		6010B	9/19/07
Chromium	133	mg/kg		6010B	9/19/07
Copper	87.8	mg/kg		6010B	9/19/07
Mercury	<0.033	mg/kg		7471A	9/18/07
Manganese	386	mg/kg		6010B	9/19/07
Lead	6.10	mg/kg		6010B	9/19/07
Selenium	<4	mg/kg		6010B	9/19/07
Zinc	61.2	mg/kg		6010B	9/19/07

Tests:URS KELLY SOIL|

Reviewed By: _____

Date 9/20/07

9/20/07 16:27

AZ: AZ0538 CA: CERT NO. 2080 CO: CERT NO. ID00019 ID: ID00019 MT: CERT. 0027 NV: CERT. ID19 WA: C1268

Client :URS Corporation						SVL JOB No: 131431		Analysis Date
Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found	LCS %R		
Silver	6010B	SOIL	mg/kg	<0.50 ✓	5.00	4.96	99.2 ✓	9/19/07
Arsenic	6010B	SOIL	mg/kg	<2.5	100	88.3	88.3 ✓	9/19/07
Barium	6010B	SOIL	mg/kg	<0.20	100	97.0	97.0 ✓	9/19/07
Cadmium	6010B	SOIL	mg/kg	<0.20	100	93.0	93.0 ✓	9/19/07
Cobalt	6010B	SOIL	mg/kg	<0.60	100	95.9	95.9 ✓	9/19/07
Chromium	6010B	SOIL	mg/kg	<0.60	100	96.7	96.7	9/19/07
Copper	6010B	SOIL	mg/kg	<1.0	100	103	103.0 ✓	9/19/07
Manganese	6010B	SOIL	mg/kg	<0.40	100	98.3	98.3	9/19/07
Lead	6010B	SOIL	mg/kg	<0.75	100	93.0	93.0	9/19/07
Selenium	6010B	SOIL	mg/kg	<4	100	93	93.0	9/19/07
Zinc	6010B	SOIL	mg/kg	<1.0	100	84.5	✓84.5	9/19/07
Mercury	7471A	SOIL	mg/kg	<0.033	0.834	0.937	✓112.4	9/18/07

LEGEND:

LCS = Laboratory Control Sample

LCS %R = LCS Percent Recovery

N/A = Not Applicable

85-112

Client :URS Corporation							SVL JOB No: 131431			
Test Method Mtx		QC SAMPLE ID		Duplicate or		MSD	Matrix Spike		Analysis	
		Units	Result	Found		RPD%	Result	SPK ADD	%R	Date
Ag	6010B S	1 mg/kg	34.3	37.9	M	3.6	39.3	5.00	100.0	9/19/07
As	6010B S	1 mg/kg	<13	103	M	2.9	106	100	106.0	9/19/07
Ba	6010B S	1 mg/kg	4.8	103	M	1.0	104	100	99.2	9/19/07
Cd	6010B S	1 mg/kg	7.5	103	M	1.0	102	100	94.5	9/19/07
Co	6010B S	1 mg/kg	3.8	100	M	1.0	101	100	97.2	9/19/07
Cr	6010B S	1 mg/kg	66.2	162	M	6.0	172	100	105.8	9/19/07
Cu	6010B S	1 mg/kg	8760	8900	M	2.7	9140	100	R >4S	9/19/07
Mn	6010B S	1 mg/kg	2760	2820	M	3.1	2910	100	R >4S	9/19/07
Pb	6010B S	1 mg/kg	43.2	138.0	M	0.7	139.0	100	95.8	9/19/07
Se	6010B S	1 mg/kg	35	131	M	0.8	132	100	97.0	9/19/07
Zn	6010B S	1 mg/kg	66	153	M	1.9	156	100	90.0	9/19/07
Hg	7471A S	1 mg/kg	<0.033	0.135	M	16.0	0.115	0.167	68.9	9/18/07

LEGEND:

RPD% = $(|SAM - DUP| / ((SAM + DUP)/2)) * 100$ UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.
 RPD% = $(|SPK - MSD| / ((SPK + MSD)/2)) * 100$ M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC limits for MS recoveries apply only if the spike is at least 1/4 the concentration of the analyte in the sample.

Control limits for the RPD apply only if the concentration of the analyte in the sample is at least five times the reporting limit.

QC Sample 1: SVL SAM No.: 600987 Client Sample ID: WR-1

0.033 RL x 4 = 0.132

75-125%



CHAIN OF CUSTODY RECORD

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

Page 1 of 1

Report to Company: <u>URS</u>	Invoice Sent To: _____
Contact: <u>Christina Wheeler</u>	Contact: _____
Address: <u>111 SW Columbia St #1500</u>	Address: _____
<u>Portland OR 97261</u>	Address: _____
Phone Number: <u>503</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: _____	PO#: _____

FOR SVL USE ONLY: SVL JOB # _____
TEMP on Receipt: <u>13.431</u>
Table 1 - Matrix Type 1 = Surface Water, 2 = Ground Water 3 = Soil/Sediment, 4 = Plastic, 5 = Oil 6 = Waste, 7 = Other _____

Project Name: Kelly Camp Mine

Sampler's Signature: _____

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)								Analyses Required	Rush Instructions (Days)	Comments	
	Date	Time		Collected by: (init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O															
Thanks!															
1	WR-1														* Metal list Ag As Ba Cd Co Cr Cu Mn Pb Se Zn
2	WR-2													* Please Report DATA in 5 business days (OR ASAP)	
3	WR-3														
4															
5															
6															
7															
8															
9															
10															

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05



Case Narrative
Job W700523
August 30, 2007

URS Corporation

Analyses Performed: 6010B and 7471A on 3 samples, and ABA and sulfur forms on 3 samples.

Preparation: Samples were air dried, crushed and pulverized.

ICP (6010B): Sample S-30 required a 10x dilution due to the concentration of the analyte.

ABA and Sulfur Forms (LECO): A prepared LCS is used for both ANP and for total sulfur. The true value and the found results are shown on QC page 2. The material used for the ICP and CCV is a prepared standard for which the sulfur content is $1.36 \pm 0.03\%$. The ICP for total sulfur was 1.36%; the intermediate CCV was 1.35% and the final CCV was 1.36%.

QC Highlights:

Blank recoveries were acceptable except for chromium which was detected above the reporting limit and manganese and phosphorus were detected in the blank at more than one-half the reporting limit (but the concentration found in the samples was more than 10 times the reporting limit).

LCS recoveries were acceptable except for lithium and strontium for which the recovery was above the laboratory limit but within method acceptance limits, and for scandium which was not included in the LCS solution (as scandium was not on the analyte list when the work order was created).

Duplicate (matrix spike) RPDs were acceptable.

Spike recoveries were acceptable except for aluminum, calcium, copper, iron, manganese, phosphorus and titanium for which the accuracy of the spike recoveries was reduced as the analyte concentration in the sample was disproportionate to the spike level; except for silver and bismuth for which the spike recovery was below laboratory acceptance limits (LCS recovery was

A HUBZone Company



acceptable); and except for magnesium for which the spike recovery was above laboratory acceptance limits (LCS recovery was acceptable). Post-preparation spike analysis recoveries for bismuth, magnesium and silver were acceptable. There was no recovery for scandium as it was not in the spiking solution (as scandium was not on the analyte list when the work order was created.

A handwritten signature in black ink, appearing to read "Larry A. Drew". The signature is fluid and cursive, with a prominent loop at the end.

Larry A. Drew
Deputy Technical Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Nan Wilson
Laboratory Director
27-Aug-2007

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
RS-13	W700523-01	Solid	27-Jul-07	CM	30-Jul-07
S-21	W700523-02	Solid	27-Jul-07	CM	30-Jul-07
S-30	W700523-03	Solid	27-Jul-07	CM	30-Jul-07
WR-1	W700523-04	Solid	27-Jul-07	CM	30-Jul-07
WR-2	W700523-05	Solid	27-Jul-07	CM	30-Jul-07
WR-3	W700523-06	Solid	27-Jul-07	CM	30-Jul-07

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

Client Sample ID:

RS-13

Sampled: 27-Jul-07

SVL Sample ID:

W700523-01 (Solid)

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Aluminum	9330	mg/kg	8.00	1.70			04-Aug-07	DT
EPA 6010B	Antimony	3.43	mg/kg	2.00	0.660			04-Aug-07	DT
EPA 6010B	Arsenic	7.55	mg/kg	2.50	0.740			04-Aug-07	DT
EPA 6010B	Barium	107	mg/kg	0.2	0.03			04-Aug-07	DT
EPA 6010B	Beryllium	1.18	mg/kg	0.200	0.0210			04-Aug-07	DT
EPA 6010B	Bismuth	196	mg/kg	6.0	1.3			04-Aug-07	DT
EPA 6010B	Boron	< 4.00	mg/kg	4.00	0.570			04-Aug-07	DT
EPA 6010B	Cadmium	3.06	mg/kg	0.200	0.0520			04-Aug-07	DT
EPA 6010B	Calcium	7550	mg/kg	4.00	0.560			04-Aug-07	DT
EPA 6010B	Chromium	12.5	mg/kg	0.600	0.0800			04-Aug-07	DT
EPA 6010B	Cobalt	7.22	mg/kg	0.600	0.0630			04-Aug-07	DT
EPA 6010B	Copper	2740	mg/kg	1.00	0.270			04-Aug-07	DT
EPA 6010B	Gallium	< 2.00	mg/kg	2.00	0.730			04-Aug-07	DT
EPA 6010B	Iron	21200	mg/kg	6.00	0.950			04-Aug-07	DT
EPA 6010B	Lead	40.5	mg/kg	0.750	0.500			04-Aug-07	DT
EPA 6010B	Lithium	9.38	mg/kg	2.00	0.380			04-Aug-07	DT
EPA 6010B	Magnesium	3260	mg/kg	6.00	2.10			04-Aug-07	DT
EPA 6010B	Manganese	816	mg/kg	0.400	0.0590			04-Aug-07	DT
EPA 6010B	Molybdenum	8.01	mg/kg	0.800	0.130			04-Aug-07	DT
EPA 6010B	Nickel	3.23	mg/kg	1.00	0.290			04-Aug-07	DT
EPA 6010B	Phosphorus	798	mg/kg	5.00	0.890			04-Aug-07	DT
EPA 6010B	Potassium	1210	mg/kg	50.0	5.10			04-Aug-07	DT
EPA 6010B	Scandium	1.94	mg/kg	0.200	0.0130			04-Aug-07	DT
EPA 6010B	Selenium	< 4.00	mg/kg	4.00	1.10			04-Aug-07	DT
EPA 6010B	Silver	11.7	mg/kg	0.500	0.0600			04-Aug-07	DT
EPA 6010B	Sodium	94.5	mg/kg	50.0	1.30			04-Aug-07	DT
EPA 6010B	Strontium	32.6	mg/kg	0.500	0.0890			04-Aug-07	DT
EPA 6010B	Thallium	< 1.50	mg/kg	1.50	0.630			04-Aug-07	DT
EPA 6010B	Tin	77.2	mg/kg	5.00	0.800			04-Aug-07	DT
EPA 6010B	Titanium	535	mg/kg	0.500	0.0130			04-Aug-07	DT
EPA 6010B	Vanadium	27.1	mg/kg	0.500	0.0740			04-Aug-07	DT
EPA 6010B	Zinc	73.7	mg/kg	1.00	0.130			04-Aug-07	DT

Mercury by SW846 Methods

EPA 7471A	Mercury	0.042	mg/kg	0.033	0.007			02-Aug-07	JAA
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SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929 Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212Work Order: W700523
Reported 27-Aug-07 10:02

Client Sample ID:

S-21

Sampled: 27-Jul-07

SVL Sample ID:

W700523-02 (Solid)

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
--------	---------	--------	-------	----	-----	----------	-------	----------	---------

Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Aluminum	22800	mg/kg	8.00	1.70			04-Aug-07	DT
EPA 6010B	Antimony	5.58	mg/kg	2.00	0.660			04-Aug-07	DT
EPA 6010B	Arsenic	8.01	mg/kg	2.50	0.740			04-Aug-07	DT
EPA 6010B	Barium	428	mg/kg	0.2	0.03			04-Aug-07	DT
EPA 6010B	Beryllium	4.36	mg/kg	0.200	0.0210			04-Aug-07	DT
EPA 6010B	Bismuth	35.6	mg/kg	6.0	1.3			04-Aug-07	DT
EPA 6010B	Boron	< 4.00	mg/kg	4.00	0.570			04-Aug-07	DT
EPA 6010B	Cadmium	8.27	mg/kg	0.200	0.0520			04-Aug-07	DT
EPA 6010B	Calcium	4800	mg/kg	4.00	0.560			04-Aug-07	DT
EPA 6010B	Chromium	35.1	mg/kg	0.600	0.0800			04-Aug-07	DT
EPA 6010B	Cobalt	14.5	mg/kg	0.600	0.0630			04-Aug-07	DT
EPA 6010B	Copper	636	mg/kg	1.00	0.270			04-Aug-07	DT
EPA 6010B	Gallium	11.7	mg/kg	2.00	0.730			04-Aug-07	DT
EPA 6010B	Iron	51100	mg/kg	6.00	0.950			04-Aug-07	DT
EPA 6010B	Lead	12.2	mg/kg	0.750	0.500			04-Aug-07	DT
EPA 6010B	Lithium	43.6	mg/kg	2.00	0.380			04-Aug-07	DT
EPA 6010B	Magnesium	15600	mg/kg	6.00	2.10			04-Aug-07	DT
EPA 6010B	Manganese	770	mg/kg	0.400	0.0590			04-Aug-07	DT
EPA 6010B	Molybdenum	3.81	mg/kg	0.800	0.130			04-Aug-07	DT
EPA 6010B	Nickel	1.26	mg/kg	1.00	0.290			04-Aug-07	DT
EPA 6010B	Phosphorus	707	mg/kg	5.00	0.890			04-Aug-07	DT
EPA 6010B	Potassium	10600	mg/kg	50.0	5.10			04-Aug-07	DT
EPA 6010B	Scandium	16.7	mg/kg	0.200	0.0130			04-Aug-07	DT
EPA 6010B	Selenium	< 4.00	mg/kg	4.00	1.10			04-Aug-07	DT
EPA 6010B	Silver	3.26	mg/kg	0.500	0.0600			04-Aug-07	DT
EPA 6010B	Sodium	111	mg/kg	50.0	1.30			04-Aug-07	DT
EPA 6010B	Strontium	15.6	mg/kg	0.500	0.0890			04-Aug-07	DT
EPA 6010B	Thallium	< 1.50	mg/kg	1.50	0.630			04-Aug-07	DT
EPA 6010B	Tin	< 5.00	mg/kg	5.00	0.800			04-Aug-07	DT
EPA 6010B	Titanium	3540	mg/kg	0.500	0.0130			04-Aug-07	DT
EPA 6010B	Vanadium	157	mg/kg	0.500	0.0740			04-Aug-07	DT
EPA 6010B	Zinc	117	mg/kg	1.00	0.130			04-Aug-07	DT

Mercury by SW846 Methods

EPA 7471A	Mercury	0.252	mg/kg	0.033	0.007			02-Aug-07	JAA
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SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212Work Order: W700523
Reported 27-Aug-07 10:02

Client Sample ID:

SVL Sample ID:

S-30
W700523-03 (Solid)

Sampled: 27-Jul-07

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Aluminum	10700	mg/kg	8.00	1.70			04-Aug-07	DT
EPA 6010B	Antimony	3.09	mg/kg	2.00	0.660			04-Aug-07	DT
EPA 6010B	Arsenic	7.21	mg/kg	2.50	0.740			04-Aug-07	DT
EPA 6010B	Barium	59.7	mg/kg	0.2	0.03			04-Aug-07	DT
EPA 6010B	Beryllium	1.41	mg/kg	0.200	0.0210			04-Aug-07	DT
EPA 6010B	Bismuth	242	mg/kg	6.0	1.3			04-Aug-07	DT
EPA 6010B	Boron	< 4.00	mg/kg	4.00	0.570			04-Aug-07	DT
EPA 6010B	Cadmium	2.79	mg/kg	0.200	0.0520			04-Aug-07	DT
EPA 6010B	Calcium	3510	mg/kg	4.00	0.560			04-Aug-07	DT
EPA 6010B	Chromium	13.5	mg/kg	0.600	0.0800			04-Aug-07	DT
EPA 6010B	Cobalt	8.38	mg/kg	0.600	0.0630			04-Aug-07	DT
EPA 6010B	Copper	12600	mg/kg	10.0	2.70	10	D2	08-Aug-07	DT
EPA 6010B	Gallium	< 2.00	mg/kg	2.00	0.730			04-Aug-07	DT
EPA 6010B	Iron	20700	mg/kg	6.00	0.950			04-Aug-07	DT
EPA 6010B	Lead	17.8	mg/kg	0.750	0.500			04-Aug-07	DT
EPA 6010B	Lithium	9.31	mg/kg	2.00	0.380			04-Aug-07	DT
EPA 6010B	Magnesium	3500	mg/kg	6.00	2.10			04-Aug-07	DT
EPA 6010B	Manganese	746	mg/kg	0.400	0.0590			04-Aug-07	DT
EPA 6010B	Molybdenum	6.23	mg/kg	0.800	0.130			04-Aug-07	DT
EPA 6010B	Nickel	3.73	mg/kg	1.00	0.290			04-Aug-07	DT
EPA 6010B	Phosphorus	1240	mg/kg	5.00	0.890			04-Aug-07	DT
EPA 6010B	Potassium	1180	mg/kg	50.0	5.10			04-Aug-07	DT
EPA 6010B	Scandium	2.55	mg/kg	0.200	0.0130			04-Aug-07	DT
EPA 6010B	Selenium	6.67	mg/kg	4.00	1.10			04-Aug-07	DT
EPA 6010B	Silver	20.5	mg/kg	0.500	0.0600			04-Aug-07	DT
EPA 6010B	Sodium	76.6	mg/kg	50.0	1.30			04-Aug-07	DT
EPA 6010B	Strontium	40.5	mg/kg	0.500	0.0890			04-Aug-07	DT
EPA 6010B	Thallium	< 1.50	mg/kg	1.50	0.630			04-Aug-07	DT
EPA 6010B	Tin	38.6	mg/kg	5.00	0.800			04-Aug-07	DT
EPA 6010B	Titanium	637	mg/kg	0.500	0.0130			04-Aug-07	DT
EPA 6010B	Vanadium	29.6	mg/kg	0.500	0.0740			04-Aug-07	DT
EPA 6010B	Zinc	69.9	mg/kg	1.00	0.130			04-Aug-07	DT

Mercury by SW846 Methods

EPA 7471A	Mercury	0.037	mg/kg	0.033	0.007			02-Aug-07	JAA
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SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

Client Sample ID:

WR-1

Sampled: 27-Jul-07

SVL Sample ID:

W700523-04 (Solid)

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Acid/Base Accounting & Sulfur Forms

ASTM E1915-05	ABA	40.40	TCaCO ₃ /kT					03-Aug-07	BJF
ASTM E1915-05	AGP	1.27	TCaCO ₃ /kT					03-Aug-07	BJF
Modified Sobek/ ASTM E1915-05	ANP	41.67	TCaCO ₃ /kT	0.30	1.000E-3			03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-extractable Sulfur	0.05	%	0.01				03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-Sulfate Sulfur	0.10	%	0.01				03-Aug-07	BJF
ASTM E1915-05	Pyritic Sulfur	0.04	%					03-Aug-07	BJF
ASTM E1915-05	Sulfate Sulfur	0.11	%					03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Total Sulfur	0.20	%	0.01				03-Aug-07	BJF

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929 Kellogg ID 83837-0929

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URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

Client Sample ID:

WR-2

Sampled: 27-Jul-07

SVL Sample ID:

W700523-05 (Solid)

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Acid/Base Accounting & Sulfur Forms

ASTM E1915-05	ABA	296.4	TCaCO3/kT					03-Aug-07	BJF
ASTM E1915-05	AGP	0.00	TCaCO3/kT					03-Aug-07	BJF
Modified Sobek/ ASTM E1915-05	ANP	296.44	TCaCO3/kT	0.30	1.000E-3			03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-extractable Sulfur	< 0.01	%	0.01				03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-Sulfate Sulfur	< 0.01	%	0.01				03-Aug-07	BJF
ASTM E1915-05	Pyritic Sulfur	0.00	%					03-Aug-07	BJF
ASTM E1915-05	Sulfate Sulfur	0.00	%					03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Total Sulfur	< 0.01	%	0.01				03-Aug-07	BJF

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

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URS Corporation - Spokane
920 North Argonne
Spokane, WA 99212

Work Order: W700523

Reported 27-Aug-07 10:02

Client Sample ID:

WR-3

Sampled: 27-Jul-07

SVL Sample ID:

W700523-06 (Solid)

Received: 30-Jul-07

Sampled: CM

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Acid/Base Accounting & Sulfur Forms

ASTM E1915-05	ABA	17.28	TCaCO3/kT					03-Aug-07	BJF
ASTM E1915-05	AGP	5.22	TCaCO3/kT					03-Aug-07	BJF
Modified Sobek/ ASTM E1915-05	ANP	22.50	TCaCO3/kT	0.30	1.000E-3			03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-extractable Sulfur	< 0.01	%	0.01				03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Non-Sulfate Sulfur	0.17	%	0.01				03-Aug-07	BJF
ASTM E1915-05	Pyritic Sulfur	0.17	%					03-Aug-07	BJF
ASTM E1915-05	Sulfate Sulfur	0.03	%					03-Aug-07	BJF
Modified Sobek/ASTM E1915-05	Total Sulfur	0.20	%	0.01				03-Aug-07	BJF

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929 Kellogg ID 83837-0929

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URS Corporation - Spokane
920 North Argonne
Spokane, WA 99212

Work Order: W700523

Reported 27-Aug-07 10:02

Quality Control Data

Blank Data

Method	Analyte	Units	Result	MDL	RL	Batch ID	Notes	Analyzed
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Aluminum	mg/kg	<8.00	1.70	8.00	W708005		
EPA 6010B	Antimony	mg/kg	<2.00	0.660	2.00	W708005		04-Aug-07
EPA 6010B	Arsenic	mg/kg	<2.50	0.740	2.50	W708005		04-Aug-07
EPA 6010B	Barium	mg/kg	<0.2	0.03	0.2	W708005		04-Aug-07
EPA 6010B	Beryllium	mg/kg	<0.200	0.0210	0.200	W708005		04-Aug-07
EPA 6010B	Bismuth	mg/kg	<6.0	1.3	6.0	W708005		04-Aug-07
EPA 6010B	Boron	mg/kg	<4.00	0.570	4.00	W708005		04-Aug-07
EPA 6010B	Cadmium	mg/kg	<0.200	0.0520	0.200	W708005		04-Aug-07
EPA 6010B	Calcium	mg/kg	<4.00	0.560	4.00	W708005		04-Aug-07
EPA 6010B	Chromium	mg/kg	0.614	0.0800	0.600	W708005	B7	04-Aug-07
EPA 6010B	Cobalt	mg/kg	<0.600	0.0630	0.600	W708005		04-Aug-07
EPA 6010B	Copper	mg/kg	<1.00	0.270	1.00	W708005		04-Aug-07
EPA 6010B	Gallium	mg/kg	<2.00	0.730	2.00	W708005		04-Aug-07
EPA 6010B	Iron	mg/kg	<6.00	0.950	6.00	W708005		04-Aug-07
EPA 6010B	Lead	mg/kg	<0.750	0.500	0.750	W708005		04-Aug-07
EPA 6010B	Lithium	mg/kg	<2.00	0.380	2.00	W708005		04-Aug-07
EPA 6010B	Magnesium	mg/kg	<6.00	2.10	6.00	W708005		04-Aug-07
EPA 6010B	Manganese	mg/kg	<0.400	0.0590	0.400	W708005	B7	04-Aug-07
EPA 6010B	Molybdenum	mg/kg	<0.800	0.130	0.800	W708005		04-Aug-07
EPA 6010B	Nickel	mg/kg	<1.00	0.290	1.00	W708005		04-Aug-07
EPA 6010B	Phosphorus	mg/kg	<5.00	0.890	5.00	W708005	B7	04-Aug-07
EPA 6010B	Potassium	mg/kg	<50.0	5.10	50.0	W708005		04-Aug-07
EPA 6010B	Scandium	mg/kg	<0.200	0.0130	0.200	W708005		04-Aug-07
EPA 6010B	Selenium	mg/kg	<4.00	1.10	4.00	W708005		04-Aug-07
EPA 6010B	Silver	mg/kg	<0.500	0.0600	0.500	W708005		04-Aug-07
EPA 6010B	Sodium	mg/kg	<50.0	1.30	50.0	W708005		04-Aug-07
EPA 6010B	Strontium	mg/kg	<0.500	0.0890	0.500	W708005		04-Aug-07
EPA 6010B	Thallium	mg/kg	<1.50	0.630	1.50	W708005		04-Aug-07
EPA 6010B	Tin	mg/kg	<5.00	0.800	5.00	W708005		04-Aug-07
EPA 6010B	Titanium	mg/kg	<0.500	0.0130	0.500	W708005		04-Aug-07
EPA 6010B	Vanadium	mg/kg	<0.500	0.0740	0.500	W708005		04-Aug-07
EPA 6010B	Zinc	mg/kg	<1.00	0.130	1.00	W708005		04-Aug-07

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	<0.033	0.007	0.033	W708011		02-Aug-07
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Acid/Base Accounting & Sulfur Forms

Modified Sobek/	ANP	TCaCO ₃ /KT	<0.30	1.000E-3	0.30	W707197		03-Aug-07
Modified Sobek/	Non-extractable Sulfur	%	<0.01		0.01	W707198		03-Aug-07
Modified Sobek/	Non-Sulfate Sulfur	%	<0.01		0.01	W707198		03-Aug-07
Modified Sobek/	Total Sulfur	%	<0.01		0.01	W707198		03-Aug-07



One Government Gulch - PO Box 929 Kellogg ID 83837-0929

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URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

Duplicate Sample Data

Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch ID	Notes	Analyzed
Acid/Base Accounting & Sulfur Forms									
Modified Sobek/ AS	ANP	TCaCO ₃ /kT	37.53	41.67	10.5	20	W707197		
Modified Sobek/AS	Non-extractable Sulfur	%	0.0348	0.0544	43.9	20	W707198		03-Aug-07
Modified Sobek/AS	Non-Sulfate Sulfur	%	0.105	0.0951	9.9	20	W707198		03-Aug-07
Modified Sobek/AS	Total Sulfur	%	0.209	0.205	1.9	20	W707198		03-Aug-07

Laboratory Control Sample Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Notes	Analyzed
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Aluminum	mg/kg	102	100	102	88 - 111	W708005		04-Aug-07
EPA 6010B	Antimony	mg/kg	98.8	100	98.8	84 - 110	W708005		04-Aug-07
EPA 6010B	Arsenic	mg/kg	96.8	100	96.8	84 - 110	W708005		04-Aug-07
EPA 6010B	Barium	mg/kg	98.1	100	98.1	92 - 112	W708005		04-Aug-07
EPA 6010B	Beryllium	mg/kg	107	100	107	89 - 107	W708005		04-Aug-07
EPA 6010B	Bismuth	mg/kg	95.9	100	95.9	81 - 112	W708005		04-Aug-07
EPA 6010B	Boron	mg/kg	102	100	102	89 - 107	W708005		04-Aug-07
EPA 6010B	Cadmium	mg/kg	94.6	100	94.6	86 - 110	W708005		04-Aug-07
EPA 6010B	Calcium	mg/kg	1970	2000	98.7	87 - 107	W708005		04-Aug-07
EPA 6010B	Chromium	mg/kg	101	100	101	89 - 111	W708005		04-Aug-07
EPA 6010B	Cobalt	mg/kg	98.9	100	98.9	89 - 107	W708005		04-Aug-07
EPA 6010B	Copper	mg/kg	112	100	112	89 - 112	W708005		04-Aug-07
EPA 6010B	Gallium	mg/kg	102	100	102	89 - 106	W708005		04-Aug-07
EPA 6010B	Iron	mg/kg	1000	1000	100	86 - 117	W708005		04-Aug-07
EPA 6010B	Lead	mg/kg	96.1	100	96.1	82 - 117	W708005		04-Aug-07
EPA 6010B	Lithium	mg/kg	111	100	111	88 - 110	W708005	L5	04-Aug-07
EPA 6010B	Magnesium	mg/kg	2030	2000	101	86 - 105	W708005		04-Aug-07
EPA 6010B	Manganese	mg/kg	103	100	103	80 - 120	W708005		04-Aug-07
EPA 6010B	Molybdenum	mg/kg	111	100	111	86 - 115	W708005		04-Aug-07
EPA 6010B	Nickel	mg/kg	94.2	100	94.2	84 - 101	W708005		04-Aug-07
EPA 6010B	Phosphorus	mg/kg	97.4	100	97.4	80 - 119	W708005		04-Aug-07
EPA 6010B	Potassium	mg/kg	2090	2000	105	89 - 108	W708005		04-Aug-07
EPA 6010B	Scandium	mg/kg	0.0369	50.0	0.0738	88 - 107	W708005	L2	04-Aug-07
EPA 6010B	Selenium	mg/kg	87.4	100	87.4	80 - 108	W708005		04-Aug-07
EPA 6010B	Silver	mg/kg	5.01	5.00	100	90 - 118	W708005		04-Aug-07
EPA 6010B	Sodium	mg/kg	1980	1900	104	87 - 108	W708005		04-Aug-07
EPA 6010B	Strontium	mg/kg	108	100	108	89 - 107	W708005	L5	04-Aug-07
EPA 6010B	Thallium	mg/kg	94.2	100	94.2	85 - 109	W708005		04-Aug-07
EPA 6010B	Tin	mg/kg	99.1	100	99.1	88 - 112	W708005		04-Aug-07
EPA 6010B	Titanium	mg/kg	105	100	105	90 - 110	W708005		04-Aug-07
EPA 6010B	Vanadium	mg/kg	105	100	105	93 - 109	W708005		04-Aug-07
EPA 6010B	Zinc	mg/kg	93.0	100	93.0	85 - 112	W708005		04-Aug-07

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.930	0.833	112	85 - 115	W708011		02-Aug-07
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Acid/Base Accounting & Sulfur Forms

Modified Sobek/ AS	ANP	TCaCO ₃ /k	52.55	52.0	101	83 - 113	W707197		03-Aug-07
Modified Sobek/AS	Total Sulfur	%	0.303	0.280	108	84 - 136	W707198		03-Aug-07

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

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URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523

Reported 27-Aug-07 10:02

Matrix Spike Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Notes	Analyzed
Total Recoverable Metals by EPA 6000/7000 Series Methods										
EPA 6010B	Aluminum	mg/kg	10700	9330	100	R > 4S	75 - 125	W708005		
EPA 6010B	Antimony	mg/kg	83.7	3.43	100	80.3	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Arsenic	mg/kg	106	7.55	100	98.4	75 - 125	W708005		04-Aug-07
EPA 6010B	Barium	mg/kg	193	107	100	85.9	75 - 125	W708005		04-Aug-07
EPA 6010B	Beryllium	mg/kg	110	1.18	100	109.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Bismuth	mg/kg	163	196	100	-33.4	75 - 125	W708005	M2	04-Aug-07
EPA 6010B	Boron	mg/kg	104	1.65	100	103.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Cadmium	mg/kg	97.0	3.06	100	93.9	75 - 125	W708005		04-Aug-07
EPA 6010B	Calcium	mg/kg	10600	7550	2000	153.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Chromium	mg/kg	111	12.5	100	98.8	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Cobalt	mg/kg	105	7.22	100	97.7	75 - 125	W708005		04-Aug-07
EPA 6010B	Copper	mg/kg	2840	2740	100	92.3	75 - 125	W708005		04-Aug-07
EPA 6010B	Gallium	mg/kg	104	<2.00	100	104.0	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Iron	mg/kg	22200	21200	1000	97.1	75 - 125	W708005		04-Aug-07
EPA 6010B	Lead	mg/kg	126	40.5	100	85.7	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Lithium	mg/kg	126	9.38	100	116.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Magnesium	mg/kg	5960	3260	2000	135.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Manganese	mg/kg	855	816	100	R > 4S	75 - 125	W708005	M1	04-Aug-07
EPA 6010B	Molybdenum	mg/kg	116	8.01	100	108.0	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Nickel	mg/kg	108	3.23	100	105.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Phosphorus	mg/kg	1040	798	100	R > 4S	75 - 125	W708005		04-Aug-07
EPA 6010B	Potassium	mg/kg	3410	1210	2000	110.0	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Scandium	mg/kg	2.02	1.94	50.0	0.2	75 - 125	W708005		04-Aug-07
EPA 6010B	Selenium	mg/kg	92.1	2.17	100	90.0	75 - 125	W708005	N	04-Aug-07
EPA 6010B	Silver	mg/kg	8.84	11.7	5.00	-56.6	75 - 125	W708005		04-Aug-07
EPA 6010B	Sodium	mg/kg	2150	94.5	1900	108.0	75 - 125	W708005	M2	04-Aug-07
EPA 6010B	Strontium	mg/kg	139	32.6	100	106.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Thallium	mg/kg	90.1	<1.50	100	90.1	75 - 125	W708005		04-Aug-07
EPA 6010B	Tin	mg/kg	184	77.2	100	107.0	75 - 125	W708005		04-Aug-07
EPA 6010B	Titanium	mg/kg	695	535	100	R > 4S	75 - 125	W708005		04-Aug-07
EPA 6010B	Vanadium	mg/kg	133	27.1	100	105.0	75 - 125	W708005	M3	04-Aug-07
EPA 6010B	Zinc	mg/kg	163	73.7	100	89.5	75 - 125	W708005		04-Aug-07

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.202	0.042	0.167	96.0	75 - 125	W708011		02-Aug-07
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SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Spokane
920 North Argonne
Spokane, WA99212Work Order: W700523
Reported 27-Aug-07 10:02**Matrix Spike Duplicate Data**

Method	Analyte	Units	Spike Result	Sample Result	Spike Level	% Rec.	Rec. Limits	RPD	RPD Limit	Batch	Notes	Analyzed
Total Recoverable Metals by EPA 6000/7000 Series Methods												
EPA 6010B	Aluminum	mg/kg	10500	9330	100	1150	75-125	1.7	20	W708005	M3	04-Aug-07
EPA 6010B	Antimony	mg/kg	82.4	3.43	100	78.9	75-125	1.6	20	W708005		04-Aug-07
EPA 6010B	Arsenic	mg/kg	107	7.55	100	99.1	75-125	0.7	20	W708005		04-Aug-07
EPA 6010B	Barium	mg/kg	195	107	100	87.5	75-125	0.8	20	W708005		04-Aug-07
EPA 6010B	Beryllium	mg/kg	110	1.18	100	109	75-125	0.5	20	W708005		04-Aug-07
EPA 6010B	Bismuth	mg/kg	159	196	100	-36.6	75-125	2.0	20	W708005	M2	04-Aug-07
EPA 6010B	Boron	mg/kg	105	1.65	100	103	75-125	0.4	20	W708005		04-Aug-07
EPA 6010B	Cadmium	mg/kg	95.7	3.06	100	92.6	75-125	1.3	20	W708005		04-Aug-07
EPA 6010B	Calcium	mg/kg	10500	7550	2000	150	75-125	0.7	20	W708005	M3	04-Aug-07
EPA 6010B	Chromium	mg/kg	113	12.5	100	100	75-125	1.3	20	W708005		04-Aug-07
EPA 6010B	Cobalt	mg/kg	105	7.22	100	98.1	75-125	0.4	20	W708005		04-Aug-07
EPA 6010B	Copper	mg/kg	2760	2740	100	14.5	75-125	2.8	20	W708005	M3	04-Aug-07
EPA 6010B	Gallium	mg/kg	103	ND	100	103	75-125	0.9	20	W708005		04-Aug-07
EPA 6010B	Iron	mg/kg	21900	21200	1000	72.7	75-125	1.1	20	W708005	M3	04-Aug-07
EPA 6010B	Lead	mg/kg	123	40.5	100	82.5	75-125	2.6	20	W708005		04-Aug-07
EPA 6010B	Lithium	mg/kg	123	9.38	100	114	75-125	2.0	20	W708005		04-Aug-07
EPA 6010B	Magnesium	mg/kg	5870	3260	2000	131	75-125	1.5	20	W708005	M1	04-Aug-07
EPA 6010B	Manganese	mg/kg	846	816	100	30.4	75-125	1.0	20	W708005	M3	04-Aug-07
EPA 6010B	Molybdenum	mg/kg	115	8.01	100	107	75-125	0.9	20	W708005		04-Aug-07
EPA 6010B	Nickel	mg/kg	108	3.23	100	105	75-125	0.4	20	W708005		04-Aug-07
EPA 6010B	Phosphorus	mg/kg	1020	798	100	221	75-125	1.5	20	W708005	M3	04-Aug-07
EPA 6010B	Potassium	mg/kg	3380	1210	2000	108	75-125	0.9	20	W708005		04-Aug-07
EPA 6010B	Scandium	mg/kg	2.00	1.94	50.0	0.111	75-125	1.2	20	W708005		04-Aug-07
EPA 6010B	Selenium	mg/kg	92.6	2.17	100	90.4	75-125	0.5	20	W708005		04-Aug-07
EPA 6010B	Silver	mg/kg	8.95	11.7	5.00	-54.5	75-125	1.1	20	W708005	M2	04-Aug-07
EPA 6010B	Sodium	mg/kg	2120	94.5	1900	106	75-125	1.4	20	W708005		04-Aug-07
EPA 6010B	Strontium	mg/kg	138	32.6	100	105	75-125	0.8	20	W708005		04-Aug-07
EPA 6010B	Thallium	mg/kg	88.2	ND	100	88.2	75-125	2.1	20	W708005		04-Aug-07
EPA 6010B	Tin	mg/kg	182	77.2	100	104	75-125	1.6	20	W708005		04-Aug-07
EPA 6010B	Titanium	mg/kg	685	535	100	151	75-125	1.4	20	W708005	M3	04-Aug-07
EPA 6010B	Vanadium	mg/kg	133	27.1	100	106	75-125	0.5	20	W708005		04-Aug-07
EPA 6010B	Zinc	mg/kg	164	73.7	100	90.5	75-125	0.6	20	W708005		04-Aug-07

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.213	0.042	0.167	103	75-125	5.6	20	W708011		02-Aug-07
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Post-Prep Spike Data

Method	Analyte	Units	Spike Result	Sample Result	Spike Level	% Rec.	Acceptance Limits	Batch ID	Notes	Analyzed
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Bismuth	mg/L	3.0	2.0	1.00	107	75 - 125	W708005		08-Aug-07
EPA 6010B	Magnesium	mg/L	54.6	32.6	20.0	110	75 - 125	W708005		08-Aug-07
EPA 6010B	Silver	mg/L	0.176	0.117	0.0500	119	75 - 125	W708005		08-Aug-07

SVL Analytical, Inc.

Certifications: AZ 0538, CA 2080, ID00019, E87993, ID00019, CERT0027, ID000192007A, WA 1268, ID00019



URS Corporation - Spokane
920 North Argonne
Spokane, WA99212

Work Order: W700523
Reported 27-Aug-07 10:02

Notes and Definitions

N	Matrix spike recovery not within control limits.
M3	The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
M2	Matrix spike was low, but the LCS was acceptable.
M1	Matrix spike was high, but the LCS was acceptable.
L5	The associated LCS recovery was outside laboratory acceptance limits, but within method acceptance limits.
L2	The associated LCS recovery was below laboratory acceptance limits.
D2	Sample required dilution due to high concentration of target analyte.
B7	Target analyte detected in method blank at or above method reporting limit, but concentration found in the sample is 10 times the concentration found in the method blank.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference



CHAIN OF CUSTODY RECORD

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Page 1 of 3

#130799

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt: 1°C

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503-222-7200
FAX Number:
E-mail: christina-wheeler@urscorp.com

Invoice Sent To: URS - Spokane
Contact: Dave Enos
Address: 920 N Argonne
Spokane WA
Phone Number:
FAX Number:
PO#:

Project Name: Kelly Camp Mine
Sampler's Signature: Chris Moody

Indicate State of sample origination: WA USACE? ☐ Yes ☒ No

Sample ID	Collection		Misc.	Preservative(s)							Analyses Required		Rush Instructions (Days)	Comments		
	Date	Time		Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH			Other (Specify)	Total Metals
1 RS-11	7/27/07	0740	C	3	1	X								X		
2 RS-12	7/27/07	0744	C	3	1	X								X		
3 RS-13	7/27/07	0746	C	3	1	X							X			
4 RS-14	7/27/07	0750	C	3	1	X								X		
5 S-15	7/27/07	0759	C	3	1	X								X		
6 S-16	7/27/07	0802	C	3	1	X								X		
7 S-17	7/27/07	0806	C	3	1	X								X		
8 S-18	7/27/07	0815	C	3	1	X								X		
9 S-19	7/27/07	0822	C	3	1	X								X		
10 S-20	7/27/07	0826	C	3	1	X								X		

Relinquished by: Chris Moody Date: 7/27/07 Time: 1637
Received by: [Signature] Date: 7/27/07 Time: 0750

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Rec@KL9SVL by: J. Sieg 7/30/07 @ 10:30



CHAIN OF CUSTODY RECORD

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Page 2 of 3

Report to Company: <u>URS</u>	Invoice Sent To: <u>URS - Spokane</u>
Contact: <u>111 SW Columbia St #1500</u>	Contact: <u>Dave Enes</u>
Address: <u>Portland OR 97201</u>	Address: _____
Phone Number: <u>503-222-7200</u>	Phone Number: _____
FAX Number: _____	FAX Number: _____
E-mail: <u>christina.wheeler@urscorp.com</u>	PO#: _____

#130799

FOR SVL USE ONLY
SVL JOB #

1°C

TEMP on Receipt:

Table 1. -- Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other _____

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature]

Indicate State of sample origination: _____ USACE? ☐ Yes ☐ No

Indicate State of sample origination: _____										USACE? ☐ Yes ☐ No		Analyses Required				Comments	
Sample ID		Collection		Misc.	Preservative(s)							Rush Instructions (Days)					
Please take care to distinguish between: 1 and I 2 and Z 5 and S 0 and O		Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄				NaOH	Other (Specify)	
Thanks!																	
1	S-21	7/27/07	0831	C	3	1	X								X		
2	S-22	7/27/07	0836	C	3	1	X								X		
3	S-23	7/27/07	0844	C	3	1	X								X		
4	S-24	7/27/07	0846	C	3	1	X								X		
5	S-25	7/27/07	0850	C	3	1	X								X		
6	S-26	7/27/07	0855	C	3	1	X								X		
7	S-27	7/27/07	0902	C	3	1	X								X		
8	S-28	7/27/07	0908	C	3	1	X								X		
9	S-29	7/27/07	0915	C	3	1	X								X		
10	S-30	7/27/07	0920	C	3	1	X								X		

Total Metals
Hold for further inst.

Analyses Required

Comments

Date: 7-27-07

Time: 11:37

Relinquished by: [Signature] Date: 7/27/07 Time: 16:37 Received by: [Signature] Date: 7/27/07 Time: 1637

Relinquished by: [Signature] Date: 7/30/07 Time: 0742 Received by: [Signature] Date: 7/30/07 Time: 0750

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days) 30/07 0925

White: LAB COPY Yellow: CUSTOMER COPY

Fahl & [Signature] J. Sieg 7-3-07 0925 SVL-COC 9/05

7-30-07 1030



CHAIN OF CUSTODY RECORD

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Page 3 of 3

#130799

FOR SVL USE ONLY

SVL JOB #

1°C

TEMP on Receipt:

Table 1. -- Matrix Type

1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other rock

Report to Company: URS
Contact: Christina Wheeler
Address: 111 SW Columbia St #1500
Portland OR 97201
Phone Number: 503-222-7200
FAX Number: _____
E-mail: christina_wheeler@urscorp.com

Invoice Sent To: URS - Spokane
Contact: Dave Enos
Address: _____
Phone Number: _____
FAX Number: _____
PO#: _____

Project Name: Kelly Camp Mine

Sampler's Signature: [Signature] 7/27/07

Indicate State of sample origination: _____

USACE? ☐ Yes ☐ No

Sample ID		Collection		Misc.	Preservative(s)							Analyses Required		Rush Instructions (Days)	Comments
Please take care to distinguish between:		Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO ₃ Filtered	HNO ₃ Unfiltered	HCl	H ₂ SO ₄	NaOH	Other (Specify)		
1 and I 2 and Z 5 and S 0 and O															
Thanks!															
1	S-31	7/27/07	0925	CM	3	1	X							X	
2	S-32	7/27/07	0930	CM	3	1	X							X	
3	S-33	7/27/07	0937	CM	3	1	X							X	
4	S-34	7/27/07	0945	CM	3	1	X							X	
5	S-35	7/27/07	0950	CM	3	1	X							X	
6	S-36	7/27/07	1255	CM	3	1	X							X	
7	WR-1	7/27/07	1020	CM	6	1	X							X	
8	WR-2	7/27/07	1030	CM	6	1	X							X	
9	WR-3	7/27/07	1255	CM	6	1	X							X	
10															

Relinquished by: [Signature] Chris Moody

Date: 7/27/07 Time: 1637

Received by: [Signature]

Date: 7/27/07 Time: 1637

Date: 7/27/07 Time: 0750

Relinquished by: [Signature]

Date: 7/30/07 Time: 7:49

Received by: [Signature]

Date: 7/30/07 Time: 0925

Date: 7/30/07 Time: 1030

Sample Reject: [Signature]

☐ Return

☐ Dispose

☐ Store (30 Days)

White: LAB COPY

Yellow: CUSTOMER COPY

SVL-COC 9/05

[Signature]

J. Sieg

7-30-07 0926

7-30-07 1030



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Portland
111 SW Columbia St. #1500
Portland, OR 97201

Work Order: **W701660**
Reported 09-Oct-07 14:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BLAST ROCK WR-4	W701660-01	Solid	20-Sep-07	02-Oct-07

The complete report includes pages for each sample; a full QC report, and a notes page.



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Portland
111 SW Columbia St. #1500
Portland, OR 97201

Work Order: **W701660**

Reported 09-Oct-07 14:11

Client Sample ID: **BLAST ROCK WR-4**

Sampled: 20-Sep-07

Received: 02-Oct-07

SVL Sample ID: **W701660-01 (Solid)**

Sample Report Page 1 of 1

Sampled By:

Method	Analyte	Result	Units	RL	MDL	Dilution	Notes	Analyzed	Analyst
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Arsenic	204	mg/kg	2.5	0.7			08-Oct-07	AS
EPA 6010B	Barium	21.3	mg/kg	0.20	0.03			08-Oct-07	AS
EPA 6010B	Cadmium	2.24	mg/kg	0.20	0.05			08-Oct-07	AS
EPA 6010B	Chromium	63.0	mg/kg	0.60	0.08			08-Oct-07	AS
EPA 6010B	Cobalt	12.7	mg/kg	0.60	0.06			08-Oct-07	AS
EPA 6010B	Copper	1450	mg/kg	1.00	0.27			08-Oct-07	AS
EPA 6010B	Lead	21.2	mg/kg	0.75	0.50			08-Oct-07	AS
EPA 6010B	Manganese	1920	mg/kg	0.40	0.06			08-Oct-07	AS
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1			08-Oct-07	AS
EPA 6010B	Silver	4.85	mg/kg	0.50	0.06			08-Oct-07	AS
EPA 6010B	Zinc	63.6	mg/kg	1.00	0.13			08-Oct-07	AS

Mercury by SW846 Methods

EPA 7471A	Mercury	< 0.033	mg/kg	0.033	0.007			09-Oct-07	JAA
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This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Larry Drew
Technical Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Portland
111 SW Columbia St. #1500
Portland, OR 97201

Work Order: **W701660**
Reported 09-Oct-07 14:11

Quality Control - BLANK Data

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Arsenic	mg/kg	<2.5	0.7	2.5	W710182	08-Oct-07	
EPA 6010B	Barium	mg/kg	<0.20	0.03	0.20	W710182	08-Oct-07	
EPA 6010B	Cadmium	mg/kg	<0.20	0.05	0.20	W710182	08-Oct-07	
EPA 6010B	Chromium	mg/kg	<0.60	0.08	0.60	W710182	08-Oct-07	
EPA 6010B	Cobalt	mg/kg	<0.60	0.06	0.60	W710182	08-Oct-07	
EPA 6010B	Copper	mg/kg	<1.00	0.27	1.00	W710182	08-Oct-07	
EPA 6010B	Lead	mg/kg	<0.75	0.50	0.75	W710182	08-Oct-07	
EPA 6010B	Manganese	mg/kg	<0.40	0.06	0.40	W710182	08-Oct-07	
EPA 6010B	Selenium	mg/kg	<4.0	1.1	4.0	W710182	08-Oct-07	
EPA 6010B	Silver	mg/kg	<0.50	0.06	0.50	W710182	08-Oct-07	
EPA 6010B	Zinc	mg/kg	<1.00	0.13	1.00	W710182	08-Oct-07	

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	<0.033	0.007	0.033	W710170	09-Oct-07	
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Quality Control - LABORATORY CONTROL SAMPLE Data

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Arsenic	mg/kg	87.6	100	87.6	84 - 110	W710182	08-Oct-07	
EPA 6010B	Barium	mg/kg	100	100	100	92 - 112	W710182	08-Oct-07	
EPA 6010B	Cadmium	mg/kg	94.1	100	94.1	86 - 110	W710182	08-Oct-07	
EPA 6010B	Chromium	mg/kg	99.8	100	99.8	89 - 111	W710182	08-Oct-07	
EPA 6010B	Cobalt	mg/kg	94.2	100	94.2	89 - 107	W710182	08-Oct-07	
EPA 6010B	Copper	mg/kg	101	100	101	89 - 112	W710182	08-Oct-07	
EPA 6010B	Lead	mg/kg	94.6	100	94.6	82 - 117	W710182	08-Oct-07	
EPA 6010B	Manganese	mg/kg	97.6	100	97.6	80 - 120	W710182	08-Oct-07	
EPA 6010B	Selenium	mg/kg	79.6	100	79.6	80 - 108	W710182	08-Oct-07	
EPA 6010B	Silver	mg/kg	4.90	5.00	97.9	90 - 118	W710182	08-Oct-07	
EPA 6010B	Zinc	mg/kg	91.5	100	91.5	85 - 112	W710182	08-Oct-07	

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.927	0.833	111	85 - 115	W710170	09-Oct-07	
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Quality Control - MATRIX SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Arsenic	mg/kg	85.9	<2.5	100	85.9	75 - 125	W710182	08-Oct-07	
EPA 6010B	Barium	mg/kg	169	18.2	100	151	75 - 125	W710182	08-Oct-07	M1
EPA 6010B	Cadmium	mg/kg	92.6	<0.20	100	92.6	75 - 125	W710182	08-Oct-07	
EPA 6010B	Chromium	mg/kg	99.0	<0.60	100	98.7	75 - 125	W710182	08-Oct-07	
EPA 6010B	Cobalt	mg/kg	94.0	3.31	100	90.7	75 - 125	W710182	08-Oct-07	
EPA 6010B	Copper	mg/kg	102	<1.00	100	101	75 - 125	W710182	08-Oct-07	
EPA 6010B	Lead	mg/kg	93.4	<0.75	100	93.4	75 - 125	W710182	08-Oct-07	
EPA 6010B	Manganese	mg/kg	98.7	1.31	100	97.4	75 - 125	W710182	08-Oct-07	
EPA 6010B	Selenium	mg/kg	73.8	<4.0	100	73.8	75 - 125	W710182	08-Oct-07	M2
EPA 6010B	Silver	mg/kg	4.88	<0.50	5.00	97.5	75 - 125	W710182	08-Oct-07	
EPA 6010B	Zinc	mg/kg	89.4	<1.00	100	89.2	75 - 125	W710182	08-Oct-07	

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.367	0.200	0.167	100	75 - 125	W710170	09-Oct-07	
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One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

URS Corporation - Portland
111 SW Columbia St. #1500
Portland, OR 97201

Work Order: **W701660**
Reported 09-Oct-07 14:11

Quality Control - MATRIX SPIKE DUPLICATE Data

Method	Analyte	Units	Spike Result	Sample Result	Spike Level	% Rec.	Rec. Limits	RPD	RPD Limit	Batch ID	Analyzed	Notes
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Arsenic	mg/kg	82.3	ND	100	82.3	75-125	4.2	20	W710182	8-Oct-07	
EPA 6010B	Barium	mg/kg	128	18.2	100	110	75-125	27.5	20	W710182	8-Oct-07	R2
EPA 6010B	Cadmium	mg/kg	88.0	ND	100	88.0	75-125	5.1	20	W710182	8-Oct-07	
EPA 6010B	Chromium	mg/kg	93.0	0.30	100	92.7	75-125	6.3	20	W710182	8-Oct-07	
EPA 6010B	Cobalt	mg/kg	89.2	3.31	100	85.9	75-125	5.2	20	W710182	8-Oct-07	
EPA 6010B	Copper	mg/kg	97.5	0.85	100	96.7	75-125	4.2	20	W710182	8-Oct-07	
EPA 6010B	Lead	mg/kg	89.3	ND	100	89.3	75-125	4.4	20	W710182	8-Oct-07	
EPA 6010B	Manganese	mg/kg	95.7	1.31	100	94.4	75-125	3.1	20	W710182	8-Oct-07	
EPA 6010B	Selenium	mg/kg	70.7	ND	100	70.7	75-125	4.4	20	W710182	8-Oct-07	
EPA 6010B	Silver	mg/kg	4.73	ND	5.00	94.6	75-125	3.1	20	W710182	8-Oct-07	
EPA 6010B	Zinc	mg/kg	85.6	0.14	100	85.5	75-125	4.3	20	W710182	8-Oct-07	

Mercury by SW846 Methods

EPA 7471A	Mercury	mg/kg	0.348	0.200	0.167	89.0	75-125	5.1	20	W710170	9-Oct-07	
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Quality Control - POST DIGESTION SPIKE Data

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
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Total Recoverable Metals by EPA 6000/7000 Series Methods

EPA 6010B	Barium	mg/kg	121	18.2	100	103	75 - 125	W710182	08-Oct-07	
EPA 6010B	Selenium	mg/kg	80.6	<4.0	100	80.6	75 - 125	W710182	08-Oct-07	

Notes and Definitions

R2	RPD exceeded the laboratory control limit.
M2	Matrix spike was low, but the LCS was acceptable.
M1	Matrix spike was high, but the LCS was acceptable.

APPENDIX D
WASTE ROCK VOLUME CALCULATIONS

(See separate file)