APPENDIX J-2

Preliminary Endangerment Assessment

DRAFT FINAL
PRELIMINARY ENDANGERMENT ASSESSMENT
for
FORMER SPRING HILL MINE PROPERTY
APNs 35-260-62, 63 and 64
Grass Valley, California

Prepared for:
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Project No. 3292-02
January 11, 2008

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

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January 11, 2008

Gallelli & Sons, LLC
4240 Rocklin Road, Suite 9
Rocklin, California 95677

Attention: Mr. Warren Hughes

Reference: ***Former Spring Hill Mine Property***
APNs 35-260-62, 63, and 64
Grass Valley, California

Subject: ***Draft Final Preliminary Endangerment Assessment***

Dear Mr. Hughes:

Holdrege & Kull (H&K) is pleased to present this draft final Preliminary Endangerment Assessment (PEA) report for the former Spring Hill Mine Property (site) in Grass Valley, California. The approximately 26-acre site is comprised of Assessor's Parcel Numbers 35-260-62, 63, and 64 located immediately south of Dorsey Drive and southeast of Highway 49/20. This report presents the results of sampling and laboratory analysis of mine waste and ambient native soil samples at the site, human health screening evaluation, evaluation of risk to surface water and groundwater quality, conclusions regarding the site characterization, and preliminary recommendations for mitigation.

H&K is submitting this draft PEA report to the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) for review in accordance with your Voluntary Cleanup Agreement (VCA) with DTSC.

Please contact us if you have any questions regarding the site characterization or the conclusions and recommendations presented in this report.

Sincerely,

HOLDREGE & KULL

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LIST OF ACRONYMS

ABA	Acid-base accounting
AGP	Acid generating potential
APN	Assessor's Parcel Number
bgs	Below ground surface
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
COPC	Constituent of potential concern
DI	Deionized water
DLM	The Designated Level Methodology
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
GPS	Global positioning system
H&K	Holdrege & Kull
mg/kg	Milligrams per kilogram
MSL	Mean sea level
MYBP	Million years before present
na	Not analyzed/ not available
NCDEH	Nevada County Department of Environmental Health
NP	Acid neutralizing potential
PEA	Preliminary Endangerment Assessment
RAW	Remedial Action Workplan
RL	Reporting limit
RME	Reasonable maximum exposure
RWQCB	California Regional Water Quality Control Board
SDL	Soluble designated level
TCLP	Toxicity Characteristic Leaching Procedure
UCL	Upper confidence limit
USGS	Unites States Geological Survey
VCA	Volunteer Cleanup Agreement
WET	Waste Extraction Test
μg/dL	Micrograms per deciliter
μg/L	Micrograms per liter

EXECUTIVE SUMMARY

The former Spring Hill Mine Property (site) is the subject of this Preliminary Endangerment Assessment (PEA), which is intended to determine whether past hard rock gold mining and ore processing activities have resulted in the release of metals and/or cyanide at concentrations that pose a threat to human health or the environment. The PEA findings indicate that remedial action is appropriate to restrict the exposure of future workers and visitors at the proposed commercial development to elevated metals concentrations in mine waste and affected soil.

The approximately 26-acre site is located south of Dorsey Drive and southeast of State Highway 49/20 in Grass Valley, Nevada County, California. The site is comprised of Nevada County Assessor's Parcel Numbers (APNs) 35-260-62, 35-260-63 and 35-260-64.

The gently to moderately sloping site is currently undeveloped. Commercial site development has been proposed. Nearby land uses include State Highway 49/20, commercial development, and residential apartment complexes. Sierra Nevada Memorial Hospital is located west across the highway from the site.

The site is located in the historic Grass Valley Mining District at the former location of the Spring Hill Mine, which operated intermittently from the late 1800s to the early 1940s. Abandoned mine features identified at the site include horizontal and inclined excavations, pits, relic foundations, stockpiles of mine waste rock, and tailing ponds.

An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of tailings are present at the site. Of this, an estimated 1,700 cubic yards of mine waste and affected soil identified at the Former Mill Area are not suitable to remain at the site under existing conditions. Off site disposal is proposed for this waste.

A human health risk assessment was performed to evaluate baseline conditions. Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of particulates originating from the affected soil. In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk. Antimony, vanadium and other metals also contribute to the chronic human health hazard.

Mine waste in the Former Mill Area is not acceptable for use under the three exposure scenarios considered: standard (unrestricted land use), commercial indoor worker and construction worker.

Other mine waste identified at the site (excluding the Former Mill Area) is also not acceptable for use under the standard exposure scenario, but is potentially acceptable for use under the commercial indoor worker and construction worker exposure scenarios. On-site consolidation and burial of this waste beneath future commercial development appears to be a feasible remedial alternative. The proposed burial location should be identified on the site development plans and recorded with the County of Nevada.

Results of acid-base accounting indicate that the mine waste rock and tailings are not acid-generating; thus, soluble metals were evaluated by DI-WET. Soluble arsenic and lead were detected by DI-WET at concentrations exceeding the calculated SDL for surface water and groundwater under current conditions. However, the mine waste rock and tailings (excluding the Former Mill Area) are suitable for on-site consolidation and burial beneath the proposed commercial development and can be classified as Group C mine waste per CCR Title 27.

Based on the PEA findings, soil arsenic remediation goals are proposed. The mine waste and affected soil to be consolidated and buried on-site should have a 95% upper confidence limit (UCL) on the mean total arsenic concentration that is protective under the construction worker scenario (22 mg/kg), and soluble arsenic should not exceed the arsenic SDL (20 µg/L). Soil which is not to be consolidated and buried should have arsenic concentrations within the range of local background levels. Cleanup goals for other metals of potential concern (such as antimony, copper and vanadium) should be developed as part of a Remedial Action Workplan (RAW).

The abandoned mine excavations identified at the site, as well as other mine excavations that may be present on and adjacent to the site, present physical hazards and may not be suitable to support structural improvements. The excavations should be closed to address the possibility of entrapment, collapse, hazardous confined space conditions and other physical hazards. Temporary measures are appropriate to reduce the existing physical hazards. Final physical closure of the excavations should be performed in accordance with recommendations from a qualified geotechnical engineer and with the approval of the local building department.

The mine waste is to be cleaned up to background levels and either (1) consolidated and buried beneath the proposed commercial development or (2) excavated and removed from the site. The proposed commercial development will essentially eliminate exposure pathways for ecological receptors. Therefore, an ecological scoping assessment was not performed as part of this PEA.

A community profile performed by H&K determines that public notification is not warranted as part of the PEA investigation, although such notification is appropriate prior to site remediation.

1 INTRODUCTION

At the request of Gallelli & Sons, LLC, Holdrege & Kull (H&K) prepared this Preliminary Endangerment Assessment (PEA) report for the former Spring Hill Mine Property (site) in Grass Valley, California. The Nevada County Assessor's Parcel Numbers (APNs) for the site are 35-260-62, 63 and 64. Based on the assessor's office information, the total area of the three parcels is 26.7 acres. This PEA report was prepared pursuant to a Voluntary Cleanup Agreement (VCA) between the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) and the proponent, Gallelli & Sons, LLC.

A. Purpose

The purpose of the PEA, as defined in the California Health and Safety Code, Division 20, Chapter 6.8, Section 25319.5, is "to determine whether current or past waste management practices have resulted in the release or threatened release of hazardous substances which pose a threat to public health or the environment." The PEA process was incorporated into DTSC's site mitigation process as part of Senate Bill 475 in July 1989, to establish a mechanism for determining whether sites containing known or potentially hazardous substances require remedial action. The purpose of this PEA is to provide information for use in determining whether past gold mining and ore processing performed on the site has released hazardous substances that present a risk to human health or to the environment.

B. Background

H&K performed historical literature review, site reconnaissance, and sampling and analysis pertaining to the abandoned mine features at the site for prospective purchasers of the property at different times since 2003. Investigations were conducted in May 2003, October 2005 and most recently in March and April 2007. The May 2003 and October 2005 investigation results were summarized in H&K's report, *Preliminary Characterization of the Spring Hill Mine Property* dated March 10, 2006. The March and April 2007 investigation results were summarized in H&K's report, *Results of Limited Subsurface Investigation of Spring Hill Mine Property* dated May 8, 2007. Data resulting from these investigations are included in this PEA report.

2 SITE DESCRIPTION

A. General Site Characteristics

1. Site Location

The approximately 26-acre site is located south of Dorsey Drive and southeast of State Highway 49/20 within the Grass Valley city limits in Nevada County, California. According to the Grass Valley Quadrangle topographic map (United States Geological Survey (USGS), 1995 provisional edition), the site is located in the southern half of the southeast quarter of Section 23 and the northern half of the northeastern quarter of Section 26, Township 16 North, Range 8 East. The site location is depicted on Figure 1.

2. Site Description

The site is comprised of three contiguous parcels, an eastern parcel (Assessor's Parcel Number (APN) 35-260-64, 11.37 acres), a northern parcel (APN 35-260-62, 1.7 acres) and a western parcel (APN 35-260-63, 13.67 acres). Figure 2 is an aerial photograph of the site and vicinity that shows the approximate site boundary.

Surface topography at the site generally slopes toward the south and southwest from a relatively flat-lying area in the northern portion of the site and a knoll in the northern central portion of the site. The northern portion of the eastern edge of the site slopes toward the southeast. The site elevation ranges from approximately 2550 feet above mean sea level (MSL) to approximately 2690 feet above MSL. The site is generally vegetated by oak, manzanita, pine and cedar. Rock outcrop is present at several locations on the north and west sides of the site.

3. Historic Mining Features

H&K performed site reconnaissance to confirm the presence of features depicted on historical mining maps and documents by others, which are discussed in Section III of this report. The locations of horizontal and inclined exploratory mining excavations, apparent prospecting trenches, building foundations, mine waste rock and mill tailings were observed at the site as depicted on Figure 3.

Extensive surface exposures of mine waste rock and mill tailings are present on the central and western portions of the property. An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of tailings were identified at the site. These volume estimates are based on observations during subsurface investigations and were not calculated using survey methods.

4. Current Land Use and Zoning

The site is currently undeveloped. Foundations of structures from the historic mining operations remain at the site. Several roads and trails are located within the site, some of which are depicted on Figure 3. The roads and trails may be used periodically by trespassers. The site is zoned corporate business park (CBP) by the City of Grass Valley Planning Department.

5. Adjacent Properties

The site is bordered by Dorsey Drive to the north, and across it an apartment complex; by State Highway 49/20 to the northwest, by commercial property to the south and southwest, and by an apartment complex to the east. Sierra Nevada Memorial Hospital is located approximately 500 feet west of the site, across State Highway 49/20 and at a higher elevation. The Spring Hill Manor convalescent hospital is also located west of the site, across State Highway 49/20.

6. Site Identification Information

Site Identification Information **Former Spring Hill Mine Property** Grass Valley, Nevada County, California	
Site Name	Former Spring Hill Mine Property
Contact Person	Warren Hughes, Gallelli & Sons, LLC
Site Address	Dorsey Drive, Grass Valley
Mailing Address of Contact Person	4240 Rocklin Road, Suite 9, Rocklin, CA 95677
Phone Number of Contact Person	(916) 580-4180, (916) 784-7550
Other Site Names	Spring Hill, Dorsey Drive property
USEPA Identification Number	none
CalSites Identification Number	none
Assessor's Parcel Numbers	35-260-62, 63 and 64
Township, Range, Section	Section 23 and 26, Township 16 North, Range 8 East
Land Use	currently undeveloped
Zoning	CBP – corporate business park

B. Site Maps

1. General Location Maps

Figure 1 is a site location map. Figure 2 is an aerial photograph of the site.

2. Detailed Site Diagrams

Figure 3 is a site map depicting historic mine features and roads, site boundaries and soil sample locations.

Figure 4 is a site map depicting historic mine features and roads, site boundaries, and the mine waste assessment areas including approximate aerial extent of waste rock piles and tailings deposits.

3 BACKGROUND

A. Site Status and History

Past operations at the site include hard rock gold mining, processing of mined ore, and extraction of gold from the processed ore. The site is located in the historic Grass Valley Gold Mining District at the former location of the Spring Hill Mine, which operated intermittently from the late 1800s to the early 1940s.

B. Historical Research

H&K reviewed several topographic surveys, historical mining maps and documents relating to site mining history, as well as a Phase 1 environmental site assessment of the Spring Hill Mine property prepared by others in 1997. Figure 3 and 4 depict the approximate locations of the identified mine features. The following documents were reviewed:

- *Nevada County Mining Review* (Grass Valley Daily Morning Union, 1895),
- Nevada City Special Folio, California (United States Geologic Survey; 1896),
- Map of the Vicinity of Grass Valley/Nevada City, California (Uren, 1897),
- *Gold Quartz Veins of Grass Valley* (Johnston, 1940),
- *State Mineralogists Report XXXVII*, (California State Mining Bureau, 1940),
- Map of Spring Hill Mining Co., (E. Uren, 1942), and
- *Phase I Environmental Site Assessment, Spring Hill Mine Area* (Anton Geological, July 10, 1997).

The 1897 Map of the Vicinity of Grass Valley/Nevada City, California depicts the Spring Hill Mine claim boundaries covering the site and extending onto adjacent property.

The 1896 Nevada City Special Folio shows an east-west trending quartz vein passing through the central portion of the site with three mine shafts on the site. The approximate shaft locations are indicated on Figure 3.

The 1895 *Nevada County Mining Review* indicates two mining locations and one mill site were present at the Spring Hill Mine and that a 2400-foot quartz vein passes through the site, which is described as 3 to 4 feet wide with “heavy outcrops”.

The 1940 *Gold Quartz Veins of Grass Valley* states that the quartz vein passing through the site strikes east and dips to the south (contrary to the earlier map depicting shafts inclined to the north). Only shallow shafts were advanced in the “early days” and the mine reopened in 1931. The ore body was reportedly located along the contact between serpentine and minor diorite rock. “Much carbonate” was present in the serpentine.

The 1940 *State Mineralogist’s Report* indicates prospecting had occurred at the Spring Hill Mine for many years. A 100-ton ore processing plant employing floatation operated part time (the likely source of the mill tailings observed at the site). The main shaft had reportedly been sunk to a depth of 1900 feet with many thousands of feet of drift. Results as of 1940 were reported to be “not satisfactory.”

The 1942 Map of the Spring Hill Mine Co. depicted the Spring Hill shaft, inclined to the north-northwest and numerous other features including apparent structures labeled “bin,” “hoist,” “compressor,” “mill,” “machine shop,” “carpenter shop,” “dry,” “furnace,” “superintendent residence,” and “garage”. Some labels on the map were not legible. The bin and hoist were depicted in-line with and south of the Spring Hill shaft. The mill was located to the east of the bin. Areas of mine waste labeled dump and tailings were depicted in the approximate locations where mine waste was observed during the site reconnaissance. Perimeter concrete foundations and slabs of former structures shown on the map were observed during site reconnaissance.

Record of mining activities at the site after the early 1940s was not encountered. Most hard rock gold mines in the area closed during World War II and did not reopen.

C. Site Status and Proposed Improvements

H&K understands that commercial development is planned for the site. The proposed development is to include several large commercial buildings and parking areas. Significant grading and fill placement will be required for the development of the sloping southern portion of the site. At this time, neither an Environmental Impact Report (EIR) nor a tentative map for the project has been submitted to the City of Grass Valley.

D. Hazardous Substance/Waste Management Information

H&K estimates that 44,000 cubic yards of mine waste rock and 20,000 cubic yards of tailings may be present at the site. An estimated 1,700 cubic yards of the mine waste rock, tailings and affected native soil were identified in the Former Mill Area. The material identified in the Former Mill Area contains elevated levels of arsenic, lead and mercury which are not likely suitable to remain at the site and likely will require off-site disposal at a Class I or Class II solid waste disposal facility. The mine waste identified outside of the Former Mill Area is potentially suitable for onsite placement. The volume estimates are not based on survey and are therefore approximate.

E. Site Reconnaissance and Results

H&K conducted site reconnaissance to observe existing surface conditions and to identify historic mining features. Dense vegetation obscured the ground surface in some areas, particularly on steep slopes in the southern central and southeastern portions of the site.

Significant abandoned mine features were identified in much of the central and western-central portions of the site where historic maps indicated the presence of shafts, foundations, mine waste rock and tailings. An isolated occurrence of apparent near-surface exploration spoils was identified in the eastern central portion of the site. Figure 3 and 4 depict the approximate locations of the identified site features, which are discussed below. The base map for Figures 3 and 4 is the 1942 Uren Map.

The apparent Spring Hill shaft was identified at the approximate location depicted in the 1942 Uren map (see Figure 3), in line and to the northwest of the foundations labeled “bin”, “hoist” and “compressor”. Approximately 500 feet northeast of the Spring Hill shaft, H&K observed mounded soil, rock and wood debris that appeared to be a shaft that was backfilled or capped, possibly one of the shafts identified on the 1986 folio map. An apparent collapsed shaft, approximately 10 to 15 feet wide and open to a depth of 15 feet or greater, was identified approximately 400 feet southwest of the Spring Hill shaft. This is the approximate location of a feature on the 1942 Uren map that may be a vertical shaft. Our investigation did not include assessing the method or adequacy of physical shaft closure.

Several relic concrete foundations and concrete slabs were identified at the approximate locations of historic mining features depicted on the 1942 Uren map (bin, hoist, compressor, mill, machine shop, carpenter shop, dry, furnace, superintendent residence). No structures remain in these locations. The “bin” foundation (assumed to be for an ore bin), approximately 10 feet by 15 feet by 8 feet high, apparently served as an ore storage area between the Spring Hill shaft and the mill located to the southeast of the shaft. The mill foundation, located approximately 100 feet to the east of the bin foundation, was approximately 50 feet by 75 feet with concrete wall remnants up to 6 feet high.

Extensive surface exposures of mine waste were identified in the central and western portions of the site. Mine waste rock generally consisted of slightly to moderately weathered, mineralized serpentine and diabase rock with abundant quartz. The waste rock was generally coarse grained with variable amounts of sand and gravel. The waste rock was present in several benches extending down slope to the south and southwest of the knoll-top, the location of the former mill and superintendent's residence. There was some evidence of disturbance or removal of waste rock in the area of the bin foundation in post-mining times. Smaller mine waste rock stockpiles of similar consistency were observed in the area between the bin and compressor foundations. Scattered waste rock was observed at the perimeter of the larger, main stockpiles of mine waste rock in the central and western portion of the site.

Somewhat finer grained waste rock (silty sand and gravel with approximately 10 to 30 percent rock over 2 inches in diameter) was observed in the area surrounding the ore bin foundation.

Mill tailings, consisting of light grey, grayish green and olive-brown silt with fine sand, were observed in the central and western portions of the site (see Figure 4). The areas of observed tailings are down slope of the mill foundation. Two former "tailing ponds" were identified in this area.

A small volume of apparent near surface excavation spoils was observed in the eastern portion of the site, in the areas of samples EXP-1, S-3, S-4, S-5 and S-7 (see Figure 3). The spoils consisted of silty sand and fine gravel and appeared to be between approximately 50 and 100 cubic yards in volume.

A thin layer of fine to medium sand was identified next to the south side of the foundation labeled "dry" on the 1942 Uren map. The sand did not appear to be native soil and may have originated from past mining activities. The sand covered an area of approximately 25 feet by 50 feet and was observed to be up to 2 feet deep.

Mine waste was observed on approximately 6.5 acres of the 26.7-acre site.

4 APPARENT PROBLEM

Arsenic occurs naturally in soil and is commonly associated with hydrothermal alteration and gold-bearing veins. Mineralized rock was mined from gold-bearing veins beneath the site and transported to the site surface. Some of the mined rock was crushed and chemically processed to extract gold, the tailings of which remain at the site. Mine waste rock was deposited in stockpiles without being milled or processed. Both the mill tailings and mine waste rock contain arsenic and other metals at concentrations above site background concentrations, as well as typical background concentrations for the Grass Valley area. Elevated soil metals concentrations present a potential human health risk resulting from potential exposure pathways including incidental soil ingestion, inhalation of soil dust, and dermal contact. Figure 5 is a conceptual site model. In addition, the mining excavations present potential physical hazards and may not be suitable in their present state to support structural improvements.

5 ENVIRONMENTAL SETTING

A. Regional Physiographic Conditions

The site is situated in the Sierra Nevada physiographic province. Physiographic conditions consist of gently to moderately rolling terrain. Typical vegetation includes ponderosa and gray pines, black oak, manzanita, and ceanothus.

B. Geologic Setting

The property is located within a region underlain by a complex assemblage of igneous and metamorphic rocks in the western foothills of the Sierra Nevada. The regional structure of the foothills is characterized by the north-northwest trending Foothills Fault System, a feature formed during the Mesozoic era (between 65 million and 248 million years before present (MYBP)) in a compressional tectonic environment. A change to an extensional tectonic environment during the late Cenozoic (last nine million years) resulted in normal faulting which has occurred coincident with some segments of the older faults in the region.

C. Geologic Conditions

Based on the Geologic Map of the Grass Valley - Colfax Area (A. Tuminas, 1983), the site is mapped as serpentine rocks of the Early Mesozoic aged Ultramafic-Mafic "Basement" Unit of the Lake Combie Complex. According to the Mineral Land Classification of Nevada County (Special Report 164, California Department of Conservation Division of Mines and Geology, 1990), the site geology is mapped as the ultramafic unit of the Jurassic-aged Lake Combie Complex. The Mesozoic era occurred from approximately 245 to 65 million years ago. The Jurassic period occurred from approximately 206 to 144 million years ago.

The *Nevada City Special Folio, California* (United States Geologic Survey; 1896) depicts an east-west trending quartz vein passing through the central portion of the site. The vein apparently dips to the north.

D. Soil Conditions

The *Soil Survey of Nevada County, California, Western Part* (United States Department of Agriculture, Soil Conservation Service, August 1993) indicates that soil conditions across the majority of the site are mapped as rock outcrop of the Dubakella Complex, 5 to 50% slopes. The central portion of the site is mapped as "Placer

Diggings", although this classification is incorrect based on the identification of past hard rock gold mining in this area. A limited area in the eastern portion of the site is mapped as Sites loam, 9 to 15% slopes.

H&K excavated exploratory trenches through native soil at the site. Native soil was encountered at the ground surface in some trenches and at depth beneath waste rock and tailings in other trenches. The native soil generally consisted of clay, sandy clay and gravelly sandy clay. Severely to moderately weathered diabase and serpentine was encountered in several trenches beneath the clay in the central portion of the site. In the trenches where rock was encountered, the clay was observed to be up to 2.5 feet thick.

E. Groundwater Conditions

H&K reviewed well completion reports provided by the California Department of Water Resources (DWR) for wells in the site vicinity. The DWR information reviewed is summarized in Table 1.

The DWR well completion reports indicate that depths to first encountered groundwater ranged from 60 to 152 feet in wells constructed within 2000 feet of the site. A well at Spring Hill Manor convalescent hospital located approximately 300 feet west of the site is screened from 65 to 85 feet bgs (water level not reported). Based on the well completion reports, groundwater in the site vicinity is typically encountered within bedrock fractures.

Potential groundwater pathways include domestic consumption of groundwater and dermal contact with groundwater extracted from beneath the site or adjacent properties that is potentially impacted by mine waste. H&K's opinion is that the mine waste at the site does not present significant risk to groundwater quality, based on the following:

- H&K's subsurface investigation indicates that the mine waste stockpiles are typically underlain by at least two to three feet of native clayey soil.

- Total metals concentrations in samples of the native clayey soil beneath waste rock piles and tailings ponds and beneath tailings deposits near the mill, ranged from non-detect (using a reporting limit of 2.0 milligrams per kilogram (mg/kg)) to 18.3 mg/kg. For comparison, total arsenic concentrations in background/ambient soil samples obtained from the site ranged from non-detect (using a reporting limit of 1.0 mg/kg) to 17 mg/kg. Local background arsenic concentrations range from non-detect to 48 mg/kg, as discussed below in Section 5.G and Appendix A of this PEA report.

- The depth to usable groundwater in the site vicinity is approximately 60 feet based on DWR reports for domestic wells.

The proposed site development likely will not include construction of water supply wells because the site is within the city limits and domestic water is provided by a treated municipal source.

F. Surface Water Conditions

Surface water was not encountered on the site, although seasonal surface water flow associated with storm water runoff is expected in the lower (southern) portion of the site. According to the 7.5-minute Grass Valley Quadrangle Map (U.S. Geological Survey (USGS), provisional edition 1995), Wolf Creek is located approximately 500 feet south and down-gradient of the site.

Wolf Creek flows approximately 14 miles south of its location near the site into the Bear River near the southern border of Nevada County. The Bear River then flows approximately nine miles northwest into Camp Far West Reservoir and then approximately 17 miles southwest from Camp Far West Reservoir into the Feather River.

Potential surface water pathways include domestic consumption of surface water and dermal contact with surface water, on or down-gradient from the site, that is potentially impacted by the mine waste. H&K's opinion is that the mine waste at the site does not present significant risk to surface water quality, based on the distance to Wolf Creek and the relatively low soluble metals concentrations detected in the waste.

G. Regional Arsenic Concentrations in Background Soil

H&K compiled background soil arsenic data obtained from eight PEA sites (including the subject site) near Grass Valley, California. The local PEA sites include Spring Hill, North Star, Kenny Ranch, Winds Aloft, Osborne Hill, Loma Rica, La Barr Meadows and Bear River Mill. The locations of the above-listed sites with respect to the subject site are depicted on Figure 1 of Appendix A. Background arsenic concentrations are presented in Table 1 of Appendix A. With the exception of the subject site, DTSC has reviewed and approved the PEAs from which the background data were obtained.

The 208 local background arsenic concentrations range from non-detect to 48 mg/kg. The mean is 5.3 mg/kg, the standard deviation is 6.9 mg/kg and the coefficient of variation (CV) is 1.3. Descriptive statistics for the non-transformed and base 10 log-transformed data are presented in Tables 2 and 3, respectively, of Appendix A.

DTSC (1997, 2007) provides a framework in which risk assessors may identify background arsenic concentrations. Based on these guidance documents, H&K performed visual and statistical evaluation of the local background arsenic data as described below.

Microsoft Excel Analyze-it™ version 1.73 was used to prepare normality plots of the non-transformed and log-transformed data. The plots are presented in Appendix A. The non-transformed data are clearly not normal, as is often the case with trace metals. Although the log-transformed data generally display a linear distribution, the data are not normally distributed based on the Shapiro-Wilk normality test. The CV (1.29), as well as gaps and inflections observed in the log-transformed data, attest to the fact that the data were obtained from different sites and different geologic units.

With the exception of the Winds Aloft site, the eight local PEA sites share similar geology. Published geologic descriptions generally indicate that the sites are underlain by quartz diorite, diabase and/or ultramafic rock, as plotted on the QAP diagram presented as Figure 2 in Appendix A. The QAP in figure 2 is a simplified depiction of the compositional ratio of quartz (Q), alkali feldspar (A), and plagioclase feldspar (P) in igneous plutonic rocks found at seven of the eight local PEA sites. Specific geologic descriptions are presented in Table 4 of Appendix A.

Outlying data were evaluated using the fourth spread procedure described by DTSC (2007). The fourth spread, f_s, is defined as the measure of spread in a data set that is resistant to outliers and is calculated according to the following equation: $f_s = Q_3 - Q_1$. By definition, any observation farther than $1.5f_s$ from the closest fourth is considered an outlier. For the log-transformed data set, $1.5f_s$ is equal to 1.25, and any observation below $Q_1 - 1.5f_s$ or above $Q_3 + 1.5f_s$ would be considered an outlier. By this method, none of the data were determined to be outliers.

The 95th percentile value for the local background arsenic data set is 17 mg/kg. This value is conservatively used to represent the local upper bound background soil arsenic concentration.

6 SAMPLING, ANALYSIS, AND RESULTS

A. Summary of Activities

1. 2003 and 2005 Sampling and Analysis

Near-Surface Soil Sampling

H&K obtained 42 samples of near-surface soil and mine waste in May 2003 and October 2005. Figure 3 shows the sample locations. Sampling was conducted as follows:

- Six background soil samples (BG-1 through BG-6) were obtained from surface soil in areas up slope and to the east, northeast and northwest of identified mine waste at the site.
- Eleven soil samples of mine waste rock and near-surface excavation spoils (EXP-1, FND-1, FND-2, FND-S3, FND-S4, FND-S5, FND-S6, SND-S1, WR1-S1, WR1-S2 and WR1-S3) were obtained from depths of 0 to 3.0 feet below ground surface (bgs) at the eastern and central portion of the site.
- Twenty-one soil samples of mine waste rock and tailings (WR-S1 through WR-S21) were obtained from depths of 0 to 2.0 feet bgs at the western and central portion of the site.
- Four samples of apparent mill tailings (SM-S1 through SM-S4) were obtained from depths of 0 to 2.0 feet bgs at the western portion of the site.

Sample Analysis

The samples from 2003 and 2005 were analyzed for total arsenic, lead and mercury (except the three background samples from 2005, which were not tested for mercury) using EPA Methods 6010B and 7471A. Three samples of mine waste rock obtained in October 2005 (FND-S5, WR-S13 and WR-S17) were analyzed for seventeen Title 22 metals using EPA Methods 6010B and 7471A. Four samples of apparent mill tailings (SM-S1 through SM-S4) were analyzed for cyanide using Standard Method 4500.

Two samples of mine waste rock obtained in October 2005 (FND-S5 and WR-S17) were analyzed for acid generating potential (AGP) and neutralizing potential (NP), using the Sobek method, and pH.

Based on acid-base accounting and total metals results, three samples of mine waste obtained in October 2005 (WR-17, FND-S5 and FND-S6) were analyzed for soluble arsenic, lead and nickel by the Title 22 Waste Extraction Test (WET) using deionized water as the extractant solution (DI-WET). One sample from the 2003 investigation (FND-1) was analyzed for soluble lead and arsenic by the standard WET test using a citrate solution as the extractant.

2. 2007 Sampling and Analysis

<u>Near-Surface Soil Sampling</u>

On March 22, March 23, April 5 and April 18, 2007 H&K obtained 13 near-surface soil samples (S-1 through S-13) from various locations of the site. The near-surface soil samples were obtained at depths of 0.25 feet and 0.5 feet bgs.

- Samples S-1 and S-8 were obtained from the area of the former furnace building (S-1 from the concrete floor and S-8 from just outside the foundation at what appeared to be a doorway).

- Sample S-2 was obtained from the area of the former garage of the superintendent's house.

- Samples S-3, S-4, S-5, S-6 and S-7 were obtained from apparent mining excavation soil/waste rock piles.

- Samples S-9, S-10 and S-11 were obtained from the area near the northeast corner of the former mill (S-9 and S-10 were from outside the mill foundation and S-11 was from the concrete floor from inside the mill).

- Samples S-12 and S-13 were ambient soil samples obtained from areas up slope and to the north of identified mine waste at the site (areas apparently not impacted by former mining activities).

Subsurface Investigation and Soil Sampling

On March 13, March 14 and April 5, 2007, H&K obtained subsurface soil samples. Thirty-one test pits (TP-1 through TP-31) were excavated for obtaining soil samples, and for observing subsurface conditions and depths of mine waste piles. Figure 3 shows the approximate test pit locations.

Test pits were excavated at the following locations:

- Waste Rock/Spoils Piles - TP-1, TP-2, TP-3, TP-6, TP-7, TP-8, TP-9, TP-10, TP-13, TP-14, TP-16 (waste rock/tailings contact), TP-26, TP-27 (tailings over waste rock), and TP-31

- Tailings Deposits - TP-4, TP-5, TP-15, TP-16 (waste rock/tailings contact), TP-17, TP-27 (tailings over waste rock), TP-28, TP-29, and TP-30

- South/Up Slope Side of Mill - TP-11 and TP-12

- North/Down Slope Side of Mill - TP-18 through TP-25

Sample Analysis

The samples from 2007, except for background samples S-12 and S-13, were analyzed for total arsenic, total lead, total mercury and total nickel using EPA Methods 6010B and 7471A. Sample S-12 and S-13 analysis did not include mercury. Thirteen of the test pit soil samples analyzed included native soil samples from beneath the waste rock piles and tailings deposits, and subsurface soil in the mill area. The samples include TP-2-10, TP-5-19, TP-10-12, TP-13-4, TP-14-2, TP-15-6, TP-16-1B, TP-18-1, TP-20-1, TP-21-1.5, TP-22-0.75, TP-23-0.75 and TP-24-0.25.

Selected samples were also analyzed for other metals and selected soluble metals. Six of the samples were analyzed for seventeen Title 22 metals using EPA Methods 6010B and 7471A. Two of the samples were analyzed for AGP and NP using the Sobek method, and pH. Nine samples were analyzed for total cyanide using EPA Method 9014. Twelve samples were analyzed for total nitrate using EPA Method 300.0. Seventeen samples were analyzed for soluble arsenic, lead and nickel by DI-WET followed by EPA Method 6010B. Six of the samples for were also analyzed for soluble mercury by DI-WET followed by EPA Method 7471A.

3. Sample Collection and Handling Methods

Near-surface samples were collected using hand tools and subsurface samples were collected using the excavator and hand tools. The soil samples were placed in four-ounce glass containers provided by the project laboratory. The sample containers were sealed with Teflon-lined plastic caps, labeled with project site, sample number, sampling date and time, and placed in a chilled, thermally insulated cooler for transportation to the project laboratory. Sampling equipment was cleaned between sampling points using disposable towelettes to remove soil.

The soil samples were transported under chain-of-custody protocol to Excelchem Environmental Labs (Excelchem) of Rocklin, California. Excelchem is a state certified analytical laboratory for the analysis requested.

B. Presentation of Data

Tables 2 through 6 summarize the laboratory analytical results of soil samples. Table 2 summarizes metals and inorganic analysis results. Table 3 summarizes metal results for background soil samples. Table 4 summarizes Title 22 metals analysis results. Table 5 summarizes metals solubility analysis results. Table 6 summarizes acid-base accounting results. Appendix B presents the laboratory reports and chain of custody documentation.

C. Discussion of Results

1. Total Metals Results

<u>Mine Waste Rock and Spoils Piles</u>

For samples obtained from waste rock and spoils piles, the laboratory reported arsenic concentrations ranging from non-detect (using reporting limits of either 1.0 or 2.0 mg/kg) to a concentration 180 mg/kg. Lead concentrations ranged from non-detect (using a reporting limit of 2.0 mg/kg) to 310 mg/kg. Mercury concentrations ranged from non-detect (using a reporting limit of 0.10 mg/kg) to 1.2 mg/kg. Nickel concentrations ranged from 96.3 to 1,290 mg/kg.

Tailings

For samples obtained from tailings deposits, the laboratory reported arsenic concentrations ranging from non-detect (using a reporting limit of 2.0 mg/kg) to 94.6 mg/kg. Lead concentrations ranged from 2.6 to 20.8 mg/kg. Mercury concentrations ranged from 0.023 to 19.5 mg/kg. Nickel concentrations ranged from 197 to 768 mg/kg.

South/Up Slope Side of Mill

For soil samples obtained from the south/up-slope side of the mill, arsenic concentrations ranged from 3.5 to 10.2 mg/kg. Lead concentrations ranged from 15.3 to 71.8 mg/kg. Mercury concentrations ranged from 0.06 to 0.432 mg/kg. Nickel concentrations ranged from 85.8 to 398 mg/kg.

North/Down Slope Side of Mill

For soil samples obtained from the north/down slope side of the mill, the laboratory reported arsenic concentrations ranging from non-detect (using a reporting limit of 1.0 mg/kg) to 579 mg/kg. Lead concentrations ranged from non-detect (using a reporting limit of 1.0 mg/kg) to 810 mg/kg. Mercury concentrations ranged from 0.039 to 22.5 mg/kg. Nickel concentrations ranged from 104 to 739 mg/kg.

Furnace Building Foundation

For soil samples obtained from the concrete floor and adjacent to the foundation of the former furnace building, arsenic concentrations ranged from 25.5 to 33.2 mg/kg. Lead concentrations ranged from 300 to 376 mg/kg. Mercury concentrations ranged from 0.059 to 0.507 mg/kg. Nickel concentrations ranged from 685 to 1,180 mg/kg.

Native Soil from the Subsurface

For the 13 native soil samples from beneath the waste rock piles and tailings deposits, and subsurface soil in the mill area, arsenic concentrations ranged from non-detect (using a reporting limit of 2.0 mg/kg) to 18.3 mg/kg. Lead concentrations ranged from non-detect (using a reporting limit of 2.0 mg/kg) to 70.2 mg/kg. Mercury concentrations ranged from 0.014 to 8.38 mg/kg. Nickel concentrations ranged from 96.3 to 940 mg/kg.

The analytical results indicate that total arsenic, lead, and mercury were detected in the samples at concentrations exceeding background levels. With the exception of arsenic, sample concentrations did not exceed the commercial/industrial California Human Health Screening Levels (CHHSLs). Table 4 lists residential and commercial/industrial CHHSLs.

Mine waste and soil samples obtained from the area surrounding the ore bin foundation and near the north side of the mill had significantly higher arsenic and lead concentrations than samples from other areas of the site.

2. Acid-Base Accounting Results

Acid-base accounting results of the waste rock/spoils pile samples FND-S5, WR-S17 and TP-8-6 indicated that the AGP was 1.9,2.5 and13 tons per 1000 tons respectively, the NP was180, 150 and 250 tons per 1000 tons respectively, the pH was relatively high at 9.14, 9.54 and 9.42 respectively, and the calculated NP/AGP ratio was 94.7, 60.0 and19.2 respectively. Acid-base accounting results of the tailing sample TP-17-4 indicated that the AGP was non-detect with a reporting limit of 0.3 tons per 1000 tons, the NP was 320 tons per 1000 tons, the pH was relatively high at 9.77, and the calculated NP/AGP ratio was 1066.7. The calculated NP/AGP ratios were significantly higher than the benchmark NP/AGP ratio of 3, indicating net neutralizing conditions in the waste.

Results of acid-base accounting and pH testing indicated that the mine waste is acid neutralizing (consistent with historical documents for the site that indicate the presence of carbonate minerals in the ore body). These results support the use of the DI-WET method for metals solubility testing of mine waste that is proposed to be left on-site.

3. Soluble Metals Results

<u>Arsenic</u>

Eighteen samples of mine waste rock and tailings (and one duplicate sample) were analyzed for soluble arsenic by DI-WET. Soluble arsenic concentrations ranged from below a reporting limit of 2.0 µg/L to 44.7 µg/L. Arsenic was not detected in eight of the 18 samples above reporting limits ranging from 2 to 10 µg/L. The sample (TP-5-10) having the highest soluble arsenic detection (44.7 µg/L) was re-analyzed, resulting in no soluble arsenic detected above a reporting limit of 2.0 µg/L. Two background soil samples were analyzed for soluble arsenic by DI-WET. Soluble arsenic was detected in one of the samples at 18.6 µg/L, and was not detected in the other above a reporting limit of 10 µg/L.

Lead

Eighteen samples of mine waste rock and tailings (and one duplicate analysis) were analyzed for soluble lead by DI-WET. Soluble lead concentrations ranged from less than 1.2 µg/L to 11.6 µg/L. Soluble lead was not detected in 13 of the 18 samples above reporting limits ranging from 1.2 to 10 µg/L. Two background soil samples were analyzed for soluble lead by DI-WET. Soluble lead was not detected in either of the samples above a reporting limit of 6 µg/L.

Mercury

Six samples of mine waste rock and tailings were analyzed for soluble mercury by DI-WET. Soluble mercury was not detected above a laboratory reporting limit of 0.333 µg/L.

Nickel

Seventeen samples of mine waste rock and tailings (and one duplicate sample) were analyzed for soluble nickel by DI-WET. Soluble nickel concentrations ranged from 2.3 to 48.1 µg/L. Nickel was not detected in five of the 17 samples above a reporting limit of 10 µg/L. Two background soil samples were analyzed for soluble nickel by DI-WET. Soluble nickel was detected in the samples at 58.5 and 26.2 µg/L

Solubility testing of a discrete sample of mine waste from the bin foundation area (FND-1) by the citrate WET method detected soluble lead at 13 milligrams per liter (mg/L), which exceeds the soluble threshold limit concentration (STLC) of 5 mg/L for lead. Citrate WET results and STLCs are levels used to characterize waste for landfill disposal purposes.

D. Data Validation

The quality of the chemical data reported by Excelchem was assessed from the results of internal laboratory spike, method blank and duplicate analysis. The internal laboratory spike, method blank and duplicate data were within acceptable recovery limits and/or were accepted based on acceptable laboratory control sample recovery according to Excelchem. The samples were also analyzed within U.S. EPA holding times.

7 HUMAN HEALTH SCREENING EVALUATION

The human health screening evaluation considers excess lifetime cancer risk and chronic health hazard associated with inorganic metals in site soil. The evaluation was performed in accordance with DTSC's PEA Guidance Manual (1999). As discussed under the heading "Risk Characterization", exposure parameters set forth in the Guidance Manual were modified based on U.S. EPA (2002 and 2004) and OEHHA (2004). This evaluation considers data obtained during the 2007 investigation, as well as data obtained during the 2003 and 2005 investigations.

H&K's investigation addresses the occurrence of Title 22 metals. Metals such as arsenic and lead occur naturally in soil and rock, and are often present at elevated concentrations in mine waste based on the natural concentration of the metals within mineralized veins, as well as the concentration and liberation that may occur during the processing of ore.

Selected soil samples were analyzed for cyanide and nitrate. Cyanide is believed to have been used near the mill site as part of the gold extraction process, and nitrate is a breakdown product of cyanide.

Table 2 summarizes analytical results for total arsenic, lead, mercury, nickel, cyanide and nitrate. Ninety-two samples of mine waste rock, tailings and associated soil were analyzed for total arsenic, lead and mercury. Fifty-six samples were analyzed for total nickel, thirteen were analyzed for total cyanide, and twelve were analyzed for total nitrate.

Table 3 presents total arsenic, lead, mercury and nickel concentrations in background soil. Eight background soil samples were analyzed for total arsenic and lead, three were analyzed for total mercury, and two were analyzed for total nickel.

Table 4 summarizes results of seventeen Title 22 metals analyses. Nine soil samples (all from mine waste rock or tailings assessment areas) were analyzed for seventeen Title 22 metals, and one of the samples was analyzed for hexavalent chromium.

A. Exposure Pathways and Media of Concern

Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of particulates originating from the affected soil. A conceptual site model is presented as Figure 5.

Groundwater and surface water pathways are not considered in the risk assessment based on the low concentrations of soluble metals detected and the observed attenuation of metals in clayey native soil beneath the waste. The proposed commercial site development is to be provided with municipal water and sewer.

The data suggest that arsenic, lead, mercury and other metals occur in the mine waste rock and tailings at concentrations exceeding background levels. Per DTSC (1999) the metals are considered constituents of potential concern (COPCs). Arsenic concentrations typically exceeded the CHHSL (0.24 mg/kg) for industrial soil.

B. Exposure Point Concentrations and Chemical

Exposure point concentrations are summarized in Tables 1a, 1b and 1c of Appendix C. For data sets having a population greater than seven, the reasonable maximum exposure (RME) concentration was considered using the 95 percent upper confidence limit (UCL), as calculated by ProUCL Version 3.0 (U.S. EPA, 2004). Appendix C presents the ProUCL "General Statistics" summary sheets.

The data are grouped into three sets:

1. the area immediately adjacent to and down slope from the Former Mill Area,

2. the mine waste rock and tailings areas located on the remainder of the site, excluding the Former Mill Area, and

3. background soil apparently not impacted by past mining and processing activities.

These data sets are described below.

1. Former Mill Area

For this evaluation, data associated with twelve soil samples (FDN-1, FDN-2, FDN-S3, S-1, S-10, TP-18-0.25, TP-20-0.25, TP-20-1.0, TP-21-0.75, TP-22-0.25, TP-23-0.25, and S-11) obtained in the immediate vicinity of the Former Mill Area were culled from the site-wide data sets and evaluated separately. H&K anticipates that the mine waste and affected soil at these areas will be removed from the site and disposed at an appropriate solid waste facility. Arsenic, lead and mercury were detected at concentrations ranging up to 579, 810 and 19.5 mg/kg, respectively, in soil near the mill area. Exposure Point Concentrations (EPCs) for the Former Mill Area are summarized below and presented in Table 1a of Appendix C.

Antimony

Concentrations range from 4.3 to 12.4 mg/kg in the three samples analyzed for antimony. The maximum detection (12.4 mg/kg) is used as the EPC.

Arsenic

Concentrations range from less than 1 to 579 mg/kg. The mean arsenic detection is 153 mg/kg in the 12 samples analyzed for arsenic. ProUCL determines that the data follow gamma distribution and recommends the use of the Approximate Gamma UCL (348 mg/kg), which is used as the EPC.

Barium

Concentrations range from 44.3 to 103 mg/kg in the three samples analyzed for barium. The maximum detection (103 mg/kg) is used as the EPC.

Beryllium

Beryllium was not detected above a laboratory reporting limit of 0.5 mg/kg in the three samples analyzed for beryllium.

Cadmium

Concentrations range from 2.3 to 3.4 mg/kg in the three samples analyzed for cadmium. The maximum detection (3.4 mg/kg) is used as the EPC.

Chromium

Concentrations range from 43.2 to 962 mg/kg in the three samples analyzed for total chromium. The maximum detection (962 mg/kg) is used as the EPC.

Cobalt

Concentrations range from 21.4 to 79.4 mg/kg in the three samples analyzed for cobalt. The maximum detection (79.4 mg/kg) is used as the EPC.

Copper

Concentrations range from 72 to 467 mg/kg in the three samples analyzed for copper. The maximum detection (467 mg/kg) is used as the EPC.

Lead

Concentrations range from 18.4 to 810 mg/kg. The mean lead detection is 213 mg/kg in the 12 samples analyzed for lead. ProUCL determines that the data follow gamma distribution and recommends the use of the Approximate Gamma UCL (408 mg/kg), which is used as the EPC.

Mercury

Concentrations range from 0.059 to 19.5 mg/kg. The mean mercury detection is 4 mg/kg in the 12 samples analyzed for mercury. ProUCL determines that the data follow gamma distribution and recommends the use of the Approximate Gamma UCL (10.1 mg/kg), which is used as the EPC.

Molybdenum

Concentrations range from 1.1 to 3.7 mg/kg in the three samples analyzed for molybdenum. The maximum detection (3.7 mg/kg) is used as the EPC.

Nickel

Concentrations range from 104 to 1180 mg/kg. The mean nickel detection was 391 mg/kg in the 9 samples analyzed for nickel. ProUCL determined that the data follow gamma distribution and recommended the use of the Approximate Gamma UCL (640 mg/kg).

Selenium

Selenium was not detected above a laboratory reporting limit of 2.0 mg/kg in the three samples analyzed.

Silver

Concentrations range from less than 2 to 21.8 mg/kg in the three samples analyzed for silver. The maximum detection (21.8 mg/kg) is used as the EPC.

Thallium

Thallium was not detected above a laboratory reporting limit of 2.0 mg/kg in the three samples analyzed.

Vanadium

Concentrations range from 47.4 to 948 mg/kg in the three samples analyzed for vanadium. The maximum detection (948 mg/kg) is used as the EPC.

Zinc

Concentrations range from 129 to 318 mg/kg in the three samples analyzed for zinc. The maximum detection (318 mg/kg) is used as the EPC.

2. Mine Waste Rock and Tailings

Data pertaining to the mine waste rock and tailings, excluding the twelve samples of impacted soil near the mill site, are summarized below. EPCs are presented in Table 1b of Appendix C.

Antimony

Concentrations range from 5.0 to 12.2 mg/kg and average 7.9 mg/kg in the six samples analyzed for antimony. The maximum detection (12.2 mg/kg) is used as the EPC.

Arsenic

Concentrations range from less than 1.0 to 94.6 mg/kg. The mean arsenic detection is 9.1 mg/kg in the 86 samples analyzed for arsenic. ProUCL determines that the data are non-parametric and recommends the use of the 97.5% Chebyshev (Mean, Sd) UCL (21.9 mg/kg), which is used as the EPC.

Barium

Concentrations range from 4.0 to 12.5 mg/kg and average 8.3 mg/kg in the six samples analyzed for barium. The maximum detection (12.5 mg/kg) is used as the EPC.

Beryllium

Beryllium was not detected above a laboratory reporting limit of 0.5 mg/kg in the six samples analyzed for beryllium.

Cadmium

Concentrations range from 0.7 to 1.5 mg/kg and average 1.1 mg/kg in the six samples analyzed for cadmium. The maximum detection (1.5 mg/kg) is used as the EPC.

Chromium

Concentrations range from 20.8 to 60.4 mg/kg and average 38 mg/kg in the six samples analyzed for total chromium. The maximum detection (60.4 mg/kg) is used as the EPC.

Hexavalent Chromium

Hexavalent chromium was not detected above a laboratory reporting limit of 0.001 mg/kg in the one sample analyzed for hexavalent chromium.

Cobalt

Concentrations range from 13.1 to 56.3 mg/kg and average 37.8 mg/kg in the six samples analyzed for cobalt. The maximum detection (56.3 mg/kg) is used as the EPC.

Copper

Concentrations range from 11.0 to 94.2 mg/kg and average 36.3 mg/kg in the six samples analyzed for copper. The maximum detection (94.2 mg/kg) is used as the EPC.

Cyanide and Nitrate

Thirteen soil samples were analyzed for cyanide, and twelve soil samples were analyzed for total nitrate. Neither cyanide nor nitrate was detected in the samples. Laboratory reporting limits ranged from 0.25 to 1.0 mg/kg for cyanide, and the reporting limit for nitrate was 0.5 mg/kg.

Lead

Concentrations range from below a reporting limit of 1.0 to 341 mg/kg. The mean lead detection is 19.8 mg/kg in the 86 samples analyzed for lead. ProUCL determines that the data are non-parametric and recommends the use of the 97.5% Chebyshev (Mean, Sd) UCL (36.1 mg/kg), which is used as the EPC.

Mercury

Concentrations range from below a reporting limit of 0.01 to 1.29 mg/kg. The mean mercury detection is 0.18 mg/kg in the 86 samples analyzed for mercury. ProUCL determines that the data follow gamma distribution and recommends the use of the Approximate Gamma UCL (0.22 mg/kg), which is used as the EPC.

Molybdenum

Molybdenum was not detected above a laboratory reporting limit of 1.0 mg/kg in the six samples analyzed.

Nickel

Concentrations range from 85.8 to 1290 mg/kg. The mean nickel detection is 402 mg/kg in the 53 samples analyzed for nickel. ProUCL determines that the data follow gamma distribution and recommends the use of the Approximate Gamma UCL (466 mg/kg), which is used as the EPC.

Selenium

Selenium was not detected above a laboratory reporting limit of 2.0 mg/kg in the six samples analyzed.

Silver

Silver was not detected above a laboratory reporting limit of 2.0 mg/kg in the six samples analyzed.

Thallium

Thallium was not detected above a laboratory reporting limit of 2.0 mg/kg in the six samples analyzed.

Vanadium

Concentrations range from 16.6 to 54.6 mg/kg and average 32 mg/kg in the six samples analyzed for vanadium. The maximum detection (54.6 mg/kg) is used as the EPC.

Zinc

Concentrations range from 17.7 to 38.4 mg/kg and average 26.7 mg/kg in the six samples analyzed for zinc. The maximum detection (38.4 mg/kg) is used as the EPC.

3. Background Soil

EPCs are presented in Table 1c of Appendix C.

Arsenic

Arsenic was not detected above a reporting limit of 1.0 mg/kg in seven of the eight background soil samples analyzed for arsenic, and was detected at a concentration of 17 mg/kg in the remaining background sample. The mean detection (2.6 mg/kg) is used as the EPC. The mean detection was calculated using a value equal to half of the laboratory reporting limit for non-detections.

Lead

Lead was detected at concentrations ranging from 3.1 to 20.4 mg/kg in the eight background soil samples analyzed for lead. ProUCL determined that the background lead data are normal and recommended the use of the Student's-t UCL (13.7 mg/kg), which is used as the EPC.

Mercury

Mercury was detected at concentrations ranging from 0.066 to 0.14 mg/kg in the three background soil samples analyzed for mercury. The average detected concentration (0.09 mg/kg) is used as the EPC.

Nickel

Nickel was detected at concentrations of 1620 and 1680 mg/kg in the two background soil samples analyzed for nickel. The mean detection (1650 mg/kg) is used as the EPC.

C. Toxicity Values

Table 2 of Appendix C presents the toxicity values.

D. Risk Characterization

1. Standard Exposure Scenario

Risk and hazard calculations are performed under the standard exposure scenario using the following equations, which are based on Figures 5 through 8 of DTSC's PEA Guidance Manual (1999). Hazard is evaluated for child exposure. Exposure parameters are listed in Tables 3 through 5 of Appendix C.

$$Risk_{soil} = SF_o \times C_s \times [((IR_{s,child} \times EF \times ED_{child} \times 10^{-6}\ kg/mg) / (BW_{child} \times AT \times 365\ days/yr))+((SA_{child} \times AF \times ABS \times EF_{child} \times ED_{child} \times 10^{-6}\ kg/mg) / (BW_{child} \times AT \times 365\ days/yr)) +((IR_{s,adult} \times EF \times ED_{adult} \times 10^{-6}\ kg/mg)/(BW_{adult} \times AT \times 365\ days/yr)) + ((SA_{adult} \times AF \times ABS \times EF_{adult} \times ED_{adult} \times 10^{-6}\ kg/mg) / (BW_{adult} \times AT \times 365\ days/yr))]$$

$$Hazard_{soil} = (C_s / RfD_o) \times [((IR_s \times EF \times ED \times 10^{-6}\ kg/mg) / (BW \times AT \times 356\ days/yr)) + ((SA \times AF \times ABS \times EF \times ED \times 10^{-6}\ kg/mg) / (BW \times AT \times 365\ days/yr))]$$

$$Risk_{air} = SF_i \times C_a \times [((IR_{child} \times EF \times ED_{child}) / (BW_{child} \times AT \times 365\ days/yr))+ ((IR_{adult} \times EF \times ED_{adult}) / (BW_{adult} \times AT \times 365\ days/yr))]$$

$$Hazard_{air} = (C_a / RfD_i) \times (IR \times EF \times ED) / (BW \times AT \times 365\ days/yr)$$

Where:
ABS = absorption fraction of chemical from soil
AT = averaging time, 70 yr
AF = soil to skin adherence factor, mg/cm^2
BW = body weight, 70 kg adult, 15 kg child

C_a = concentration in air, mg/m^3 ($C_a = C_s$ / PEF)
C_s = concentration in soil, mg/kg
ED = exposure duration, years
EF = exposure frequency
ET = dermal exposure time for water, 0.14 hr/day child, 0.25 hr/day adult
$Hazard_{air}$ = non-cancer chronic health hazard for air pathways
$Hazard_{soil}$ = non-cancer chronic health hazard for soil pathways
IR_a = inhalation rate, 10 m^3/day child, 20 m^3/day adult
IR_s = incidental soil ingestion rate, 20 mg/day child, 100 mg/day adult
SA = exposed skin surface area, 2800 cm^2 child, 5700 cm^2 adult
SF_i = inhalation cancer slope factor, (mg/kg-day)$^{-1}$
SF_o = oral cancer slope factor, (mg/kg-day)$^{-1}$
RfD_i = inhalation reference dose, mg/kg-day
RfD_o = oral reference dose, mg/kg-day
$Risk_{air}$ = lifetime excess cancer risk for air pathways
$Risk_{soil}$ = lifetime excess cancer risk for soil pathways

Exposure parameters are adopted from the PEA Guidance Manual with the following updates:

- Exposure duration for adults is 30 years, per *Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil* (OEHHA, November 2004, revised January 2005).

- Exposed skin surface area is 2800 square centimeters (cm^2) for children and 5700 cm^2 for adults, per *Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil* (OEHHA, November 2004, revised January 2005).

- Adherence factor is 0.2 mg/cm^2 per *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final* (U.S. EPA, OSWER 9285.7-02EP, July 2004).

- Particulate emission factor is 1.36 x 10^9 cubic meters per kilogram (m^3/kg), per *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (U.S. EPA, OSWER 9355.4-24, December 2002).

2. Commercial Indoor Worker Exposure Scenario

Human health risk and hazard are assessed under a commercial indoor worker scenario using the formulae set forth above for the standard scenario and the exposure parameters listed in Tables 6 and 7 of Appendix C.

3. Construction Worker Exposure Scenario

Human health risk and hazard are assessed under a construction worker scenario using the formulae set forth above for the standard scenario and the exposure parameters listed in Tables 8 and 9 of Appendix C.

4. Risk Characterization Summary

Results of the human health risk assessment are summarized in Table 10 of Appendix C and are discussed below. In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk.

Antimony, vanadium and other metals also contribute to the chronic human health hazard, although the critical health effects vary from metal to metal. For example, the U.S. EPA Integrated Risk Information System (IRIS) website (http://www.epa.gov/iris/) cites the following critical chronic health effects from oral exposure:

- Arsenic: hyperpigmentation (darkening of an area of skin or nails caused by increased melanin), keratosis (growth of keratin (fibrous structural proteins) on the skin, and possible vascular complications
- Antimony: longevity, blood glucose and cholesterol
- Vanadium (as vanadium pentoxide): decreased hair cystine (an amino acid)

This screening evaluation does not differentiate chronic health hazards by critical health effect, but instead conservatively considers the aggregate hazard index irrespective of critical health effect.

For the purposes of this screening evaluation, all detected metals which exceed site background concentrations are considered COPCs. Nickel is not considered a COPC based on a comparison to background data. Additional background metals testing may demonstrate that other metals, such as vanadium, also occur in mine waste rock and tailings within the range of site background concentrations and therefore may be excluded from the risk assessment. However, such metals are included in the absence of background data.

Former Mill Area

Waste and affected soil in the former mill area present a chronic human health hazard and lifetime excess cancer risk under the standard exposure scenario which are not suitable for unrestricted land use. Table 3 in Appendix C summarizes the hazard and risk for the standard exposure scenario. The hazard index and risk under the standard exposure scenario are 3.E+01 and 6.E-03, respectively. The arsenic hazard quotient is 2.E+01, and the arsenic risk is 6.E-03.

Waste at the former mill area presents an unacceptable risk under the commercial indoor worker scenario. Table 6 in Appendix C summarizes the hazard and risk for the commercial indoor worker scenario. The hazard index and risk under the commercial indoor worker scenario are 1.E+00 and 8.E-04, respectively. The arsenic hazard quotient is 8.E-01, and the arsenic risk is 8.E-04.

Waste at the former mill area presents unacceptable hazard and risk under the construction worker scenario. Table 8 in Appendix C summarizes the hazard and risk for the construction worker scenario. The hazard index and risk under the construction worker scenario are 9.E+00 and 2.E-04, respectively. The arsenic hazard quotient is 5.E+00, and the arsenic risk is 2.E-04.

Mine Waste Rock and Tailings (excluding Former Mill Area)

Table 4 in Appendix C summarizes the hazard and risk for the standard exposure scenario. Mine waste rock and tailings (excluding the Former Mill Area) present a chronic human health hazard (2.E+00) and lifetime excess cancer risk (3.E-04) under the standard exposure scenario which are not suitable for unrestricted land use. The arsenic hazard quotient is 1.E+00, and the arsenic risk is 3.E-04.

Table 7 in Appendix C summarizes the hazard and risk for the commercial indoor worker scenario. Hazard and risk under the commercial indoor worker scenario are 1.E-01 and 5.E-05, respectively. The hazard is less than the benchmark value of 1, and the risk falls between the lower (1.E-06) and upper (1.E-04) benchmark values for risk management decision-making. The arsenic hazard quotient is 5.E-02, and the arsenic risk is 5.E-05.

Table 9 in Appendix C summarizes the hazard and risk for the construction worker scenario. Hazard and risk under the construction worker scenario are 7.E-01 and 1.E-05, respectively. The hazard is less than the benchmark value of 1, and the risk falls between the lower and upper benchmark risk values. The arsenic hazard quotient is 3.E-01, and the arsenic risk is 1.E-05.

Background Soil

Table 5 in Appendix C summarizes the hazard and risk for background soil under the standard (unrestricted land use) exposure scenario. Hazard and risk for background soil under the standard exposure scenario are 1.E-01 and 4.E-05, respectively. Arsenic is the primary contributor to risk, with a hazard quotient of 1.E-01 and a risk of 4.E-05.

The range of arsenic concentrations detected in background soil at the site is consistent with the range of arsenic concentrations in local background soil, as discussed in Section 5.G and Appendix A of this PEA report. Arsenic occurs naturally in soil as a result of the weathering of rocks and minerals. Low concentrations of arsenic are present in almost all foods and drinking water, which are the primary sources of human exposure (OEHHA 2004). The natural occurrence of arsenic in soil, water and food presents a human health risk that typically exceeds one per million.

5. Lead Risk Assessment

Lead hazards were evaluated using the *Lead Risk Assessment Spreadsheet Version 7* (DTSC) for the standard exposure scenario. Table 11 of Appendix C summarizes the lead risk assessment results. Calculations were performed using UCL values for lead in the Former Mill Area (408 mg/kg), Waste Rock and Tailings (excluding the Former Mill Area; 36.1 mg/kg), and background soil (13.7 mg/kg). The resulting 99^{th} percentile blood lead levels for non-pica child are 19.9, 5.8 and 5.0 micrograms per deciliter (µg/dL), respectively. The resulting 99^{th} percentile blood lead levels for an adult are 7.3, 3.7 and 3.4 µg/dL, respectively. The calculated value for the Former Mill Area exceeds the benchmark blood lead concentration of 10 µg/dL and is not acceptable for unrestricted use. The calculated values for Waste Rock and Tailings (excluding the Former Mill Area) and background soil are below the benchmark blood lead concentration. Appendix C presents the lead risk assessment calculation spreadsheets.

6. Uncertainty

Per OEHHA (2004), “systematic, logical and informed approaches to decision making about carcinogens in the environment call for quantitative assessments, because the absence of clearly definable thresholds does not permit identification of ‘safe’ levels of exposure. Unfortunately, due to the frequent lack of sufficient data, assumptions have to be made in order to complete quantitative assessments of cancer risk.”

There are uncertainties associated with metals content of waste and affected soil, the amount of exposure to waste and soil; the biological uptake of metals from waste and soil; and the toxicological effects of biologically available metals. Such uncertainty must be discussed so that the assessment does not result in a “higher degree of implied certainty in the overall assessment than is warranted” (OEHHA, 2004).

As a result of the uncertainties described below, confidence in the exposure assessment is moderate. Confidence in toxicity values ranges from low to high based on the data available for specific metals. The risk assessment conservatively considers the commercial indoor worker exposure scenario for waste that will likely be consolidated beneath the proposed commercial development, thus eliminating the exposure pathways. The assessment also conservatively assumes that the metals are entirely bioavailable.

Sampling Uncertainty

Sampling uncertainty related to contaminant concentration in soil, as well as sampling uncertainty related to the literature-derived exposure and toxicity parameters, contribute to the overall uncertainty of the assessment. Statistical analysis is performed as part of the assessment to develop a reasonable maximum exposure level. Confidence in a population mean and variance increases as the number of samples taken from the population increases (USEPA, 2003).

Model Uncertainty

The literature-derived exposure factors and toxicity factors used in the assessment were obtained with the goal of reducing uncertainty; however, limitations of existing data pertaining to activity patterns for future site occupants, as well as health effects from metals exposure, result in model uncertainty.

Bioavailability

The assessment assumes that metals in soil are completely available for biological uptake. Unpublished studies of other abandoned mine land in Nevada County indicate that the actual bioavailability of arsenic, for example, may be lower than 15 percent. The assumption of 100 percent bioavailability likely overestimates the health effects presented by waste and affected soil at the site.

Detection Limits

The concentrations of metals of concern in soil generally exceed the corresponding laboratory detection limits. Therefore, detection limits are not expected to be a significant source of uncertainty.

Toxicity Values

The California slope factor for oral arsenic exposure (9.45 per mg/kg-day, OEHHA 2007) was used for the risk assessment presented herein. For comparison, the U.S. EPA slope factor is currently 1.5 per mg/kg-day. The slope factors imply a linear (no threshold) dose-response relationship; however, others have postulated a non-linear relationship, and the mechanisms for arsenic carcinogenicity are not known (OEHHA 2004). If the dose-response relationship is non-linear, the assumption of linearity would overestimate risks.

8 ECOLOGICAL SCREENING EVALUATION

An ecological screening evaluation was not performed based on the anticipated lack of complete ecological exposure pathways associated with the proposed site development. The assessment areas at the site comprise an estimated 64,000 cubic yards of mine waste rock and mill tailings. Some of the waste is to be removed from the site, and the remainder is to be consolidated beneath the proposed commercial development. The proposed development includes grading, paving and infrastructure construction that will likely reduce or eliminate ecological habitat in the assessment area.

9 COMMUNITY PROFILE

Appendix D presents the community profile. The community profile was performed in general accordance with guidelines provided in the *Preliminary Endangerment Assessment Guidance Manual* (DTSC, June 1999). H&K finds that public notification is not warranted as part of the PEA investigation, although such notification is appropriate if site remediation is performed.

10 EVALUATION OF RISK TO SURFACE WATER AND GROUNDWATER

A. Basis for Evaluation

The following documents are pertinent to the evaluation of surface water and groundwater at the site:

- *The Designated Level Methodology* (DLM) (RWQCB, June 1989),
- *A Compilation of Water Quality Goals* (Water Quality Goals) (RWQCB, August 2003),
- *Fourth Edition of the Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan) (RWQCB, September 1998), and
- *Resolution No. 68-16 (Antidegradation Policy)* (California State Water Resources Control Board, October 28, 1968).

According to the Basin Plan and other RWQCB documents, California water bodies must be protected against water quality degradation for the most restrictive beneficial use. Surface water was not encountered during the investigation, although seasonal surface water flow associated with storm water runoff is expected in the lower (southern) portion of the site. Beneficial uses that could apply to surface water include domestic, agricultural and industrial water supply, recreation and aesthetic enjoyment, and preservation of fish, wildlife and other aquatic resources or preserves. We understand that groundwater at the site will not be used; however, domestic wells are located in the site vicinity. Review of well completion logs provided by DWR for the site vicinity indicates that useable groundwater may be located approximately 60 feet below the ground surface.

The DLM outlines a process for evaluating site specific conditions to determine whether a threat is posed to surface water or groundwater quality from soluble constituents in the mine waste rock and tailings identified at the site. The DLM allows for the assumption of attenuation of contaminant concentrations between the exploration deposits and groundwater or surface water, provided that specific parameters and assumptions are defined. Tables 7a, 7b, 8a and 8b present attenuation factors and soluble designated levels (SDLs) for surface water and groundwater.

H&K's rationale for selecting the simplified environmental attenuation factor for surface water was based on review of the characteristics listed for surface water in Figure 10 of the DLM. An environmental attenuation factor of 10 to 100 may be appropriate for assessing current site conditions. The mine waste rock and tailings on the southern portion of the site are subject to ephemeral storm water runoff and are located approximately 500 feet above Wolf Creek. The COPCs are not volatile or degradable, and are generally not subject to other waste constituents that could affect their mobility. However, arsenic is readily attenuated in the clayey, iron-rich soil that typifies the site vicinity, as demonstrated by the low metals concentrations in native soil below the waste.

The proposed commercial site development will likely include excavation of the mine waste rock and tailings, transport within the site, and placement of the mine waste rock and tailings within a fill area that is not subject to surface water infiltration or groundwater seepage. If the mine waste rock and tailings are placed on-site in such a manner, H&K's opinion is that an environmental attenuation factor of 100 would be applicable for evaluation of surface water quality.

H&K's rationale for selecting the simplified attenuation factor for groundwater was based on review of the characteristics listed for groundwater in Figure 10 of the DLM. An environmental attenuation factor of 10 to 100 may be appropriate for assessing current site conditions. The mine waste rock and tailings are generally underlain by low permeability clay. Acid-base accounting results indicate that the mine waste rock and tailings are acid neutralizing (NP:AGP results range from 19 to 1067).

As discussed above for surface water, the proposed commercial site development will likely include excavation of the mine waste rock and tailings, transport within the site, and placement of the mine waste rock and tailings within a fill area that is not subject to surface water infiltration or groundwater seepage. If the mine waste rock and tailings are placed on-site in such a manner, H&K's opinion is that an environmental attenuation factor of 100 would be applicable for evaluation of groundwater quality

B. Water Quality Goals

Tables 7a, 7b, 8a and 8b summarize the water quality goals used for this evaluation. The water quality goal for arsenic (2.0 µg/L) corresponds to a typically achievable laboratory reporting limit, which is greater than the California Public Health Goal for arsenic in drinking water (0.04 µg/L).

C. Laboratory Reporting Limits

Laboratory reporting limits ranged from 2 to 10 µg/L for DI-WET arsenic and from 1.2 to 10 µg/L for DI-WET lead. Reporting limits for mercury and nickel were 0.333 and 10 µg/L, respectively.

D. Summary of Laboratory Test Results

Arsenic

Eighteen samples of mine waste rock and tailings (and one duplicate sample) were analyzed for soluble arsenic by DI-WET. Soluble arsenic concentrations ranged from below a reporting limit of 2.0 µg/L to 44.7 µg/L. Arsenic was not detected in eight of the 18 samples above reporting limits ranging from 2 to 10 µg/L. The sample (TP-5-10) having the highest soluble arsenic detection (44.7 µg/L) was re-analyzed, resulting in no soluble arsenic detected above a reporting limit of 2.0 µg/L.

ProUCL determined that the soluble arsenic data follow gamma distribution and recommended the use of the Approximate Gamma UCL (17.3 µg/L). The data set used for statistical evaluation includes the duplicate analysis and uses a value of half the reporting limit for non-detections. ProUCL output is presented in Appendix C.

Two background soil samples were analyzed for soluble arsenic by DI-WET. Soluble arsenic was detected in one of the samples at 18.6 µg/L, and was not detected in the other above a reporting limit of 10 µg/L.

Lead

Eighteen samples of mine waste rock and tailings (and one duplicate analysis) were analyzed for soluble lead by DI-WET. Soluble lead concentrations ranged from less than 1.2 µg/L to 11.6 µg/L. Soluble lead was not detected in 13 of the 18 samples above reporting limits ranging from 1.2 to 10 µg/L.

ProUCL determined that the soluble lead data follow gamma distribution and recommended the use of the Approximate Gamma UCL (4.5 µg/L). The data set used for statistical evaluation includes the duplicate analysis and uses a value of half the reporting limit for non-detections. ProUCL output is presented in Appendix C.

Two background soil samples were analyzed for soluble lead by DI-WET. Soluble lead was not detected in either of the samples above a reporting limit of 6 µg/L.

Mercury

Six samples of mine waste rock and tailings were analyzed for soluble mercury by DI-WET. Soluble mercury was not detected above a laboratory reporting limit of 0.333 µg/L.

Nickel

Seventeen samples of mine waste rock and tailings (and one duplicate sample) were analyzed for soluble nickel by DI-WET. Soluble nickel concentrations ranged from 2.3 to 48.1 µg/L. Nickel was not detected in five of the 17 samples above a reporting limit of 10 µg/L.

ProUCL determined that the data are lognormal and recommended the use of the H-UCL (19.0 µg/L). The data set for statistical evaluation uses a value of half the reporting limit for non-detections. ProUCL output is presented in Appendix C.

Total nickel concentrations detected in the mine waste rock and tailings are within the range of nickel concentrations detected in background soil. Similarly, soluble nickel detections in mine waste rock and tailings are within the range of soluble nickel concentrations detected in background soil. Two background soil samples were analyzed for soluble nickel by DI-WET. Soluble nickel was detected in the samples at 58.5 and 26.2 µg/L.

E. Evaluation

Findings of the DLM evaluation indicate that the potential for water quality impact may exist under current site conditions. However, significant water quality impact is not anticipated in the case of the proposed on-site placement as part of commercial site development. Specific analytes are discussed below.

Arsenic

The maximum arsenic detection (44.7 µg/L) and UCL value (17.3 µg/L) exceed the SDL for current site conditions (2 µg/L). Soluble arsenic was not detected in a duplicate analysis of the sample displaying the maximum detected concentration, indicating that the maximum detected concentration may be anomalous. Other soluble arsenic detections are near the soluble arsenic concentration detected in background soil (18.6 µg/L). The UCL value (17.3 µg/L), which includes the potentially anomalous maximum detected value, is lower than the anticipated SDL for the proposed on-site placement (20 µg/L).

Lead

The maximum lead detection (11.6 µg/L) and UCL value (4.5 µg/L) exceed the SDL for current site conditions (2 µg/L). These values are lower than the anticipated SDL for the proposed on-site placement (20 µg/L).

Mercury

Soluble mercury was not detected by DI-WET. The reporting limit is less than the SDLs for both current conditions and on-site placement.

Nickel

The maximum nickel detection (48.1 µg/L) is within the range of soluble nickel concentrations detected in background soil (26.2 to 58.5 µg/L). Similarly, total nickel concentrations detected in mine waste and tailings are within the range of total nickel concentrations in background soil.

Based on the results of the DLM evaluation, the mine waste may be classified as Group B mine waste as defined in California Code of Regulations (CCR) Title 27, without taking any other factors into consideration. Per Section 22480(C) of CCR Title 27, which pertains to the management of mining waste, the mine waste may be classified as Group C waste because it contains hazardous constituents only at low concentrations, has low acid generation potential, and is readily containable by measures that are less stringent than those required for Group B waste.

11 SUMMARY AND CONCLUSIONS

The PEA findings, and conclusions based on the findings, are summarized below.

1. The site is located in an area that was subject to past gold mining and ore processing. Abandoned mine features identified at the site include horizontal and inclined excavations, pits, relic foundations, stockpiles of mine waste rock, and tailings ponds. Many of the abandoned mine features identified at the site are associated with the former Spring Hill Mine, which operated intermittently from the late 1800s to the early 1940s.

2. An estimated 44,000 cubic yards of mine waste rock and 20,000 cubic yards of tailings may be present at the site. These volume estimates are based on limited subsurface data and were not calculated using survey methods. Thus, the actual volume may vary significantly from the estimated volumes. Figures 3 and 4 show the areas of mine waste rock and tailings.

3. An estimated 1,700 cubic yards (approximately 2,300 tons) of mine waste rock, tailings and impacted native soil were identified at the Former Mill Area. The soil contains elevated levels of arsenic, lead and mercury which are not suitable to remain at the site under existing conditions. In addition, a pipe that originated from the Former Mill Area may have deposited materials with elevated metals concentrations down slope of the former mill site. Although such deposits were not encountered as part of the site investigation, other deposits which require off-site disposal may be present at the site. The possibility of other "hot spots" may be addressed during a future remedial action as set forth in a verification sampling and analysis plan.

4. The site investigation evaluated concentrations of seventeen Title 22 metals and cyanide in soil. Metals such as arsenic and lead occur naturally in soil and rock and are present in mine waste at concentrations exceeding background levels as a result of past mining and ore processing activities. Mercury and cyanide are associated with ore processing which was performed at the site.

5. In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk. Antimony, vanadium and other metals also contribute to the chronic human health hazard.

6. Arsenic was detected in site background soil up to 17 mg/kg. The range of background soil arsenic concentrations at the site is consistent with local

background levels. Local background arsenic concentrations range from non-detect to 48 mg/kg, as discussed in Section 5.G and Appendix A of this PEA report. The 95th percentile value for the local background arsenic data set is 17 mg/kg. This value is conservatively used to represent the local upper bound background soil arsenic concentration.

7. A human health risk assessment was performed to evaluate baseline (current) conditions. The goal of the assessment is to predict potential adverse human health effects of chemical contaminants identified at the site. The risk assessment findings are also to be used to develop remedial alternatives for a non-time critical remedial action. Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of particulates originating from the affected soil. Risk assessment findings are summarized below:

    a. Waste and affected soil in the Former Mill Area are not acceptable for use under the three exposure scenarios considered: standard (unrestricted land use), commercial indoor worker and construction worker.

    b. Mine Waste Rock and Tailings (excluding the Former Mill Area) are not acceptable for use under the standard exposure scenario. However, the Mine Waste and Tailings are potentially acceptable for use under the commercial indoor worker and construction worker exposure scenarios, as the hazard indices are less than the benchmark value of 1 and the risk values fall between the lower (1.E-06) and upper (1.E-04) benchmark values for risk management decision-making.

8. Because the risk values calculated for the Mine Waste Rock and Tailings (excluding the Former Mill Area) under the commercial indoor worker and construction worker exposure scenarios exceed the lower benchmark risk value, additional consideration should be given to the potential future exposure pathways. The Mine Waste Rock and Tailings are to be consolidated beneath the proposed commercial development, and are to be covered by structures and pavement. The exposure pathways considered under the commercial indoor exposure scenario will be eliminated in the case of burial and surface covering. Additionally, the proposed remedial action is to be performed per an approved soil management plan to reduce the chance of exposure under the construction worker scenario. Therefore, H&K's opinion is that the mine waste rock and tailings identified at the site (excluding the Former Mill Area) are appropriate for use in the proposed commercial development.

9. Results of acid-base accounting indicate that the mine waste rock and tailings are not acid-generating; thus, soluble metals were evaluated by DI-WET.

10. Soluble arsenic and lead were detected by DI-WET at concentrations exceeding the calculated SDL for surface water and groundwater under current conditions. However, the Mine Waste Rock and Tailings (excluding the Former Mill Area) are suitable for on-site consolidation and burial beneath the proposed commercial development and can be classified as Group C mine waste per CCR Title 27.

11. A community profile performed by H&K determines that public notification is not warranted as part of the PEA investigation, although public involvement is appropriate prior to remedial action.

12. Based on the local geology, naturally occurring asbestos (NOA) may be encountered at the site during remediation and site development. In the Sierra Nevada foothills area, ultramafic rock and serpentinite are associated with NOA minerals such as chrysotile, actinolite, and tremolite. Under California law, disturbance of soil and rock that contain ultramafic rock, serpentinite or NOA minerals must be handled as described in Cal/EPA Air Resources Board Regulation 93105, *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations* (ATCM). Per the ACTM, site work must be performed according to protocols established by an Asbestos Dust Mitigation Plan (ADMP). An ADMP outlines engineering controls to reduce the risk of release of NOA fibers into the environment during mechanical soil disturbance. Mechanical soil disturbance includes site clearing, grading, underground utility work, transportation, and disposal activities.

13. The abandoned mine excavations identified at the site, as well as other mine excavations that may be present on and adjacent to the site, present physical hazards and may not be suitable to support structural improvements. The condition of the known excavations was not investigated, and other excavations that were not identified as part of this investigation may be obscured as a result of past grading, vegetative growth, or other causes.

12 RECOMMENDATIONS

H&K makes the following recommendations based on the PEA findings.

1. Mine waste rock and tailings identified at the site, particularly near the Former Mill Site, are not likely suitable for unrestricted use due to elevated metals concentrations. Exposure to the soil, including ingestion, inhalation of soil dust, and dermal contact, should be avoided.

2. The risk assessment findings should be used to develop remedial alternatives for a non-time critical remedial action. The evaluation of remedial alternatives, as well as methods and procedures to implement the selected remedial actions, should be set forth in a Removal Action Workplan (RAW) for review and approval by DTSC.

3. The estimated 2,300 tons of waste and affected soil at the Former Mill Area should be excavated, transported offsite, and disposed at an appropriate solid waste facility. Additional characterization of the waste may be required by the landfill during the remedial action to meet their acceptance criteria.

4. The remaining Mine Waste Rock and Tailings identified at the site (excluding the Former Mill Area) should be excavated, transported within the site, and consolidated in an area not subject to surface water infiltration or groundwater seepage. The relocation and burial of mine waste rock and tailings should be performed in accordance with an approved RAW, a geotechnical engineering report, and a grading plan.

5. The proposed Mine Waste Rock and Tailings burial location should be identified on the site development plans and recorded with the County of Nevada. The 95% UCL on the mean concentration of total arsenic in the Mine Waste Rock and Tailings is 21.9 mg/kg, which is acceptable under the construction worker scenario. Based on the results of the human health risk assessment, and because the waste is to be buried beneath structural improvements and pavement, additional land use controls are not required.

6. Based on the PEA findings, the following arsenic remediation goals are recommended. Cleanup goals for other metals of potential concern (such as antimony, copper and vanadium) should be developed as part of a RAW based on the evaluation of site background concentrations.

a. Mine waste and affected soil at the Former Mill Area is to be excavated, transported offsite, and disposed at an appropriate solid waste facility. If the resulting soil arsenic concentrations are within the background range (17 mg/kg and lower), further excavation will not be required with respect to soil arsenic concentrations. If arsenic concentrations exceed the site background range, total and soluble arsenic concentrations should be evaluated according to the methodology set forth in this PEA to determine whether the soil is suitable for on-site burial. Specifically, the resulting 95% UCL on the mean total arsenic concentration must be protective under the construction worker scenario (22 mg/kg), and soluble arsenic concentrations should not exceed the arsenic SDL (20 µg/L).

b. Mine Waste and Tailings identified at other locations of the site should be excavated, transported within the site, and buried. If the resulting soil arsenic concentrations are within the background range (17 mg/kg and lower), further excavation will not be required with respect to soil arsenic concentrations.

7. Recommendations for reducing fugitive dust generation and potential exposure to NOA during site remediation and development should be incorporated into a future RAW for the site.

8. Mining excavations on and near the site present physical hazards and may not be suitable for support of structural improvements. Mining excavation may extend beneath the site from adjacent property. The excavations should be closed to address the possibility of entrapment, collapse, hazardous confined space conditions and other physical hazards. Temporary measures are appropriate to reduce the existing physical hazards. Final physical closure of the excavations should be performed in accordance with recommendations from a qualified geotechnical engineer and with the approval of the local building department.

13 LIMITATIONS

The recommendations and conclusions in this report are preliminary in nature based on existing site conditions; interpretation of site history and site usage information; and the results of the investigation, sample screening, and laboratory analyses. The concentrations detected in the samples obtained during the site investigations may not be representative of conditions between locations sampled. Other forms of contamination may be present within the site that the investigation did not detect.

The purpose of the assessment was not to guarantee or certify a clean site, but to assess site conditions in accordance with DTSC protocol. H&K used judgment and experience to develop the PEA conclusions and recommendations. Therefore, the conclusions and recommendations are not to be considered scientific certainties. The recommendations provided herein are contingent upon H&K's review of future sampling results or any other pertinent information that becomes available, as well as review and approval by the appropriate regulatory agencies.

The scope of work did not include determining the presence of asbestos, radon, lead paint, geologic hazards, archeological sites, or ecologically sensitive areas (e.g., vernal pools and wetlands).

H&K prepared and issued this report for the exclusive use of our client. The information, conclusions and recommendations presented apply only to the subject property. Holdrege & Kull is not responsible for any other party's interpretations of the reported information.

H&K performed this work in accordance with present, regional, generally accepted standards of care. This report does not represent a legal opinion. No warranty, expressed or implied, including any implied warranty of merchantability or fitness for the purpose is made or intended in connection with the work.

The findings of this report are valid as of the present date. However, changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. Changes in regulations, interpretations, and/or enforcement policies may occur at any time. Such changes may affect the extent of remediation required.

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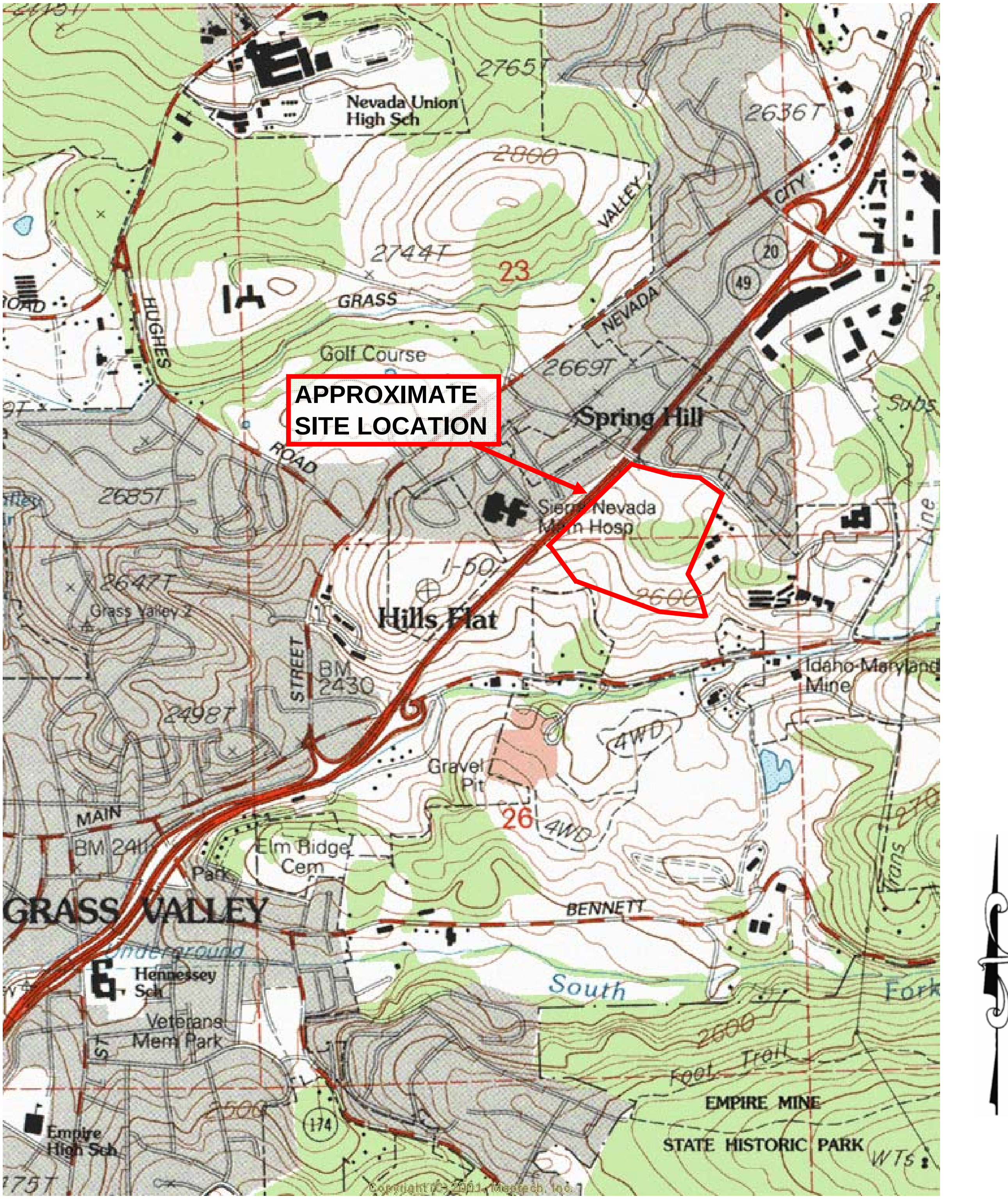
FIGURES



NO SCALE SOURCE: GRASS VALLEY QUADRANGLE MAP (USGS, PROVISIONAL EDITION 1995)

HOLDREGE & KULL CONSULTING ENGINEERS • GEOLOGISTS 792 Searls Avenue • Nevada City, CA 95959 (530) 478-1305 • FAX (530) 478-1019	**SITE LOCATION MAP** SPRING HILL MINE PROPERTY GRASS VALLEY, CALIFORNIA	PROJECT NO. 3292-02 JULY 2007 FIGURE 1

FIGURE 2

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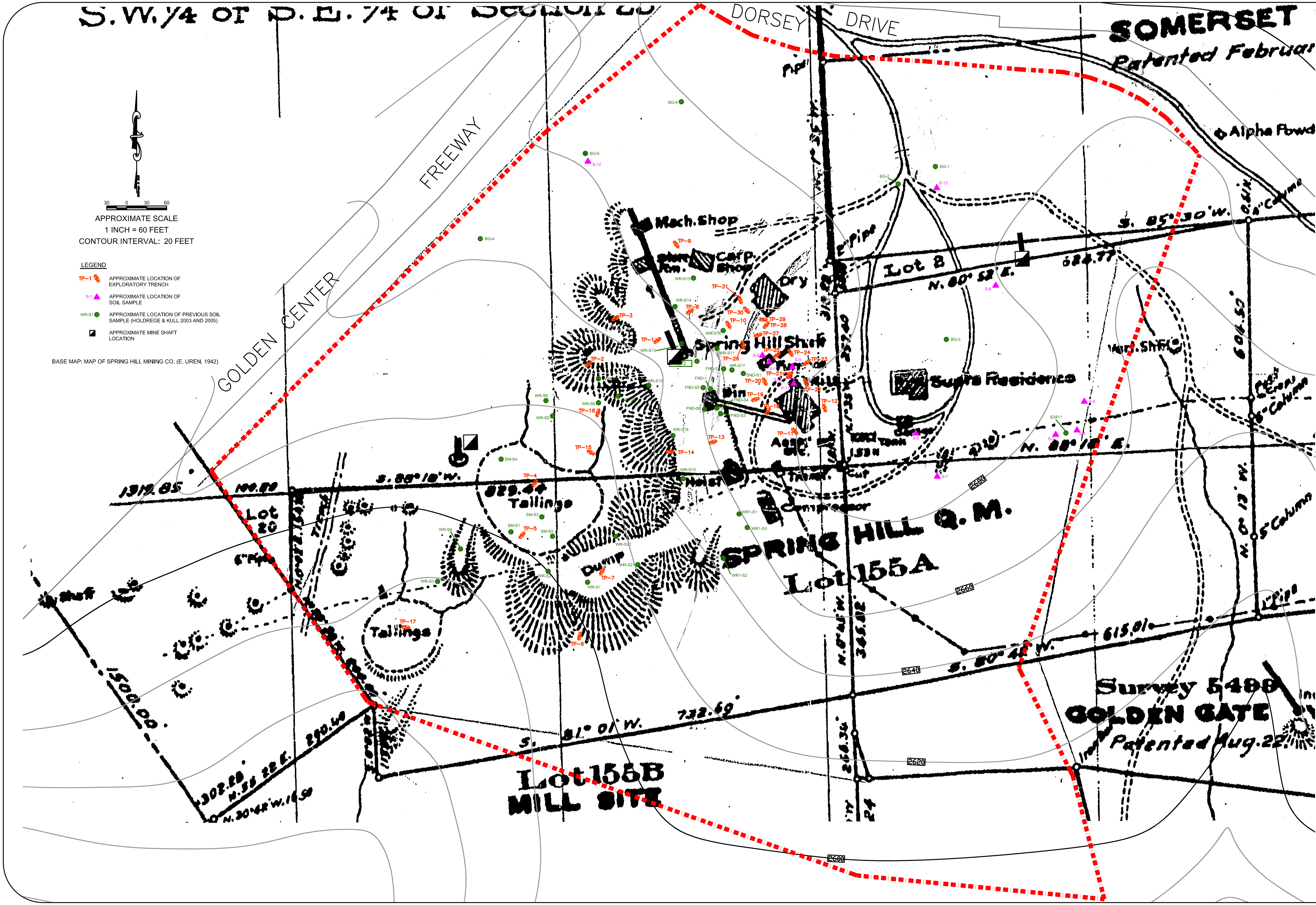
AERIAL PHOTOGRAPH OF SITE

SPRING HILL MINE PROPERTY

GRASS VALLEY, CALIFORNIA

NO.	REVISIONS	DATE

CHECKED BY:	CDR
DRAWN BY:	DFD
DATE:	JULY 2007
DRAWING NAME:	3292-02-FIG2-4
PROJECT NO.:	3292-02



SAMPLE LOCATION MAP
SPRING HILL MINE PROPERTY
GRASS VALLEY, CALIFORNIA

DESIGNED BY:	CDR
DRAWN BY:	JWM
DATE:	JULY 2007
DRAWING NAME:	3292-02-FIG2-4
PROJECT No.:	3292-02

REVISIONS — NO. | DATE

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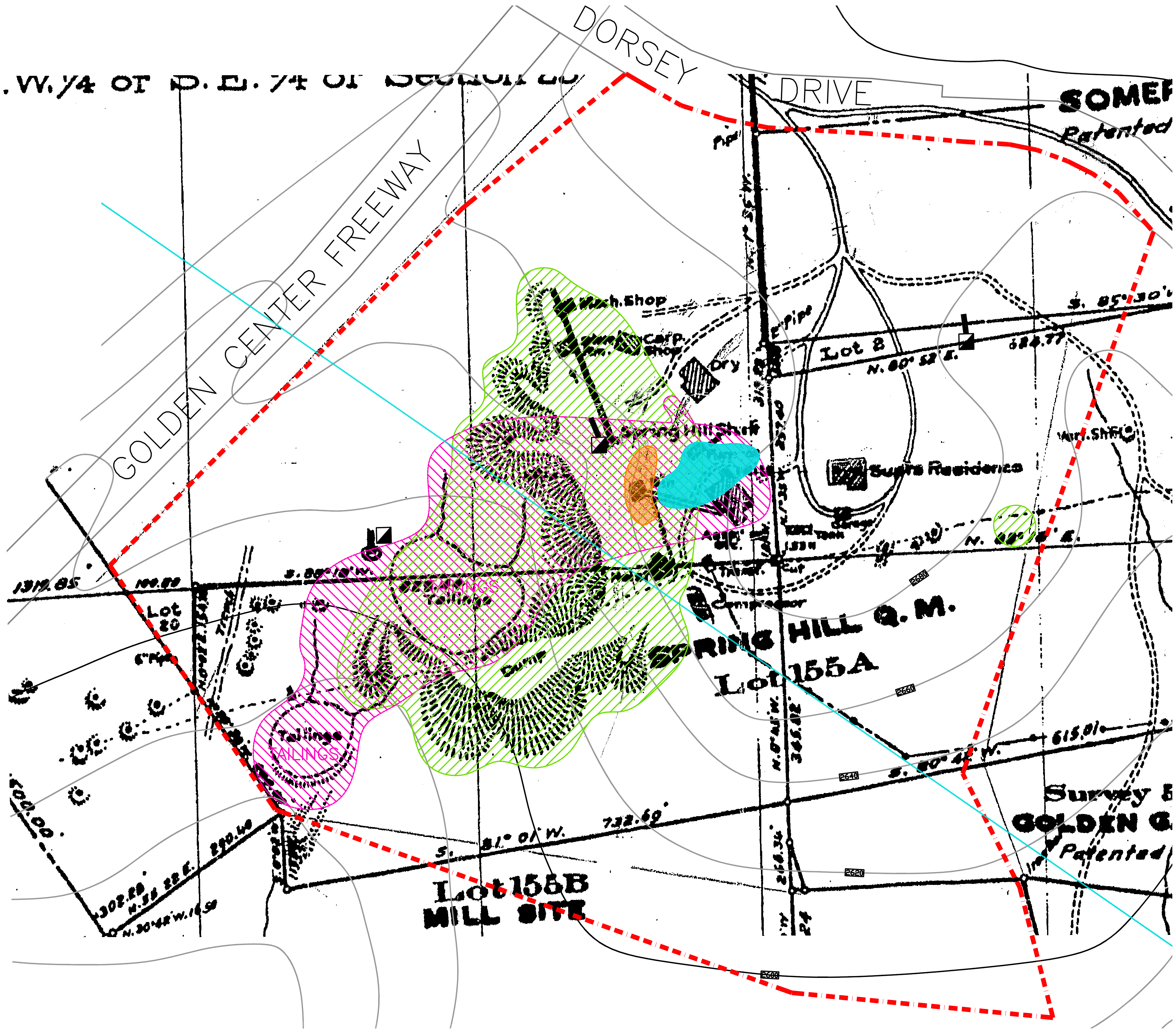
FIGURE 3



50 0 50 100

APPROXIMATE SCALE

1 INCH = 100 FEET

CONTOUR INTERVAL: 20 FEET

LEGEND

- TAILINGS DEPOSITS
- WASTE ROCK PILES
- ANTICIPATED SOIL / TAILINGS REQUIRING REMOVAL AND LANDFILL DISPOSAL AS HAZARDOUS WASTE (ESTIMATED 750 CUBIC YARDS / 1,050 TONS, BASED ON 2 FEET DEPTH)
- ANTICIPATED SOIL / WASTE ROCK REQUIRING REMOVAL AND LANDFILL DISPOSAL AS HAZARDOUS WASTE (ESTIMATED 900 CUBIC YARDS / 1,260 TONS, BASED ON 6 FEET DEPTH)
- APPROXIMATE MINE SHAFT LOCATION

BASE MAP: MAP OF SPRING HILL MINING CO. (E. UREN, 1942)

FIGURE 4

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
792 SEARLS AVENUE
NEVADA CITY, CA 95959
(530) 478-1305 FAX 478-1019

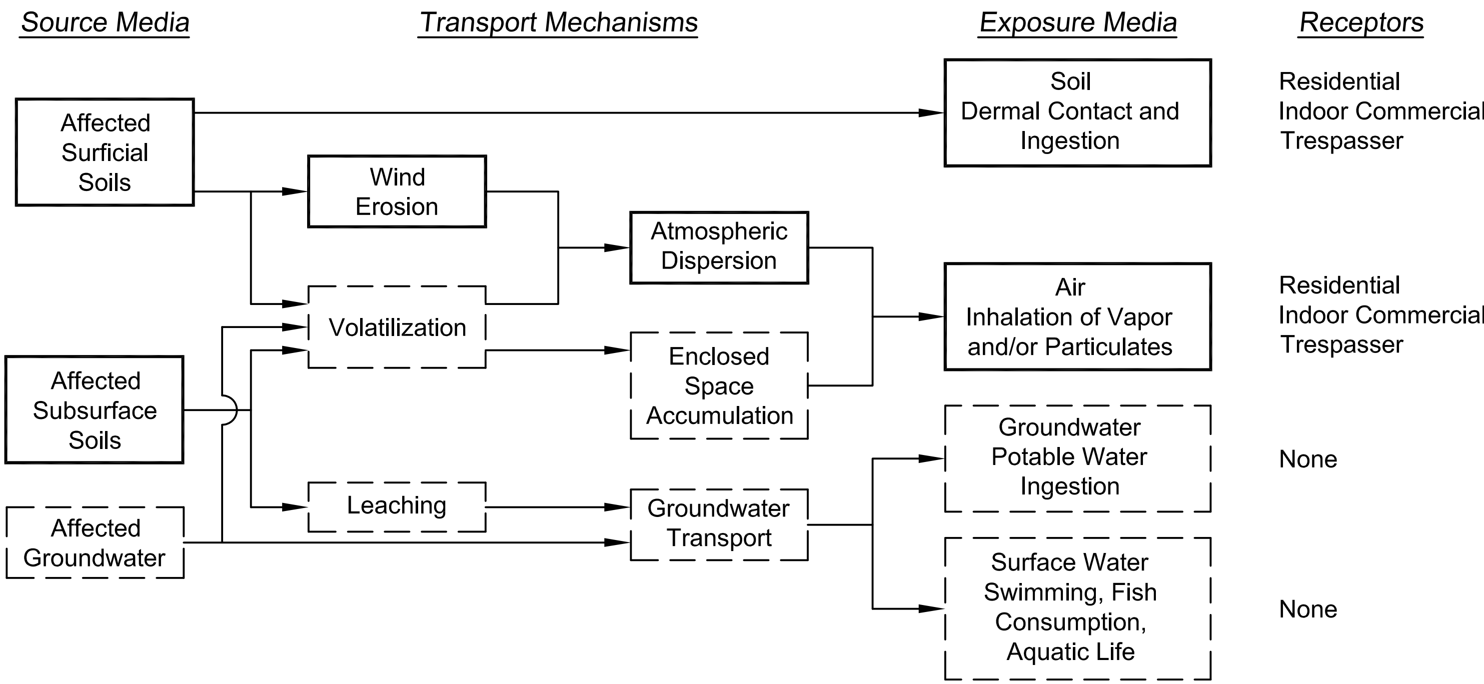
MINE WASTE ASSESSMENT AREAS

SPRING HILL MINE PROPERTY

GRASS VALLEY, CALIFORNIA

NO.	REVISIONS	DATE

CHECKED BY:	CDR
DRAWN BY:	JWM
DATE:	JULY 2007
DRAWING NAME:	3292-02-FIG2-4
PROJECT NO.:	3292-02



HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS
792 SEARLS AVENUE
NEVADA CITY, CA 95959
(530) 478-1305 FAX 478-1019

CONCEPTUAL SITE MODEL
SPRING HILL MINE PROPERTY
GRASS VALLEY, CALIFORNIA

DRAWN BY: DFD	CHECKED BY: JWM
PROJECT NO.: 3292-02	
DATE: JULY 2007	
FIGURE NO.: 5	

TABLES

Table 1 - Summary of DWR Well Completion Reports Fomer Spring Hill Mine Property APNs 35-260-62, 63 and 64 Grass Valley, California										
No.	**Reported Site Address[1]**	**Reported APN[1]**	**DWR Well Log No.**	**Estimated Elevation[2] (feet MSL)**	**Estimated Distance From Site[2] (feet)**	**Direction From Site[2] (feet)**	**Reported Depth to First Water[1] (feet)**	**Reported Depth of Static Water Level[1] (feet)**	**Reported Depth to Rock[1] (feet)**	**Reported Depth of Well[1] (feet)**
1	Dorsey Drive	NR	111604	2680	200	W	NR	NR	25 - 55	130
2	Sutton Way	NR	208239	2600	1400	NE	152	30	24	625
3	Hughes Road	NR	81784	2560	2000	W	60	35	14	225
4	1040 East Main Street	NR	305758	2600	2000	NW	60	NR	40	180
5	1040 East Main Street	NR	305767	2600	2000	NW	60	NR	40	400

Notes:

1 Based on DWR Well Completion Report

2 Based on USGS 7.5' Quadrangle Map of Grass Valley CA (Provisional Edition, 1995)

APN = Nevada County assessors parcel number

DWR = State of California Department of Water Resources

MSL = mean sea level

NR = not reported on well completion report

Owner Name and Mailing Address[1]

No. 1 - Spring Hill Manor Convalescent Hospital

No. 2 - Francis Teut, 13240 North Day Rd, Grass Valley

No. 3 - Timberline Homes, 154 Hughes Rd, Grass Valley

No. 4 and 5 - Nevada County Country Club, 1040 E. Main St., Grass Valley

Table 2 - Total Metals and Inorganics Results for Soil Samples
Former Spring Hill Mine Site
APNs 35-260-62, 63 and 64
Grass Valley, California

Sample Number	Sample Location	Sample Type	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Cyanide (mg/kg)	Total Nitrate (mg/kg)
EXP-1	EXP-1	WR/SP	0.5	5/20/03	19	5.2	0.045	na	na	na
FND-1	FND-1	WR/SP	0.5	5/20/03	130	190	0.670	na	na	na
FND-2	FND-2	WR/SP	0.5	5/20/03	74	44	1.2	na	na	na
FND-S3	FND-S3	WR/SP	1.5	5/20/03	180	310	0.150	na	na	na
WR1-S1	WR1-S1	WR/SP	0.5	5/20/03	ND<1.0	4.8	0.310	na	na	na
WR1-S2	WR1-S2	WR/SP	1.0	5/20/03	28	37	0.200	na	na	na
WR1-S3	WR1-S3	WR/SP	1.0	5/20/03	ND<1.0	ND<1.0	0.220	na	na	na
WR-S1	WR-S1	WR/SP	0 - 0.5	10/11/05	1.1	6.3	0.189	na	na	na
WR-S2	WR-S2	WR/SP	1	10/11/05	2.5	3.6	0.180	na	na	na
WR-S3	WR-S3	WR/SP	0 - 0.5	10/11/05	ND<1.0	7.2	0.034	na	na	na
WR-S4	WR-S4	WR/SP	1.5	10/11/05	5.6	8.6	0.020	na	na	na
WR-S5	WR-S5	WR/SP	0 - 0.5	10/11/05	4.0	8.3	0.067	na	na	na
WR-S6	WR-S6	WR/SP	2	10/11/05	10.5	5.0	0.072	na	na	na
WR-S7	WR-S7	WR/SP	0.7	10/11/05	2.4	17.1	0.056	na	na	na
WR-S8	WR-S8	WR/SP	1	10/11/05	ND<1.0	9.5	0.019	na	na	na
WR-S9	WR-S9	WR/SP	0 - 0.5	10/11/05	1.0	11.3	0.029	na	na	na
WR-S10	WR-S10	WR/SP	0 - 0.5	10/11/05	1.2	8.8	0.081	na	na	na
WR-S11	WR-S11	WR/SP	1	10/11/05	3.9	19.8	0.306	na	na	na
WR-S12	WR-S12	WR/SP	0 - 0.5	10/11/05	5.3	47.6	0.048	na	na	na
WR-S13	WR-S13	WR/SP	0 - 0.5	10/11/05	11.2	11.9	0.122	na	na	na
WR-S14	WR-S14	WR/SP	0 - 0.5	10/11/05	ND<1.0	4.5	0.117	na	na	na
WR-S15	WR-S15	WR/SP	0 - 0.5	10/11/05	ND<1.0	44.9	0.219	na	na	na
WR-S16	WR-S16	WR/SP	0 - 0.5	10/11/05	3.6	9.8	0.106	na	na	na
WR-S17	WR-S17	WR/SP	0.5	10/11/05	22	52.9	0.126	na	na	na
WR-S18	WR-S18	WR/SP	2	10/11/05	2.7	10.9	0.208	na	na	na
WR-S19	WR-S19	WR/SP	0.5	10/11/05	4.1	11.7	0.239	na	na	na
WR-S20	WR-S20	WR/SP	1	10/11/05	5.7	4.4	0.136	na	na	na
WR-S21	WR-S21	WR/SP	1.5	10/11/05	6.9	3.9	0.193	na	na	na
SM-S1	SM-S1	T	0 - 0.5	10/11/05	ND<1.0	3.2	0.023	na	ND<0.25	na
SM-S2	SM-S2	T	0 - 0.5	10/11/05	ND<1.0	3.0	0.025	na	ND<0.25	na
SM-S3	SM-S3	T	2	10/11/05	2.6	3.0	0.051	na	ND<0.25	na
SM-S4	SM-S4	T	0 - 0.5	10/11/05	ND<1.0	2.9	0.028	na	ND<0.25	na
FND-S4	FND-S4	WR/SP	0.5	10/25/05	34	52.1	0.129	na	na	na
FND-S5	FND-S5	WR/SP	3	10/25/05	52.1	48	0.190	na	na	na
FND-S6	FND-S6	WR/SP	0-0.5	10/25/05	36.2	103	0.273	na	na	na
SND-S1	SND-S1	WR/SP	0-0.5	10/25/05	17.8	17.5	0.253	na	na	na
TP-2-6	Test Pit 2	WR/SP	6	3/13/07	6.9	ND<2.0	0.086	486	na	na
TP-2-10	Test Pit 2	WR/SP	10	3/13/07	ND<2.0	ND<2.0	0.014	548	na	na
TP-4-3	Test Pit 4	T	3	3/13/07	ND<2.0	ND<2.0	0.025	201	ND<1.0	ND<0.5
TP-4-6	Test Pit 4	T	6	3/13/07	ND<2.0	4.4	0.039	275	na	na
TP-5-10	Test Pit 5	T	10	3/13/07	20.2	5.1	0.186	403	ND<1.0	ND<0.5
TP-5-15	Test Pit 5	T	15	3/13/07	ND<2.0	3.1	0.092	212	ND<1.0	ND<0.5
TP-5-19	Test Pit 5	T	19	3/13/07	ND<2.0	5.6	0.055	295	ND<1.0	ND<0.5

Table 2 - Total Metals and Inorganics Results for Soil Samples
Former Spring Hill Mine Site
APNs 35-260-62, 63 and 64
Grass Valley, California

Sample Number	Sample Location	Sample Type	Sample Depth (feet bgs)	Sample Date	Total Arsenic (mg/kg)	Total Lead (mg/kg)	Total Mercury (mg/kg)	Total Nickel (mg/kg)	Total Cyanide (mg/kg)	Total Nitrate (mg/kg)
TP-8-3	Test Pit 8	WR/SP	3	3/13/07	3.2	7.5	0.321	407	na	na
TP-8-6	Test Pit 8	WR/SP	6	3/13/07	6.2	5.0	0.243	296	na	na
TP-9-0.5	Test Pit 9	WR/SP	0.5	3/13/07	ND<2.0	16.8	0.139	1,290	na	na
TP-9-6	Test Pit 9	WR/SP	6	3/13/07	19.2	3.5	0.123	583	na	na
TP-10-8	Test Pit 10	WR/SP	8	3/13/07	2.1	2.2	0.283	585	na	na
TP-10-12	Test Pit 10	WR/SP	12	3/13/07	ND<2.0	70.2	0.127	940	na	na
TP-11-0.5	Test Pit 11	AS/NS	0.5	3/14/07	10.2	71.8	0.269	398	na	na
TP-12-0.5	Test Pit 12	AS/NS	0.5	3/14/07	8.2	15.3	0.432	421	na	na
TP-12-1.5	Test Pit 12	AS/NS	1.5	3/14/07	3.5	38.2	0.060	85.8	na	na
TP-13-2	Test Pit 13	WR/SP	2	3/14/07	ND<2.0	3.2	0.511	134	na	na
TP-13-4	Test Pit 13	WR/SP	4	3/14/07	ND<2.0	3.7	0.105	96.3	na	na
TP-14-0.5	Test Pit 14	WR/SP	0.5	3/14/07	ND<2.0	3.9	0.117	482	na	na
TP-14-2	Test Pit 14	WR/SP	2	3/14/07	4.2	4.9	0.065	206	na	na
TP-15-3	Test Pit 15	T	3	3/14/07	3.0	13.1	1.16	328	na	na
TP-15-5	Test Pit 15	T	5	3/14/07	2.0	4.2	0.030	238	na	na
TP-15-6	Test Pit 15	T	6	3/14/07	2.5	7.0	0.040	408	na	na
TP-16-0.5A	Test Pit 16	T	0.5	3/14/07	7.7	7.8	0.115	254	na	na
TP-16-1B	Test Pit 16	AS/NS	1	3/14/07	ND<2.0	4.1	0.054	709	na	na
TP-16-1C	Test Pit 16	WR/SP	1	3/14/07	ND<2.0	3.7	0.087	364	na	na
TP-17-4	Test Pit 17	T	4	3/14/07	6.4	5.7	0.070	197	ND<1.0	ND<0.5
TP-17-9	Test Pit 17	T	9	3/14/07	10.1	8.3	0.651	768	ND<1.0	ND<0.5
S-1	S-1	AS/NS	0.25	3/14/07	33.2	376	0.059	1,180	na	na
S-2	S-2	AS/NS	0.25	3/22/07	ND<1.0	65.9	0.166	121	na	ND<0.5
S-3	S-3	WR/SP	0.25	3/22/07	30.7	7.9	0.066	253	na	ND<0.5
S-4	S-4	WR/SP	0.25	3/22/07	ND<1.0	7.6	0.137	159	na	ND<0.5
S-5	S-5	WR/SP	0.5	3/22/07	ND<1.0	8.7	0.057	319	na	1.3
S-6	S-6	AS/NS	0.5	3/22/07	ND<1.0	50.0	0.105	796	na	1.6
S-7	S-7	WR/SP	0.5	3/22/07	ND<1.0	8.6	ND<0.010	142	na	0.5
S-8	S-8	AS/NS	0.5	3/23/07	25.5	341	0.507	685	ND<1.0	ND<0.5
S-9	S-9	AS/NS	0.25	3/23/07	50.2	76.6	1.29	111	ND<1.0	ND<0.5
S-10	S-10	AS/NS	0.25	3/23/07	579	418	8.69	400	ND<1.0	ND<0.5
TP-18-0.25	Test Pit 18	AS/NS	0.25	4/5/07	52.4	56.2	0.484	278	na	na
TP-18-1.0	Test Pit 18	AS/NS	1.0	4/5/07	18.3	12.3	0.108	182	na	na
TP-19-0.25	Test Pit 19	AS/NS	0.25	4/5/07	12.3	60.4	0.275	225	na	na
TP-19-0.75	Test Pit 19	AS/NS	0.75	4/5/07	ND<1.0	3.3	0.039	126	na	na
TP-20-0.25	Test Pit 20	AS/NS	0.25	4/5/07	ND<1.0	49.8	1.48	217	na	na
TP-20-1.0	Test Pit 20	AS/NS	1.0	4/5/07	4.6	18.4	8.38	174	na	na
TP-21-0.75	Test Pit 21	AS/NS	0.75	4/5/07	426	810	7.32	438	na	na
TP-21-1.5	Test Pit 21	AS/NS	1.5	4/5/07	ND<1.0	8.7	0.207	494	na	na
TP-22-0.25	Test Pit 22	AS/NS	0.25	4/5/07	52.3	196	3.76	239	na	na
TP-22-0.75	Test Pit 22	AS/NS	0.75	4/5/07	6.0	7.4	0.249	168	na	na
TP-23-0.25	Test Pit 23	AS/NS	0.25	4/5/07	271	69.5	0.964	104	na	na
TP-23-0.75	Test Pit 23	AS/NS	0.75	4/5/07	7.4	5.5	0.041	739	na	na

Table 2 - Total Metals and Inorganics Results for Soil Samples **Former Spring Hill Mine Site** APNs 35-260-62, 63 and 64 Grass Valley, California										
Sample Number	**Sample Location**	**Sample Type**	**Sample Depth (feet bgs)**	**Sample Date**	**Total Arsenic (mg/kg)**	**Total Lead (mg/kg)**	**Total Mercury (mg/kg)**	**Total Nickel (mg/kg)**	**Total Cyanide (mg/kg)**	**Total Nitrate (mg/kg)**
TP-24-0.25	Test Pit 24	AS/NS	0.25	4/5/07	7.6	11.0	0.109	614	na	na
TP-25-0.75	Test Pit 25	AS/NS	0.75	4/5/07	2.5	1.6	0.171	314	na	na
TP-25-1.5	Test Pit 25	AS/NS	1.5	4/5/07	3.0	ND<1.0	0.105	274	na	na
TP-27-0.5	Test Pit 27	T	0.5	4/5/07	3.5	3.1	0.040	348	na	na
TP-27-2.0	Test Pit 27	T	2.0	4/5/07	2.6	2.6	0.039	211	na	na
S-11	S-11	T	0.25	4/5/07	35.0	20.8	19.5	488	na	na

Notes:
bgs- below ground surface
mg/kg - milligrams per kilogram
ND<1.0 - not detected at or above indicated laboratory reporting limit
na - not analyzed
WR/SP - waste rock and spoils pile
T - tailings
AS/NS - soil affected by mining or processing activities and native soil

Analysis for total arsenic, lead and nickel by U.S. EPA Test Method 6010B
Analysis for total mercury by U.S. EPA Test Method 7471A
Analysis for total cyanide by U.S. EPA Test Method 9014
Analysis for total nitrate by U.S. EPA Test Method 300.0

Table 3 - Total Metals Results for Background Soil Samples **Former Spring Hill Mine Site** APNs 35-260-62, 63 and 64 Grass Valley, California							
Sample Number	**Sample Location**	**Sample Depth (feet bgs)**	**Sample Date**	**Total Arsenic (mg/kg)**	**Total Lead (mg/kg)**	**Total Mercury (mg/kg)**	**Total Nickel (mg/kg)**
BG-1	BG-1	0 - 0.5	5/20/03	ND<1.0	6.0	0.069	na
BG-2	BG-2	0 - 0.5	5/20/03	ND<1.0	9.1	0.140	na
BG-3	BG-3	0 - 0.5	5/20/03	17	13	0.066	na
BG-4	BG-4	0 - 0.5	10/11/05	ND<1.0	20.4	na	na
BG-5	BG-5	0 - 0.5	10/11/05	ND<1.0	6.8	na	na
BG-6	BG-6	0 - 0.5	10/11/05	ND<1.0	15.0	na	na
S-12	S-12	0.25	4/18/07	ND<1.0	5.0	na	1,620
S-13	S-13	0.25	4/18/07	ND<1.0	3.1	na	1,680

Notes:

bgs- below ground surface

mg/kg - milligrams per kilogram

ND< - not detected at or above indicated laboratory reporting limit

na - not analyzed

Analysis for total arsenic, lead and nickel by U.S. EPA Test Method 6010B

Analysis for total mercury by U.S. EPA Test Method 7471A

Analysis for total cyanide by U.S. EPA Test Method 9014

Analysis for total nitrate by U.S. EPA Test Method 300.0

Table 4 - Title 22 Metals Results for Soil Samples
Former Spring Hill Mine Site
APNs 35-260-62, 63 and 64
Grass Valley, California

Analyte (mg/kg)	Sample Identification									*Laboratory Reporting Limit (mg/kg)*	*Residential CHHSL (mg/kg)*	*Industrial CHHSL (mg/kg)*	*TTLC (mg/kg)*	*STLC (mg/L)*
	FND-S5	WR-S13	WR-S17	TP-5-10	TP-9-0.5	TP-15-3	S-1	S-10	TP-21-0.75					
Antimony	10.2	12.2	6.9	5.0	7.0	6.2	4.3	9.9	12.4	*1.0*	*30*	*380*	*500*	*15*
Arsenic	22.3	20.2	45.8	94.6	ND	10.6	27.6	377	302	*1.0*	*0.07*	*0.24*	*500*	*5*
Barium	7.1	9.5	12.5	5.5	11.1	4.0	48.3	103	71.7	*2.0*	*5,200*	*63,000*	*10,000*	*100*
Beryllium	ND<0.3	ND<0.3	ND<0.3	ND	ND	ND	ND	ND	ND	*0.5*	*150*	*1,700*	*75*	*0.75*
Cadmium	0.8	1.1	0.7	1.2	1.5	1.0	2.3	2.6	3.4	*1.0*	*1.7*	*7.5*	*100*	*1.0*
Chromium	26	55.3	26.3	39.1	20.8	60.4	962	43.2	85.9	*1.0*	*100,000*	*100,000*	*2500*	*560*
Hex. Chromium	na	na	ND	na	na	na	na	na	na	*0.001*	*17*	*37*	*500*	*5*
Cobalt	49.5	41.3	47.3	19.1	56.3	13.1	41.3	21.4	79.4	*5.0*	*660*	*3,200*	*8000*	*80*
Copper	17.9	94.2	26.2	31.2	36.6	11.8	72.0	235	467	*2.0*	*3,000*	*38,000*	*2500*	*25*
Lead	21.6	12.2	37.1	12.3	6.9	18.4	300	348	615	*1.0*	*150*	*3,500*	*1000*	*5*
Mercury	0.276	0.189	0.129	0.193	0.215	1.08	0.231	22.5	10.8	*0.010*	*18*	*180*	*20*	*0.2*
Molybdenum	ND	ND	ND	ND	ND	ND	3.7	1.1	ND	*1.0*	*380*	*4,800*	*3500*	*350*
Nickel	677	464	680	285	1,050	278	977	303	471	*1.0*	*1,600*	*16,000*	*2000*	*20*
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	*2.0*	*380*	*4,800*	*100*	*1.0*
Silver	ND	ND	ND	ND	ND	ND	ND	16.7	21.8	*2.0*	*380*	*4,800*	*500*	*5*
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	*2.0*	*5.0*	*63*	*700*	*7.0*
Vanadium	23.5	48.1	20.4	29.0	16.6	54.6	948	47.4	79.4	*2.0*	*530*	*6,700*	*2400*	*24*
Zinc	38.4	31.9	29.8	20.9	17.7	21.4	129	165	318	*2.0*	*23,000*	*100,000*	*5000*	*250*

Notes:
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
ND = Not detected at or above the laboratory reporting limit
CHHSL = California Human Health Screening Level
TTLC = Total threshold limit concentration
STLC = Soluble threshold limit concentration
na = Not analyzed

The laboratory reporting limit for mercury in sample S-10 was 0.050 mg/kg.

Table 5 - DI-WET Solubility Analysis Results **Former Spring Hill Mine Site** APNs 35-260-62, 63 and 64 Grass Valley, California					
Sample Number	Sample Date	DI-WET As (ug/L)	DI-WET Pb (ug/L)	DI-WET Hg (ug/L)	DI-WET Ni (ug/L)
WR-17	10/11/05	ND<10	ND<10	na	ND<10
FND-S5	10/25/05	ND<10	ND<10	na	ND<10
FND-S6	10/25/05	ND<10	ND<10	na	ND<10
TP-5-10	3/13/07	44.7	ND<6	ND<0.333	ND<10
TP-5-10*	3/13/07	ND<2.0	ND<1.2	na	32.7
TP-9-0.5	3/13/07	15.6	ND<6	ND<0.333	25.2
TP-15-3	3/14/07	15.1	ND<6	ND<0.333	ND<10
S-1	3/14/07	ND<10	ND<6	ND<0.333	48.1
S-10	3/23/07	26.1	9.3	ND<0.333	15.5
TP-21-0.75	4/5/07	26.5	11.6	ND<0.333	na
TP-2-6	3/13/07	11.3	1.4	na	4.5
TP-8-3	3/13/07	3.7	1.2	na	16.8
TP-8-6	3/13/07	6.3	ND<1.2	na	2.3
TP-9-6	3/13/07	24.7	ND<1.2	na	3.4
TP-13-2	3/14/07	3.4	1.4	na	10.9
TP-5-15	3/13/07	5.2	1.7	na	4.9
TP-15-5	3/14/07	ND<2.0	ND<1.2	na	6.2
TP-16-0.5A	3/14/07	ND<2.0	ND<1.2	na	10.5
TP-17-4	3/14/07	ND<2.0	ND<1.2	na	8.9
S-12**	4/18/07	ND<10.0	ND<6.0	na	58.5
S-13**	4/18/07	18.6	ND<6.0	na	26.2

Notes:

DI = Deionized water
WET = Waste Extraction Test
As = Arsenic
Pb = Lead
Hg = Mercury
Ni = Nickel
ug/L = micrograms per liter
ND< = Not detected above indicated laboratory reporting limit
na = Not analyzed
* = TP-5-10 was re-analyzed using lower reporting limits for As, Pb and Ni.
** = Background sample

The As, Pb and Ni analysis of the extract was conducted using EPA Test Method 6010B.
The mercury analysis of the extract was condcuted using EPA Test Method 7471.

Table 6 - Acid-Base Accounting Results **Spring Hill Property** APNs 35-260-62, 63 and 64 Grass Valley, California						
Sample Number	Sample Date	AGP Sulfide	AGP Total	NP	NP/Total AGP	pH
FND-S5	10/25/2005	0.9	1.9	180	94.7	9.14
WR-S17	10/11/2005	1.9	2.5	150	60.0	9.54
TP-8-6	3/13/2007	11	13	250	19.2	9.42
TP-17-4	3/13/2007	ND<0.3	ND<0.3	320	1066.7	9.77

Notes:

mg/kg = Milligrams per kilogram

AGP = Acid generating potential (tons/1000 tons)

NP = Neutralizing potential (tons/1000 tons)

Reporting limit used for non-detectable results to calculate NP/AGP.

Table 7a - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Surface Water for Current Site Conditions APNs 35-260-62, 63 and 64 Grass Valley, California			
Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	10	2 µg/L
Lead	2.0 µg/L[3]	10	2 µg/L
Mercury	1.2 µg/L[4]	10	1.2 µg/L
Nickel	12 µg/L[5]	10	12 µg/L

Notes:
1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water
µg/L = micrograms per liter

Table 7b - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Surface Water Proposed On Site Placement APNs 35-260-62, 63 and 64 Grass Valley, California			
Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	100	20 µg/L
Lead	2.0 µg/L[3]	100	20 µg/L
Mercury	1.2 µg/L[4]	100	12 µg/L
Nickel	12 µg/L[5]	100	120 µg/L

Notes:
1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water
µg/L = micrograms per liter

Table 8a - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Groundwater for Current Site Conditions APNs 35-260-62, 63 and 64 Grass Valley, California			
Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	10	2 µg/L
Lead	2.0 µg/L[3]	10	2 µg/L
Mercury	1.2 µg/L[4]	10	1.2 µg/L
Nickel	12 µg/L[5]	10	12 µg/L

Notes:
1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water
µg/L = micrograms per liter

Table 8b - Water Quality Goals, Attenuation Factors and Soluble Designated Levels (SDLs) for Groundwater Proposed On Site Placement APNs 35-260-62, 63 and 64 Grass Valley, California			
Constituent of Potential Concern	Water Quality Goal	Attenuation Factor	Calculated SDL[1]
Arsenic	2.0 µg/L[2]	100	20 µg/L
Lead	2.0 µg/L[3]	100	20 µg/L
Mercury	1.2 µg/L[4]	100	12 µg/L
Nickel	12 µg/L[5]	100	120 µg/L

Notes:
1 SDL (for extract of a solid waste constituent, mg/L) = Water Quality Goal (mg/L) x Environmental Attenuation Factor / 10 (DLM, Equation 4)
2 Laboratory quantitation limit (2.0 µg/L) is greater than California Public Health Goal for drinking water (0.004 µg/L)
3 California Public Health Goal for drinking water
4 California Public Health Goal for drinking water (non-methylmercury)
5 California Public Health Goal for drinking water
µg/L = micrograms per liter