Tuleyome, Inc.
607 North Street
Woodland, CA 95695

Iron Precipitate Characterization and Repository Design Basis for Corona and Twin Peaks Mercury Mines

Prepared by

Burleson Consulting, Inc.
950 Glenn Drive, Suite 245
Folsom, California 95630

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Acronyms and Abbreviations

amsl	above mean sea level
APN	Assessor's Parcel Number
Burleson	Burleson Consulting, Inc.
CCR	California Code of Regulations
CWA	Clean Water Act
DI WET	De-ionized Water Waste Extraction Test
DLM	Designated Level Methodology
EPA	Environmental Protection Agency
gpm	gallons per minute
mg/L	milligrams per liter
mg/kg	milligram per kilogram
RWQCB	Regional Water Quality Control Board
STLC	Soluble Threshold Limit Concentration
SWRCB	State Water Resources Control Board
TCLP	Toxicity Characteristic Leaching Potential
TMDL	Total Maximum Daily Load
TTLC	Total Threshold Limit Concentration
WET	Waste Extraction Test

1.0 Introduction

The Corona Mine is located in northern Napa County, California (Figure 1). As part of the Corona and Twin Peaks Mine Drainage Treatment Project, Tuleyome Inc. (Tuleyome) has requested that Burleson Consulting Inc. (Burleson) prepare this precipitate characterization and repository design basis for the Corona and Twin Peaks Mercury Mines. Iron-rich precipitate forms from drainage that flows from three locations at the site: Boilerhouse Portal and Drain Tunnel Outlet at the Corona Mine; and the Twin Peaks Portal at the Twin Peaks Mine (Figure 2). Drainage from the Boilerhouse Portal and Twin Peaks Portal currently discharges to infiltration trenches. The iron-rich precipitates accumulate slowly in each of the infiltration trenches. Iron rich precipitates at the Drain Tunnel currently accumulate on the bank and within the channel of Kidd Creek. This document describes the site, presents information to characterize the iron rich precipitates, describes site characteristics and classification of the iron rich precipitates, and describes a conceptual repository design based on the characterization and classification of the iron rich precipitates.

Project goals are to (1) render the project site safe for public use; and (2) support healthy aquatic ecosystems downstream in James Creek, Pope Creek, Lake Berryessa, lower Putah Creek, lower Yolo Bypass, and the Delta. Project objectives are to (1) improve the effectiveness of existing mine drainage treatment systems for the Boilerhouse and Twin Peaks portals; (2) minimize leaching and mobilization of nickel and acid drainage from the mined ore body through the Corona Drain Tunnel; and (3) address physical and chemical hazards on the site.

1.1 Report Organization

This report includes an Introduction (Section 1.0), Material Characterization (Section 2.0), Material Classification (Section 3.0), Conceptual Repository Design (Section 4.0), and References Cited (Section 5.0). The figures follow the text.

The following text provides a site description and background, operational history, and history of prior investigations, cleanups, and remediation activities.

1.2 Site Description & Background

The Corona Mine is located along Oat Hill Road within the East Mayacmas Mercury District (Yates et al., 1946). Corona Mine is in the northern portion of the project area and project features are predominantly located on parcels with assessor parcel numbers (APN) 016-020-035, 016-020-020, and 016-020-026. The site is at an elevation of about 1,900 feet above mean sea level (amsl) and the topography is relatively steep and forested. Mining features present include waste rock and tailings piles, portals, collapses, a drain tunnel, and up to 2 miles of underground mine workings.

In 1895, James McCauley and the Vallejo Quicksilver Mining Company opened the Corona Mine and operated it until 1906 (Bradley, 1981; Davey, 1895; Williams, 1895). He leased out the claim to various individuals and companies who worked

the mine in 1911, 1916, and from 1939-44 (Gould, 1929). Under Emerson's ownership, Hugh Ingle, Jr. leased and operated the mine from 1957 to 1972 (Swent, 2000). The Corona Claim was purchased by John Livermore in 1995 (Parker, 2012). The Corona Mine has one of the longest mining histories in the region and witnessed many changes in cinnabar mining and mercury extraction practices. These changes left their mark on the ground, from the stone and brick Scott Furnace built in 1901, to the tube and "D" retorts, and the Gould and Cottrell rotary furnaces of the 1930s and 1940s.

Geologic Setting. The project is located within the Coast Range geomorphic province of California. The Coast Ranges formed within a seismically active region at the western margin of North America. Active faults in the region include the Hunting Creek-Berryessa fault about 7 miles east of the project, the West Napa fault about 10 miles southeast of the project, and the Green Valley Fault about 12 miles southeast of the project. Figure 3 provides a geologic map for the project site. The project is located at the contact of Franciscan Complex sandstone in close proximity to Great Valley serpentinite (USGS, 2007). Other geologic units present near the project are Sonoma Volcanic rocks to the southwest and Great Valley sandstone to the southeast. The Franciscan Complex sandstone and Great Valley serpentinite are interpreted to be emplaced over Great Valley Sandstone southeast of the project by a thrust fault. The contacts between serpentinite and sandstone, and serpentinite and Sonoma Volcanic rocks are interpreted to be high angle faults (USGS, 2007). These faults are not identified as active (Napa County, 2007).

Hydrology. The project site is located upgradient to Kidd Creek and Bateman Creek in the headwaters of James Creek. James Creek is a tributary to Pope Creek which enters Lake Berryessa about 15 miles downstream from the project. Lake Berryessa drains to lower Putah Creek, which is diverted via canal to Solano County or flows into the Yolo Bypass and the Sacramento-San Joaquin River Delta. James Creek is listed as an impaired water body under the Clean Water Act (CWA) Section 303(d) Total Maximum Daily Load (TMDL) Program list due to nickel and mercury attributed to discharges from historical mercury mines (Central Valley Water Board, 2012).

Upstream from the Corona Drain Tunnel, Kidd Creek flows during the spring but is dry from mid-June through January depending on the quantity of precipitation. The Corona Drain Tunnel discharges directly to Kidd Creek, and is a significant water source during the dry season. The Corona Drain Tunnel discharge rate varies with higher flows in spring and lower flows in summer and fall. Flow rates estimated for the Corona Drain Tunnel range from about 15 gallons per minute (gpm) to 150 gpm.

Soil and Topography. The project area consists of steep rugged terrain along the north slope of Mt. St. Helena in the Mayacmas Mountains. Soils within the project area are a mix of those derived from the volcanic bedrock making up much of Mt. St. Helena and the Palisades and those derived from the serpentine bedrock that underlies much of the area. These soils support a mixed coniferous/hardwood forest with patches of chaparral and occasional meadows.

1.3 Description of Iron-Rich Precipitates and Objectives

Results from field investigations completed during 2003 and 2004 by the US Geological Survey, EnviroGeo during 2007, and Tuleyome during 2012 documented that the iron rich precipitate consists primarily of iron with some trace metals including chromium and nickel (USGS, 2007; EnviroGeo, 2007; Tuleyome, 2013).

Occurrence

Iron-rich precipitate forms from mine drainage at the site. The precipitates accumulate within infiltration trenches at the Boilerhouse Portal and Twin Peaks Portal, and on the bank of Kidd Creek at the Corona Drain Tunnel.

The volume of iron precipitate from the Boilerhouse Portal is estimated to be no more than 10 cubic yards per year, from the Twin Peaks Portal no more than 10 cubic yards per year, and from the Drain Tunnel Outlet to be no more than 25 cubic yards per year.

The iron-rich precipitate currently remains at these three locations. Precipitate at the infiltration trenches accumulates in the soil void spaces, eventually reducing the infiltration rate. Precipitate at the Corona Drain Tunnel accumulates on the bank of Kidd Creek where it is subject to erosion and transport downstream.

Objectives

The objective of this memorandum is to characterize the iron rich precipitate with respect to waste management criteria, classify the iron rich precipitate in consideration of site characteristics, and identify an appropriate long term on-site storage option for the iron precipitate.

2.0 Material Characterization

This section presents analytical data collected to characterize the iron-rich precipitates.

Composite samples of iron precipitate were collected on September 1, 2016 from the Boilerhouse infiltration trench, Twin Peaks infiltration trench, and the Drain Tunnel. The samples were analyzed for Total Threshold Limit Concentration (TTLC) metals, Toxicity Characteristic Leaching Potential (TCLP) metals, and Soluble Threshold Limit Concentrations (STLC) for metals using the California Waste Extraction Test (WET) by CLS Labs, Rancho Cordova, California (ELAP No. 1233) and Acid/Base Accounting and Sulfur Forms by SVL Analytical, Kellogg, Idaho (ELAP No. 2080). Analytical results are provided in Attachment 1 and summarized in Tables 1 through 3 following the text and Table 4 below.

2.1 Analytical Results

Samples were analyzed for total metals and leachable metals for comparison with federal and California waste classification thresholds. Each sample was also analyzed for acid-base account to assess the likelihood for acid formation.

Total Threshold Limit Concentration

Total metal concentrations are compared with the TTLCs to determine whether the material is considered a hazardous waste. All metals were detected below their respective TTLCs in the iron precipitate samples. Thus, the iron precipitate is not considered hazardous under federal or California regulations based on metal content.

Toxicity Characteristic Leaching Potential

TCLP is evaluated to determine if a material is hazardous under federal regulations due to the mobility of hazardous substances. A leachate is prepared from the material of interest and analyzed for the hazardous substances. The resulting leachate concentrations are compared to the TCLP limits to assess the material (Table 2). All metals were detected below their respective TCLP levels in leachates prepared from the iron precipitates. Thus, the iron precipitate is not considered hazardous under federal regulations based on leachable metal content.

Solubility Threshold Limit Concentration

STLC is evaluated to determine if a material is hazardous under California regulations due to the mobility of hazardous substances. A leachate is prepared from the material of interest and analyzed for the hazardous substances. The resulting leachate concentrations are compared to the STLC limits to assess the material (Table 2). All metals in WET extracts from samples from the Twin Peaks infiltration trench and Drain Tunnel were below the STLC. Only total chromium in the sample from the Boilerhouse infiltration trench exceeded the STLC, all other metals in the Boilerhouse infiltration trench material were below the STLC.

De-ionized Water Waste Extraction Test

De-ionized Water Waste Extraction Test (DI WET) assesses the mobility of hazardous substances in a material under ambient conditions when exposed to infiltrating water such as rainfall or runoff. DI WET concentrations are compared with water quality criteria protective of beneficial uses to assess potential water quality impacts from the material (Table 3). DI WET concentrations for nickel exceeded the maximum contaminant level for nickel in iron precipitates at the Boilerhouse Portal, Twin Peaks Portal, and Drain Tunnel. DI WET concentrations for mercury exceeded the California Toxics Rule Fresh Water level protective of Human Health in iron precipitates at the Boilerhouse Portal and Twin Peaks Portal. DI WET concentrations for cobalt exceeded the agricultural water quality limit in iron precipitates at the Boilerhouse Portal and Twin Peaks Portal. DI WET concentrations for all other metals were below water quality criteria.

Acid Base Account

Acid base account analysis allows evaluation of the waste characteristics with respect to acid generation via comparison of the acid neutralization potential with the acid generation potential. In general, acidic conditions may favor the mobility of metals. Each of the samples has a negative acid base account indicating that the material could generate acid. In addition, the neutralization potential:acid generation potential ratio is less than three in each sample (according to the DLM at ratios below 3, the material is considered to be potentially acid generating). These results are summarized in Table 4.

Table 4: Iron Precipitate Acid Base Account

Location	Acid Neutralization Potential (ANP)	Acid Generation Potential (AGP)	ANP-AGP	ANP:AGP
Boilerhouse Portal	5.5	9.1	-3.6	0.6
Twin Peaks Portal	<0.3	14.0	-14	<0.01
Drain Tunnel Outlet	<0.3	23.5	-23.5	<0.006

Note: All values in T $CaCO_3$/kT or lb $CaCO_3$/T

2.2 Characterization

Iron rich precipitate at each source may generate acidic conditions when wet. Total and leachable metal concentrations in Drain Tunnel Outlet and Twin Peaks Portal precipitates were below hazardous waste criteria and considered non-hazardous. The leachable total chromium concentration in Boilerhouse Portal precipitates exceeded the STLC and this material may be considered a California Hazardous Waste.

Cobalt, mercury, and nickel concentrations in DI WET leachate prepared from iron rich precipitate from the Boilerhouse Portal and Twin Peaks Portal exceeded water quality criteria protective of beneficial uses.

Nickel concentrations in DI WET leachate prepared from iron rich precipitate from the Drain Tunnel Outlet exceeded water quality criteria protective of beneficial uses.

These characterization data are used in consideration of site characteristics in Section 3 to classify the iron rich precipitate in accordance with California Code of Regulations (CCR) Division 2, Title 27, Chapter 7 Subchapter 1, Article 1 State Water Resources Control Board (SWRCB) – Mining Waste Management Regulations. The proposed classification is then used to provide a basis for design of an on-site repository for storage of the iron precipitates.

3.0 Iron Rich Precipitate Classification

3.1 Mine Waste Classification Regulations

Mine waste classification in accordance with the CCR Division 2, Title 27, Chapter 7 Subchapter 1, Article 1 SWRCB – Mining Waste Management Regulations, is as follows:

(1) Group A — mining wastes of Group A are wastes that must be managed as hazardous waste pursuant to Chapter 11 of Division 4.5, of Title 22 of this code, provided the Regional Water Quality Control Board (RWQCB) finds that such mining wastes pose a significant threat to water quality;

(2) Group B — mining waste of Group B are either:

(A) mining wastes that consist of or contain hazardous wastes, that qualify for a variance under Chapter 11 of Division 4.5, of Title 22 of this code, provided that the RWQCB finds that such mining wastes pose a low risk to water quality; or

(B) mining wastes that consist of or contain nonhazardous soluble pollutants of concentrations which exceed water quality objectives for, or could cause, degradation of waters of the state; or

(3) Group C — mining wastes from Group C are wastes from which any discharge would be in compliance with the applicable water quality control plan, including water quality objectives other than turbidity.

Chapter 7 Subchapter 1, Article 1 22470 describes exemptions from certain provisions of Article 1 requiring liners, leachate control systems, and monitoring systems based on no/little/poor groundwater:

(c) Exemptions Based on No/Little/Poor G.W. — The RWQCB can exempt a Group A or B (see §22480 of Article 7) Mining Unit from certain provisions of this article if a comprehensive hydrogeologic investigation demonstrates that:

(1) there are only very minor amounts of groundwater underlying the area; or

(2) the discharge is in compliance with the applicable water quality control plan; and

(3) either natural conditions or containment structures will prevent lateral hydraulic interconnection with natural geologic materials containing ground water suitable for agricultural, domestic, or municipal beneficial uses. There is no detectable vertical hydraulic interconnection between the natural geologic materials underlying the Unit and natural geologic materials containing such ground water.

The Designated Level Methodology (DLM) (RWQCB, 1989, Page 23) notes that mine wastes may be capable of generating acidic conditions leading to increased mobility of metals. The DLM notes that the neutralization and acid generation potential of mine waste should be measured to determine which test (WET vs DI WET) best represents the waste behavior in a repository. The DLM states that mine waste with an NP:AGP < 3 should be represented using the WET leachate concentrations, and that mine waste with an NP:AGP>3 could be represented using the DI WET leachate concentrations.

Chapter 5 of the DLM states that hazardous waste management regulations of CCR Title 22 determine the boundary between Group A and Group B mining wastes, and that the DLM may be used to determine the boundary between Group B and Group C mining wastes. The DLM also considers site characteristics.

3.2 Site Characteristics

Geology

The site is underlain by Franciscan sandstone and shale, silica carbonate rock, and serpentinite. Serpentinite and silica carbonate rock underlay very steep slopes at the site and are known to host rare plants. For this reason, an area of the site underlain by Franciscan rock should be selected for the repository.

No active faults are known to be present at the site (the Franciscan-serpentinite contact is an ancient fault zone).

The proposed repository location is underlain by Franciscan sandstone containing abundant calcite veinlets and calcite. Thus, the natural geologic materials are capable of neutralizing acidic solutions.

The site is not located within a groundwater basin identified by California Department of Water Resources or Napa County. No groundwater basins used to provide drinking water or agricultural irrigation water are known to underlie the site. Site groundwater occurs along fractures and in associated pore spaces in bedrock. Site groundwater is captured by the Drain Tunnel, thus any infiltrating water would flow to the Drain Tunnel outlet. Treatment of discharge from the Drain Tunnel is part of ongoing work

Mine Drainage

Corona Mine acid drainage forms in contact with mineralized rock in the underground mine workings and is in contact with the iron precipitates in the infiltration trench. The iron precipitate forms as iron and other metals precipitate from this acid drainage. Samples of the acid drainage in contact with the iron precipitate contain from 0.00099 to 0.0283 milligrams/liter (mg/L) of total chromium. The mine drainage contains significantly less chromium than the WET extract and likely is more representative of any leachate that could form from the dried iron precipitates than the WET extract. In addition, acid drainage at the Drain Tunnel that receives infiltrating acid drainage from the Boilerhouse contains from 0.00376 to 0.028 mg/L total chromium. Acid drainage at the site contains total chromium below the drinking water maximum contaminant level (MCL). Chromium is not mobilized from the iron precipitates by acid drainage at the site.

Chromium in iron precipitate at the Boilerhouse Portal is not mobilized at significant concentrations, even when exposed to infiltrating acid drainage under site conditions. The Boilerhouse acid drainage contains chromium below the MCL despite fully saturating the iron precipitate present in the adit and infiltration trenches. In further support of this conclusion, total chromium was reported a below detection limits (<20 micrograms per liter [µg/L]) in a DI WET extract solution prepared from the iron precipitate. The DI WET extract is believed to reflect the concentration expected when precipitation infiltrates the iron precipitate.

Attenuation

DI WET extracts from iron precipitate at the Boilerhouse Portal and Twin Peaks Portal contained cobalt, mercury, and nickel above concentrations protective of beneficial use. The DI WET extract from iron precipitate at the Drain Tunnel Outlet contained nickel above the MCL. Estimation of attenuation factors using VZCOMML software based on site soil and hydrology characteristics showed that the attenuation factor of about 10 is sufficient to prevent water quality degradation by cobalt and mercury in iron precipitate from the Boilerhouse Portal and Twin Peaks Portal, and nickel in iron precipitate from the Twin Peaks Portal and Drain Tunnel Outlet.

Thus, only nickel in iron precipitate from the Boilerhouse Portal poses a potential threat to water quality based on the DI WET extract.

3.3 Iron Rich Precipitate Classification

The iron precipitates are classified with respect to Chapter 15 Article 7 Chapter 7, Subchapter 1, Mining Waste Management. Chapter 15 §22480 defines mining wastes and waste groups.

Iron precipitate from the Twin Peaks infiltration trench and Drain Tunnel are not hazardous, and pose no threat to water quality under site conditions, and are classified as a Group C waste.

The chromium concentration of the Boilerhouse iron precipitate is 210 mg/kg, less than 10 percent of the 2,500 mg/kg TTLC hazardous waste criteria. The chromium STLC is 5 mg/L, and the Boilerhouse STLC WET extract chromium concentration was 5.4 mg/L. Thus, the Boilerhouse iron precipitate only slightly exceeds the STLC hazardous waste criteria. DI WET extracts were also prepared and chromium was not detected in this extract (< 20 µg/L compared with the MCL of 50 µg/L).

In addition to the STLC extract, at the Corona Mine, acid drainage forms in contact with mineralized rock in the underground mine workings and is in contact with the iron precipitates in the infiltration trench. The iron precipitate forms as iron and other metals precipitate from this acid drainage. Samples of the acid drainage in contact with the iron precipitate contained from 0.00099 to 0.0283 mg/L of total chromium. The mine drainage contains significantly less chromium than the WET extract and likely is more representative of any leachate that could form from the dried iron precipitates than the WET extract. In addition, acid drainage at the Drain Tunnel that receives infiltrating acid drainage from the Boilerhouse trench contains from 0.00376 to 0.028 mg/L total chromium. Acid drainage at the site contains total chromium below the MCL. Results indicate that chromium is not mobilized from the iron precipitates by acid drainage at the site.

Total chromium in iron precipitate at the Boilerhouse Portal is not mobilized at significant concentrations, even when exposed to infiltrating acid drainage under site conditions. The Boilerhouse acid drainage contains total chromium below the MCL despite fully saturating the iron precipitate present in the adit and infiltration trenches. DI-WET extract does not contain detectable total chromium.

Iron precipitate from the Boilerhouse infiltration trench may be characterized for off-site management as hazardous due to the detection of chromium slightly above the STLC. However, when maintained at the site under ambient conditions, the iron precipitate from the Boilerhouse Portal is non-hazardous (only very low total chromium detected in acid drainage at the site and total chromium below detection limits in DI-WET extracts).

This material originates as a result of mining activities, and is subject to exemptions from hazardous waste management (22CCR66261.4 (b)(5)).

Iron precipitate from the Boilerhouse Portal and infiltration trench is classified in accordance with §22480(c)(1) as a Group C waste under site conditions because this material contains only low concentrations of hazardous constituents; analytical data shows that chromium is not mobilized under acidic site conditions.

While nickel in the DI WET extract exceeded the MCL, this test was conducted in the acid forming material. If the iron precipitates from the Boilerhouse Portal are mixed with ground calcite to prevent acid generation, threats to water quality associated with the AGP and nickel would be mitigated further, thereby minimizing the need to install waste containment structures §22480(d).

If iron rich precipitate is maintained at the site, in a location isolated from surface water, and protected from surface run on and infiltration, this material would be expected to pose very little threat to water quality. Such protection would also prevent direct contact, further reducing any hazards.

3.3 Recommendations

Iron precipitates from the Twin Peaks infiltration trench and Corona Drain Tunnel should be managed in an on-site location where the material is protected from run-on, erosion is prevented, and runoff is controlled to prevent entering surface water. The material should be collected during the summer months, allowed to air dry, and placed at the storage location. After placement, the material would be covered with iron precipitates from the Boilerhouse infiltration trench. Managed in this way, iron precipitates from the Twin Peaks infiltration trench and Corona Drain Tunnel should be classified as a Group C waste.

Iron precipitate from the Boilerhouse infiltration trench currently remains in the infiltration trench where it is wet. Removing this material would result in allowing it to dry, thereby reducing the likelihood that chromium would be mobilized. Drying and segregation onsite is expected to stabilize the chromium so that it is no longer mobile. Further stabilization would be achieved by mixing agricultural lime (ground calcite) with the iron precipitate at a rate of about 25 pounds of lime per ton of precipitate. This is expected to neutralize the precipitate and prevent leaching of the chromium. Removing the mobility of the chromium would result in removing the hazard and the material would be considered a Group C waste. This material should be managed onsite in an area where the material is protected from run-on, erosion is prevented, and runoff is controlled to prevent entering surface water. Managed in this way, iron precipitates from the Boilerhouse infiltration trench should be classified as a Group C waste.

4.0 Iron-Rich Precipitate Repository

A repository should be constructed on-site at the location shown on Figure 2. Iron precipitate from the Boilerhouse Portal should be collected and allowed to air dry, and then mixed with crushed calcite and placed on top of iron precipitates from Twin Peaks infiltration trench and the Drain Tunnel. The dry material should be covered with top soil removed during preparation of the repository.

Table 5 summarizes site characteristics with respect to CCR Title 27 siting requirements, and Table 6 summarizes design considerations for an on-site Group C repository to contain the iron precipitates from the Boilerhouse Portal, Twin Peaks Portal, and Drain Tunnel.

Table 5. Site Characteristics, Group C Repository for Iron Precipitates

Group C Mining Unit Requirements	Site Characteristics
20260(a) Adequate Separation from waters of the State	The repository location is at least 250 feet from the nearest drainage and is located about 400 feet above the groundwater surface.
20260(b) Size of landfill	About 40 feet by 300 feet by 5 feet.
20260(b) Hydraulic conductivity and transmissivity of underlying soils	The hydraulic conductivity of underlying soils is about 3.5×10^{-4} cm/sec. Underlying bedrock is fractured and consists of limited domains of higher hydraulic conductivity separated by wider domains

Group C Mining Unit Requirements	Site Characteristics
	of much lower hydraulic conductivity. Springs with very low year-round flow rates of a few gallons per minute, and drying of the local streams each spring show that the permeable zones are limited in extent, and transmissivity of underlying bedrock is believed to be very low.
20260(b) Background quality of ground water	Springs in the area are of generally high quality.
20260(b) Current and anticipated use of the groundwater	Groundwater is not used, groundwater flows to nearby Kidd Creek
20260(b) Annual Precipitation	Annual precipitation at the site is about 45 inches per year (Napa County isohyetal map).
22490(a) Not on Holocene Faults	The project is not known to be located on a Holocene fault. The nearest active fault is the Hunting Creek-Berryessa Fault about seven miles east of the project
22490(a) Outside Area of Rapid Geologic Change	The repository is on a gently sloping area outside the limits of any known landslides, and at least 250 feet from the nearest drainage course.
22490(b) Flooding: Table 1.2 precludes increased sediment in surface water	Slopes between the repository and surface water or dry drainages are well vegetated. Storm water runoff will be diverted away from the repository. Erosion control BMPs and vegetation will be used to prevent erosion of the interim and final cover respectively.

Table 6. Design Considerations, Group C Repository for Iron Precipitates

Group C Mining Unit Requirements	Site Characteristics
20260(c) flooding-designed and constructed to prevent inundation or washout due to flows with a 100 year return period.	The site is not located within a floodplain and is located on a flat ridge between dry surface drainage courses.
20365(f) resist erosion from 100 year 24 hour storm	• A berm will direct surface runoff away from the repository. • A compacted soil cover will be emplaced by October 1 each year • BMPs such as netting, straw mulch, and straw wattles will be used to protect the soil cover from erosion. • Vegetation will be used to stabilize the final cover.
20370(a) withstand probable maximum earthquake	The peak ground shaking anticipated to be experienced at the project area due to movement along active faults in the region is acceleration from 0.318 to 0.365 of gravity (California Geological Survey 2012). A geotechnical evaluation at the site found that slopes less than 20 degrees are expected to remain stable under these conditions. The repository slopes will be constructed to be less than 20 degrees.
22480(d) Treatment	Treatment to neutralize the iron precipitate will consist of mixing the Boilerhouse portal precipitates with agricultural lime (crushed calcite) at a rate of 25 pounds crushed calcite per ton of iron precipitate before disposal in the repository.
22510(a) Closure Performance Standard	The closed repository will be vegetated with native plants, and public access will be restricted through use of fences, gates, and signs.
22510(b) Plan	Closure of the repository will be conducted in accordance with the Corona and Twin Peaks Operations, Maintenance, and Monitoring Plan that is being prepared.
22510(h) Ending Post-Closure	The Regional Board will determine that the waste no longer poses a threat to water quality before the post closure maintenance period ends.

Group C Mining Unit Requirements	Site Characteristics
22510(i) Vegetation	Native vegetation will be used to stabilize the final cover. Native vegetation will not require irrigation and will minimize infiltration by transpiring infiltrating precipitation.
22510(m) Erosion and Sedimentation Protection	The repository will be protected from sheet wash through construction and maintenance of a berm. Erosion control best management practices (straw, netting, wattles, etc.) will be used to prevent erosion of the cover prior to establishing vegetation. Native plants will be established to prevent erosion of the final cover.

This method of storage would ensure that all of the iron precipitate is sequestered from the environment and minimize the likelihood that leachate would be created. Any leachate would be expected to infiltrate into the Franciscan Formation and encounter calcite that would provide additional acid buffering capacity and prevent the migration of chromium or nickel to groundwater or surface water. Conceptual design for the repository are shown in Figure 4.

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Tables

(3 Pages)

Table 1: Iron Precipitate TTLC Metals
Corona and Twin Peaks Mines
Napa County, California

Sample Location	Sample Number	Sample Description	TTLC Metals (mg/kg wet weight)															
			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Corona and Twin Peaks Mines	160901 BHO	Boiler House Outlet	8	<1.0	6	<1.0	1.8	210	3.7	420	<2.5	1.8	<1.0	84	<2.5	<1.0	<1.0	16	24
	160901 TPO	Twin Peaks Outlet	4.2	1.2	2.7	<1.0	1.7	83	22	410	<2.5	4.9	<1.0	180	<2.5	<1.0	<1.0	5.2	42
	160901 DTO	Drain Tunnel Outlet	3.3	<1.0	1.7	<1.0	1.8	25	<1.0	430	<2.5	<0.10	<1.0	70	<2.5	<1.0	<1.0	2.4	26
Total Threshold Limit Concentration	TTLC Metals - Californai Hazardous Waste Criteria, CCR Title 22, Section 66261.24		500	500	10,000	75	100	2,500	8,000	2,500	1,000	20	3,500	2,000	100	500	700	2,400	5,000

Key:
mg/kg = milligrams per kilogram

Table 2: Iron Precipitate TCLP and STLC Metals
Corona and Twin Peaks Mercury Mines
Napa County, California

Sample Location	Sample Number	Sample Description/Material Type	TCLP Metals (mg/L)								STLC Metals (WET-citrate) (mg/L)																
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Corona and Twin Peaks Mines	160901BHO	Boiler House Outlet	<0.50	<0.50	<0.10	<0.50	<0.50	<0.010	<0.50	<0.50	<0.50	<0.50	0.9	<0.10	<0.10	5.4	<0.50	0.62	<0.50	<0.050	<0.50	3.3	**<0.50**	**<0.10**	**<0.25**	**<0.50**	1.1
	160901TPO	Twin Peaks Outlet	<0.50	0.54	<0.10	<0.50	<0.50	<0.010	<0.50	<0.50	<0.50	<0.50	<0.50	<0.10	<0.10	0.92	0.66	<0.50	<0.50	<0.050	<0.50	4.3	**<0.50**	**<0.10**	**<0.25**	**<0.50**	0.71
	160901DTO	Drain Tunnel Outlet	<0.50	<0.50	<0.10	<0.50	<0.50	<0.010	<0.50	<0.50	<0.50	<0.50	<0.50	<0.10	<0.10	<0.50	<0.50	<0.50	<0.50	<0.050	<0.50	0.95	**<0.50**	**<0.10**	**<0.25**	**<0.50**	<0.50
Toxicity Characteristic Leaching Procedure Soluble Threshold Limit Concentration	TCLP Metals - Federal Hazardous Waste Criteria, CFR Title 40, part 261.24 STLC Metals (WET) - California Hazardous Waste Criteria, CCR Title 22, section 66261.24		5.0	100.0	1.0	**5.0**	**5.0**	**0.2**	**1.0**	**5.0**	**15.0**	**5.0**	**100**	**0.75**	**1.0**	**5.0**	**80.0**	**25**	**5.0**	**0.2**	**350**	**20**	**1.0**	**5.0**	**7.0**	**24.0**	**250**

Key:
cy = Cubic yard
mg/L = Milligrams per liter
NA = Not analyzed
NL = No Limit
Exceeds limit concentration

Soil volume was estimated by considering a one-foot layer within a 25-feet radius around each around each furnace or retort.

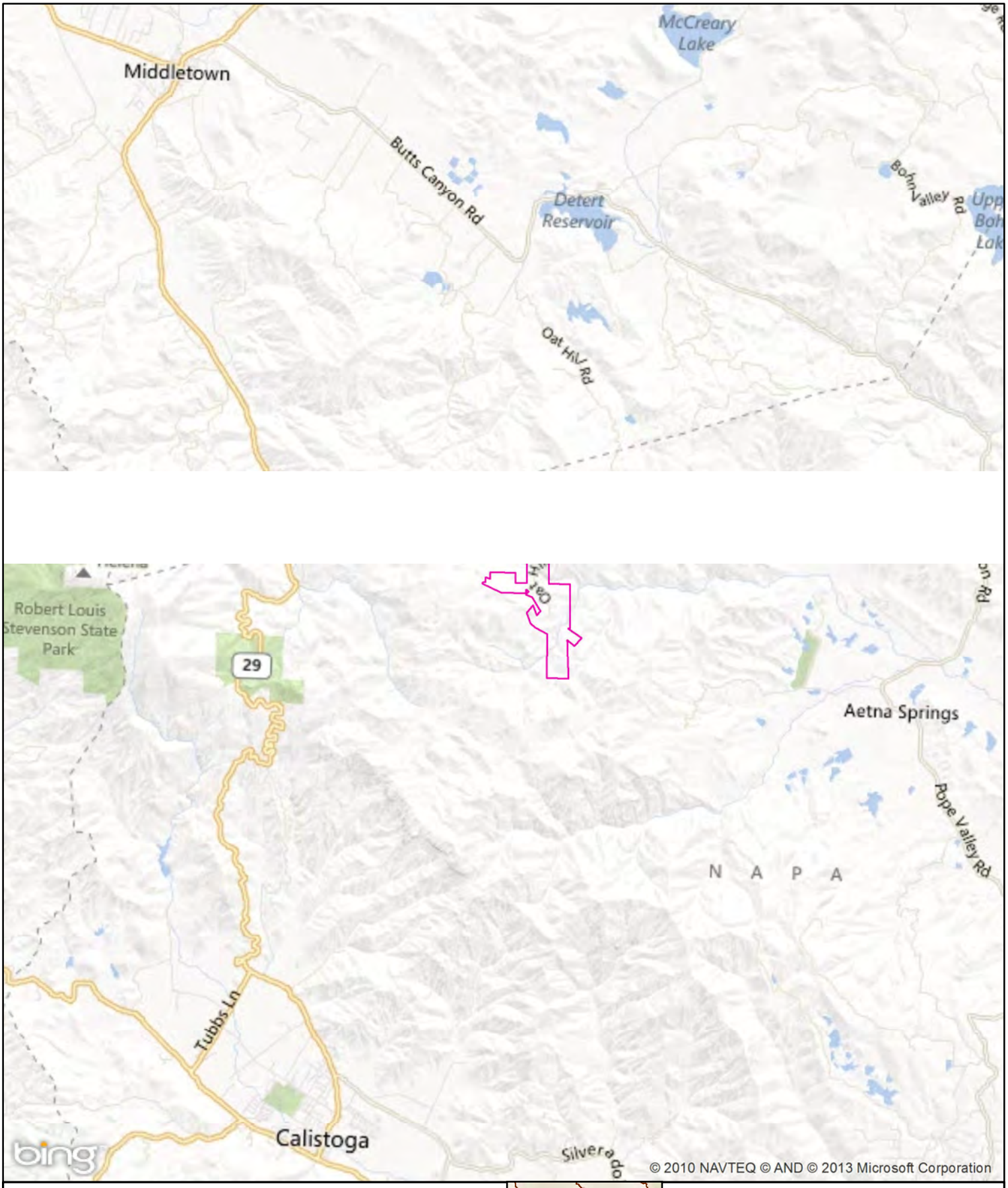
Table 3: Iron Precipitate DI WET Metals
Corona and Twin Peaks Mercury Mines
Napa County, California

Sample Location	Sample Number	Sample Description	STLC (WET-DI water)(ug/L)															
			Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenu	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Corona and Twin Peaks Mines	160901BHO	Boiler House Outlet	<50	<5	120	<10	<10	<20	120	<20	<5	0.059	<20	2,900	<5	<5	<5	<20	66
	160901TPO	Twin Peaks Outlet	<50	<5	<20	<10	<10	<20	56	<20	<5	0.15	<20	960	<5	<5	<5	<20	28
	160901DTO	Drain Tunnel Outlet	<50	<5	<20	<10	<10	<20	<20	<20	<5	<0.050	<20	730	<5	<5	<5	<20	22
Water Quality Numeric Criteria			6.0	10	1,000	4.0	5.0	50	50	27	9.8	0.05	10	100	5	31	1.7	100	350
			MCL	MCL	MCL	MCL	MCL	MCL	Ag WQ Limit	CTR-Fresh AL	CTR-Fresh AL	CTR-Fresh HH	Ag WQ Limit	MCL	CTR-Fresh AL	CTR-Fresh AL	CTR-Fresh HH	Ag WQ Limit	CTR-Fresh AL

Notes:
AgWQ = Agricultural Water Quality Limit
AWQC = Ambient Water Quality Criteria
CTR = California Toxic Rule
DI WET = Deionized Waste Extraction Treatment
HH = Human Health
MCL = Maximum Contamination Level
µg/L = micrograms per liter
= Result exceeds screening level

Figures

(4 Pages)



Legend

John Livermore Property

0 0.5 1 2

Miles

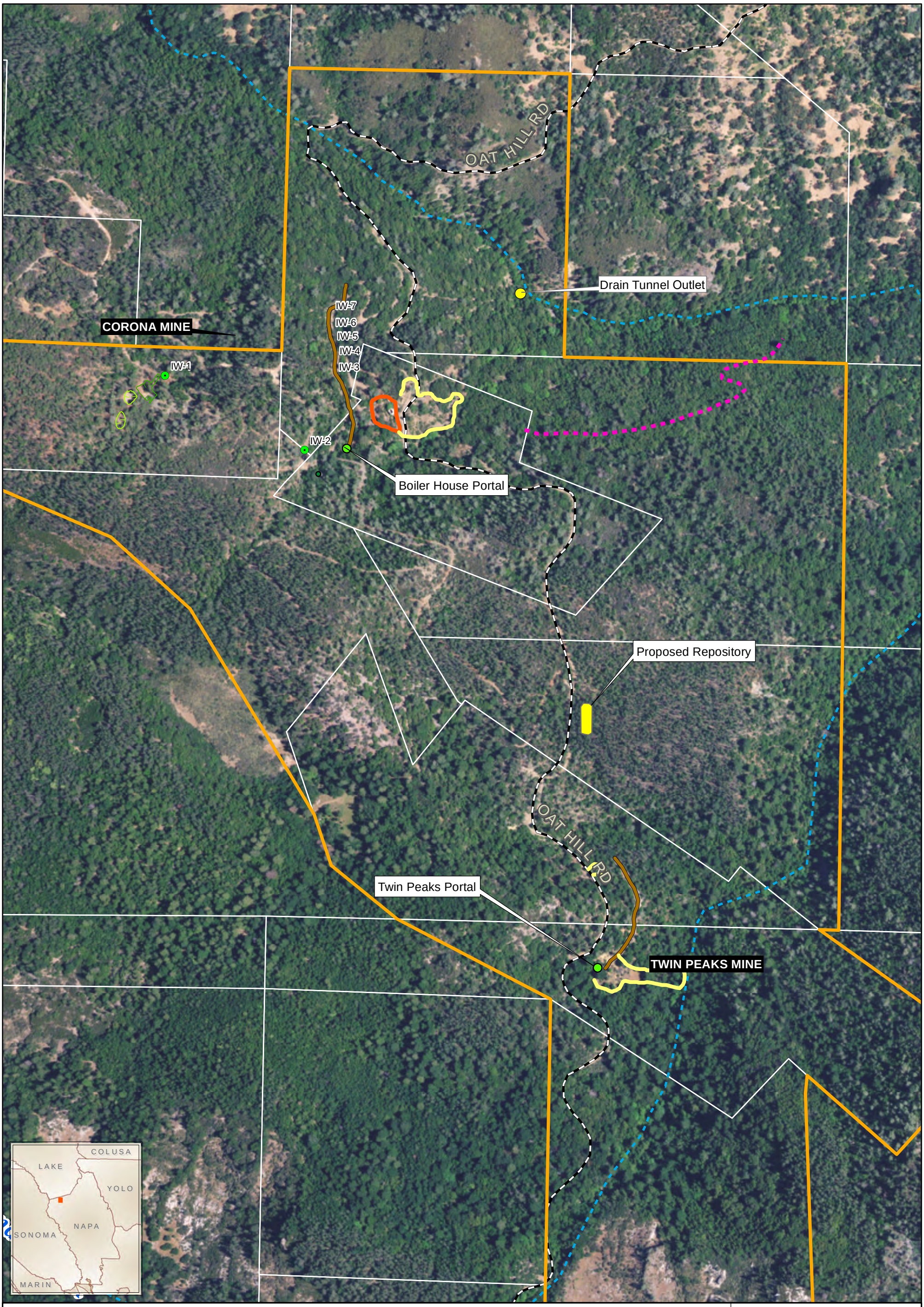
Corona Mine & Twin Peaks Mine

Figure 1 - Site Location

Source: Bing Maps roadways web mapping service; Napa County GIS Department 2012.

Burleson Consulting, Inc.

Path: S:\GIS\Projects\Corona - Twin Peaks Mine\CTP 06-06-2012 Figure 1 - Site Location Map.mxd



Legend

- Proposed Repository
- Historic Ore Processing Area
- Collapse Feature
- Pit
- Access Path
- Existing Trench
- Approximate Limit of Mine Waste
- IW-1
- IW-2
- Drain Tunnel Portal
- Portal
- Trust Property
- Parcels
- 50ft Contour
- Roads
- Creeks

0 165 330 660

Feet

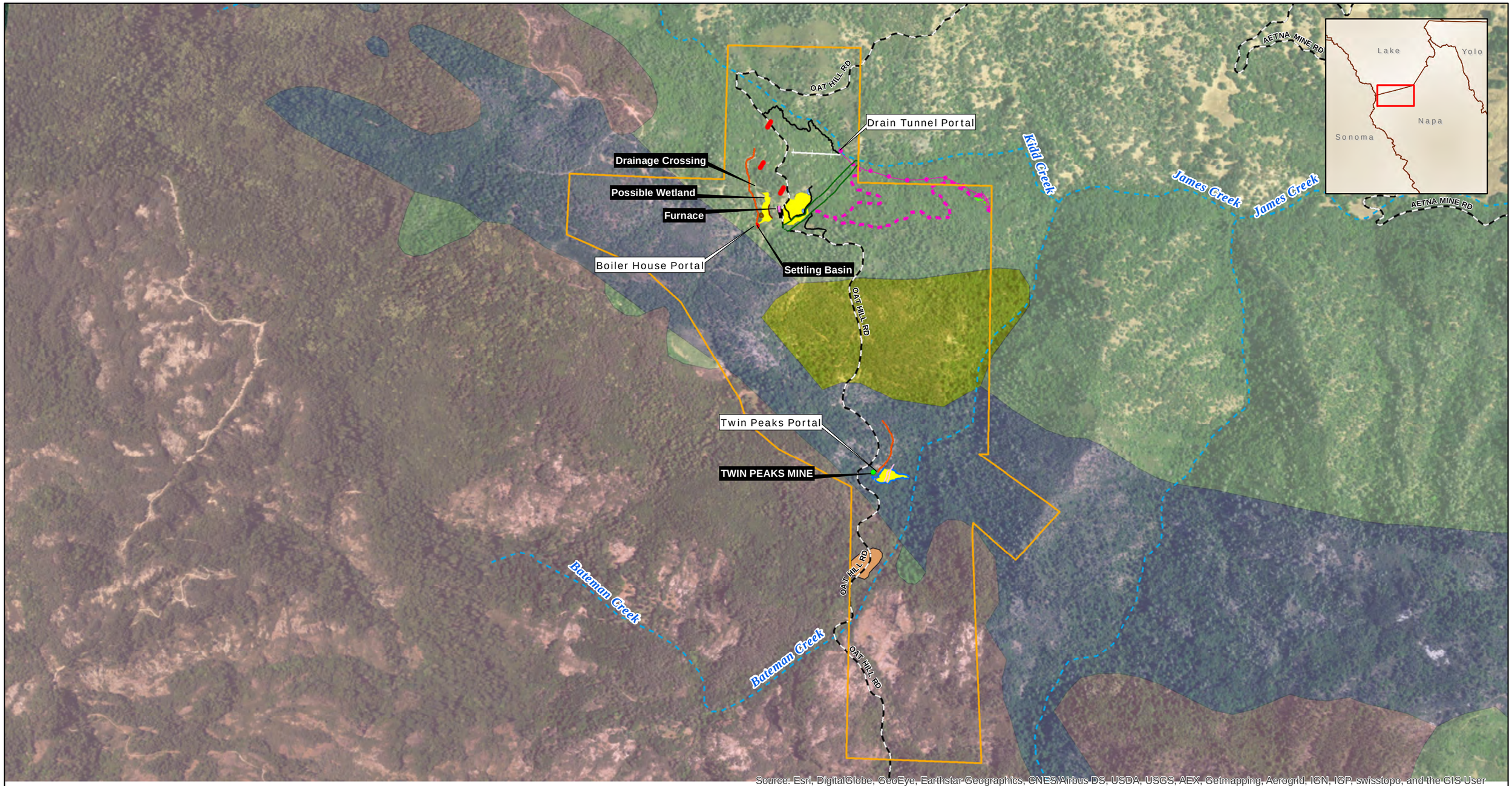
Corona Mine

Figure 2 - Site Features

Source: ESRI Data Server 2016; Burleson Consulting 2012; Napa County GIS Department

Burleson Consulting, Inc.

Path: S:\GIS\Projects\Corona_Mine_II\Figure 2 Proposed Repository Upper Corona.mxd



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- John Livermore Property
- Roads
- Creeks
- Future Gate
- Bench
- Slope Area
- Existing Path
- Timber Wall
- Drainage
- Existing Path
- Existing Rail Track Line
- Future Spoils Storage
- Riparian Area
- Future Settling Basin
- Future Trench
- Future Access Path
- Future Pipeline
- Future Fence
- Existing Trench
- Settling Basin
- Hunters Camp
- Mine Waste

Geologic Types

- Jsp - Great Valley Complex serpentinite
- KJfs - Franciscan Complex sedimentary rocks
- Qsl - Hillslope Deposits
- Tpmv - Sonoma Volcanic rocks

N

0 500 1,000 2,000

Feet

Corona Mine

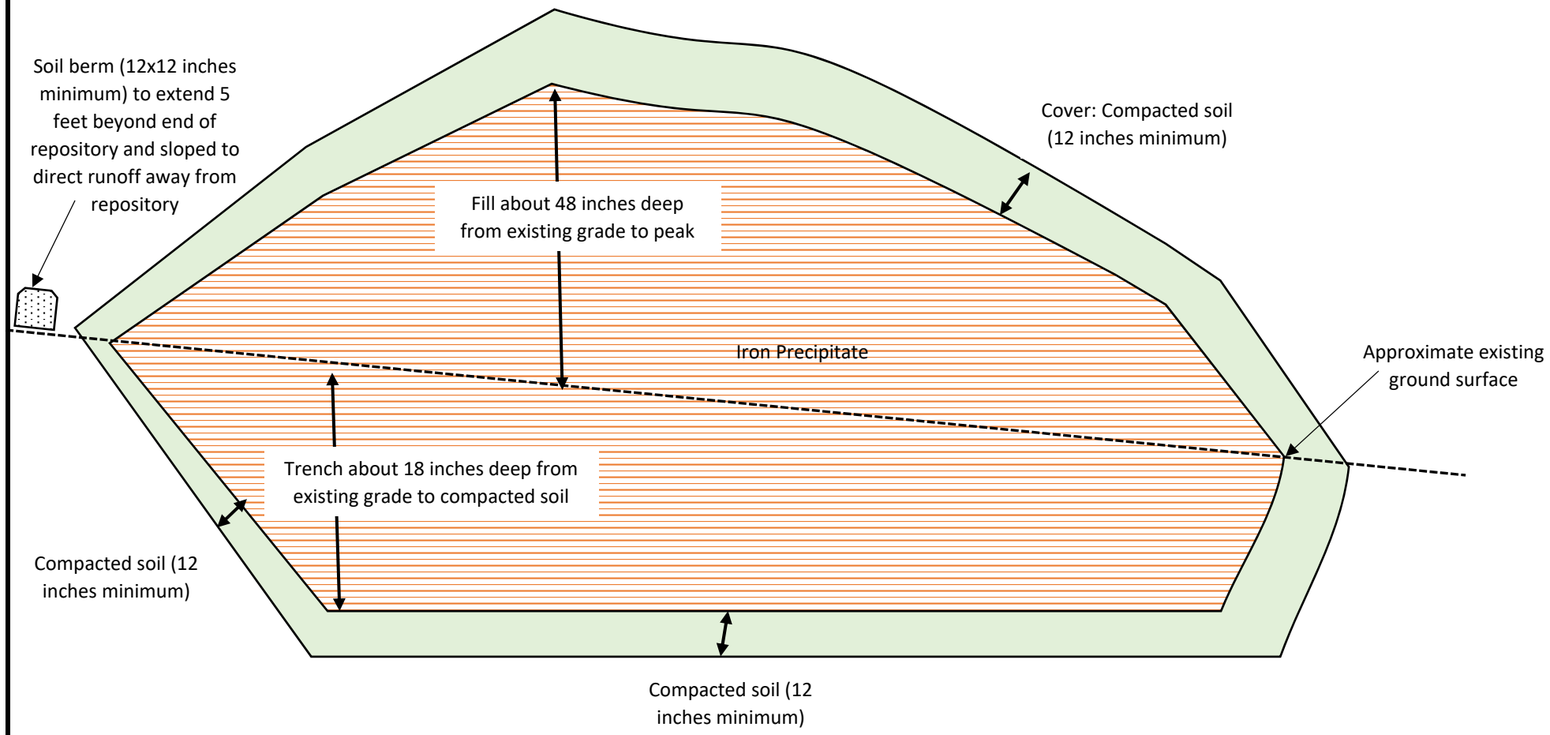
Figure 3: Geologic Map

Source: Bing Maps aerial imagery web mapping service; USGS 2012; Napa County GIS Department 2011; Burleson Consulting 2012.

Burleson Consulting, Inc.

Path: S:\Corona II\Repository\Figures\Figure 3 - Geologic Map.pdf.mxd

Iron Precipitate Conceptual Repository Section



Notes:

1) Trench to be about 40 feet wide (east-west) and extend about 100 yards north-south.
2) Trench to be excavated about 20 feet north south initially, and expanded as necessary thereafter. Trench bottom to be moistened and compacted in place using a sheeps foot
3) First material placed at bottom of repository to be material from Twin Peaks or Drain Tunnel. Boiler House precipitate mixed with ground calcite at rate of 25 pounds per ton to be placed on top of this material.
4) Material to be placed and wheel rolled for compaction.
5) Cover to consist of soil removed during trench excavation, to be placed and compacted enough to remain in place until vegetation is established. Vegetation from native seed bank and grown from local plant stock.
6) Cover to be protected from erosion by used of netting and straw until vegetation is established.
7) Cover to be maintained by repairing any rills and kept vegetated.
8) Uphill berm to be maintained as needed to direct runoff away from repository.

Corona Mine

Figure 4: Repository Design

Burleson Consulting, Inc

Attachment 1

Analytical Laboratory Reports

(33 Pages)

CALIFORNIA LABORATORY SERVICES

3249 Fitzgerald Road Rancho Cordova, CA 95742

September 13, 2016

CLS Work Order #: CZI0068
COC #: 169941

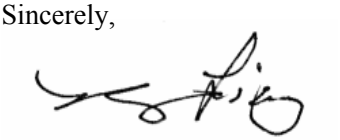
Greg Reller
Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project Name: Corona

Enclosed are the results of analyses for samples received by the laboratory on 09/02/16 09:30. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,



James Liang, Ph.D.
Laboratory Director

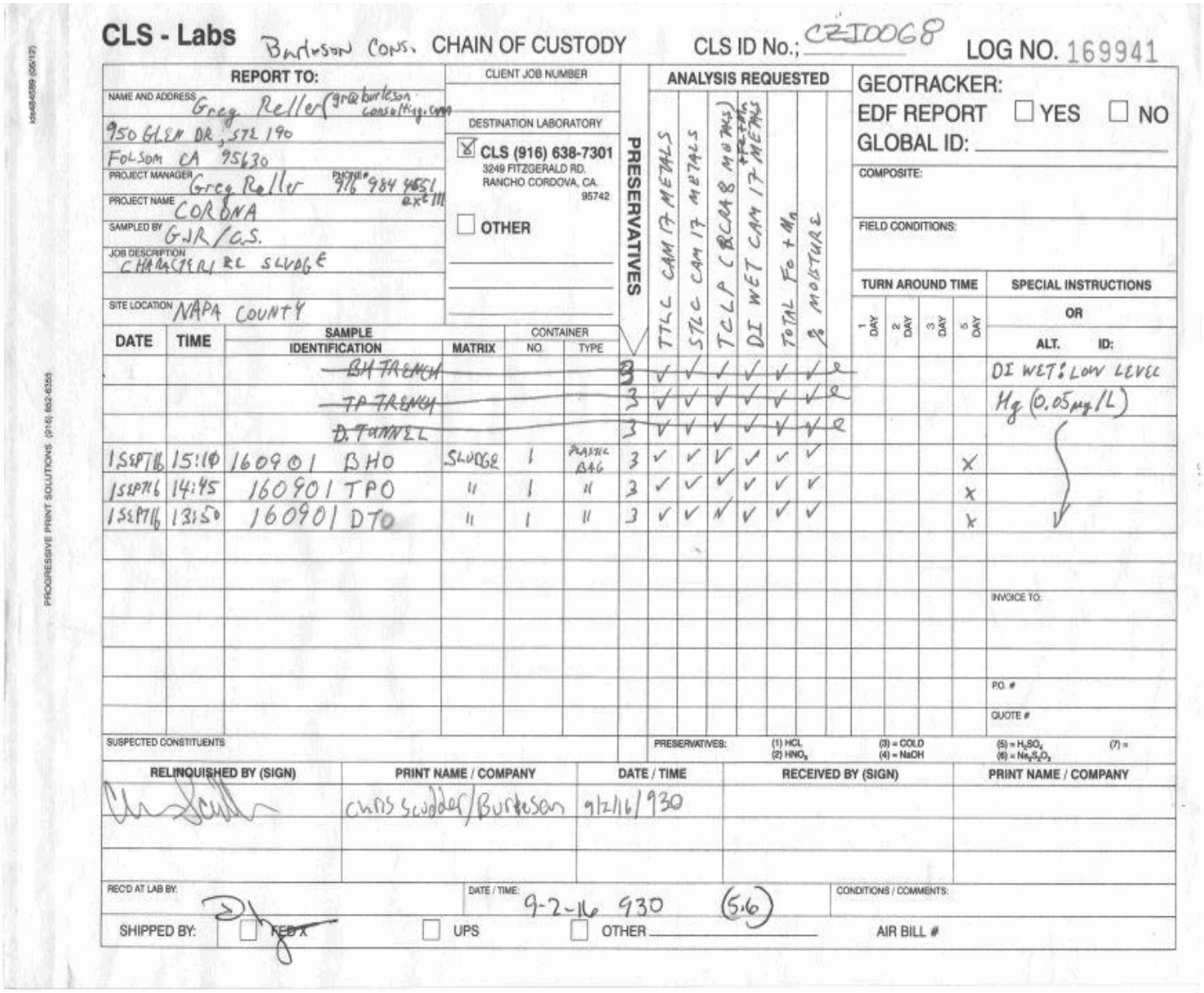
CA DOHS ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES

Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project: Corona
Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941



CLS - Labs Burleson Cons. CHAIN OF CUSTODY CLS ID No.: CZI0068 LOG NO. 169941

REPORT TO:
NAME AND ADDRESS: Greg Reller (gr@burlesonconsulting.com)
950 GLEN DR, STE 190
Folsom CA 95630
PROJECT MANAGER: Greg Reller PHONE#: 916 984 4651 ext 111
PROJECT NAME: CORONA
SAMPLED BY: GJR / C.S.
JOB DESCRIPTION: CHARACTERIZE SLUDGE
SITE LOCATION: NAPA COUNTY

CLIENT JOB NUMBER

DESTINATION LABORATORY
☒ CLS (916) 638-7301
3249 FITZGERALD RD.
RANCHO CORDOVA, CA.
95742
☐ OTHER

PRESERVATIVES

ANALYSIS REQUESTED: TTLC CAM 17 METALS; STLC CAM 17 METALS; TCLP (RCRA 8 METALS + TOTAL CAM 17 METALS); DI WET CAM 17 METALS; TOTAL Fe + Mn; % MOISTURE

GEOTRACKER:
EDF REPORT ☐ YES ☐ NO
GLOBAL ID:
COMPOSITE:
FIELD CONDITIONS:

TURN AROUND TIME: 1 DAY; 2 DAY; 3 DAY; 5 DAY
SPECIAL INSTRUCTIONS OR ALT. ID:

DATE	TIME	SAMPLE IDENTIFICATION	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	TTLC CAM 17 METALS	STLC CAM 17 METALS	TCLP (RCRA 8 METALS + TOTAL CAM 17 METALS)	DI WET CAM 17 METALS	TOTAL Fe + Mn	% MOISTURE	5 DAY	SPECIAL INSTRUCTIONS
		~~BH TRENCH~~				3	✓	✓	✓	✓	✓	✓		DI WET & LOW LEVEL
		~~TP TRENCH~~				3	✓	✓	✓	✓	✓	✓		Hg (0.05 µg/L)
		~~D. TUNNEL~~				3	✓	✓	✓	✓	✓	✓		
1 SEPT 16	15:10	160901 BHO	SLUDGE	1	PLASTIC BAG	3	✓	✓	✓	✓	✓	✓	X	
1 SEPT 16	14:45	160901 TPO	"	1	"	3	✓	✓	✓	✓	✓	✓	X	
1 SEPT 16	13:50	160901 DTO	"	1	"	3	✓	✓	✓	✓	✓	✓	X	

INVOICE TO:
P.O. #
QUOTE #

SUSPECTED CONSTITUENTS

PRESERVATIVES: (1) HCL (2) HNO_3 (3) = COLD (4) = NaOH (5) = H_2SO_4 (6) = $Na_2S_2O_3$ (7) =

RELINQUISHED BY (SIGN)	PRINT NAME / COMPANY	DATE / TIME	RECEIVED BY (SIGN)	PRINT NAME / COMPANY
	Chris Scudder / Burleson	9/2/16 930		

REC'D AT LAB BY: DATE / TIME: 9-2-16 930 (5.6) CONDITIONS / COMMENTS:

SHIPPED BY: ☐ FED X ☐ UPS ☐ OTHER AIR BILL #

Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project: Corona
Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941

CAM 17 Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge Sampled: 09/01/16 15:10 Received: 09/02/16 09:30									
Antimony	**8.0**	2.5	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Arsenic	ND	1.0	"	5	"	"	09/06/16	EPA 6020	
Barium	**6.0**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Beryllium	ND	1.0	"	"	"	"	"	"	
Cadmium	**1.8**	1.0	"	"	"	"	"	"	
Chromium	**210**	1.0	"	"	"	"	"	"	
Cobalt	**3.7**	1.0	"	"	"	"	"	"	
Copper	**420**	1.0	"	"	"	"	"	"	
Lead	ND	2.5	"	"	"	"	"	"	
Mercury	**1.8**	1.0	"	10	CZ06451	09/06/16	09/06/16	EPA 7471A	
Molybdenum	ND	1.0	"	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Nickel	**84**	1.0	"	"	"	"	"	"	
Selenium	ND	2.5	"	5	"	"	09/06/16	EPA 6020	
Silver	ND	1.0	"	1	"	"	09/06/16	EPA 6010B	QC-2H
Thallium	ND	1.0	"	5	"	"	09/06/16	EPA 6020	
Vanadium	**16**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Zinc	**24**	1.0	"	"	"	"	"	"	
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	**4.2**	2.5	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Arsenic	**1.2**	1.0	"	5	"	"	09/06/16	EPA 6020	
Barium	**2.7**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Beryllium	ND	1.0	"	"	"	"	"	"	
Cadmium	**1.7**	1.0	"	"	"	"	"	"	
Chromium	**83**	1.0	"	"	"	"	"	"	
Cobalt	**22**	1.0	"	"	"	"	"	"	
Copper	**410**	1.0	"	"	"	"	"	"	
Lead	ND	2.5	"	"	"	"	"	"	
Mercury	**4.9**	1.0	"	10	CZ06451	09/06/16	09/06/16	EPA 7471A	
Molybdenum	ND	1.0	"	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Nickel	**180**	1.0	"	"	"	"	"	"	

Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project: Corona
Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941

CAM 17 Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Selenium	ND	2.5	mg/kg	5	CZ06450	"	09/06/16	EPA 6020	
Silver	ND	1.0	"	1	"	"	09/06/16	EPA 6010B	QC-2H
Thallium	ND	1.0	"	5	"	"	09/06/16	EPA 6020	
Vanadium	**5.2**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Zinc	**42**	1.0	"	"	"	"	"	"	
160901 DTO (CZI0068-03) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	**3.3**	2.5	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Arsenic	ND	1.0	"	5	"	"	09/06/16	EPA 6020	
Barium	**1.7**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Beryllium	ND	1.0	"	"	"	"	"	"	
Cadmium	**1.8**	1.0	"	"	"	"	"	"	
Chromium	**25**	1.0	"	"	"	"	"	"	
Cobalt	ND	1.0	"	"	"	"	"	"	
Copper	**430**	1.0	"	"	"	"	"	"	
Lead	ND	2.5	"	"	"	"	"	"	
Mercury	ND	0.10	"	"	CZ06451	09/06/16	09/06/16	EPA 7471A	
Molybdenum	ND	1.0	"	"	CZ06450	09/06/16	09/06/16	EPA 6010B	
Nickel	**70**	1.0	"	"	"	"	"	"	
Selenium	ND	2.5	"	5	"	"	09/06/16	EPA 6020	
Silver	ND	1.0	"	1	"	"	09/06/16	EPA 6010B	QC-2H
Thallium	ND	1.0	"	5	"	"	09/06/16	EPA 6020	
Vanadium	**2.4**	1.0	"	1	"	"	09/06/16	EPA 6010B	
Zinc	**26**	1.0	"	"	"	"	"	"	

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Folsom, CA 95630

Project: Corona
Project Number: [none]
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CLS Work Order #: CZI0068
COC #: 169941

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge	**Sampled: 09/01/16 15:10**	**Received: 09/02/16 09:30**							
% Moisture	**76**		%	1	CZ06453	09/06/16	09/06/16	SM 2540B	
160901 TPO (CZI0068-02) Sludge	**Sampled: 09/01/16 14:45**	**Received: 09/02/16 09:30**							
% Moisture	**70**		%	1	CZ06453	09/06/16	09/06/16	SM 2540B	
160901 DTO (CZI0068-03) Sludge	**Sampled: 09/01/16 14:45**	**Received: 09/02/16 09:30**							
% Moisture	**84**		%	1	CZ06453	09/06/16	09/06/16	SM 2540B	

Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project: Corona
Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941

DI STLC (DI WET) Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge Sampled: 09/01/16 15:10 Received: 09/02/16 09:30									
Antimony	ND	0.050	mg/L	1	CZ06601	09/09/16	09/09/16	EPA 6010B	
Arsenic	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Barium	**0.12**	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Beryllium	ND	0.010	"	"	"	"	"	"	
Cadmium	ND	0.010	"	"	"	"	"	"	
Chromium	ND	0.020	"	"	"	"	"	"	
Cobalt	**0.12**	0.020	"	"	"	"	"	"	
Copper	ND	0.020	"	"	"	"	"	"	
Lead	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Mercury	**0.000059**	0.000050	"	"	CZ06580	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Nickel	**2.9**	0.020	"	"	"	"	"	"	
Selenium	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Silver	ND	0.0050	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Zinc	**0.066**	0.020	"	"	"	"	"	"	
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.050	mg/L	1	CZ06601	09/09/16	09/09/16	EPA 6010B	
Arsenic	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Barium	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Beryllium	ND	0.010	"	"	"	"	"	"	
Cadmium	ND	0.010	"	"	"	"	"	"	
Chromium	ND	0.020	"	"	"	"	"	"	
Cobalt	**0.056**	0.020	"	"	"	"	"	"	
Copper	ND	0.020	"	"	"	"	"	"	
Lead	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Mercury	**0.00015**	0.000050	"	"	CZ06580	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Nickel	**0.96**	0.020	"	"	"	"	"	"	

Burleson Consulting
950 Glenn Drive Suite 245
Folsom, CA 95630

Project: Corona
Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941

DI STLC (DI WET) Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Selenium	ND	0.0050	mg/L	1	CZ06582	09/09/16	09/09/16	EPA 6020	
Silver	ND	0.0050	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Zinc	**0.028**	0.020	"	"	"	"	"	"	
160901 DTO (CZI0068-03) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.050	mg/L	1	CZ06601	09/09/16	09/09/16	EPA 6010B	
Arsenic	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Barium	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Beryllium	ND	0.010	"	"	"	"	"	"	
Cadmium	ND	0.010	"	"	"	"	"	"	
Chromium	ND	0.020	"	"	"	"	"	"	
Cobalt	ND	0.020	"	"	"	"	"	"	
Copper	ND	0.020	"	"	"	"	"	"	
Lead	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Mercury	ND	0.000050	"	"	CZ06580	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Nickel	**0.73**	0.020	"	"	"	"	"	"	
Selenium	ND	0.0050	"	"	CZ06582	09/09/16	09/09/16	EPA 6020	
Silver	ND	0.0050	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	ND	0.020	"	"	CZ06601	09/09/16	09/09/16	EPA 6010B	
Zinc	**0.022**	0.020	"	"	"	"	"	"	

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Project Number: [none]
Project Manager: Greg Reller

CLS Work Order #: CZI0068
COC #: 169941

Metals by EPA 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge	**Sampled: 09/01/16 15:10**	**Received: 09/02/16 09:30**							
Iron	**80000**	10	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Manganese	**18**	1.0	"	"	"	"	"	"	
160901 TPO (CZI0068-02) Sludge	**Sampled: 09/01/16 14:45**	**Received: 09/02/16 09:30**							
Iron	**77000**	10	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Manganese	**120**	1.0	"	"	"	"	"	"	
160901 DTO (CZI0068-03) Sludge	**Sampled: 09/01/16 14:45**	**Received: 09/02/16 09:30**							
Iron	**81000**	10	mg/kg	1	CZ06450	09/06/16	09/06/16	EPA 6010B	
Manganese	ND	1.0	"	"	"	"	"	"	

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STLC (WET) Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge Sampled: 09/01/16 15:10 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06481	09/07/16	09/07/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/07/16	EPA 6020	
Barium	**0.90**	0.50	"	"	"	"	09/08/16	EPA 6010B	
Beryllium	ND	0.10	"	"	"	"	09/07/16	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	**5.4**	0.50	"	"	"	"	"	"	
Cobalt	ND	0.50	"	"	"	"	"	"	
Copper	**0.62**	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.050	"	"	CZ06579	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06481	09/07/16	09/07/16	EPA 6010B	
Nickel	**3.3**	0.50	"	"	"	"	"	"	
Selenium	ND	0.50	"	"	"	"	09/07/16	EPA 6020	
Silver	ND	0.10	"	"	"	"	09/07/16	EPA 6010B	QC-2H
Thallium	ND	0.25	"	"	"	"	09/07/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/07/16	EPA 6010B	
Zinc	**1.1**	0.50	"	"	"	"	"	"	
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06481	09/07/16	09/07/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/07/16	EPA 6020	
Barium	ND	0.50	"	"	"	"	09/07/16	EPA 6010B	QC-2H
Beryllium	ND	0.10	"	"	"	"	"	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	**0.92**	0.50	"	"	"	"	"	"	
Cobalt	**0.66**	0.50	"	"	"	"	"	"	
Copper	ND	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.050	"	"	CZ06579	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06481	09/07/16	09/07/16	EPA 6010B	
Nickel	**4.3**	0.50	"	"	"	"	"	"	

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STLC (WET) Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Selenium	ND	0.50	mg/L	1	CZ06481	"	09/07/16	EPA 6020	
Silver	ND	0.10	"	"	"	"	09/07/16	EPA 6010B	QC-2H
Thallium	ND	0.25	"	"	"	"	09/07/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/07/16	EPA 6010B	
Zinc	**0.71**	0.50	"	"	"	"	"	"	
160901 DTO (CZI0068-03) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06481	09/07/16	09/07/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/07/16	EPA 6020	
Barium	ND	0.50	"	"	"	"	09/07/16	EPA 6010B	QC-2H
Beryllium	ND	0.10	"	"	"	"	"	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	ND	0.50	"	"	"	"	"	"	
Cobalt	ND	0.50	"	"	"	"	"	"	
Copper	ND	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.050	"	"	CZ06579	09/09/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06481	09/07/16	09/07/16	EPA 6010B	
Nickel	**0.95**	0.50	"	"	"	"	"	"	
Selenium	ND	0.50	"	"	"	"	09/07/16	EPA 6020	
Silver	ND	0.10	"	"	"	"	09/07/16	EPA 6010B	QC-2H
Thallium	ND	0.25	"	"	"	"	09/07/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/07/16	EPA 6010B	
Zinc	ND	0.50	"	"	"	"	"	"	

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TCLP Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 BHO (CZI0068-01) Sludge Sampled: 09/01/16 15:10 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06560	09/08/16	09/09/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Barium	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	
Beryllium	ND	0.10	"	"	"	"	"	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	ND	0.50	"	"	"	"	"	"	
Cobalt	ND	0.50	"	"	"	"	"	"	
Copper	ND	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.010	"	"	CZ06564	09/08/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06560	09/08/16	09/09/16	EPA 6010B	
Nickel	**0.99**	0.50	"	"	"	"	"	"	
Selenium	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Silver	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	QC-2H
Thallium	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	
Zinc	ND	0.50	"	"	"	"	"	"	
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06560	09/08/16	09/09/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Barium	**0.54**	0.50	"	"	"	"	09/09/16	EPA 6010B	
Beryllium	ND	0.10	"	"	"	"	"	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	ND	0.50	"	"	"	"	"	"	
Cobalt	ND	0.50	"	"	"	"	"	"	
Copper	ND	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.010	"	"	CZ06564	09/08/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06560	09/08/16	09/09/16	EPA 6010B	
Nickel	**0.58**	0.50	"	"	"	"	"	"	

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TCLP Metals by 6000/7000 Series Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
160901 TPO (CZI0068-02) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Selenium	ND	0.50	mg/L	1	CZ06560	"	09/08/16	EPA 6020	
Silver	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	QC-2H
Thallium	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	
Zinc	ND	0.50	"	"	"	"	"	"	
160901 DTO (CZI0068-03) Sludge Sampled: 09/01/16 14:45 Received: 09/02/16 09:30									
Antimony	ND	0.50	mg/L	1	CZ06560	09/08/16	09/09/16	EPA 6010B	
Arsenic	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Barium	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	
Beryllium	ND	0.10	"	"	"	"	"	"	
Cadmium	ND	0.10	"	"	"	"	"	"	
Chromium	ND	0.50	"	"	"	"	"	"	
Cobalt	ND	0.50	"	"	"	"	"	"	
Copper	ND	0.50	"	"	"	"	"	"	
Lead	ND	0.50	"	"	"	"	"	"	
Mercury	ND	0.010	"	"	CZ06564	09/08/16	09/12/16	EPA 7470A	
Molybdenum	ND	0.50	"	"	CZ06560	09/08/16	09/09/16	EPA 6010B	
Nickel	ND	0.50	"	"	"	"	"	"	
Selenium	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Silver	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	QC-2H
Thallium	ND	0.50	"	"	"	"	09/08/16	EPA 6020	
Vanadium	ND	0.50	"	"	"	"	09/09/16	EPA 6010B	
Zinc	ND	0.50	"	"	"	"	"	"	

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CAM 17 Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06450 - EPA 3050B										
Blank (CZ06450-BLK1)				Prepared & Analyzed: 09/06/16						
Arsenic	ND	0.20	mg/kg							
Antimony	ND	2.5	"							
Barium	ND	1.0	"							
Selenium	ND	0.50	"							
Beryllium	ND	1.0	"							
Thallium	ND	1.0	"							
Cadmium	ND	1.0	"							
Cobalt	ND	1.0	"							
Chromium	ND	1.0	"							
Copper	ND	1.0	"							
Lead	ND	2.5	"							
Molybdenum	ND	1.0	"							
Nickel	ND	1.0	"							
Silver	ND	1.0	"							
Vanadium	ND	1.0	"							
Zinc	ND	1.0	"							
LCS (CZ06450-BS1)				Prepared & Analyzed: 09/06/16						
Arsenic	91.9	1.0	mg/kg	100		92	75-125			
Antimony	91.9	2.5	"	100		92	75-125			
Barium	98.8	1.0	"	100		99	75-125			
Selenium	95.2	2.5	"	100		95	75-125			
Thallium	88.6	1.0	"	100		89	75-125			
Beryllium	97.7	1.0	"	100		98	75-125			
Cadmium	100	1.0	"	100		100	75-125			
Cobalt	97.7	1.0	"	100		98	75-125			
Chromium	100	1.0	"	100		100	75-125			
Copper	101	1.0	"	100		101	75-125			
Lead	102	2.5	"	100		102	75-125			
Molybdenum	98.6	1.0	"	100		99	75-125			
Nickel	102	1.0	"	100		102	75-125			
Silver	91.9	1.0	"	100		92	75-125			

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CAM 17 Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06450 - EPA 3050B										
LCS (CZ06450-BS1)				Prepared & Analyzed: 09/06/16						
Vanadium	97.8	1.0	mg/kg	100		98	75-125			
Zinc	97.6	1.0	"	100		98	75-125			
Matrix Spike (CZ06450-MS1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Arsenic	30.9	1.0	mg/kg	100	22.0	9	75-125			QM-5
Antimony	38.7	2.5	"	100	2.66	36	75-125			QM-5
Barium	170	1.0	"	100	67.4	103	75-125			
Selenium	22.1	2.5	"	100	1.12	21	75-125			QM-5
Thallium	34.7	1.0	"	100	0.100	35	75-125			QM-5
Beryllium	89.7	1.0	"	100	ND	90	75-125			
Cadmium	88.3	1.0	"	100	0.670	88	75-125			
Cobalt	95.1	1.0	"	100	9.40	86	75-125			
Chromium	154	1.0	"	100	51.1	103	75-125			
Copper	241	1.0	"	100	133	108	75-125			
Lead	143	2.5	"	100	53.3	89	75-125			
Molybdenum	85.0	1.0	"	100	3.44	82	75-125			
Nickel	130	1.0	"	100	34.8	95	75-125			
Silver	111	1.0	"	100	ND	111	75-125			
Vanadium	121	1.0	"	100	29.2	92	75-125			
Zinc	285	1.0	"	100	165	120	75-125			
Matrix Spike Dup (CZ06450-MSD1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Arsenic	90.2	1.0	mg/kg	100	22.0	68	75-125	98	30	QM-5
Antimony	30.5	2.5	"	100	2.66	28	75-125	24	30	QM-5
Selenium	72.8	2.5	"	100	1.12	72	75-125	107	30	QM-5
Barium	163	1.0	"	100	67.4	96	75-125	4	30	
Beryllium	87.6	1.0	"	100	ND	88	75-125	2	30	
Thallium	86.9	1.0	"	100	0.100	87	75-125	86	30	QM-5
Cadmium	85.9	1.0	"	100	0.670	85	75-125	3	30	
Cobalt	93.3	1.0	"	100	9.40	84	75-125	2	30	
Chromium	145	1.0	"	100	51.1	94	75-125	6	30	
Copper	233	1.0	"	100	133	100	75-125	3	30	

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CAM 17 Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06450 - EPA 3050B										
Matrix Spike Dup (CZ06450-MSD1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Lead	132	2.5	mg/kg	100	53.3	79	75-125	7	30	
Molybdenum	79.8	1.0	"	100	3.44	76	75-125	6	30	
Nickel	128	1.0	"	100	34.8	93	75-125	2	30	
Silver	108	1.0	"	100	ND	108	75-125	3	30	
Vanadium	116	1.0	"	100	29.2	86	75-125	5	30	
Zinc	255	1.0	"	100	165	90	75-125	11	30	
Batch CZ06451 - EPA 7471A										
Blank (CZ06451-BLK1)				Prepared & Analyzed: 09/06/16						
Mercury	ND	0.10	mg/kg							
LCS (CZ06451-BS1)				Prepared & Analyzed: 09/06/16						
Mercury	0.276	0.10	mg/kg	0.250		110	75-125			
Matrix Spike (CZ06451-MS1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Mercury	2.40	1.0	mg/kg	0.250	1.33	427	75-125			QM-4X
Matrix Spike Dup (CZ06451-MSD1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Mercury	1.71	1.0	mg/kg	0.250	1.33	154	75-125	33	25	QM-4X

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Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06453 - General Preparation										
Blank (CZ06453-BLK1)				Prepared & Analyzed: 09/06/16						
% Moisture	0.00		%							

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DI STLC (DI WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06580 - EPA 7470A										
Blank (CZ06580-BLK1)				Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	ND	0.0010	mg/L							
LCS (CZ06580-BS1)				Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.00551	0.0010	mg/L	0.00500		110	75-125			
Matrix Spike (CZ06580-MS1)		**Source: CZI0068-01**		Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.00603	0.0010	mg/L	0.00500	ND	121	75-125			
Matrix Spike Dup (CZ06580-MSD1)		**Source: CZI0068-01**		Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.00612	0.0010	mg/L	0.00500	ND	122	75-125	1	25	
Batch CZ06582 - EPA 3010A										
Blank (CZ06582-BLK1)				Prepared & Analyzed: 09/09/16						
Arsenic	ND	0.0050	mg/L							
Selenium	ND	0.0050	"							
Silver	ND	0.0050	"							
Thallium	ND	0.0050	"							
Lead	ND	0.0050	"							
LCS (CZ06582-BS1)				Prepared & Analyzed: 09/09/16						
Arsenic	0.106	0.0050	mg/L	0.100		106	75-125			
Selenium	0.109	0.0050	"	0.100		109	75-125			
Silver	0.100	0.0050	"	0.100		100	75-125			
Thallium	0.0939	0.0050	"	0.100		94	75-125			
Lead	0.0965	0.0050	"	0.100		96	75-125			

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CLS Work Order #: CZI0068
COC #: 169941

DI STLC (DI WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06582 - EPA 3010A										
Matrix Spike (CZ06582-MS1)		**Source: CZI0068-01**		Prepared & Analyzed: 09/09/16						
Arsenic	0.101	0.0050	mg/L	0.100	ND	101	75-125			
Selenium	0.114	0.0050	"	0.100	ND	114	75-125			
Silver	0.0654	0.0050	"	0.100	ND	65	75-125			QM-5
Thallium	0.191	0.0050	"	0.100	0.000770	191	75-125			QM-5
Lead	0.196	0.0050	"	0.100	ND	196	75-125			QM-5
Matrix Spike Dup (CZ06582-MSD1)		**Source: CZI0068-01**		Prepared & Analyzed: 09/09/16						
Arsenic	0.101	0.0050	mg/L	0.100	ND	101	75-125	0.4	30	
Selenium	0.114	0.0050	"	0.100	ND	114	75-125	0.1	30	
Silver	0.0653	0.0050	"	0.100	ND	65	75-125	0.2	30	QM-5
Thallium	0.191	0.0050	"	0.100	0.000770	191	75-125	0.05	30	QM-5
Lead	0.193	0.0050	"	0.100	ND	193	75-125	1	30	QM-5
Batch CZ06601 - EPA 3050B										
Blank (CZ06601-BLK1)				Prepared & Analyzed: 09/09/16						
Antimony	ND	0.050	mg/L							
Barium	ND	0.020	"							
Beryllium	ND	0.010	"							
Cadmium	ND	0.010	"							
Cobalt	ND	0.020	"							
Chromium	ND	0.020	"							
Copper	ND	0.020	"							
Molybdenum	ND	0.020	"							
Nickel	ND	0.020	"							
Vanadium	ND	0.020	"							
Zinc	ND	0.020	"							

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Project Manager: Greg Reller

CLS Work Order #: CZI0068
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DI STLC (DI WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06601 - EPA 3050B										
LCS (CZ06601-BS1)				Prepared & Analyzed: 09/09/16						
Antimony	1.05	0.050	mg/L	1.00		105	75-125			
Barium	1.10	0.020	"	1.00		110	75-125			
Beryllium	1.07	0.010	"	1.00		107	75-125			
Cadmium	1.09	0.010	"	1.00		109	75-125			
Cobalt	1.07	0.020	"	1.00		107	75-125			
Chromium	1.08	0.020	"	1.00		108	75-125			
Copper	1.11	0.020	"	1.00		111	75-125			
Molybdenum	1.08	0.020	"	1.00		108	75-125			
Nickel	1.13	0.020	"	1.00		113	75-125			
Vanadium	1.05	0.020	"	1.00		105	75-125			
Zinc	1.07	0.020	"	1.00		107	75-125			
Matrix Spike (CZ06601-MS1)		**Source: CZI0068-01**		Prepared & Analyzed: 09/09/16						
Antimony	0.984	0.050	mg/L	1.00	ND	98	75-125			
Barium	1.20	0.020	"	1.00	0.123	108	75-125			
Beryllium	1.07	0.010	"	1.00	ND	107	75-125			
Cadmium	1.09	0.010	"	1.00	ND	109	75-125			
Cobalt	1.15	0.020	"	1.00	0.118	103	75-125			
Chromium	1.06	0.020	"	1.00	ND	106	75-125			
Copper	1.07	0.020	"	1.00	ND	107	75-125			
Molybdenum	1.01	0.020	"	1.00	ND	101	75-125			
Nickel	3.91	0.020	"	1.00	2.92	99	75-125			
Vanadium	1.02	0.020	"	1.00	ND	102	75-125			
Zinc	1.16	0.020	"	1.00	0.0660	110	75-125			
Matrix Spike Dup (CZ06601-MSD1)		**Source: CZI0068-01**		Prepared & Analyzed: 09/09/16						
Antimony	0.969	0.050	mg/L	1.00	ND	97	75-125	1	30	
Barium	1.17	0.020	"	1.00	0.123	104	75-125	3	30	
Beryllium	1.04	0.010	"	1.00	ND	104	75-125	2	30	
Cadmium	1.06	0.010	"	1.00	ND	106	75-125	3	30	
Cobalt	1.11	0.020	"	1.00	0.118	100	75-125	3	30	
Chromium	1.04	0.020	"	1.00	ND	104	75-125	3	30	

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DI STLC (DI WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06601 - EPA 3050B										
Matrix Spike Dup (CZ06601-MSD1)	**Source: CZI0068-01**			Prepared & Analyzed: 09/09/16						
Copper	1.06	0.020	mg/L	1.00	ND	106	75-125	0.9	30	
Molybdenum	0.985	0.020	"	1.00	ND	98	75-125	2	30	
Nickel	3.87	0.020	"	1.00	2.92	95	75-125	1	30	
Vanadium	0.998	0.020	"	1.00	ND	100	75-125	3	30	
Zinc	1.13	0.020	"	1.00	0.0660	107	75-125	3	30	

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Metals by EPA 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06450 - EPA 3050B										
Blank (CZ06450-BLK1)				Prepared & Analyzed: 09/06/16						
Iron	ND	10	mg/kg							
Manganese	ND	1.0	"							
LCS (CZ06450-BS1)				Prepared & Analyzed: 09/06/16						
Iron	99.0	10	mg/kg	100		99	75-125			
Manganese	101	1.0	"	100		101	75-125			
Matrix Spike (CZ06450-MS1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Iron	24200	10	mg/kg	100	20800	NR	75-125			QM-4X
Manganese	304	1.0	"	100	212	92	75-125			
Matrix Spike Dup (CZ06450-MSD1)	**Source: CZI0086-01**			Prepared & Analyzed: 09/06/16						
Iron	23300	10	mg/kg	100	20800	NR	75-125	4	30	QM-4X
Manganese	314	1.0	"	100	212	102	75-125	3	30	

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STLC (WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06481 - EPA 3010A										
Blank (CZ06481-BLK1)				Prepared & Analyzed: 09/07/16						
Antimony	ND	0.50	mg/L							
Barium	ND	0.50	"							
Beryllium	ND	0.10	"							
Cadmium	ND	0.10	"							
Cobalt	ND	0.50	"							
Chromium	ND	0.50	"							
Copper	ND	0.50	"							
Lead	ND	0.50	"							
Molybdenum	ND	0.50	"							
Arsenic	ND	0.50	"							
Nickel	ND	0.50	"							
Silver	ND	0.10	"							
Selenium	ND	0.50	"							
Vanadium	ND	0.50	"							
Zinc	ND	0.50	"							
Thallium	ND	0.25	"							
LCS (CZ06481-BS1)				Prepared & Analyzed: 09/07/16						
Antimony	52.7	0.50	mg/L	50.0		105	75-125			
Barium	54.7	0.50	"	50.0		109	75-125			
Beryllium	56.8	0.10	"	50.0		114	75-125			
Cadmium	57.2	0.10	"	50.0		114	75-125			
Cobalt	56.7	0.50	"	50.0		113	75-125			
Chromium	57.4	0.50	"	50.0		115	75-125			
Copper	56.3	0.50	"	50.0		113	75-125			
Lead	57.9	0.50	"	50.0		116	75-125			
Molybdenum	55.4	0.50	"	50.0		111	75-125			
Nickel	58.0	0.50	"	50.0		116	75-125			
Arsenic	47.2	0.50	"	50.0		94	75-125			
Silver	66.4	0.10	"	50.0		133	75-125			QM-1
Selenium	52.5	0.50	"	50.0		105	75-125			
Vanadium	55.5	0.50	"	50.0		111	75-125			

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STLC (WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06481 - EPA 3010A										
LCS (CZ06481-BS1)				Prepared & Analyzed: 09/07/16						
Zinc	56.3	0.50	mg/L	50.0		113	75-125			
Thallium	42.0	0.25	"	50.0		84	75-125			
Matrix Spike (CZ06481-MS1)	**Source: CZI0066-01**			Prepared & Analyzed: 09/07/16						
Antimony	48.9	0.50	mg/L	50.0	0.161	97	75-125			
Barium	63.7	0.50	"	50.0	11.7	104	75-125			
Beryllium	52.1	0.10	"	50.0	0.00355	104	75-125			
Cadmium	51.5	0.10	"	50.0	0.00571	103	75-125			
Cobalt	50.3	0.50	"	50.0	0.404	100	75-125			
Chromium	51.9	0.50	"	50.0	0.200	103	75-125			
Copper	49.9	0.50	"	50.0	0.0520	100	75-125			
Lead	49.6	0.50	"	50.0	ND	99	75-125			
Molybdenum	50.8	0.50	"	50.0	ND	102	75-125			
Arsenic	41.1	0.50	"	50.0	0.166	82	75-125			
Nickel	49.8	0.50	"	50.0	1.01	98	75-125			
Selenium	44.4	0.50	"	50.0	ND	89	75-125			
Silver	60.1	0.10	"	50.0	0.00650	120	75-125			
Vanadium	50.5	0.50	"	50.0	0.416	100	75-125			
Zinc	52.7	0.50	"	50.0	0.328	105	75-125			
Thallium	42.9	0.25	"	50.0	0.0515	86	75-125			
Matrix Spike Dup (CZ06481-MSD1)	**Source: CZI0066-01**			Prepared & Analyzed: 09/07/16						
Antimony	48.5	0.50	mg/L	50.0	0.161	97	75-125	0.8	30	
Barium	63.1	0.50	"	50.0	11.7	103	75-125	1	30	
Beryllium	51.4	0.10	"	50.0	0.00355	103	75-125	1	30	
Cadmium	50.6	0.10	"	50.0	0.00571	101	75-125	2	30	
Cobalt	49.4	0.50	"	50.0	0.404	98	75-125	2	30	
Chromium	50.9	0.50	"	50.0	0.200	101	75-125	2	30	
Copper	48.9	0.50	"	50.0	0.0520	98	75-125	2	30	
Lead	48.7	0.50	"	50.0	ND	97	75-125	2	30	
Molybdenum	50.2	0.50	"	50.0	ND	100	75-125	1	30	
Arsenic	40.6	0.50	"	50.0	0.166	81	75-125	1	30	

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STLC (WET) Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06481 - EPA 3010A										
Matrix Spike Dup (CZ06481-MSD1)	**Source: CZI0066-01**			Prepared & Analyzed: 09/07/16						
Nickel	49.1	0.50	mg/L	50.0	1.01	96	75-125	1	30	
Selenium	43.7	0.50	"	50.0	ND	87	75-125	1	30	
Silver	58.7	0.10	"	50.0	0.00650	117	75-125	2	30	
Vanadium	49.5	0.50	"	50.0	0.416	98	75-125	2	30	
Zinc	51.8	0.50	"	50.0	0.328	103	75-125	2	30	
Thallium	40.2	0.25	"	50.0	0.0515	80	75-125	7	30	
Batch CZ06579 - EPA 7470A										
Blank (CZ06579-BLK1)				Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	ND	0.050	mg/L							
LCS (CZ06579-BS1)				Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.146	0.050	mg/L	0.125		117	75-125			
Matrix Spike (CZ06579-MS1)	**Source: CZI0066-01**			Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.677	0.25	mg/L	0.125	0.533	116	75-125			
Matrix Spike Dup (CZ06579-MSD1)	**Source: CZI0066-01**			Prepared: 09/09/16 Analyzed: 09/12/16						
Mercury	0.639	0.25	mg/L	0.125	0.533	85	75-125	6	25	

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TCLP Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06560 - EPA 3010A TCLP										
Blank (CZ06560-BLK1)				Prepared & Analyzed: 09/08/16						
Arsenic	ND	0.50	mg/L							
Antimony	ND	0.50	"							
Barium	ND	0.50	"							
Selenium	ND	0.50	"							
Thallium	ND	0.50	"							
Beryllium	ND	0.10	"							
Cadmium	ND	0.10	"							
Cobalt	ND	0.50	"							
Chromium	ND	0.50	"							
Copper	ND	0.50	"							
Lead	ND	0.50	"							
Molybdenum	ND	0.50	"							
Nickel	ND	0.50	"							
Silver	ND	0.50	"							
Vanadium	ND	0.50	"							
Zinc	ND	0.50	"							
LCS (CZ06560-BS1)				Prepared: 09/08/16 Analyzed: 09/09/16						
Antimony	48.6	0.50	mg/L	50.0		97	75-125			
Barium	49.5	0.50	"	50.0		99	75-125			
Beryllium	51.6	0.10	"	50.0		103	75-125			
Cadmium	51.3	0.10	"	50.0		103	75-125			
Cobalt	49.6	0.50	"	50.0		99	75-125			
Chromium	50.3	0.50	"	50.0		101	75-125			
Copper	52.9	0.50	"	50.0		106	75-125			
Lead	52.8	0.50	"	50.0		106	75-125			
Molybdenum	49.8	0.50	"	50.0		100	75-125			
Nickel	52.2	0.50	"	50.0		104	75-125			
Silver	61.9	0.50	"	50.0		124	75-125			
Vanadium	50.5	0.50	"	50.0		101	75-125			
Zinc	49.3	0.50	"	50.0		99	75-125			

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TCLP Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06560 - EPA 3010A TCLP										
Matrix Spike (CZ06560-MS1)	**Source: CZI0066-01**			Prepared & Analyzed: 09/08/16						
Arsenic	47.5	0.50	mg/L	50.0	0.00850	95	75-125			
Antimony	49.2	0.50	"	50.0	0.0574	98	75-125			
Barium	52.3	0.50	"	50.0	1.58	101	75-125			
Selenium	53.8	0.50	"	50.0	0.0590	107	75-125			
Thallium	43.6	0.50	"	50.0	0.0255	87	75-125			
Beryllium	53.2	0.10	"	50.0	0.00378	106	75-125			
Cadmium	52.3	0.10	"	50.0	0.00321	105	75-125			
Cobalt	49.8	0.50	"	50.0	ND	100	75-125			
Chromium	50.8	0.50	"	50.0	ND	102	75-125			
Copper	53.4	0.50	"	50.0	0.0755	107	75-125			
Lead	52.4	0.50	"	50.0	ND	105	75-125			
Molybdenum	50.8	0.50	"	50.0	ND	102	75-125			
Nickel	51.7	0.50	"	50.0	ND	103	75-125			
Silver	61.9	0.50	"	50.0	ND	124	75-125			
Vanadium	51.9	0.50	"	50.0	ND	104	75-125			
Zinc	50.7	0.50	"	50.0	0.162	101	75-125			
Matrix Spike Dup (CZ06560-MSD1)	**Source: CZI0066-01**			Prepared & Analyzed: 09/08/16						
Arsenic	48.0	0.50	mg/L	50.0	0.00850	96	75-125	1	30	
Antimony	49.6	0.50	"	50.0	0.0574	99	75-125	0.8	30	
Barium	52.9	0.50	"	50.0	1.58	103	75-125	1	30	
Thallium	44.9	0.50	"	50.0	0.0255	90	75-125	3	30	
Selenium	54.2	0.50	"	50.0	0.0590	108	75-125	0.9	30	
Beryllium	53.3	0.10	"	50.0	0.00378	107	75-125	0.2	30	
Cadmium	52.4	0.10	"	50.0	0.00321	105	75-125	0.3	30	
Cobalt	50.0	0.50	"	50.0	ND	100	75-125	0.3	30	
Chromium	51.1	0.50	"	50.0	ND	102	75-125	0.7	30	
Copper	53.4	0.50	"	50.0	0.0755	107	75-125	0.08	30	
Lead	52.6	0.50	"	50.0	ND	105	75-125	0.3	30	
Molybdenum	50.8	0.50	"	50.0	ND	102	75-125	0.02	30	
Nickel	51.7	0.50	"	50.0	ND	103	75-125	0.06	30	
Silver	62.7	0.50	"	50.0	ND	125	75-125	1	30	

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TCLP Metals by 6000/7000 Series Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CZ06560 - EPA 3010A TCLP										
Matrix Spike Dup (CZ06560-MSD1)	**Source: CZI0066-01**			Prepared: 09/08/16 Analyzed: 09/09/16						
Vanadium	51.9	0.50	mg/L	50.0	ND	104	75-125	0.02	30	
Zinc	50.8	0.50	"	50.0	0.162	101	75-125	0.3	30	
Batch CZ06564 - EPA 7470A										
Blank (CZ06564-BLK1)				Prepared: 09/08/16 Analyzed: 09/12/16						
Mercury	ND	0.010	mg/L							
LCS (CZ06564-BS1)				Prepared: 09/08/16 Analyzed: 09/12/16						
Mercury	0.0259	0.010	mg/L	0.0250		104	75-125			
Matrix Spike (CZ06564-MS1)	**Source: CZI0066-01**			Prepared: 09/08/16 Analyzed: 09/12/16						
Mercury	0.0874	0.050	mg/L	0.0250	0.0602	109	75-125			
Matrix Spike Dup (CZ06564-MSD1)	**Source: CZI0066-01**			Prepared: 09/08/16 Analyzed: 09/12/16						
Mercury	0.0955	0.050	mg/L	0.0250	0.0602	141	75-125	9	25	QM-5

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Folsom, CA 95630	Project Manager: Greg Reller	COC #: 169941

Notes and Definitions

QM-5	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QM-1	The spike recovery was outside acceptance limits for the LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries & RPD's.
QC-2H	The recovery of one CCV was greater than the acceptance limit. However, all analytes in the associated samples were ND; therefore a reanalysis was not performed.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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950 Glenn Drive i e 5
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Project Name: Corona 2016 / 8303
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ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received	Notes
090	0 5 0	il	0 e 5 0		e 0	
090 ' '	0 5 0	il	0 e 5		e 0	
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SVL holds the following certifications
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Sample Report Page 1 of 1

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i ie e	**Non-extractable Sulfur**	0	0 0	0 005		0095 G	09 0 5	
i ie e	**Non-Sulfate Sulfur**	0	0 0	0 005		0095 G	09 0 5 05	
i ie e	**Pyritic Sulfur**	0 9	0 0				09 0 5	
i ie e	**Sulfate Sulfur**	0 5	0 0				09 0 5 05	
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Kirby Gray
Technical Director

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Sample Report Page 1 of 1

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Acid/Base Accounting & Sulfur Forms								
i ie e	**ABA**	0	0				09 0 5	
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i ie e	n e r le l r	0 0	0 0	0 005		0095 G	09 0 5	
i ie e	**Non-Sulfate Sulfur**	0 5	0 0	0 005		0095 G	09 0 5 0	
i ie e	**Pyritic Sulfur**	0 5	0 0				09 0 5	
i ie e	**Sulfate Sulfur**	0	0 0				09 0 5 0	
i ie e	**Total Sulfur**	0 9	0 0	0 005		0095 G	09	

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Kirby Gray
Technical Director

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Acid/Base Accounting & Sulfur Forms								
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Kirby Gray
Technical Director

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Quality Control - BLANK Data

e	n l e	ni	e l	D		D	n l e	e
Acid/Base Accounting & Sulfur Forms								
i ie e			0		0	0095	0	e
i ie e	n e r le l r		0 0	0 005	0 0	0095	0	e
i ie e	n l e l r		0 0	0 005	0 0	0095	0	e
i ie e	l l r		0 0	0 005	0 0	0095		e

Quality Control - LABORATORY CONTROL SAMPLE Data

e	n l e	ni	e l	r e	e	e n e i i	D	n l e	e
Acid/Base Accounting & Sulfur Forms									
i ie e					0	0 0	0095	0	e
i ie e	l l r		05	00	05	0 0	0095		e

Quality Control - DUPLICATE Data

e	n l e	ni	D li e e l	le e l	D	D i i	D	n l e	e
Acid/Base Accounting & Sulfur Forms									
i ie e			50	55	95	0	0095	0	e
i ie e	n e r le l r		00	0	5 0	0	0095	0	e
i ie e	n l e l r		0	0		0	0095	0	e
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Notes and Definitions

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