



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

75 Hawthorne Street
San Francisco, CA 94105

ACTION MEMORANDUM

JUL 02 2015

DATE:

SUBJECT: Request for Approval for Change in Scope and a Ceiling Increase at the Argonaut Mine Site, City of Jackson, Amador County, California

FROM: Daniel Shane, On-Scene Coordinator
Emergency Response Section (SFD-9-2)

TO: Daniel Meer, Assistant Director
Superfund Division (SFD-9)

THRU: Harry L Allen, Chief *HA*
Emergency Response Section (SFD-9-2)

I. PURPOSE

The purpose of this Action Memorandum is to request and document your approval of (1) a change in the scope of the Argonaut Mine Site ("Site") project, and (2) an increase of the project ceiling from \$3,609,456 to \$4,944,324 in order to mitigate threats to public health, welfare, and the environment posed by the presence of high concentrations of arsenic in residential surface soils. The continuing actions proposed herein will mitigate Site conditions by removing and or capping arsenic-contaminated surface soils at 12 residential properties and at the Jackson Junior High School, all of which are located in close proximity to the Argonaut Mine tailings disposal areas. The response action will be conducted in accordance with Section 104(a)(1) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9604(c)(1)(A).

Previous Action Memorandums requesting approval for an exemption to the \$2 million and 12-month statutory limitations for removal actions were approved on May 15, 2014 (see Attachment 1) and February 11, 2015 (see Attachment 2), respectively. There are no nationally significant or precedent-setting issues associated with this response. A removal action (Phase 1) which began on March 16, 2015 and was completed on March 28, 2015, involved the excavation and removal of arsenic-contaminated tailings and soils at a vacant lot located in close proximity to residential properties that are currently proposed, in this Action Memorandum, for a removal action. This response will involve the removal of surface soils to a depth of one foot at 12 residential properties where arsenic concentrations exceed the site-specific action level of 100 mg/kg.¹

¹ As described in Section A.3. below, Region 9 developed a site-specific action

II. SITE CONDITIONS AND BACKGROUND

Category of Removal: Time-Critical
CERCLIS ID: CAD983650011
SITE ID: A930

A. Site Description

Please refer to the attached Action Memorandums, dated May 15, 2014 and February 11, 2015.

1. Removal Site Evaluation

Please refer to the attached Action Memorandums, dated May 15, 2014 and February 11, 2015.

2. Physical Location

Please refer to the attached Action Memorandums, dated May 15, 2014 and February 11, 2015.

3. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant.

Please refer to the attached Action Memorandum, dated May 15, 2014.

During the Preliminary Assessment/Site Inspection ("PASI") in July 2014, new areas were found where arsenic concentrations in soils exceeded the EPA's site-specific Regional Screening Level (RSL) of 100 mg/kg. All PASI samples from residential properties had lead and mercury concentrations below the RSL, except one sample adjacent to the 0.39-acre vacant lot. This sample contained concentrations of 39,900 mg/kg arsenic, 3,220 mg/kg for lead and 193 mg/kg for mercury.

Based on these PASI findings, sampling was conducted during the Phase I removal action in March 2015 at 19 residential properties and Jackson Junior High School. Soil samples from these properties were analyzed for arsenic and lead. Mercury was not considered a primary contaminant of concern for the residential properties because, except in limited cases where sampling encountered black semi-processed fine-grained tailings at the vacant lot, mercury concentrations in previous residential samples did not exceed the screening levels. The black tailings were not encountered in samples collected from the residential properties except for those collected immediately adjacent to the vacant lot. Sampling in March 2015 revealed additional properties where arsenic and lead concentrations exceeded the RSLs.

During the Phase I removal action in March 2015, samples were collected from the black tailings encountered in the buried trenches during the excavation of the vacant lot. These sample results were

level for this response based on site-specific bio-availability testing of 40 soil samples. Selection of a one-foot depth of excavation is based on EPA guidance for residential properties, including excavation of properties with lead contamination. See EPA Guidance, Superfund Lead-Contaminated Residential Sites Handbook, <http://www.epa.gov/superfund/lead/products/handbook.pdf> at page 37 (page 44 of pdf) (August 2003); see also http://www.epa.gov/superfund/eparecovery/south_minneapolis.html (regarding excavation of arsenic-contaminated soils).

encountered in the buried trenches during the excavation of the vacant lot. These sample results were similar to the PASI sample collected on the property line adjacent to the vacant lot. Samples collected from the black tailings revealed a maximum arsenic concentration of 59,000 mg/kg. Additionally, an embankment below the athletic field at the Jackson Junior High School was found to be composed of tailings and the arsenic concentrations in surface soils exceeded the action level.

As described in the Action Memo dated May 15, 2014, the Removal Site Evaluation used 61 mg/kg for arsenic based on a modified EPA Regional Screening Level (RSL) using an assumed 60% bioavailability factor and an estimated excess cancer risk of 10^{-4} for a residential scenario. In January 2015, EPA conducted an in vitro bio-accessibility assay of 40 soil/tailings samples collected from the Site and surrounding areas. This assay indicated a bioavailability factor of 20% was appropriate for this Site. As a result, EPA determined that a site-specific screening level of 100 mg/kg for arsenic was appropriate, in order to provide an estimated excess cancer risk of 10^{-4} or below for a residential scenario and an estimated non-cancer hazard index of 1 for a residential scenario (i.e., below the level at which non-cancer risks are expected to be a concern). See Attachment 3, June 30, 2015 Memorandum Arsenic Contamination - Site Specific Screening and Action Level for Residential Cleanups at the Argonaut Mine Site in Jackson, California.

4. NPL Status

The Site is not currently on or proposed for the NPL. A PASI has been completed by EPA Region 9 Brownfields & Site Assessment Section. The Section is currently evaluating whether the Site qualifies for inclusion on the NPL.

5. Maps and Other Graphic Representations

Please refer to Attachment 4 for an overview map showing the locations of the residential properties and Jackson Junior High School and color-coded maps showing the residential properties and Jackson Junior High School where arsenic concentrations in surface soils were above the removal action level.

B. Other Actions to Date

1. Previous Actions

On March 16, 2015, EPA initiated a removal action ("Phase 1") at the Site. The removal action involved the excavation of 1,872 cubic yards of contaminated soils and tailings from the vacant lot at the corner of Pioneer Street and Argonaut Lane. The contaminated soils and tailings were transported to the 5-acre parcel within the 64.8-acre mine tailings disposal area. A small repository, a two foot thick capillary barrier evapotranspiration ("ET") cover system was constructed in the southeast corner of the 5-acre parcel. The excavation was backfilled with clean imported soil, graded, hydro-seeded and the property was fenced. Additionally, EPA assisted the City of Jackson with the installation of a subsurface storm water drain pipe to help alleviate flooding in this area and protect the vegetative cap. EPA over-excavated a trench and installed the pipe below the two foot soil cover across the property. The removal action was completed on March 28, 2015.

2. Current Actions

During the PASI in July 2014, soil samples were collected from several residential properties. The sampling results indicated arsenic concentrations in surface soils were above the action level of 100 mg/kg on several of the residential properties located in close proximity to the vacant lot (6 homes), cyanide plant (4 homes) and lower earthen tailings dam (2 homes). Additionally, historical aerial photographs from the EPA's Environmental Photographic Interpretation Center revealed past disposal practices in this area. A 1944 aerial image revealed trenches, pits, berms in the area where there are currently 12 residential properties and homes, and the vacant lot. The residential area (one block) was bordered by Argonaut Lane, Buena Vista Drive and Pioneer Street. It is believed the Argonaut Mining Company conveyed tailings through a pipeline from the mill to the trenches. The 1944 aerial images also indicated several residential properties near the cyanide plant and lower earthen dam impoundment that may have been impacted by tailings disposal. During the excavation of the vacant lot during the Phase 1 removal action, the old trenches and tailings were encountered approximately 2-4 feet below the original grade. The tailings were excavated up to the north and east property line of the vacant lot which bordered developed property and likely extended under several homes. The maximum arsenic concentration was 59,000 mg/kg in a sample collected from the sidewall of the excavation along the east property line.

In addition, during the removal action (Phase 1) in March 2015, a removal site evaluation was conducted at 19 of 20 residential properties (one property owner refused access). Each property was divided into several decision units (front, back and side yards) and a five-point composite soil sample was collected from each decision unit at the surface (0"-2") and subsurface (14"-18"). The sampling strategy was based on guidance provided in the EPA Superfund lead-Contaminated Residential Sites Handbook dated August 2003. The following is a summary of soil sampling results:

- The action level for arsenic (100 mg/kg) was exceeded at 16 of the 19 residential properties for surface and/or subsurface samples;
- The action level for arsenic was exceeded in surface soil samples from 12 of the 19 residential properties. The proposed removal action will involve the excavation and removal of contaminated surface soils to a depth of one foot below ground surface where arsenic levels exceeded the action level;
- The action level for arsenic was exceeded in subsurface soil samples from 15 of the 19 properties;
- The action level for lead (400 mg/kg) was exceeded in only the subsurface soil samples from 3 residential properties. The highest lead concentrations ranged from 505 mg/kg to 2,070 mg/kg and were generally associated with high arsenic concentrations ranging from 369 mg/kg to 4,892 mg/kg;
- The action level for arsenic was not exceeded at 3 residential properties. These properties were generally located near the outer boundaries of the tailings disposal trenches which were identified in the 1944 aerial images.

12-Residential Properties near Warner Property

Based on historical aerial photographs it appeared that the Argonaut Mining Company disposed of tailings from their mill operations in an area bordered by Argonaut Lane, Buena Vista Drive and Pioneer Street. The 12 developed residential properties and the vacant lot are located within this area. Homes were built on top of or adjacent to the trenches and pits that were used to dispose of tailings in

the 1940's.

The action level for arsenic in soils was exceeded in surface and subsurface soil samples at 8 of 12 residential properties. The action level for arsenic in surface soil samples was exceeded at 6 of the 12 residential properties. The highest arsenic concentration in surface soil was 331 mg/kg; subsurface soil was 4,892 mg/kg. Two properties had lead contamination in subsurface soils ranging from 505 mg/kg to 2,070 mg/kg. Three families have young children. Three properties had no arsenic or lead contamination in either surface or subsurface soils above the action level.

5-Residential Properties near Cyanide Plant

The action level for arsenic in surface and subsurface soils was exceeded in all 5 residential properties. The action level for arsenic in surface soil samples were exceeded in 4 of the 5 residential properties. The highest arsenic concentration in surface soil was 219 mg/kg; subsurface soil was 160 mg/kg. One property had lead contamination in subsurface soils (597 mg/kg). Two families have young children.

2-Residential Properties near Lower Earthen Tailings Dam

The action level for arsenic in surface and subsurface soils was exceeded in both residential properties. The action level for arsenic in surface soil samples were exceeded in 2 of the 2 residential properties. The highest arsenic concentration in surface soil was 665 mg/kg; subsurface soil was 798 mg/kg. The property with the highest arsenic concentration in surface soil was located next to the property whose owner denied EPA access to collect soil samples. It is likely the backyard area of this residence has high arsenic concentrations. No soil samples had lead concentrations above the action level.

Jackson Junior High School

The action level for arsenic in surface soils was exceeded in the two soil samples collected during the PASI from a 10,000 square foot embankment below the athletic field. The depth of the soils samples was 0-6 inches below ground surface. The arsenic concentrations were 239 mg/kg and 659 mg/kg. The geotechnical properties of the material used to construct the embankment appeared to be similar to the grey sands tailings located at the Argonaut Mine tailings disposal area. The slopes are nearly void of vegetative growth and the fine-grained tailings were susceptible to wind erosion and fugitive dust emissions. The embankment is located along the main school entrance road and is in close proximity to classroom buildings.

C. Potential for continued State/Local response

Please refer to the attached Action Memorandums, dated May 15, 2014 and February 11, 2015.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

EPA determined that conditions at the Argonaut Mine Site continue to present an imminent and substantial endangerment to public health, welfare, and the environment and meet the criteria for a time-

critical removal action provided for in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), as amended, 40 C.F.R. Part 300. These criteria are documented in the original Action Memorandum signed on May 15, 2014. If the response action is not completed as planned, threats to the public health or welfare or the environment will continue, as considered in accordance with the following NCP factors:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby human populations, animals or the food chain

High concentrations of arsenic have been detected in samples from surface soils collected from 12 residential properties and an embankment below the athletic field at Jackson Junior High School. Families and their young children are most at risk from exposure to arsenic through inhalation of dust particles and accidental ingestion. High levels of arsenic and lead will remain in the subsurface soils on some properties following remediation. However, the soils will be covered (capped) with one foot of clean soil and no exposures are anticipated unless these areas are excavated by the property owner.

2. High Levels of Hazardous Substance or Pollutants or Contaminants in Soils at or Near the Surface that May Migrate

The arsenic-contaminated surface soils located in residential yards and the school are generally lack vegetation and cover and are exposed to wind and rain. The contaminated soils can be dispersed in the wind and become an inhalation hazard. Additionally, the contaminated soils can be tracked into homes and classrooms and potentially increase the duration of exposure. There is a risk that young children playing in yards may ingest contaminated soils.

3. Weather Conditions that may Cause Hazardous Substances or Pollutants or Contaminants to Migrate or be Released.

Surface water runoff during storms can carry contaminated soils into storm drains which flow into nearby creeks. Children with muddy shoes can track contamination into homes and classrooms.

4. Availability of Other Appropriate Federal or State Response Mechanisms to Respond to the Release

The State of California is unable to respond to the release due to insufficient funds to carry out a removal action. In August 2013, DTSC officially requested EPA assistance in conducting a removal action at the Argonaut Mine Site.

IV. ENDANGERMENT DETERMINATION

The current Site conditions, including the presence of arsenic contaminated materials, if not mitigated by completing the planned response actions, will continue to pose a threat to human health and the environment through inhalation and ingestion, and migration of materials off-Site and into the local ecosystem. Arsenic is a hazardous substance under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

Consistent with the factors set forth at 40 C.F.R. § 300.415(b)(2), the actual or threatened releases of this hazardous substance, if not addressed by completing the response action as proposed in

this memorandum, will continue to present a threat of exposure to arsenic in surface soils and pose an imminent and substantial endangerment to public health or welfare or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Previous Action Memorandums on May 14, 2014 and February 11, 2015 approved the exemptions from the \$2 million and 12-month statutory limitations for removal actions, respectively.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

The primary change in scope of work and associated costs documented in this Action Memorandum is the excavation and removal of arsenic-contaminated surface soils from 12 residential properties and capping arsenic-contaminated soils at the Jackson Junior High School. The excavation of soil will be to a depth of 12 inches below grade. Although EPA practices at similar sites suggest excavating soils to a depth of 18 inches in garden areas, there were no gardens in the contaminated areas of concern. In cases where residents mentioned plans for building a garden EPA will recommend the property owner build a raised garden at least 6 inches above grade to provide a minimum of an 18 inch clean soil zone for their garden. (In selecting final response actions for the Site, EPA may also consider using institutional controls, such as deed restriction, to ensure continuing protection from soils below 12 inches below grade.)

The contaminated soils from residential properties will be transported to a 5-acre area where a small repository was constructed during the phase I removal action. A second small repository and capillary barrier ET cover system will be constructed directly across a middle drainage channel from the previously constructed repository. The removal and consolidation of contaminated soils from various hotspot areas needs to be accomplished prior to the construction of the final repository and capillary barrier ET cover system over the 5-acre repository site which contains an estimated 120,000 cubic yards of tailings with high concentrations of arsenic, lead and mercury. The two small repositories in Phase 1 and the continuation of Phase 1 will be integrated into a single repository and capillary barrier ET cover system will be constructed over the entire 5-acre area. The construction of the final cover and improvements to the existing drainage system in the 5-acre repository site was designated phase II of the removal action in the previous Action Memorandums. Please see section "B" for a summary of all the proposed work tasks and cost estimates under this removal action.

1. Proposed Action Description

Specifically, the following activities are proposed for this phase of the response action:

Residential Properties:

- Conduct removal activities at 12 of 19 properties where the arsenic concentrations in surface soils exceed the action level of 100 mg/kg;
- Excavate soils to a depth of 1.0 feet in each decision unit that exceeds the action level;
- Transport a total of approximately 2,246 cubic yards of contaminated soils to the 5-acre repository site;

- Construct a small repository which includes a capillary barrier ET cover system;
- Install a permanent high visibility marker layer (i.e., yellow snow fence) at the bottom of the excavation. The marker layer will provide a visual barrier over soils that were not excavated during the removal action and may contain contamination above the shallow soil cleanup action level.
- Backfill excavations with clean imported topsoil or road base fill depending on the property owner's preference;
- Restore the properties which may involve replacing fencing, sod and plants;
- Prepare a final report for each property owner which will include a detailed summary of the site assessment and cleanup actions taken to mitigate the threats to public health and the environment;
- Recommend to the property owners that they implement institutional controls to prevent damage to the permanent soil cap and prevent excavations that could expose unknowing persons to arsenic and lead contamination. In selecting the final response actions for the Site, EPA will consider selecting institutional controls in the form of deed restrictions (also called land use restrictions) on excavation more than 12 inches below grade. The land use restrictions should define areas of remaining concern and restrict uses that would result in exposure.

Jackson Junior High School:

- Stabilize the steep embankment to prevent direct contact with arsenic-contaminated soils and tailings and mitigate fugitive dust emissions;
- Apply shotcrete to the slopes of the 10,000 square foot embankment;
- Install a fence at the toe of the embankment to keep children away from the embankment and protect the shotcrete surface;
- Prepare a final report for the Amador County Unified School District will include a detailed summary of the site assessment and cleanup actions taken to mitigate the threats to public health and the environment;
- Recommend to the School District to implement institutional controls to prevent damage to the permanent shotcrete surface which could expose unknowing persons to arsenic and lead contamination. In selecting final response actions for the Site, EPA will consider selecting institutional controls in the form of deed restrictions (also known as land use restrictions) when selecting the final response actions for the Site. The land use restrictions should define areas of remaining concern and restrict uses that would result in exposure.

2. Contribution to Remedial Performance

The threat posed by the presence of arsenic-contaminated surface soils meets the criteria listed in 40 C.F.R. § 300.415(b)(2) and is consistent with any long-term remedial action that may be required. The On-Scene Coordinator will continue planning and coordination with the remedial program to assure the removal action will not conflict with future remedial cleanup options. In consultation with the remedial program it was decided it would be more cost-effective to use the remedial funding authority than to use emergency removal funding authority to do the construction necessary to cut back and reduce the almost vertical slopes of the embankment, remove excess tailings and cap the slopes with clean soil, vegetation, rock or gravel fill. Several alternatives have been studied including application of dust control/soil stabilization products such as pine resin oil emulsion sealant. These products would

need to be re-applied every 1-2 years until a final remedy is selected and implemented. Extensive ground squirrel burrowing activity on the slopes would greatly reduce the effectiveness of the sealant. The shotcrete application has been selected as the best and most cost effective remedy for the nearly vertical slopes. Shotcrete is concrete conveyed through a hose and pneumatically projected at high velocity onto a surface and is a common construction technique for stabilization of steep slopes. It is reinforced by steel mesh that is tacked to the slope in 10 foot wide sections. This alternative would be a more permanent remedy that would last 6-8 years or longer if maintained properly. EPA completed the field portion of the PASI in July 2014. The Site is currently being evaluated using the Hazard Ranking System (HRS) in order to determine whether it is eligible for listing on the NPL.

The OSC has begun to make provisions for post-removal Site control consistent with the provisions of 40 C.F.R. § 300.415(k). It is likely that the California Department of Toxics Substances Control will be responsible for operation and maintenance (O&M) of the repository. If the Site is listed on the NPL, the responsibility for O&M will be determined during the remedial process.

3. Description of alternative technologies

There are no current plans to use alternative technologies this Site.

4. Applicable or Relevant and Appropriate Requirements

Please refer to the attached Action Memorandums, dated May 15, 2014 and February 11, 2015. As required by 40 C.F.R. § 300.415(j), this emergency response removal action meets, to the extent practicable, applicable or relevant and appropriate requirements under federal and state environmental laws. See CERCLA Section 121(d); 42 U.S.C. § 9621(d).

B. Project Schedule and Estimated Costs

It is expected the removal action will require 36 days to complete. The residential yard cleanup activities will require an estimated 30 days to complete. The school embankment stabilization activities will require an estimated 6 days to complete. The total removal action includes Phase I which has been completed, a continuation of Phase I which is proposed in this Action Memorandum and Phase II which was selected in the original Action Memo signed on May 15, 2014 but has not been completed.

Previous Response Action

Phase I – Excavation and removal of approximately 1,872 cubic yards of contaminated soils and tailings from the vacant lot, construction of small repository and ET cover system in the 5-acre repository site. The Emergency Rapid Response Services (“ERRS”) contractor cost ceiling for this work was \$400,000. The phase I work has been completed.

Current Proposed Response Action

Phase I (continuation) – Excavation of approximately 2,246 cubic yards of contaminated soils and tailings at 12 residential properties, construction of a small repository and ET cover system in the 5-acre repository site, and capping the arsenic contaminated soils embankment at the Jackson Junior High School. The estimated ERRS cost to continue Phase I work is \$1,000,000.00. The continuation of

Future Planned Response Action

Estimated Cost Breakdown

In addition to the extramural costs estimated for the proposed action, the Region expects to expend the following intramural costs:

Intramural Costs

The total U.S. EPA extramural and intramural costs for this removal action, based on full-cost accounting practices that will be eligible for cost recovery, are estimated to be \$4,944,324.00

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As discussed above, if the removal action does not continue, releases of hazardous substances from the Site will continue to pose threats to public health or welfare or the environment.

VIII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues for the Argonaut Mine Site.

IX. ENFORCEMENT

Enforcement strategies for the Site have not changed since the original Action Memorandum. The Enforcement Confidential Addendum is provided Attachment 5.

IX. RECOMMENDATION

This decision document recommends the selected removal action for the Argonaut Mine Site, in Amador County, California, in accordance with the standards laid out in 42 U.S.C. § 9604 (c)(1)(A) and 40 C.F.R. Section 300.415(b)(5). Because conditions at the Argonaut Mine Site continue to meet the criteria for a removal action, we recommend that you approve the proposed change in scope and increase in the project ceiling. Please indicate your decision by signing below.

Approve: 
Daniel Meer, Assistant Director
Superfund Division

2 July 2015
Date

Disapprove: _____
Daniel Meer, Assistant Director
Superfund Division

Date

Attachments:

1. May 15, 2014 Action Memorandum and Approval for Exemption to \$2 million Limitation for Removal Actions
2. February 11, 2015 Action Memorandum and Approval for Exemption to 12-Month Limitation for Removal Actions
3. June 30, 2015 Memorandum "Arsenic Contamination - Site Specific Screening and Action Level for Residential Cleanups at the Argonaut Mine Site in Jackson, California" (attaching June 29, 2015 Memo "Soil Action level for Arsenic," and EPA Region 9 Laboratory Analytical Testing Results, December 12, 2014, in vitro and total metals analysis (lab report numbers 14310a and 14310b)
4. Maps showing locations of residential properties and Jackson Junior High School where arsenic-contaminated surface soils exceed the action level
5. Enforcement Confidential Addendum

ATTACHMENT 1

May 15, 2014 Action Memorandum and Approval for Exemption to \$2 Million Limitation for Removal Actions



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

MEMORANDUM

DATE: MAY 15 2014

SUBJECT: Request for a Time-Critical Removal Action including an Exemption to the \$2 Million Limitation on Removal Actions at the Argonaut Mine Tailings Site, City of Jackson, Amador County, California

FROM: Daniel Shane,
Emergency Response Section (SFD-9-2)

THROUGH: Harry L. Allen, Chief
Emergency Response Section (SFD-9-2)

TO: Daniel Meer, Assistant Director
Superfund (SFD-9)

I. PURPOSE

The purpose of this Action Memorandum is to obtain approval to spend up to \$2,407,200.00 in direct extramural costs to mitigate threats to human health and the environment posed by the presence of mine tailings wastes at the Argonaut Mine Tailings Site, ("Site"). The Site is located north of downtown Jackson, in Amador County, California.

This Action Memorandum, if approved, will authorize the expenditures required for U.S. EPA, as the lead technical agency, to take actions described herein to abate an imminent and substantial endangerment to neighboring residents posed by hazardous substances at the Site. The proposed removal of hazardous substances would be undertaken pursuant to Section 104(a)(1) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9604(a)(1), and Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. § 300.415.

II. SITE CONDITIONS AND BACKGROUND

Site Status: Non-NPL

Category of Removal: Time-Critical

CERCLIS ID: CAD983650011

SITE ID: A930

A. Site Description

1. Physical Location

The Argonaut Mine Tailings Site (Site) is situated on undeveloped private land in the western portion of the City of Jackson, Amador County, California. The Site is located approximately ½ mile south of the Argonaut Mine main shaft and head frame. The Site is in the Jackson-Plymouth Gold Mining District approximately 45 miles east of Stockton and Sacramento. The District is a 20 mile long belt of gold mineralization that runs through western Amador County. The Site is in the western foothills of the Sierra Nevada Mountains near Highway 49 at an elevation between 1,200 and 1,600 feet. The Site is near other old gold mining towns including Angels Camp, Murphy's, Sonora and Sutter's Fort. There were approximately 1,500 people living and working within four miles of the Site in 1998. In 2009, Jackson had a population of 4,236.

The main area of the Site is comprised of a 64.8 acre area known as the Argonaut Lane mine waste area. This area consists of five parcels. The Assessor Parcel Numbers (APNs) are 044-010-100, 044-010-074, 044-010-082, 044-010-083 and 044-010-084. The most highly contaminated soils are located in a 5-acre area in the most northwestern portion of the 64.8 acres. There are several smaller parcels that have been impacted by mine waste disposal adjacent to or within 300 feet of the large mine waste disposal area. The 0.39 acre Pioneer Street mine waste area consists of two parcels. The APNs are 044-071-002, 044-071-003. A property adjacent to the 5-acre area along the northeast boundary has also been impacted by mine waste disposal. This property is currently occupied by a mental health clinic. The APN is 044-072-008.

The Site is bounded by Argonaut Lane to the west, Hoffman Street to the south, Argonaut Drive and Sutter Street to the east, and Argonaut Heights and Sierra View Estates Subdivisions to the north. Argonaut High School and West View Estates Subdivision are across Argonaut Lane from the Site. Jackson Junior High School is on Sutter Street and in close proximity to the eastern boundaries of the Site. The Amador County Offices and Superior Court are located south of the Site on Hoffman Road. There are large undeveloped parcels located to the northwest, south, and southeast.

The geographic coordinates of the Site are 38° 21' 26.9" N latitude and 120° 47' 23.4" W longitude. See Figure 1 for a Site Location Map.

2. Site characteristics

Argonaut Mine:

The Argonaut Mine was one of the two most important and successful hard rock gold mines in the Mother Lode region. The Argonaut Mine is located approximately 1/2 mile northeast of the Argonaut Mine Tailings Site. The Argonaut Mine and Kennedy Mine are designated as a California State Historical Landmark (No. 786). They were the deepest mines in the country and each had a vertical depth of more than 5900 feet. The total production for the Argonaut Mine was 2,750,000 dry tons of ore, resulting in production of gold worth an estimated \$25,197,000.

The Argonaut Mine (initially called the Pioneer Mine and not to be confused with the Pioneer Mine that is 1 mile south of Plymouth), is a gold-bearing quartz mine that operated from 1850-1942. Specifically, portions of the mine extend through Sections 17, 20 and 21 of Township 6N, Range 11E, MDM, with the main portion of the mine and tailings in Section 20. The Argonaut adjoins the Kennedy Mine which is immediately north of the Argonaut Mine. The mine's surface features straddle what is now State Highway 49/88, with the original mill and hoist house set downhill on the northeast side of the road and the head frame on the southwest side of the road. A 40-stamp mill (later a 60-stamp mill) crushed the quartz ore, followed by mercury amalgamation and concentration to obtain the gold, with a resultant waste dump hill built up and accessed by trestle below the road (now a highway). In 1916 the mill was relocated uphill to the southwest side of the road. This new mill was located on top of a hill in an area now known as Argonaut Estates II Subdivision. Residential homes have been built on the area where the mill was located.

The Argonaut Mine and mill areas are not part of the removal action. These areas are currently being investigated for potential listing of the site on the National Priority List (NPL). The Preliminary Assessment/Site Inspection (PASI) for potential long-term remediation and the Removal Site Evaluation (RSE) for short-term mitigation of immediate hazards are being conducted concurrently.

Argonaut Mine Tailings Site (Site):

The Argonaut Mine Tailings Site is located in an alluvial valley and consists of open space characterized by soil and processed mine tailings impounded behind several earthen dams and a concrete dam. When the mine and mill were in operation, the sand and silt-sized tailings from the Argonaut mill were carried by gravity flume down the back side of the hill for approximately 3,000 feet to the thickener basin and may have been discharged to tailings pond areas (i.e., historic impound and concrete dam basin) located on the Site. The thickener basin may have been used to evaporate the excess water prior to processing in the cyanide plant located east of the thickener basin. The upper earthen tailings dam is constructed of processed mine tailings and is located south of the former cyanide plant. Approximately 1 million cubic yards of cyanide process tailings waste, also known as "grey sand tailings", were placed in the impoundment

behind the dam. This dam is estimated to be 100 feet high (at its highest point) and 900 yards long. The earthen dam is curved in an arc that points downstream. The centrally located historic impound basin is contained by an approximately 60-foot high and 900-foot long earthen dam constructed from the grey sand tailings. The lower earthen tailings dam was constructed to contain runoff from the grey sands tailings stockpile. Downgradient from the lower earthen tailings dam is the concrete dam basin. The third and final tailings dam is a multiple inverted arched concrete dam which is 46 feet high and 420 feet long. The concrete dam lies above the North Fork of Jackson Creek. Jackson Creek empties into Lake Amador (a recreation area but not a drinking water source) roughly 8 miles downstream.

In the westernmost portion of the Site near the topographical high point, there is an approximately 5-acre area of concern (AOC) designated as AOC-1. The area is characterized by surface deposits of semi-processed ore. During wet weather, AOC-1 contains localized areas of saturated sediments. A surface impoundment (SI-1) had been present in AOC-1 but the containment had been breached on the south end of the berm. A second surface impoundment (SI-2) located approximately 125 yards to the southeast was used to catch overflow from SI-1. This surface impoundment was apparently backfilled and is no longer evident. The former cyanide plant was located east and down grade from AOC-1. This 6.5-acre area is designated as AOC-2 and contains abandoned vats and tanks that had been used for cyanide leaching of processed ore. There is process waste material in several of the vats and tanks. Additionally, there is a thickening basin in AOC-2 that was associated with the cyanide plant. AOC-3 is located southeast and down grade from AOC-2 and is a 48-acre area. There are three large impoundment areas in AOC-3 including the grey sand tailings area; the historic impound area and the concrete dam basin. Based on borings advanced during a State site investigation, mine wastes are present to a maximum depth of approximately 80 feet below ground surface (bgs) in AOC-3. Although the area behind the lower earthen tailings dam does retain water, both the upper and lower earthen tailings dams are currently breached and surface water eventually flows down grade to the south and/or east of AOC-3 to a 5.3 acre area containing a reversed arched concrete dam referred to as Eastwood Multiple Arch Dam (EMAD). This area is designated AOC-4.

Site soils are predominantly ore and/or waste rock in AOC-1. These soils are rocky and acidic (pH 2 to 5) and generally do not support vegetation. Mineralized salts have formed on the surface of the ground. Soils in AOC-2 and AOC-3 are predominantly grey sand tailings. In most portions of AOC-3, vegetation has been re-established and a thin layer of organic material is present over the tailings. In these areas, the soils are generally stable. This area has abundant wildlife habitat used by a variety of bird species, deer, mountain lion, black bear and other wildlife. However, large portions of AOC-2 and AOC-3 contained exposed mine tailings that are devoid of vegetation. These soils were easily eroded during large magnitude rain events and large gullies and erosion channels have formed. Some of the erosion channels in AOC-2 and AOC-3 exceeded 20 feet in depth and top-width. Several large sinkholes were present behind the lower earthen tailings dam.

The surface waters and sediment in the intermittent stream that flows through the Site and discharge from the EMAD are designated as AOC-4. Sediment and tailings have filled the basin behind the concrete dam to within a few feet of its top. The sediment becomes saturated during wet periods and impounded water flows over the top of the dam and through cracks in the dam. A large hole was cut by an unknown party near the south end of the dam to provide a drainage outlet for impounded water. Water released from the dam flows to a small ravine and then into a culvert that runs under Argonaut Drive. Surface water from the culvert flows to an intermittent stream for approximately 1,200 feet to its confluence with Jackson Creek. The intermittent stream is an open channel for approximately 600 feet before it enters a second culvert under Highway 49, and it becomes a closed channel for 600 feet until it outfalls into the North Fork of Jackson Creek near the City of Jackson Library Building.

Roughly 300 feet north of AOC-1 are two residential lots owned by a single property owner. Combined, the two lots are approximately 0.39 acres. These lots appear to have been used for storage or disposal of ore or mine tailings. These residential lots, designated as AOC-5, have yellow and orange-colored stained ground and are largely devoid of plant life. In addition, mine wastes from AOC-1 have apparently spread over to the adjacent property near the northeast corner. The property impacted by this movement of mine wastes is occupied by a Sierra Wellness and Recovery Center and is designated AOC-6.

The locations of AOC-1 through AOC-6, the approximate parcel boundaries, and other site features are shown on Figure 2 in the attachments.

3. Removal site evaluation

During the period from July 9 through July 12, 2013, EPA, START and the U. S. Coast Guard's Pacific Strike Team mobilized to Jackson, California to perform site assessment activities (i.e., soil, water, waste and sediment sampling). The weather conditions were hot and dry and no surface water was flowing in the intermittent streams. Surface water was encountered in a small pond on site and a small volume of water, possibly fed by a spring, was flowing through a culvert on the downstream side of the concrete dam. The purpose of the assessment was to evaluate the nature and extent of contaminants of concern (COCs) which included arsenic, lead, mercury, cyanides, and polycyclic aromatic hydrocarbons (PAHs) in surface and shallow subsurface soils at the Site and in sediment and surface water potentially discharging from the Site. The selection of COCs was based on previous investigations by the State and historical mining records. Generally, the highest levels of contaminants were found in AOC-1, and decreased with distance downgradient. The principle driver for the removal action is arsenic. The areas with the highest levels of lead and mercury were co-located with the areas that had the highest levels of arsenic in soil.

A total of 95 soil, sediment and waste samples were collected and analyzed using XRF technology for arsenic, lead, mercury and other toxic heavy metals. Thirty-one samples were submitted to a commercial laboratory. Twenty-one soil samples were

collected from AOC-1, five samples from AOC-2, and five samples from AOC-4. There was a very high correlation between the XRF and laboratory concentrations for toxic heavy metals. Fourteen soil, sediment and waste samples from AOC-2 and five sediment samples from AOC-4 were analyzed for total cyanides and cyanides amenable to chlorination. Ten soil, sediment and waste samples from AOC-2 and five sediment samples from AOC-4 were analyzed for PAHs due to the presence of coal tar. Three surface water samples were collected from the Site. Two surface water samples were collected downstream from the EMAD at the inlet to the culvert beneath Argonaut Drive. One surface water sample was collected from a small pond located west of lower earthen tailings dam. These samples were analyzed for heavy metals, total and amenable cyanides and PAHs. The water sampling results indicated the concentrations of arsenic, lead, mercury, total and amendable cyanides and PAHs were below the project-specific environmental screening levels.

AOC-1: The primary "area of concern" (AOC-1), a 5-acre section located on the east side of Argonaut Lane, had the highest concentrations of arsenic, lead and mercury. According to historic literature the semi-processed ore was known as "middlings." The mechanical concentrating process at the mine resulted in three product streams: mineral concentrate, "middlings" (a material of low gold value, but consisting of a high concentration of sulfide minerals), and the waste sand and slime tailings. "Middlings" were captured as a middle product, heavier than tailing sands but lighter than the gold. The "middlings" contained sulfide minerals consisting primarily of pyrite and arsenopyrite, but with the gold locked up within the sulfide crystalline structure. Both mercury amalgamation and cyanidation captured only the "free" gold so the materials were set aside until an alternative process was developed to release the gold at an economic cost. "Middlings" were also called a recalcitrant ore because the gold was caught in a matrix of pyrite or arsenopyrite and could not be effectively recovered by cyanidation. It was not until 1980's the potential for extraction of gold from recalcitrant ores was appreciated such as the use of roasting and pressure leaching and bioleaching.

The primary contaminant of concern is arsenic. The maximum concentration of arsenic in soil was 48,000 mg/kg at 12"-18" below ground surface (bgs). The average concentrations of arsenic in surface soils within the 1.30 acre and 3.22 acre "hotspots" were 7,557 mg/kg and 4,613 mg/kg, respectively. The Regional Screening Level (RSL) and the EPA action level for arsenic in residential soils at this Site is 61 mg/kg. The maximum concentration of lead in soils was 4,000 mg/kg and the RSL was 400 mg/kg. The maximum concentration of mercury in soils was 360 mg/kg and the RSL was 10 mg/kg. The estimated background levels of arsenic, lead and mercury ranged from 8 mg/kg to 21 mg/kg, 14 mg/kg to <28 mg/kg, and 0.1 mg/kg to <8.1 mg/kg, respectively.

Based on soil sampling conducted by EPA and the California Department of Toxic Substances Control (DTSC), the concentrations of arsenic in soils in AOC-1 are at least an order of magnitude, and in some samples were several orders of magnitude, greater than the concentrations in soils in AOC-2 and AOC-3. There is an estimated 120,000 cubic yards of unprocessed or semi-processed ore in the AOC-1 area.

The soil pH in 9 samples collected in AOC-1 ranged from 3.07 to 7.76. Most of the soils are acidic and corrosive to metal. DTSC had installed a security fence around the perimeter of AOC-1 and the corrosion of the metal posts caused the fence to fall down. DTSC erected a second cyclone fence.

AOC -2: AOC-2 is a 6.5 acre section that was the former location of the cyanide plant. In approximately 1917 a cyanide plant was installed to work the tailings by cyanide vat leaching. In 1922, the Amador Metals Reduction Company (AMRC) took over the operation and was treating tailings in the 250-ton cyanidation and flotation plant. The sands and slimes from Argonaut mill were pre-coated with coal tar to prevent premature precipitation of the dissolved gold within the cyanide solution and then the sand was treated in a leaching vat while the slimes were first agitated and then filtered. Sand and slime residues were discarded (the "grey sand tailings") and the gold-bearing solution was precipitated, roasted, and the gold melted down into bullion. In 1938, operations at AMRC plant were halted and much of the equipment was dismantled and removed to storage. In 1941, a (new) cyanide plant was constructed to treat concentrates from the Argonaut mill and flotation concentrates from the Plymouth Mine tailings plant and tailings from the company's Empire Mine in Plymouth. All production ceased on March 28, 1942 due to wartime limitations, however the AMRC cyanide plant continued to operate at a capacity of 500 tons. Historical records indicated the cyanide plant was dismantled in 1952.

There are several structures remaining on site including various sized concrete tanks, concrete vats and a steel framed and redwood tumbling box that was used to pre-coat tailings with coal tar (4 lbs of coal tar per ton of ore). Coal tar is similar to creosote and contains PAHs and phenols. Several of the tanks and vats contain waste materials. Arsenic concentrations in waste materials in the tanks and surface soils near the tanks were well above the action level. Based on laboratory results, the waste material in one old steel drum is likely coal tar. There are eight partially buried round concrete tanks measuring approximately 25 feet in diameter and 10 feet deep. Two of the tanks were completely filled with cyanide processing wastes. The arsenic concentrations in these tanks ranged from 200 mg/kg to 480 mg/kg. The mercury concentrations in these tanks ranged from ND to 11 mg/kg. Immediately to the west, there are four concrete vats measuring approximately 10 feet by 10 feet and an estimated 10 feet in depth. These vats contained various quantities of cyanide processing wastes. The arsenic concentrations in the two vats that were sampled were 4,900 mg/kg and 12,000 mg/kg. Two samples from the vats had mercury concentrations of 13 mg/kg and 14 mg/kg. The lead concentrations were 480 mg/kg and 750 mg/kg.

Cyanide concentrations in some samples collected from surface soils between the tanks and near the drum were above the EPA action level. The highest cyanide level in soils was 75 mg/kg located near a drum containing coal tar. The RSL for cyanide is 22 mg/kg. A waste sample collected from process piping on what appeared to be a decanting tank was tested for pH. The measured pH of the sample was 2.14. The arsenic and mercury concentrations in the waste sample were 300 mg/kg and 41 mg/kg.

respectively. These levels were significantly above the RSLs of 61 mg/kg and 10 mg/kg, respectively.

AOC-3: AOC-3 comprises approximately 48 acres. This area contains approximately 5-7 acres of grey sand tailings. This area also includes the upper earthen tailings dam, the lower earthen tailings dam, historic impound basin, and concrete dam basin. In 2008, soil sampling was conducted by URS, a contractor for DTSC. The arsenic concentrations in surface soils ranged from non-detect to 420 mg/kg. The sampling results for 34 surface soil samples indicated an average concentration of arsenic in surface soils of 131 mg/kg. The maximum arsenic concentration was 670 mg/kg at a depth of 20 feet. The lead concentrations in surface soils ranged from 6.4 mg/kg to 47 mg/kg. The maximum lead concentration was 160 mg/kg at a depth of 15 feet. URS did not analyze the soil samples for mercury. URS estimated one million cubic yards of grey sand tailings in AOC-3.

Groundwater sampling was also conducted by URS in 2008. HydroPunch groundwater samples from sonic borings were collected in four locations in AOC-3. Arsenic concentrations in groundwater from three borings ranged from 120 ug/l to 220 ug/l. The MCL for arsenic is 10 ug/l. Chromium was reported in one boring at 130 ug/l. The MCL for chromium is 50 ug/l. Nickel was reported in three borings and ranged from 150 ug/l to 400 ug/l. The MCL for nickel is 100 ug/l. Zinc was reported in all four borings and ranged from 74 to 1,200 ug/l. The MCL for zinc is 67 ug/l. The water table depths vary in response to local conditions. During wet weather, the depth to ground water is between 45 feet and 65 feet and 70 feet to below 100 feet in the dry seasons. There are no reliable large underground storage basins in the area. Pardee Reservoir on the Mokolumne River supplies water to the City of Jackson. It is about 10 miles upstream of the Site.

EPA may conduct additional soil and water sampling in this area in order to help determine whether the Site may be appropriate for listing on the National Priorities List ("NPL"). EPA does not plan to conduct removal activities in this area; however, this area may be addressed in a future response action if the Site is listed on the NPL.

Two large sink holes have developed in grey sand tailings on the near upstream side of the lower earthen tailings dam in AOC-3. The sink holes are approximately 15-20 feet deep and very unstable. Both sink holes appear to be eroding the west facing slope of the dam. Additionally, these sink holes pose a hazard to children who may play on the site. As part of the dam safety investigation, USACE is assessing the impact of these sink holes on the stability of the earthen dam.

AOC-4: The intermittent stream that flows through the 64.8 acres, the concrete multiple arched dam and the intermittent stream below the dam have been designated as AOC-4. Sediment samples collected in the intermittent stream indicate that contamination has been carried in the runoff emanating from AOC-1. In a sediment sample collected from the drainage in AOC-3, the arsenic, lead, mercury and cyanide concentrations exceeded the RSL. The arsenic, lead, mercury and cyanide concentrations

were 7,300 mg/kg, 750 mg/kg, 14 mg/kg and 23 mg/kg, respectively. The concentrations of arsenic in sediment samples collected on the downstream side of the dam were 1,400 mg/kg, 2,900 mg/kg and 4,700 mg/kg. This indicated a potential release of hazardous substances from the Site. These concentrations are well above the RSL for arsenic in soil and the California Hazardous Waste Criteria Level which is 500 mg/kg.

In a water sample collected downstream from the concrete dam at the inlet to the culvert under Argonaut Drive, the concentration of arsenic was detected at a level of 50 µg/l. This concentration was below the project-specific screening level of 150 µg/l. It should be noted that the arsenic level of 50 µg/l was five times the California MCL for drinking water of 10 µg/l. The sediment and water results suggest that impacts to groundwater or downstream surface waters are possible. It is unclear whether these contaminants have already migrated downstream to Jackson Creek. Additional assessment is planned. The water sample collected below the dam may not have been representative of water that is flushed through the tailings and released to Jackson Creek during periods of heavy rainfall and runoff. EPA is planning to return to the Site after a period of precipitation and collect water samples to characterize the release and runoff into Jackson Creek.

AOC-5: This area is located approximately 300 feet north of AOC-1. The property is comprised of two adjacent parcels owned by the same individual. The 0.39 acre is located at the corner of Pioneer Street and Argonaut Lane. Based on the sampling results there may be greater than 2,000 cubic yards of mine waste contaminated with high levels of arsenic, lead and mercury. This area is vacant land and the soils do not support vegetative growth. Argonaut High School is located approximately 1,000 feet south of AOC-5 and residential homes adjoin the property fence line on the north and east sides of the property. The property is not fenced and is an attractive nuisance to children living in the subdivision and walking to school.

The source of the surface deposits is unknown but there is a high probability the materials are ore or waste rock from the Argonaut Mine. It was common practice to use mine waste as fill for residential development in the area. The surface deposits are similar to the "middlings" material in AOC-1. The soils are generally rocky and acidic. In September 2013, EPA collected four 5-point composite surface (0"-2" bgs) and subsurface (12"-18" bgs) soil samples from two adjacent parcels. Additionally, discrete samples were collected at five locations along the fence line and drainage leading to the storm sewer to assess potential contamination of developed properties adjacent to AOC-5 and to surface waters.

The average arsenic concentration in eight surface and nine subsurface soil samples was 3,413 mg/kg and 10,040 mg/kg, respectively. The maximum arsenic concentration in surface and subsurface soil samples was 8,200 mg/kg and 25,000 mg/kg. The average lead concentration in surface and subsurface soils samples was 595 mg/kg and 1,079 mg/kg, respectively. The mercury concentration in six of nineteen soil samples was above the screening level of 10 mg/kg. The maximum mercury concentration in soil was 22 mg/kg. Two soil samples were analyzed for pH and the results were 1.3 and 2.7.

Following a period of precipitation, EPA pH-tested a pool of water with a reddish hue on the surface of the mine waste pile and it had a pH of 2. There was evidence of metal corrosion (i.e., pitting and discoloration) on sewer manhole covers and grates from contact with acidic soils and surface runoff. The high levels of arsenic, lead and mercury in samples collected along the fence line indicated contamination is likely to extend under adjacent properties to the north and east. A subsurface soil sample (12"-18" bgs) collected on an adjacent property (APN 044-071-004) had an arsenic concentration of 480 mg/kg. The surface soil sample had an arsenic concentration of 27 mg/kg. Both lead and mercury concentrations levels were below the screening levels.

AOC-6: This area borders the northeast side of AOC-1. Soil samples were collected within 25 feet of the fence line and the unpaved parking area between the fence line and the mental health clinic building. The only samples that exceeded the arsenic screening levels were surface soil samples collected approximately 10 feet and 25 feet from the fence line. The arsenic concentrations were 130 mg/kg and 150 mg/kg.

Eastwood Multiple Arch Concrete Dam (EMAD): The U.S. Army Corps of Engineers (USACE) is assisting the OSC in assessing the stability of the tailings storage dams under an Interagency Agreement. These include EMAD in AOC-4 and the lower earthen tailings dam in AOC-3. These dams were built and operated in the early 1900's. The EMAD was known to have been built in 1916. The concrete dam is approximately 46 feet high and 420 feet long. The earthen tailings dam is constructed of grey sand tailings and is approximately 60 feet high and 900 feet long. Several large, deep sink holes have developed on the upstream side of the earthen dam. These sink holes may be impacting the integrity of the dam and these holes pose a significant safety hazard to people. The USACE conducted visual inspections of the dams in July and November 2013. Based on their observations of the concrete dam, the arches appeared to be deteriorated and cracks were noticed in four of the thirteen arches and did pose structural concerns. Additionally, the concrete buttresses showed signs of concrete cracking and spalling around locations of the embedded wire ropes. The buttress braces extending between the buttress walls showed signs of significant concrete cracking, delaminating and/or spalling. Failure of a single buttress would most likely lead to failure of the dam and pose a life safety risk to businesses and people downstream and spread thousands of tons of tailings, mud and water contaminated with high levels of arsenic into populated areas below the dam.

The USACE has not completed their evaluation of the stability of the two dams. The USACE dam safety investigation will be conducted concurrently with the removal site evaluation and removal action. The final report which is due in June 2014 will provide recommendations on the repair and future analysis of the dam in the event that stability and/or seismic deficiencies are found. This removal action will not address repairs, reinforcement or replacement of existing tailings storage dams. There may be other more appropriate Federal or State agencies with responsibility for making improvements to the safety of the dams.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The mine wastes, including semi-processed ores, mine tailings and cyanide leaching process wastes, were observed at or near the ground surface in the waste piles, impound basin tailings dams, drainages and downstream of the concrete dam which is the lowermost containment for runoff emanating from the waste disposal areas. The mine wastes contain high levels of arsenic, lead, mercury and cyanide exceeding health-based benchmarks (*i.e.*, EPA RSLs). The mine wastes are highly acidic and corrosive to metal. High levels of arsenic, lead and mercury have been observed on adjacent properties and properties in close proximity to the Argonaut Lane mine waste area.

During mining operations, pyrite ore and waste rock from deep within the earth are deposited on the surface of the ground. These materials become exposed to air and water. The reactions of air, water and bacteria can oxidize the pyrites and produce acid mine drainage. The chemistry of oxidation of pyrites is very complex. Basically, the pyrites (iron sulfides) are oxidized to sulfates and hydrogen ions and a reaction, catalyzed by microorganisms, can contribute to the formation of sulfuric acid also known as acid mine drainage. Acid mine drainage increases the mobility of toxic heavy metals in the environment.

Rain events have caused erosion, mobilization, and migration of exposed waste materials. Storm water flows from the westernmost portion of the Site and conveys contaminants via an intermittent stream through the Site and is eventually impounded behind the EMAD. Runoff contaminated with heavy metals is released through holes and cracks in the concrete dam or overflow the top of the dam during rain events. Sediments downstream of the concrete dam are contaminated with high levels of arsenic. Due to drought conditions, EPA has been unable to collect water samples from the runoff but will do so during the next rain event. Additionally, the Pioneer Street mine waste area is exposed and unfenced. The soils are California regulated hazardous waste due to toxicity (Arsenic > 500 mg/kg) and corrosivity ($\text{pH} \leq 2$), respectively. Five measurements of surface water runoff from this area by Amador County Environmental Health Department (ACEHD) and one measurement by EPA revealed a pH of between 1 and 2. The most highly contaminated soil surface areas are in AOC-1 and AOC-5 which are comprised of exposed fine grained materials which can easily become airborne during windy conditions and migrate off-site.

5. NPL status

This Site is not on the National Priorities List (NPL). In 2013, the EPA Brownfields and Site Assessment Section commenced a PASI at the Argonaut Mine Site for the purpose of scoring the site for potential listing on the NPL. The Argonaut Lane and Pioneer Street mine waste areas (known collectively as the Argonaut Mine Tailings Site) may be considered operational units of the larger Argonaut Mine Site. The Argonaut Mine Site also includes the mine shaft and head frame, stamp mill and buildings that housed the ore separators, concentrators, and mercury amalgamation

processing and retort areas. Additionally, the Argonaut Mine Site includes waste rock and tailings piles on both east and west sides Highway 49 and drainages on the east side of the highway. The boundaries of the Site have not been fully delineated.

B. Other Actions to Date

On November 13, 2013, the OSC exercised his Warrant authority to erect a fence to restrict access to the top of the concrete dam from Argonaut Drive. A fence was needed to prevent children from walking on top of the dam and being exposed to contaminated soils and water in the basin behind the dam. The ERRS contractor subcontracted ERRG to construct a 3-strand barbed wire fence with metal t-posts and post a warning sign. The work was completed on November 14, 2013. The Action Memo to document the decision to initiate the emergency action was dated December 5, 2013 and signed by OSC Shane on December 30, 2013.

C. State and Local Authorities' Roles

1. State and local actions to date

The Cal-EPA, Department of Toxic Substances Control (DTSC) was the lead agency for the Site since 1992. Sampling conducted by DTSC in 1993 and 2006 revealed extensive arsenic contamination. In some locations, the soil was so corrosive it had eaten through metal fence posts causing a portion of the fence to fall over. DTSC fenced the Site after the PRP failed to comply with a fence and post order. In 1998, DTSC submitted a Preliminary Assessment (PA) report to EPA. The PA report recommended that a Site Investigation (SI) be completed and a HRS scoring package be prepared for the Site.

In 2002, a consultant for the owner of the property in AOC-5 collected soil samples for the Amador County Health Department (ACHD) for the purpose of obtaining a permit for residential development. The maximum concentration of arsenic was 1,300 mg/kg. In 2003, ACHD, in response to a citizen complaint, measured the pH of drainage emanating from the property and bodies of standing water. All five pH readings were between pH 1 and 2. In 2007, DTSC notified the PRP of an Imminent and/or Substantial Endangerment Determination. In 2008, DTSC's contractor, URS Corporation (URS), performed site investigation activities which consisted of drilling, soil sampling, and ground water sampling. A total of 80 borings and 151 soil samples were collected from AOC-1 through AOC-3. The maximum concentration of arsenic was 39,000 mg/kg from a surface soil sample in AOC-1. The maximum concentration of arsenic in the other areas of concern was 670 mg/kg from a boring at a depth of 20 feet in AOC-3. The maximum arsenic concentration detected in the groundwater was 220 ug/l. The depth to groundwater on the site is unknown, but is estimated to range from 45 feet to 100 feet bgs.

In March 2009, URS submitted to DTSC the "Argonaut Mine Tailings Site, Site Investigation Report". The report summarized the results of the SI conducted in 1993. In

May 2011, URS developed a draft Removal Action Work Plan (RAW). The plan proposed to consolidate the tailings on site, neutralize the acidic soils with lime, install a cover of clean fill, and plant with native grasses to hold the fill in place. DTSC did not have sufficient funding to implement the RAW. In December 2011, DTSC requested EPA take the lead agency role for the site during an interagency mine group meeting. On August 26, 2013, the California Department of Toxic Substances Control officially requested assistance from EPA to conduct a removal action at the Site, including the Argonaut Lane mine waste area (parcel numbers: 44-010-074-00, 44-010-082-00, 44-010-083-00, 44-010-084-00 and 44-010-100-00) and the Pioneer Street mine waste area (parcel numbers: 044-071-002, 044-071-003).

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Current Site conditions pose the threat of potential future releases of hazardous substances. These substances include arsenic, lead, mercury and cyanide present within mine waste, contaminated soils and sediments. In addition, the migration of contaminated mine waste into the surrounding community poses threats to human health or welfare or the environment. The likelihood of direct human exposure, via ingestion and/or inhalation of hazardous substances, and the threat of potential future releases and migration of those substances, may pose an imminent and substantial endangerment to public health, and/or welfare, or the environment based on the factors set forth in the NCP, 40 C.F.R. § 300.415(b)(2). These factors include:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain

High concentrations of heavy metals, including but not limited to arsenic, lead and mercury have been detected in samples of semi-processed ore, mine tailings, cyanide processing waste, soil and sediments. Analytical results indicate that concentrations of heavy metals identified in these media exceed background, EPA RSLs and California's hazardous waste criteria. Much of the contaminated material is very fine-grained and therefore likely to result in human exposure via inhalation or ingestion. Mine wastes containing documented hazardous substances may be entrained in naturally and mechanically generated dust and transported by water, by wind or on the shoes and/or clothing of persons passing over the Site.

Inorganic arsenic toxic effects of concern are related to heart and blood vessels (cardio vascular) stomach and intestines (gastrointestinal) kidney effects, liver, nerves and nervous system, lungs, reproductive, respiratory, blood and blood forming organs, and skin (dermal). Arsenic exposure also increases a person's risk to develop lung, skin, bladder, breast, prostate, kidney and liver cancer. In December 2013, for the first time, findings by the University of California (UC) Berkeley Superfund Research Program (SRP) provided strong evidence in humans that ingested arsenic in drinking water causes cancer in specific kidney and ureter cells, called transitional cells. Other recent findings

from the group suggest that people exposed to both arsenic and other known or suspected carcinogens have very high risks of lung or bladder cancer.

Lead has its predominate effects on the central nervous system in adults and children. Once absorbed by the body, lead can be stored for some time in teeth and bones. Lead can be released from these storage sites and enter the blood stream particularly when there is a lack of calcium in the body (e.g. pregnancy and osteoporosis). Generally, lead can cause problems in bones, blood kidney and the brain. High lead concentrations can have an effect on children's normal growth and mental development causing learning difficulties and mental impairment. In adults, lead exposure can increase blood pressure, digestive problems, anemia, weakness in fingers, wrists and ankles, nervous system problems and impaired memory/concentration.

Inorganic mercury salts are toxic to many organs, primarily the kidneys. Both metallic mercury vapor and methyl- and dimethyl-mercury affect the central nervous system. Pregnant women, the developing fetus, and children are the most vulnerable to mercury neurologic effects.

The mine waste areas are readily accessible to nearby part-time and/or full-time residents and other persons that live or visit in the area. The Site is in the center of burgeoning residential area and is directly adjacent to a well-traveled road (Argonaut Lane). At least 50 residences are located within 200 feet of the Site. Persons living in close proximity to the mine waste areas are likely to come into contact with uncontrolled hazardous substances, especially the Pioneer Street mine waste area which is unfenced. The Argonaut Lane mine waste area is mostly fenced but there are areas that are unfenced in the eastern boundaries parts of the Site. EPA and DTSC have observed evidence of children and others playing on the Site, including dirt bike tracks, motorized vehicles, footprints, soda bottles and golf balls.

According to a DTSC report, two children playing on Site years ago reportedly suffocated while tunneling into the grey sand tailings or in a sink hole that caved in on them. The exact location is unknown but it is believed to be in the area of the lower earthen tailings dam.

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems

In 2008, URS collected groundwater samples from several borings. Arsenic, chromium, nickel and zinc exceeded the MCL in several of the ground water samples. There are no reported municipal wells or private wells in the area being used as a drinking water supply. The City of Jackson's purchases treated water from the Amador Water Agency. The water comes directly from the Mokelumne River. Contaminated runoff from the mine waste areas flows to Jackson Creek, which eventually flows to Lake Amador. Lake Amador is not currently used as a drinking water source; however, it is a popular recreational fishing resort and is stocked with fish from its own hatchery.

Two wetlands, identified by the FWS National Wetlands Inventory, are located in the area behind the lower earthen tailings dam and the concrete dam. Habitats for threatened or endangered species are present in Jackson Creek, which is located approximately 400 yards downstream of EMAD. The species include the Foothill Yellow Legged Frog (California Rare and Endangered, observed), Western Pond Turtle (same as previous), and the California Red-Legged Frog (Federally Threatened and Endangered, habitat). The removal action should not adversely affect the habitats of these species. The removal action may improve the water quality within the habitats of these animals by significantly reducing the contaminant levels in the runoff from the Site.

3. Hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers that may pose a threat of release

The former cyanide plant area has numerous concrete tanks and vats of various sizes and construction. The arsenic concentrations in the two of the four vats that were sampled ranged from 4,900 mg/kg to 12,000 mg/kg. Two samples from the vats had mercury concentrations of 13 mg/kg and 14 mg/kg. The lead concentrations ranged from 480 mg/kg to 750 mg/kg. There are also several very old steel drums in this area. One drum was sampled for the presence of coal tar and the lab results indicated the material inside the drum was contaminated with polycyclic aromatic hydrocarbons (PAHs) which verified the presence of coal tar (which was routinely used in the gold purification process) in the drum. Several of the PAHs are harmful to human health from inhalation of fumes, ingestion, and long periods of skin contact and are known animal carcinogens.

4. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

Analytical results from sediment analysis in the drainage suggest that mine wastes are being transported by runoff from the semi-processed ore pile to the concrete dam located in AOC-4. Analytical results from sediment downstream of the concrete dam suggest that contaminants are being released from the basin behind the dam. During periods of heavy rainfall, water flows through cracks and openings in the dam structure and washes into an intermittent tributary to Jackson Creek approximately 400 yards downstream. DTSC has observed water cascading over the top of the dam during a strong storm event. The culvert under Argonaut Drive is under-sized and water ponds in a large and deep ravine. Residents have observed water overtopping the ravine and flowing onto Argonaut Drive.

Wind erosion also may result in migration of hazardous substances. The mine waste areas are fully exposed to wind. Fine-grained materials containing arsenic, lead and mercury may be transported from the site and deposited on roads and on residential properties.

5. Threat of fire or explosion

There is no threat of explosion at the Site; however, wildfires are a common occurrence in the region. A nearby fire might exacerbate conditions at the Site. Wildfires may destroy nearby vegetation leading to increased runoff impacts. Higher erosion rates would increase the likelihood of tailings deposition into surface water bodies or onto surfaces where persons may more easily come into contact with metals contamination. Furthermore, vegetative loss in the area may also increase the likelihood of wind erosion and off-site deposition, thereby increasing the likelihood of exposure.

6. Availability of other appropriate federal or State response mechanisms to respond to the release

The State of California is unable to respond to the release due to insufficient funds to carry out a removal action. In August 2013, DTSC officially requested EPA assistance in conducting a removal action at the Argonaut Lane mine waste area and the Pioneer Street mine waste area.

IV. ENDANGERMENT DETERMINATION

Actual and threatened releases of hazardous substances from this Site, if not addressed by implementing a Time-Critical Removal Action may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Section 104(c) of CERCLA generally restricts Federal lead removal actions to a total direct cost of \$2 million and 12-month duration per 42 U.S.C. § 9604(c)(1). Pursuant to Section 104(c) (1) (A) of CERCLA and 40 C.F.R. § 300.415(b) (5) (i), application of the emergency exemption is appropriate when: 1) there is an immediate risk to public health or welfare or the environment; 2) the response action is immediately required to prevent, limit, or mitigate an emergency; and 3) such assistance will not otherwise be provided on a timely basis. These criteria have been adequately addressed in this Action Memo to support an exemption from the statutory spending limit of \$2 million. Criteria 1 and 2 are addressed in Section II.A. (4), and Section III. (1-5). The Criterion 3 is addressed in Section III. (6). The project may be completed in several phases with each requiring a separate mobilization based on available funds at the time.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

EPA proposes to mitigate threats to human health, welfare, or the environment by taking steps to reduce potential or actual risks to human and ecological receptors from

contamination in semi-processed ores, mine tailings, soils, sediment, process waste, and mine influenced water (MIW). The primary objectives of the removal action will be to consolidate highly contaminated mine waste from several areas of the Site, including the Pioneer Street mine waste area, and construct a repository and evapo-transpiration cover on 5-acres of land (AOC-1) which is a portion of the 64.8 acre Argonaut Lane mine waste area. The repository will prevent direct human exposure to contaminants and eliminate contaminated runoff from the most highly contaminated area. Groundwater protection will be enhanced because rainwater that infiltrates through the cover during the winter will be stored in the sand and mulch layer until it is transpired by plants during the summer.

Construction of the repository will involve grading the mine waste in AOC-1 to conform to the natural topography. The following waste materials will be excavated, transported and consolidated with existing mine waste materials in AOC-1 and used to fill in low spots:

- 1) Process waste from the cyanide plant (AOC-2) – Approx. 60 cubic yards;
- 2) Contaminated sediments below the concrete dam (AOC-4) - Approx. 330 cubic yards;
- 3) Mine tailings from the Pioneer Street mine waste area (AOC-5) – Approx. 2,000 cubic yards;
- 4) Contaminated soils from an adjacent property (AOC-6) – Approx 300 cubic yards.

The excavations will be backfilled with clean soil, graded for proper drainage, and hydro-seeded. Once the final grade in AOC-1 is completed, the cover will be constructed in a series of lifts on top of the mine waste cell and will include the following:

- 1) Imported gravel – Approx. 4,000 cubic yards
- 2) On-site grey sand tailings – 8,100 cubic yards
- 3) Imported clean soil (12 "compacted) – 8,000 cubic yards
- 4) Imported clean soil (12 " non-compacted) – 8,000 cubic yards

The following additional actions will be taken to meet the project objectives:

- 1) Prior to the construction of the cover, a drainage swale will be constructed that will be approximately 600 feet long and 12 feet wide to divert surface water runoff away from the engineered cell. Concrete cloth and rock rip rap will be used in the construction of the drainage swale;
- 2) The grey sand tailings and imported clean fill will be amended with 10% by weight Class A, Exceptional Quality (EQ), Composted Biosolids (Approx. 1,500 cubic yards);
- 3) Erosion control measures (i.e., fiber rolls) will be installed and the final surface will be hydro-seeded with blown fertilizer mixture containing straw, mulch, seed, and tackifier;

- 4) Process wastes with high levels of arsenic, lead and mercury will be excavated from four large concrete vats in AOC-2 and transported to AOC-1;
- 5) Soils contaminated with high levels of arsenic, lead, mercury and cyanide in the vicinity of the cyanide tank structures in AOC-2 will be excavated and transported to AOC-1. A fence and locking gate will be installed around the structures to prevent exposure to wastes in the tanks. Because of the risk of damaging potentially historic structures, no attempt will be made to decontaminate the tanks. The levels of arsenic, lead and mercury in process wastes inside the tanks are similar to the levels found in AOC-3;
- 6) The large sink holes on the upstream side of the lower earthen tailings dam will be backfilled with surrounding tailings and soil in the historic impound area. The wetlands will be roped off to prevent heavy equipment from entering the area.

2. Contribution to remedial performance

The long-term cleanup plan for the Site:

There is currently no long-term cleanup plan for this Site. There is currently an on-going PASI.

Threats that will require attention prior to the start of a long-term cleanup:

In November 2013, the OSC used his delegated warrant authority to install a fence and post a danger sign to prevent public access to the top of the 46 foot high dam and contaminated tailings in the basin behind the dam.

The extent to which the removal will ensure that threats are adequately abated:

It is expected that this removal action will substantially reduce any threat of direct or indirect contact with or inhalation of hazardous substances at the Site. Additionally, the removal action should decrease loading of contaminants into the Jackson Creek watershed.

Consistency with the long-term remedy:

Concurrently with this removal action, the Site Assessment Manager (SAM), Brownfields and Site Assessment (B&SA) Section, is conducting a PASI to score the site for potential listing on the NPL. The OSC is closely coordinating the removal site evaluation and proposed removal action to mitigate the most immediate threats with the SAM. The proposed removal action should not affect the long term remediation of the Site. This removal action would mitigate the most immediate threats which exist in several areas within the 64.8 acre, the Argonaut Lane mine waste area and the Pioneer Street mine waste area. Additionally, the hazards posed by soil contamination on the mental health clinic property that was impacted by mine waste, and contaminated sediments from past releases below the concrete dam will be mitigated. The public has easy access to both of these areas. The removal action will not address other areas of the

site including the grey sand tailings pile area, historic impound area and concrete dam basin. These areas will be investigated as part of the PASI.

3. Description of alternative technologies

The use of Class A EQ Biosolids is considered to be an alternative technology. Biosolids consist of composted municipal sewage sludge and green waste. Biosolids may be used as an amendment to condition the soil and add nutrients for plant growth. Biosolids can be used to capture and bind metals within the soil structure, thereby decreasing human and eco-toxicity. Research conducted by the EPA, the USDA and others have shown that this technology is feasible and cost-effective and can significantly reduce high concentrations of bio-available metals in soil. Class A EQ Biosolids meet strict standards for chemicals and pathogens and is marketed to the public for use as soil amendment and fertilizer.

4. Applicable or relevant and appropriate requirements (ARARs)

Section 300.415(j) of the NCP provides that removal actions must attain ARARs to the extent practicable, considering the exigencies of the situation.

Section 300.5 of the NCP defines applicable requirements as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstances at a CERCLA site.

Federal cleanup standards will be based upon the EPA RSL's (May 2013) for arsenic, lead, mercury and cyanide in residential soil, or may be based upon a comparison to background concentrations in the immediate vicinity of the Site. For arsenic, EPA has tentatively calculated a risk screening level of 61 mg/kg in residential soil at this Site. This level is based on an arsenic bioavailability of 60%. EPA considers this level to be protective of health for persons exposed to soils for many decades. Additionally, groundwater contaminant concentrations were compared with the Maximum Contaminant Levels (MCLs) under the National Primary Drinking Water Regulations, May 2009.

Section 300.5 of the NCP defines relevant and appropriate requirements as cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Because CERCLA on-site response actions do not require permitting, only substantive requirements are considered as possible ARARs. Administrative

requirements such as approval of, or consultation with administrative bodies, issuance of permits, documentation, reporting, record-keeping, and enforcement are not ARARs for the CERCLA actions confined to the site.

The following ARARs have been identified for the proposed response action. All can be attained.

Federal ARARs:

Clean Water Act: Controls the discharge of pollutants to surface waters of the United States. EPA will protect against discharge of pollutants to Jackson Creek during excavation and removal of contaminated mine waste and soils by implementing standard storm water controls. Excavation will occur only during dry weather conditions where there is little risk of free flowing water escaping the excavation.

National Historic Preservation Action: Provisions under the NHPA Section 106 are meant to protect historic properties from damage during removal actions. The OSC has a qualified Historic Specialist under contract from the Anthropological Services Center at Sonoma State University (ASC) to assist EPA in the notification process, cultural resources inventory, and preparing a report on potential eligibility of the property for inclusion in the National Register of Historic Places. Consultation with the State Historic Preservation Officer (SHPO) has been initiated and the proposed removal action includes elements suggested by the SHPO. Consultation with tribes and other interested parties has also been initiated. Should EPA determine that any adverse effects might occur as a result of, or during, the removal action, EPA, with assistance from ASC, will prepare the appropriate agreement document outlining steps to mitigate the impacts and submit it to the SHPO and the Advisory Council on Historic Preservation for concurrence.

Endangered Species Act: Provisions under the ESA are meant to protect rare and endangered species and their habitat from harm during the removal actions. The OSC is coordinating this effort with the EPA Regional Ecologist. See Section III, (2) for a description of threatened and endangered species.

State ARARs:

Environmental Screening Levels: EPA may consider the following screening levels to determine if further actions are needed to mitigate threats to public health, welfare or the environment:

- California Human Health Screening Levels (CHHSLs) for residential soil, January 2005
- Central Valley Regional Water Quality Control Board, Water Quality Objectives, Jackson Creek, Freshwater Aquatic Life, May 31, 2013
- California Toxics Rule, State Water Quality Standards, May 18, 2000

5. Project schedule

The project is scheduled to begin on August 18, 2014. The start-up date is estimated pending available funding. It is estimated that removal activities will take approximately 8 weeks to complete. All or part of the hydro-seeding may be delayed until the spring of 2015 to take advantage of optimum conditions for seed germination. Additional work may be required if re-vegetation and/or other erosion controls are not immediately successful or are compromised due to extreme weather.

B. Estimated Costs

Regional Removal Allowance Costs:

Total Cleanup Contractor Costs \$ 1,806,000.00

Other Extramural Costs Not Funded from the Regional Allowance:

START Contractor Costs	\$ 150,000.00
USCG PST Costs	30,000.00
ERT Costs	20,000.00

Subtotal Extramural Costs	\$ 2,006,000.00
Extramural Costs Contingency (20%)	<u>401,200.00</u>

TOTAL, Removal Action Project Ceiling \$ 2,407,200.00

In addition to the extramural costs estimated for the proposed action, a cost recovery enforcement action also may recover the following intramural costs:

Intramural Costs

U.S. EPA Direct Costs \$ 50,000.00

U.S. EPA Indirect Costs (45.79%) \$ 1,152,256.00

(45.79% of 2,407,200 + 50,000)

TOTAL Intramural Costs \$ 1,202,256.00

The total U.S. EPA extramural and intramural costs for this removal action, based on full-cost accounting practices that will be eligible for cost recovery, are estimated to be \$3,609,456.00.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Given the site conditions, the nature of the hazardous substances documented on site, and the potential exposure pathways to nearby populations described in Sections III and IV above, actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response actions selected in this memorandum, may continue to present an imminent and substantial endangerment to public health, or welfare, or the environment.

VIII. OUTSTANDING POLICY ISSUES

There is no outstanding policy issues with the Site identified at this time.

IX. ENFORCEMENT

Please see the Confidential Enforcement Addendum for a discussion regarding enforcement against potentially responsible parties (provided as a separate document).

X. RECOMMENDATION

This decision document represents the proposed removal action for the Argonaut Mine Tailings Site, in the City of Jackson, Amador County, California, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Because conditions at the Site meet the NCP criteria for a time-critical removal Action, EPA enforcement staff recommends that you approve selection of the removal action proposed in this memorandum.

The total project ceiling if approved will be \$2,407,200.00, of which an estimated \$1,806,000 comes from the Regional Removal Allowance. Your approval or disapproval may be indicated by signing on the appropriate line below.

Approve:  for DM Date: 5/15/14
Daniel Meer, Assistant Director
Superfund

Disapprove: _____ Date: _____
Daniel Meer, Assistant Director
Superfund

The Enforcement Addendum is provided as a separate document.

Attachments:

1. Index to the Administrative Record
2. Photograph Log

Sherry Fielding, USEPA, OERR, HQ

Pat Port, OEPC, U.S. Department of Interior

Charles Ridenour, Chief, Brownfields & Environmental Restoration Protection Branch,
California Department of Toxics Substances Control

H. Allen, Chief, Emergency Response Section, SFD-9-2

L. Williams, Office of Regional Counsel, ORC-3

K. Muratore, Civil Investigator, SFD-7-5

C. Temple, SFD-9-2

Site File

ATTACHMENT I
INDEX TO THE ADMINISTRATIVE RECORD

- 1) Hazardous Waste Surveillance and Enforcement Report, Argonaut Lane Tailings, Argonaut Heights, California Department of Health Services, August 28, 1987
- 2) Cleanup and Abatement Order No. 90-722, Argonaut Heights Tailings, California Regional Water Quality Control Board, September 27, 1990
- 3) Site Visit Report, Argonaut Mine Tailings Site, Daniel Ziarkowski, April 14, 1993
- 4) Preliminary Assessment Report, Argonaut Mine Tailings (Pioneer Mine), Prepared by DTSC for EPA, October 15, 1998
- 5) Proposed Grading and Development, Lots 30 and 31, Argonaut Heights, Jackson (APN 044-071-002, 044-071-003), Letter from Robert Fourt, Registered Environmental Health Specialist, Environmental Health Department, Land Use Agency, Amador County to Larry White, Chief Building Official, City of Jackson, January 28, 2003
- 6) Argonaut Mine Tailings Site, Site Investigation Report (draft), Prepared by URS Corporation for DTSC, March 1, 2009
- 7) Interim Soil Removal Action Work Plan, Argonaut Mine Tailings Site, Jackson, Prepared by URS Corporation for DTSC, 2011
- 8) Memo: Argonaut Multiple Arch Dam (7/9/13 inspection), U.S. Army Corps of Engineers, July 23, 2013
- 9) Sampling and Analysis Plan, Argonaut Mine Tailings Pile Assessment, Jackson, CA, Prepared by START Contractor for EPA, July, 2013
- 10) Memo: Argonaut Mine Tailings Storage Dam – Initial Inspection on 7/9/13, U.S. Army Corps of Engineers, July 30, 2013
- 11) Letter from DTSC to EPA requesting a Federal removal action at the Argonaut Lane and Pioneer Street mine waste areas, August 26, 2013
- 12) Memo: Argonaut Tailings Storage Dam – 2nd inspection on 11/15/13, U.S. Army Corps of Engineers, November 19, 2013
- 13) Sampling and Analysis Plan (draft), Prepared by Weston, Inc. for EPA's Preliminary Assessment/Site Inspection (PASI), November, 2013
- 14) Tailings Pile Removal Assessment Report, Prepared by START Contractor for EPA, December 1, 2013
- 15) Action Memo: Documents decision to initiate emergency response action to fence off access to top of dam and basin, Dan Shane, On-Scene Coordinator, December 30, 2013, for actions taken on 11/13-11/14
- 16) Argonaut Mine Releasable Chronology, Kim Muratore, EPA, January 28, 2014
- 17) Tailings Pile Removal Assessment Report (AOC-5), Prepared by START Contractor for EPA, January, 2014
- 18) Pollution Report One & Final, Prepared by Dan Shane, On-Scene Coordinator, U.S. EPA, dated February 2, 2014, for emergency response actions taken on 11/13-11/14
- 19) Removal Assessment Addendum Report; Argonaut Mine Tailings Pile AOCs 1,2,4 and 6; Jackson, Amador county, CA, prepared by START Contractor for EPA, February 13, 2014

Note: Records 6, 8, 10, 12, 14, and 18 are in the Administrative Record for the previous emergency response actions taken on 11/13-11/14 (see records 15 and 18).

ATTACHMENT II PHOTOGRAPH LOG



Runoff from 64.8 acre mine waste area was observed cascading over the Eastwood Multiple Arch Concrete Dam following a large Storm Event. The ravine below the dam became a large lake (photo taken by DTSC).



View of 5-acre area used to stockpile semi-processed ore or "middlings". The fenced area is mostly barren and nearly devoid of vegetation.



View of coal tar tumbling box located at the former Amador Metals Reduction (Cyanide) Plant used to coat the ore prior to cyanidation



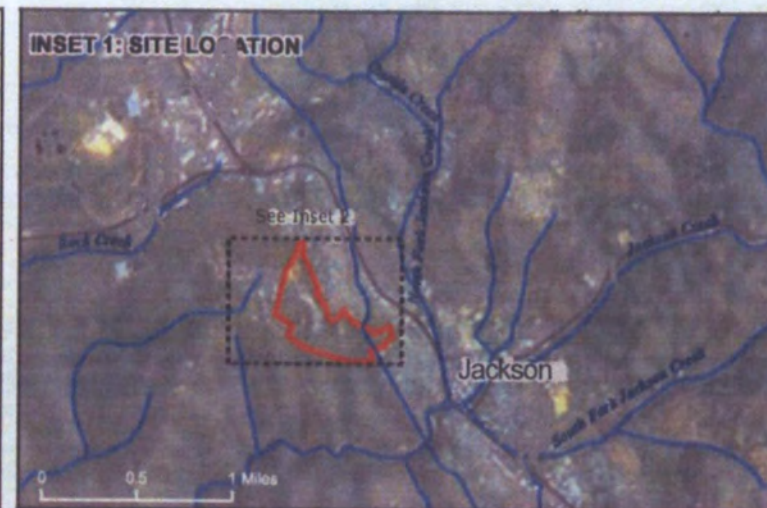
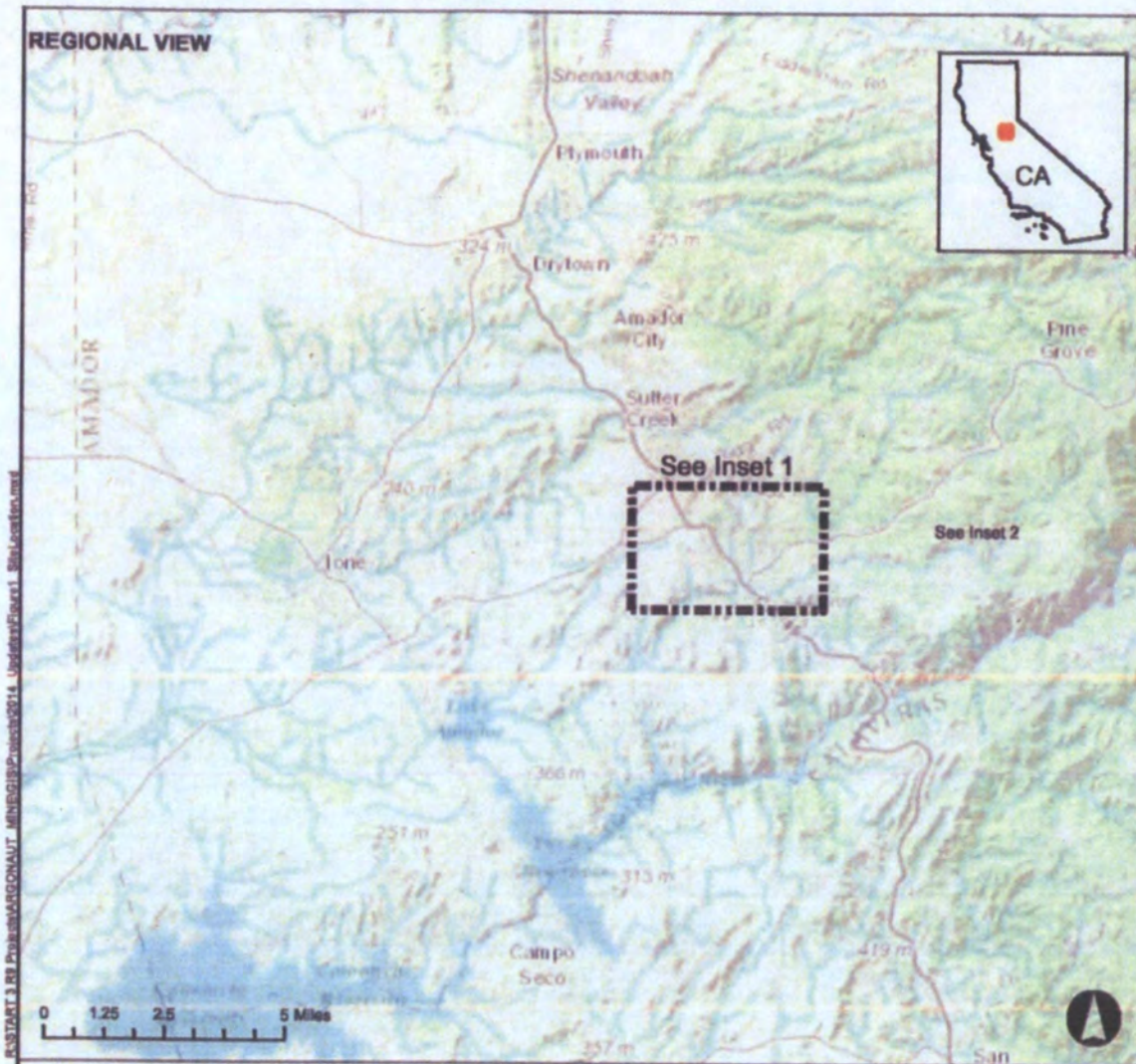
View of cyanide leaching, mixing and flotation tanks at the former cyanide plant



View of Pioneer Street Mine Waste Area at the corner of Argonaut Lane and Pioneer Street. The area is unfenced, near homes and Argonaut High School. .



View of the Eastwood Multiple Arch Dam facing south. The dam was built in 1916 and is approximately 46 feet high and 420 feet long with 13 inverted arches.



LEGEND

- Topographical Survey Boundary
- Rivers
- Major Roads

Figure 1
Site Location Map
Argonaut Mine Tailings Pile
Jackson, California



ATTACHMENT 2

February 11, 2015 Action Memorandum and Approval for Exemption to 12-Month Limitation for Removal Actions



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX**

75 Hawthorne Street
San Francisco, CA 94105

ACTION MEMORANDUM

DATE: FEB 11 2015

SUBJECT: Request for Approval of Emergency Exemption from 12-Month Limitation on Removal Actions for the Argonaut Mine Site, City of Jackson, Amador County, California

FROM: Daniel Shane, On-Scene Coordinator
Emergency Response Section (SFD-9-2)

TO: Daniel Meer, Assistant Director
Response, Planning, and Assessment Branch (SFD-9)

THRU: Harry L. Allen, Chief *HLA*
Emergency Response Section (SFD-9-2)

I. PURPOSE

The purpose of this Action Memorandum is to request a determination exempting the removal action approved on May 15, 2014 for the Argonaut Mine Site, Jackson, Amador County, California (the "Site") from the 12-month limitation for removal actions, set forth in 42 U.S.C. § 9604(c)(1)(A), and thereby authorizing the continuation of that removal action. Using its authority under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), EPA initiated a time-critical removal action at the Site on December 1, 2014, to address the presence of arsenic, lead and mercury present in soils, tailings, mine waste, structures and stream sediments at the Site. However, due to inclement weather the mobilization to begin the removal action was interrupted and the removal action has been postponed until the spring of 2015. More than 12 months is expected to elapse from the time the Action Memorandum (Attachment 1) was approved until it is completed.

II. SITE CONDITIONS AND BACKGROUND

Site Status: Non-NPL
Category of Removal: Time-Critical
CERCLIS ID: CAD983650011
SITE ID: A930

A. Site Description

The Argonaut Mine is an abandoned hard rock gold mine located in the City of Jackson, Amador

County, California which operated from 1850 to 1942. The Argonaut Mine Site encompasses a large area and includes the Argonaut Mine and Mill areas, a 64.8-acre mine tailings disposal area, a 0.39 acre vacant lot used by the mine for disposal of mine tailings in the 1940's. The Argonaut Mine and Mill areas, which are located approximately ½ mile north of the mine tailings disposal area, are not part of the removal action. The 64.8-acre mine tailings disposal area is bordered by Argonaut Lane on the west, Hoffman Street on the south, Argonaut Drive on the east and residential homes on the north. Argonaut High School is located approximately 300 feet west of the mine tailings disposal area. The approximate geographic coordinates of the mine tailings disposal area are N 38° 21'26.9" latitude, W 120° 47'23.4" longitude. The mine tailings disposal area is located on private land. The Site includes a smaller mine tailings disposal area on a nearby vacant lot. The vacant lot is bordered by residential homes on the north and east, a mental health care facility on the south and Argonaut Lane on the west. Additionally, the site includes a former cyanide plant and mercury amalgamation processing areas, large tanks and vats containing process wastes, two earthen tailings dams, one concrete dam known as the Eastwood Multiple Arch Dam (EMAD) and three impoundments. The upper earthen tailings dam (UETD) impoundment is filled with approximately one million tons of "grey-sands tailings" which was a waste material from the cyanide leaching process. The lower earthen tailings dam (LETD) has an estimated 447,000 tons of impounded tailings and has been breached on the south end of the dam. Several large sink holes are eroding into the embankment. Two thriving wetland areas with small ponds have developed in the impoundments behind the LETD and EMAD over the past 100 years. The concrete dam basin has an estimated 308,000 tons of tailings.

The two contaminated areas which pose the most immediate threat to public health and the environment are a 5-acre parcel of land located along Argonaut within the 64.8-acre mine tailings disposal area and a 0.39 acre vacant lot located 300 feet north of the 5-acre parcel at the intersection of Argonaut Lane and Pioneer Street. These two areas have high levels of arsenic, lead and mercury in residential soils. The 5-acre parcel consists of approximately 120,000 cubic yards of mine tailings. The highest levels of arsenic, lead and mercury are 48,000 mg/kg, 4,000 mg/kg and 360 mg/kg, respectively. The 0.39 acre vacant lot consists of approximately 2,000 cubic yards of mine tailings. The highest levels of arsenic, lead and mercury are 25,000 mg/kg, 1,079 mg/kg and 22 mg/kg, respectively. The levels of contamination in the vacant lot and 5-acre parcel are 50-60 times greater than other areas of the Site. In addition, the soils are very corrosive and water that is in contact with the soils has a pH of 1-2. The cleanup action levels for arsenic, lead and mercury in residential soils are 61 mg/kg, 400 mg/kg and 10 mg/kg, respectively. The background levels of arsenic, lead and mercury range from 8 mg/kg to 21 mg/kg, 14 mg/kg to <28 mg/kg, and 0.1 mg/kg to <8.1 mg/kg, respectively.

1. Removal Site Evaluation

Please refer to the attached Action Memorandum, dated May 15, 2014.

2. Current Site Conditions

EPA initiated a removal action at the Site on December 1, 2014. However, the strongest storm system in two years in the Sierra Nevada foothills caused the EPA's On-Scene Coordinator (OSC) to postpone the mobilization of personnel, materials and equipment to the Site. The work will reschedule in the spring of 2015. This phase of the removal action will involve the excavation of 2,000 cubic yards of contaminated soils and tailings from the vacant lot at the corner of Pioneer Street and Argonaut Lane

and transported to the 5-acre parcel within the 64.8-acre mine tailings disposal area. The mine waste material will be placed in a low area at the southeast corner of the 5-acre parcel, capped with two feet of clean soils from a local borrow source and hydro-seeded. Additionally, the excavated pit will be backfilled with clean soil, graded and hydro-seeded. In the interim, EPA installed a fence around the vacant lot to prevent children from playing on the lot. This work was completed on December 18, 2014.

The second phase of the removal action is scheduled for the summer or fall of 2015. This phase will involve the excavation and removal of highly contaminated tailings, soils, sediments and process wastes in several other areas of the Site. These areas include the cyanide and mercury processing areas, mental health clinic, and drainage channel below the EMAD. The total volume of contaminated waste material from these areas is approximately 800 cubic yards. These materials will be transported to the 5-acre parcel and incorporated into the repository. Clean soils will be transported to the Site from local borrow sources to be used in the construction of an evapotranspiration (ET) cover which will cap, and encapsulate in place, the contaminated mine waste materials. The *Capillary Barrier ET Cover Design System* will have a three foot cap comprised of 24-inches of fine-grained material (topsoil) and 12-inches of coarser-grained material (grey sands tailings) amended with composted biosolids. The capillary barrier and drainage layers will be comprised of 12 inches of non-amended grey sands tailings and 6 inches of washed rock or gravel underlain by 6 inches of sand. Filter fabric will be placed in the interface between the gravel and grey sands to prevent clogging the drainage layer. The grey sands tailings, which are readily available on site, are being used as a cost savings measure. The 5 acres will be hydro-seeded with a fast germinating grass seed mixture that was recommended by the California Department of Conservation, Office of Mine Reclamation. In addition, the existing drainage will be improved and concrete cloth and rip rap will be used to line the drainage swale. A sedimentation basin will be constructed downstream. Engineering and grading plans have been completed for the mine waste repository. The 5-acre parcel is currently fenced. DTSC has replaced the cyclone fence and posts several times over the years due to corrosion which had eaten through the steel posts. This was caused by contact with highly acidic and corrosive soils.

EPA is currently conducting a Preliminary Assessment/Site Inspection (PASI) to score and potentially list the Site on the NPL. The PASI is being conducted concurrently with the removal activities. The OSC is coordinating all removal assessment and cleanup activities with the Site Assessment Manager (SAM). PASI sampling began the week of July 28, 2014 and was completed on August 1. The preliminary results from the CLP Laboratory were received in mid-October. The results of the arsenic bioavailability study were received from the EPA Richmond Laboratory on 12/15/14. The EPA Toxicologist is currently evaluating the results of the bioavailability study.

Anticipated work to complete the removal action will include: finish excavating hotspot areas, backfilling, erosion control, drainage channel improvements, restoration of excavated areas, and construction of the repository and evapotranspiration cover. Additionally, the sink holes will be plugged with tailings material because they pose a significant hazard to children who may trespass on the site. EPA's On-Scene Coordinator anticipates work to be completed by summer or fall of 2015, as available funding permits.

3. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant.

Please refer to the attached Action Memorandum, dated May 15, 2014 for the basic assessment of actual and threatened releases from the Site. If the response work is not completed as planned, the releases will continue to pose a significant threat to public health, welfare and the environment. Actual releases have been documented in the drainage sediments below the EMAD where arsenic concentrations are as high as 4,700 mg/kg. High concentrations of arsenic, lead and mercury in on-site soils are poised to be released if not remediated.

4. NPL Status

The Site is not currently on or proposed for the NPL. A PASI is currently being undertaken by EPA Region 9 Brownfields & Site Assessment Section.

5. Maps and Other Graphic Representations

Please refer to the attached Action Memorandum, dated May 15, 2014, where there is a map identifying the areas of concern (AOCs) and where work will be conducted on the Site.

B. Other Actions to Date

1. Previous Actions

Please refer to the attached Action Memorandum, dated May 15, 2014.

2. Current Response Action

Removal Action

EPA is conducting a time-critical removal action at the Argonaut Mine Site. As previously mentioned, the removal action will be conducted in two phases:

Phase 1: Excavate approximately 2,000 cubic yards of mine tailings from vacant lot, transport waste materials to a 5-acre parcel, capped with clean soil, hydro-seed. The excavation will be backfilled, graded and hydro-seeded. Work will be conducted in the spring of 2015.

Phase 2: Excavate approximately 800 cubic yards of contaminated mine tailings, soils, sediments and process wastes in various hotspot areas and consolidate waste materials in the 5-acre parcel. A repository and evapotranspiration cover will be constructed over the 5-acre parcel. The existing drainage channel will be improved and lined with concrete cloth and rip rap. Erosion control measures will include the use of straw wattles and hydro-seeding with fast germinating grasses and other landscaping erosion control techniques. Several sink holes upstream of the LTD will be plugged. Work will be conducted in the summer or fall of 2015 depending on available funding.

Dam Safety Investigation

A dam failure study is being conducted by EPA concurrently with the removal action. The results of the assessment will be forwarded to the City of Jackson and Amador County for listing the dam in the Local Hazard Mitigation Plan which will allow the dam to be eligible for a FEMA Pre-Disaster or Flood Mitigation Assistance Grant. The City or County can apply for a FEMA grant to repair or retrofit the dam and/or divert surface water runoff around the dam to relieve hydraulic pressure on the structure. In February 2013, during a joint inspection of the Site with DTSC, the OSC was shown a highly deteriorated concrete tailings dam at the lowest elevation of the Site. The dam is located approximately 400 yards from downtown Jackson. Jackson Junior High School is located near the dam. The dam was constructed in 1916 and was known as the Eastwood Multiple Arch Dam. The dam is 46 feet high and 420 feet long and has 13 arches. There is an estimated 165,000 cubic yards of contaminated tailings and sediment in the impoundment. The estimated volume capacity of freestanding and pore water is 13.7 million gallons. The State Division of Safety of Dams (DSOD) does not have jurisdiction for the dam because the dam is filled with sediment and no longer meets the freestanding water storage capacity threshold of 15 acre-feet. The current estimated volume of freestanding water storage capacity is 2.8 acre-feet. The City and County lack the financial resources to conduct the assessment.

In May 2013, EPA commissioned the U.S. Army Corps of Engineers (USACE) to perform a dam safety evaluation. In June 2014, the USACE prepared the Phase I Stability Evaluation Report for EPA. The dam was determined to be unsafe and could breach under dry and wet condition scenarios. Conditions identified that could cause the collapse of the dam included earthquakes, pressure from water and tailings behind the dam, or a combination of both. In September 2014, EPA and the USACE conducted a geotechnical investigation and collected soil samples from boreholes advanced by a drill rig through the tailings to bedrock in various locations behind the EMAD and LTD. One borehole was advanced through the crest of the LTD. The soil samples were analyzed for geophysical properties to assess the potential for liquefaction of soils, slope stability, slide potential and debris flow in the event the dam breaches. The geotechnical report is due at the end of December 2014. If there is a potential for a mud/debris flow, EPA will perform debris flow modeling to estimate the extent and magnitude of damages to life and property. The modeling will be conducted by CD Smith under a subcontract with RTI. RTI is a prime contractor for EPA's Office of Research & Development. In the interim, EPA has commissioned the USACE to monitor the dam for signs of failure, particularly in conjunction with rain events that could increase saturation and hence pressure behind the dam. This monitoring is being conducted in order to increase the chances that a timely warning could be provided if there were signs that the dam posed a risk of an imminent collapse and potential to injure down-gradient people and property.

C. State and Local Authorities' Roles

The OSC has kept all Federal, State, Local and Tribal stakeholder agencies apprised of the removal action and dam safety investigation. These agencies include the Department of Toxic Substances Control, Central Valley Regional Water Quality Control Board, California Department of Conservation Office of Mine Reclamation, California Department of Fish and Game, California Department of Parks and Recreation Office of Historic Preservation, California Department of Water Resources Division of Safety of Dams, California Office of Emergency Services, Amador County

Environmental Health Department, Amador County Office of Emergency Services, Amador County Unified School District, City of Jackson, Ione Band of the Miwok Indians, Buena Vista Rancheria Tribe, U.S. Army Corps of Engineers, Federal Emergency Management Agency, and U.S. Fish & Wildlife Services.

The OSC is coordinating with agencies on the proposed removal action, traffic safety plan, measures to protect the health and safety of nearby residents, National Historic Preservation Act, cultural and historic resources survey and inventory, archaeological monitoring plan, and wetlands protection plan. These agencies are providing assistance within their respective authorities but have limited financial ability to conduct removal work. Nevertheless, in response to a request from the OSC, the City of Jackson is currently installing a fence and warning signs around the unsafe concrete dam structure and monitoring the dam following periods of heavy rainfall in order to protect public safety. On November 18, a community meeting was hosted jointly by EPA and the City of Jackson. The OSC presented information on the results of the removal assessment, proposed removal action and dam safety investigation.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

EPA determined that conditions at the Argonaut Mine Site present a release and potential threat of release of CERCLA hazardous substances threatening to public health, or welfare, or the environment based upon the factors set forth in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. § 300.415(b)(2). See Attachment 1. If the response action is not completed as planned because of the 12-month limitation, threats to the public health or welfare or the environment will continue, as considered in accordance with the NCP factors:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby human populations, animals or the food chain

High concentrations of heavy metals, including but not limited to arsenic, lead and mercury have been detected in samples of semi-processed ore, mine tailings, cyanide and mercury processing waste, soil and sediments. Analytical results indicated that concentrations of heavy metals identified in these media greatly exceed background, EPA Regional Screening Levels (RSLs) for residential soils. Additionally, the total and leachable concentrations of arsenic in soils exceed California's hazardous waste limits.

2. Actual or Potential Contamination of Drinking Water Supplies

In 2008, URS collected groundwater samples in several borings. Arsenic, chromium, nickel and zinc exceeded the Maximum Contaminant Levels (MCLs) for drinking water in several of the ground water samples. There are no reported municipal wells or private wells in the area being used as a drinking water supply. The City of Jackson's purchases treated water from the Amador Water Agency. The water comes directly from the Mokelumne River. Contaminated runoff from several different mine sites in the area flow to Jackson Creek, which eventually flows to Lake Amador. Lake Amador is not currently used as a drinking water source; however, it is a popular recreational fishing resort and is stocked with fish from its own hatchery.

3. Hazardous Substances or Pollutants or Contaminants in Drums, Barrels, Tanks, or Other Bulk Storage Containers, that may pose a Threat of Release

The former cyanide plant area has numerous concrete tanks and vats of various sizes and construction. The arsenic concentrations in the two of the four vats that were sampled ranged from 4,900 mg/kg to 12,000 mg/kg. Additionally, the waste in several tanks had elevated levels of lead and mercury above the RSLs.

4. High Levels of Hazardous Substance or Pollutants or Contaminants in Soils at or Near the Surface that May Migrate

The tailings, soils, sediments and process wastes have very high concentrations of arsenic, lead and mercury. The soils are too toxic to support plant life and can be easily eroded by the forces of wind and rain. Much of the contaminated material is very fine-grained and therefore likely to result in human exposure via inhalation or ingestion. The oxidation of pyrite and arsenopyrite ores have produced acid mine drainage which can mobilize the heavy metals. The soils have a low pH and are very corrosive to structures such as cyclone fences and sewer manholes. Mine wastes containing hazardous substances may be easily transported by water or entrained in naturally and mechanically generated dust or on the shoes and/or clothing of persons passing over the Site. The migration of contaminated mine tailings has been documented. Arsenic concentrations in sediment samples from the drainage below the concrete tailings dam exceeded California's hazardous waste criteria by a factor of nine. A previously undiscovered mercury amalgamation processing area was identified north of the cyanide plant in an area overgrown with vegetation. The concentration of mercury in exposed soils was as high as 130 mg/kg or 13 times greater than the RSL for mercury in residential soils.

5. Weather Conditions that may Cause Hazardous Substances or Pollutants or Contaminants to Migrate or be released.

Analytical results from sediment analysis in the drainage suggest that mine wastes are being transported by runoff from the 5-acre pile to the concrete tailings dam. During periods of heavy rainfall, water flows through cracks and openings in the dam structure and washes into an intermittent tributary to Jackson Creek approximately 400 yards downstream. DTSC had observed water cascading over the top of the dam during a strong storm event in 2006. The culvert under Argonaut Drive was under-sized and water flooded in a deep ravine between the concrete dam and Argonaut Drive. Residents had observed water overtopping the ravine and flowing onto Argonaut Drive. Wind erosion also may result in migration of hazardous substances. The mine waste areas are fully exposed to wind. Fine-grained materials containing arsenic, lead and mercury may be transported from the site and deposited on roads and on residential properties or settle into houses.

6. Threat of Fire or Explosion

None identified to date.

7. Availability of Other Appropriate Federal or State Response Mechanisms to Respond to the Release

The State of California is unable to respond to the release due to insufficient funds to carry out a removal action. In August 2013, DTSC officially requested EPA assistance in conducting a removal action at the Argonaut Mine Site.

IV. ENDANGERMENT DETERMINATION

The current Site conditions, including the presence of arsenic, lead and mercury contaminated materials, if not mitigated by completing the planned response actions, will continue to pose a threat to human health and the environment through direct contact, ingestion, inhalation, and migration of materials off-Site and into the food chain. Arsenic, lead and mercury are hazardous substances under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

Consistent with the factors set forth at 40 C.F.R. § 300.415(b)(2), the actual or threatened releases of this hazardous substance, if not addressed by completing the response action as proposed in this memorandum, will continue to present a threat of exposure to arsenic, lead and mercury and an imminent and substantial endangerment to public health or welfare or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Consistent with 42 U.S.C. § 9604(c)(1)(A) and 40 C.F.R. § 300.415(b)(5)(ii), EPA response staff believe that an exemption from the 12-month statutory limit for removal actions is warranted.

Standard for Exemption: An exemption from the 12-month time limit for removal actions is justifiable under the criteria of 42 U.S.C. § 9604(c)(1)(A) and 40 C.F.R. § 300.415(b)(5), which provide that the exemption is appropriate when EPA determines that: (i) the continuation of a response action is immediately required to prevent, limit or mitigate an emergency, (ii) there is an immediate risk to public health or welfare or the environment, and (iii) such assistance will not otherwise be provided on a timely basis.

An exemption from the 12-month time limit for removal actions is justifiable for the May 2014 Removal Action for the following reasons:

1. There is an immediate risk to public health or welfare or the environment.

EPA previously determined that the actual or threatened releases of hazardous substances at the Site presents a threat of exposure to the public from arsenic, lead and mercury at the Site. Until the response action is complete, contaminated soils and surface water runoff will continue migrate to off-site areas frequented by the public. Without completion of the present response action, the Site continues to present an immediate threat to human health and the environment and an emergency exemption is warranted based on the threats posed by conditions at this Site.

2. Continued response actions are immediately required to prevent, limit, or mitigate an emergency.

If the response action is not continued, there will be a continuation of air and water erosion in areas with high concentrations of hazardous substances and continue to release hazardous substances from the Site. If response actions are not continued to reduce, abate, and prevent releases from the Site, then damage to the environment may continue, including the further contamination of soil, sediment, surface water, and groundwater. Continued action at this Site is necessary to prevent, limit or mitigate the potential for further releases of hazardous substances to the environment.

3. Assistance will not otherwise be provided on a timely basis.

The California Environmental Protection Agency, Regional Water Quality Control Board and Amador County Department of Environmental Health do not have the funding necessary to undertake the necessary removal as described in this Action Memorandum. An ongoing threat to the public health, welfare, and the environment continues due to the lack of resources available to the state and local governments.

In summary, as stated above, there is an immediate risk posed by the conditions at the Site and the statutory criteria for an emergency exemption to the 12-month statutory limit have been met.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

Please see Attachment 1 for a description of the general planned removal action. The removal activities at the Site were delayed by significant early rain, which shut down operations for the winter season. Anticipated actions will include: excavation of contaminated hotspot areas and consolidation of all waste materials in a 5-acre repository; stabilization, restoration, and erosion control for excavated areas; construction of a capillary barrier evapotranspiration cover and drainage system in a 5-acre repository; protection of historic structures and wetland areas and; abating the hazards posed by open sink holes. The purpose of continuing and concluding the removal action is to mitigate the imminent and substantial threats posed to public health, or welfare, or the environment, and to ensure the integrity of the completed action.

1. Proposed Action Description

Specifically, the following activities are proposed to complete the response action:

- 1) Capping, erosion control and restoration of excavated areas and the repository;
- 2) Completion of the installation of drainage measures around the repository;
- 3) Plugging several sink holes behind the Lower Earthen Tailings Dam;
- 4) Restoration of properties affected by the response action; and
- 5) Maintenance of slopes, erosion control and water management until repository is stabilized.

2. Contribution to Remedial Performance

The threat posed by the presence of arsenic, lead and mercury meet the criteria listed in 40 C.F.R. § 300.415(b)(2) and are consistent with any long-term remedial action that may be required. The On-Scene Coordinator has initiated planning with the remedial program to assure the removal action will not conflict with future remedial cleanup options. The OSC has begun to make provisions for post-removal Site control consistent with the provisions of 40 C.F.R. § 300.415(k). It is likely that DTSC or the CVRWQCB will be responsible for operation and maintenance of the repository. The nature of the removal, managing the contaminated materials in an engineered repository, is expected to minimize the need for post-removal Site control.

3. Description of alternative technologies

No alternative technologies have been utilized at this Site to date.

4. Applicable or Relevant and Appropriate Requirements

Please see Attachment 1 for a discussion of the applicable or relevant and appropriate requirements. As required by 40 C.F.R. § 300.415(j), this emergency response removal action meets, to the extent practicable, applicable or relevant and appropriate requirements under federal environmental and state environmental laws.

B. Project Schedule and Estimated Costs

It is expected the removal action will require 8 weeks of on-site work to complete. Phase I will require 2 weeks and Phase II will require 6 weeks to complete. Phase I excavation and limited repository construction is scheduled to commence in March 2015. The excavation activities and street closures will be timed to take place during school spring vacation. Phase I costs are estimated to be \$300,000. A Task Order has been issued to ERRS for this phase of the removal action.

Phase II excavation and repository construction activities are scheduled to commence in the summer or fall of 2015, depending on available funding. Phase II costs are estimated to be \$1.5-million and are currently not funded. Additional funding will be needed to perform Phase II removal activities and complete the removal action.

Estimated Cost Breakdown

Please see Attachment 1 and the Action Memorandum dated May 15, 2014.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

As discussed above, if the complete removal action anticipated in Attachment 1 is not concluded, releases of hazardous substances from the Site will continue to pose threats to public health or welfare or the environment.

VIII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues for the Argonaut Mine Site.

IX. ENFORCEMENT

Enforcement strategies for the Site are addressed in Attachment 2.

IX. RECOMMENDATION

This decision document recommends that you approve an exception to the 12-month limitation for removal actions otherwise set forth at 42 U.S.C. § 9604(c)(1)(A), with respect to the removal action for the Argonaut Mine Site, in Amador County, California, in accordance with the standards laid out in 42 U.S.C. § 9604 (c)(1)(A) and 40 C.F.R. Section 300.415(b)(5). Because conditions at the Argonaut Mine Site meet the criteria for waiving the 12-month limitation for a removal action, we recommend that you approve this exemption. Please indicate your decision by signing below.

Approve:



Daniel Meer, Assistant Director
Response, Planning, and Assessment Branch

Date

11 February 2015

Disapprove:

Daniel Meer, Assistant Director
Response, Planning, and Assessment Branch

Date

Attachments:

1. May 15, 2014 Action Memorandum
2. Enforcement Confidential Addendum

ATTACHMENT 3

June 2015 Memorandum on Site-Specific Screening Level for Arsenic in Light of Bio-Availability Testing



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne St.

San Francisco, CA 94105

MEMORANDUM

SUBJECT: Arsenic Contamination - Site Specific Screening and Action Level for Residential Cleanups at the Argonaut Mine Site in Jackson, California

FROM: Sophia M. Serda, PhD, Toxicologist, Operations and Scientific Support Section

TO: Dan Shane, OSC, Emergency Response Section

DATE: June 30, 2015

Introduction

The purpose of this memorandum is to document the basis on which I have proposed a site-specific screening level for the cleanup of arsenic contamination at residential properties at the Argonaut Mine Site in Jackson California. The Regional Screening Level ("RSL") that EPA Region 9 had adopted for actions at this site prior to performing bioavailability studies on samples from the Site was 61 mg/kg. Based on a site-specific *in vitro* bioavailability analyses of 40 samples taken from the residences and the mill tailings at the Site, I have recommended that the Region adopt a site-specific screening and cleanup standard of 100 mg/kg. This level is a protective level for reasonably expected residential uses, including by children for both cancer and non-cancer risks and is consistent with the EPA's relevant guidance for such risks.

Analysis of Bioavailability of Arsenic in Samples from the Argonaut Mine Site

EPA's prior RSL of 61 mg/kg for arsenic was based on an assumption that 60% of the arsenic found in soils at the Site would be bioavailable. In a December 2012 guidance, "Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil" US Environmental Protection Agency Office of Solid Waste and Emergency Response: Washington, DC. OSWER 9200.1-113, (available at: <http://www.epa.gov/superfund/bioavailability/pdfs/Arsenic%20Bioavailability%20POLICY%20Memorandum%2012-20-12.pdf>) ("December 2012 Arsenic Bioavailability Guidance"), EPA

recommended, in the absence of a site-specific study of the bioavailability of arsenic, that EPA assume that 60% of arsenic found in sampling was bioavailable. This recommendation was based at studies of a number of Superfund Sites, including gold mine sites. In Region 9, site-specific studies of gold mines have found that between 4% and 60% of arsenic was bioavailable.

EPA recently conducted site specific *in vitro* bioaccessibility assay of 40 soil/tailings samples collected from the Argonaut Mine Site and surrounding areas. The attached laboratory reports, dated 12/12/14, documents that when 40 samples from the Argonaut Site, 28 from residences and 12 from the mill location were analyzed and the average bioavailability in these samples was found to be 10%. The range of bioavailability in these 40 samples was between 1% and 29%. Further calculations demonstrated that 17% was a percentage that was not exceeded in 95% of the samples. Based on these calculations, I recommended that EPA use a value of 20% bioavailability in its risk assessment. This recommendation is consistent with EPA's guidance on developing protective assumptions, which may be found in the December 2012 Arsenic Bioavailability Guidance, cited above.

Analysis of Site-Specific Arsenic RSL and Action Level

Using the bioavailability value of 20%, I calculated the arsenic cleanup level that would be protective for residents and their children, for both cancer and non-cancer impacts. In order to assure an excess cancer risk of 1×10^{-4} or below, I found that the cleanup level should be 163 mg/kg or below. In order to assure a protective level for non-cancer risks, I found that the cleanup level should be 117 or below. Based on these calculations and on EPA's guidance, I recommended that a site-specific screening and cleanup level of 100 mg/kg be selected for the Argonaut Mine Site residential cleanup, as a conservative and protective value consistent with EPA's risk assessment guidance. See U.S. EPA (U.S. Environmental Protection Agency). 1989. Risk Assessment Guidance for Superfund. Volume I. Human Health Manual (Part A). EPA/540/1-89/002.

Conclusion

The proposed arsenic screening and cleanup action level of 100 mg/kg is appropriate, based on (1) the calculated 20% bioavailability factor, (2) an estimated excess cancer risk of 10^{-4} for a residential scenario, and (3) a calculation of the level below which children will be protected from non-cancer affects.

Attachments

Soil Action Level Memo, 6/29/15

Lab Reports 12/12/14 - 14310A & 14310B



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105

June 29, 2015

MEMORANDUM

SUBJECT: Soil Action Level for Arsenic

FROM: Sophia M. Serda, PhD
Toxicologist
USEPA, Region 9

A handwritten signature in black ink, reading "Sophia M. Serda", is written over the typed name and title.

TO: Dan Shane
On-Scene Coordinator
USEPA, Region 9

This memo is in response to your request for a site-specific soil action level for arsenic (As).

A site-specific action level for arsenic was determined to be 100 mg/kg for residential areas and other areas where children are present.

Appearing below is a summary of the action level calculations and the assumptions used in the derivation.

Please feel free to contact me at 415.972.3057 or serda.sophia@epa.gov if I can be of further assistance.

ACTION LEVEL FOR ARSENIC IN SOILS

EPA manages environmental risks at Superfund sites per a federal regulation known as the National Contingency Plan (NCP, 55 Federal Register 8665-8865, March 8, 1990). The NCP defines "acceptable" risk for both carcinogenic and non-carcinogenic (systemic) effects as follows:

(1) For systemic toxicants, acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety;

(2) For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship between dose and response.

EPA uses the 10^{-4} (1 in 10,000 risk) to 10^{-6} (1 in a million risk) range as a "target range" within which the Agency strives to manage risks as part of a Superfund cleanup. Exceeding the target risk range for carcinogenic and / or non-carcinogenic effects, will typically result in a removal or remedial action at Superfund sites.

This memo derives an action level for arsenic that identifies an unacceptable level of arsenic in residential soils as per the NCP's guidance. A site-specific action level for arsenic is derived by taking into account three potential exposure pathways: 1) incidental soil ingestion, 2) dermal contact with soil, and 3) inhalation of dust containing arsenic.

The derivation is based on the following assumptions:

- Action level for arsenic in soil is to protect a child and adult resident that live in the same home for up to 30 years;
- Outdoor soil and indoor dust intake combined is 200 mg per day for young children (age 1 – 6 years) and 100 mg per day for older children and adults (age 7 – 30 years);
- Arsenic bioavailability in soil is assumed to be 20%, relative to the oral bioavailability of dissolved arsenic in water;
- Exposures occur for 350 days out of the year (allowing for a two week vacation);
- A complete discussion of all exposure assumptions and calculations used to derive an action level for arsenic is documented in the "User's Guide to USEPA's Regional Screening Levels (RSL, 2015)" available at: <http://www.epa.gov/region9/superfund/prg/>;

ARSENIC ACTION LEVEL CALCULATION

A site specific arsenic value of 20% oral bioavailability of arsenic in soils is recommended for Argonaut mine. The value is based on the 95th percentile of the predicted bioavailabilities as transformed from 40 IVBA results. The transformation was based on the latest RBA/IVBA regression which includes 83 soils dataset included paired with IVBA and RBA (both mouse and swine data) estimates.

Further, it is expected that in the near-future, a national guidance paper issued by EPA's Technical Review Workgroup (TRW) will recommend a similar RBA/IVBA regression default for arsenic in soils.

Because the generic screening level or RSL assumes 60% oral bioavailability of arsenic in soils, it is necessary to adjust these values to a 20% oral bioavailability assumption. Table 1 identifies pathway-specific soil concentrations that correspond to EPA's "acceptable" cancer risk range (10^{-6} – 10^{-4}), assuming 20 and 60% oral bioavailability. Table 2 identifies pathway-specific soil concentrations that correspond to the non-cancer reference dose for arsenic that is presented in EPA's Integrated Risk Information System (IRIS) database. These arsenic concentrations are set at levels at which non-carcinogenic effects associated with exposures to arsenic (hyperpigmentation, keratosis, and possible vascular complications) would not be expected, assuming 20 and 60% oral bioavailability.

Table 1. Pathway-specific arsenic concentrations in soil (ppm) corresponding to EPA's acceptable cancer risk range (10^{-6} to 10^{-4})		
Pathway	60% Oral Bioavailability	20% Oral Bioavailability^a
Soil Ingestion	0.77 – 77	2.32 – 232
Dermal Contact with Soil	5.49 – 549	5.49 – 549
Inhalation of Dust	888–88,800	888 – 88,800

Footnote:

^aSoil concentrations are from USEPA's Regional Screening Level (RSL) Soil Table (2015) and assume a cancer oral slope factor of $1.5 \text{ (mg/kg-day)}^{-1}$ and a cancer inhalation unit risk of $4.3 \times 10^{-3} \text{ (ug/m}^3\text{)}^{-1}$.

Table 2. Pathway-specific arsenic concentrations in soil (ppm) corresponding to exposure levels to which the human population, including sensitive subgroups, may be exposed without non-cancer health effects during a lifetime or part of a lifetime		
Pathway	60% Oral Bioavailability	20% Oral Bioavailability^a
Soil Ingestion	39	117
Dermal Contact with Soil	330	330
Inhalation of Dust	21,300	21,300

Footnote:

^aEstimated with USEPA's Regional Screening Level Calculator (2015) in site-specific mode, assuming a reference dose of 0.4 ug/mg-day (USEPA IRIS, 2012)

The Argonaut site action level for arsenic is estimated by adding the reciprocals of the pathway-specific concentrations (soil ingest + dermal contact + dust inhalation) and inverting back to a total soil number as follows:

1st Step $(1/\text{Conc_ingest} + 1/\text{Conc_dermal} + 1/\text{Conc_inhale})$

2nd Step $(1/(1/\text{Conc_ingest} + 1/\text{Conc_dermal} + 1/\text{Conc_inhale})) = \text{Action Level}$

These steps were performed for the upper end values of the soil ranges presented in Tables 1 and 2, assuming 20% oral bioavailability.

For cancer:

1st Step $(1/232 + 1/549 + 1/88,800)$

2nd Step $(1/(1/232 + 1/549 + 1/88,800)) = 160 \text{ ppm Arsenic}$

For non-cancer:

1st Step $(1/117 + 1/330 + 1/21,300)$

2nd Step $(1/(1/117 + 1/330 + 1/21,300)) = 100 \text{ ppm Arsenic}$

Based on the above calculations, an arsenic action level of 100 ppm is selected for Argonaut soils.



**United States Environmental Protection Agency
Region 9 Laboratory**

**1337 S. 46th Street Building 201
Richmond, CA 94804**

Date: 12/12/2014

Subject: Analytical Testing Results - Project R15S17
SDG: 14310A

From: Duane James, Acting Director
EPA Region 9 Laboratory
MTS-2

To: Leslie Ramirez
Brownfields and Site Assessment Section
SFD-6-1

Attached are the results from the analysis of samples from the **Argonaut Mine 2014 Site Inspection** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Eugenia McNaughton at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Richard Bauer, the Lab Project Manager at (510)412-2300.

Electronic CC: Paul Jones, Ecology and Environment
Howard Edwards, Ecology and Environment

Analyses included in this report:

Analysis of In Vitro Gastric Extracts by ICP

Metals by ICP



United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone: (510) 412-2300 Fax: (510) 412-2302

Project Manager: Leslie Ramirez

Project Number: R15S17

Project: Argonaut Mine 2014 Site Inspection

Brownfields and Site Assessment Section

75 Hawthorne Street

San Francisco CA, 94105

SDG: 14310A

Reported: 12/12/14 10:34

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
AMA-01-0	1411010-01	Soil	07/30/14 10:40	10/29/14 11:30
AMA-06-0	1411010-02	Soil	07/30/14 10:20	10/29/14 11:30
AMA-07-0	1411010-03	Soil	07/30/14 11:05	10/29/14 11:30
AMA-10-0	1411010-04	Soil	07/30/14 16:05	10/29/14 11:30
AMA-11-0	1411010-05	Soil	07/30/14 16:00	10/29/14 11:30
AMD-01	1411010-06	Soil	07/30/14 10:45	10/29/14 11:30
AMD-04	1411010-07	Soil	07/29/14 11:35	10/29/14 11:30
AMD-06	1411010-08	Soil	07/31/14 10:45	10/29/14 11:30
AMD-07	1411010-09	Soil	07/31/14 10:05	10/29/14 11:30
ARA-03-0	1411010-10	Soil	07/29/14 16:00	10/29/14 11:30
ARA-03-1	1411010-11	Soil	07/29/14 16:00	10/29/14 11:30
ARA-07-0	1411010-12	Soil	07/31/14 17:00	10/29/14 11:30
ARA-07-1	1411010-13	Soil	07/31/14 17:00	10/29/14 11:30
ARA-08-0	1411010-14	Soil	07/31/14 17:10	10/29/14 11:30
ARA-09-0	1411010-15	Soil	07/31/14 11:00	10/29/14 11:30
ARA-09-2	1411010-16	Soil	07/31/14 11:00	10/29/14 11:30
ARA-10-0	1411010-17	Soil	07/31/14 10:40	10/29/14 11:30
ARA-10-2	1411010-18	Soil	07/31/14 10:40	10/29/14 11:30
ARA-12-2	1411010-19	Soil	07/31/14 11:20	10/29/14 11:30
ARA-13-0	1411010-20	Soil	07/31/14 11:30	10/29/14 11:30

SDG ID 14310A

All samples were dried and sieved through a 250 um sieve prior to digestion and analysis.

Metals: For invitro digestion samples, the blank had a concentration of arsenic above the quantitation limit. All samples with results less than five times the amount found in the blank were flagged as estimated.



United States Environmental Protection Agency
Region 9 Laboratory

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Project Manager: Leslie Ramirez

Project Number: R15S17

Project: Argonaut Mine 2014 Site Inspection

Brownfields and Site Assessment Section

75 Hawthorne Street

San Francisco CA, 94105

SDG: 14310A

Reported: 12/12/14 10:34

Work Order(s)

1411010

In-Vitro bioaccessibility calculation

SAMPLENAME	LABSAMPID	METHODCODE	ANALYTE	Result	UNITS	Percent available
AMA-01-0	1411010-01	In Vitro metals	Arsenic	20.2	mg/kg	16.4%
AMA-01-0	1411010-01	Total metals	Arsenic	123	mg/kg	
AMA-01-0	1411010-01	In Vitro metals	Lead	26.5	mg/kg	41.2%
AMA-01-0	1411010-01	Total metals	Lead	64.3	mg/kg	
AMA-06-0	1411010-02	In Vitro metals	Arsenic	89.1	mg/kg	20.2%
AMA-06-0	1411010-02	Total metals	Arsenic	441	mg/kg	
AMA-06-0	1411010-02	In Vitro metals	Lead	34700	mg/kg	71.4%
AMA-06-0	1411010-02	Total metals	Lead	48600	mg/kg	
AMA-07-0	1411010-03	In Vitro metals	Arsenic	140	mg/kg	15.0%
AMA-07-0	1411010-03	Total metals	Arsenic	932	mg/kg	
AMA-07-0	1411010-03	In Vitro metals	Lead	13700	mg/kg	72.1%
AMA-07-0	1411010-03	Total metals	Lead	19000	mg/kg	
AMA-10-0	1411010-04	In Vitro metals	Arsenic	20.5	mg/kg	10.0%
AMA-10-0	1411010-04	Total metals	Arsenic	204	mg/kg	
AMA-10-0	1411010-04	In Vitro metals	Lead	132	mg/kg	68.4%
AMA-10-0	1411010-04	Total metals	Lead	193	mg/kg	
AMA-11-0	1411010-05	In Vitro metals	Arsenic	22.9	mg/kg	6.0%
AMA-11-0	1411010-05	Total metals	Arsenic	384	mg/kg	
AMA-11-0	1411010-05	In Vitro metals	Lead	39.4	mg/kg	37.5%
AMA-11-0	1411010-05	Total metals	Lead	105	mg/kg	
AMD-01	1411010-06	In Vitro metals	Arsenic	14.8	mg/kg	13.2%
AMD-01	1411010-06	Total metals	Arsenic	112	mg/kg	
AMD-01	1411010-06	In Vitro metals	Lead	12.5	mg/kg	38.8%
AMD-01	1411010-06	Total metals	Lead	32.2	mg/kg	
AMD-04	1411010-07	In Vitro metals	Arsenic	29.7	mg/kg	8.8%
AMD-04	1411010-07	Total metals	Arsenic	338	mg/kg	
AMD-04	1411010-07	In Vitro metals	Lead	2.20	mg/kg	24.4%
AMD-04	1411010-07	Total metals	Lead	9.03	mg/kg	
AMD-06	1411010-08	In Vitro metals	Arsenic	10.3	mg/kg	1.7%
AMD-06	1411010-08	Total metals	Arsenic	623	mg/kg	
AMD-06	1411010-08	In Vitro metals	Lead	9.51	mg/kg	17.4%
AMD-06	1411010-08	Total metals	Lead	54.6	mg/kg	
AMD-07	1411010-09	In Vitro metals	Arsenic	8.33	mg/kg	13.0%
AMD-07	1411010-09	Total metals	Arsenic	64.2	mg/kg	
AMD-07	1411010-09	In Vitro metals	Lead	7.79	mg/kg	36.2%
AMD-07	1411010-09	Total metals	Lead	21.5	mg/kg	
ARA-03-0	1411010-10	In Vitro metals	Arsenic	9.45	mg/kg	28.3%
ARA-03-0	1411010-10	Total metals	Arsenic	33.4	mg/kg	



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SDG: 14310A

Project Number: R15S17

75 Hawthorne Street

Reported: 12/12/14 10:34

Project: Argonaut Mine 2014 Site Inspection

San Francisco CA, 94105

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411010-01 Soil - Sampled: 07/30/14 10:40									
Sample ID: AMA-01-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		20		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		27		3	"	"	"	"	6010C/SOP503
Sample ID: AMA-01-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	120		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		64		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-02 Soil - Sampled: 07/30/14 10:20									
Sample ID: AMA-06-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		89		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead	RE1	35,000		300	"	"	"	12/05/14	6010C/SOP503
Sample ID: AMA-06-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	440		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead	RE2	49,000		60	"	"	"	12/05/14	6010C/SOP503
Lab ID: 1411010-03 Soil - Sampled: 07/30/14 11:05									
Sample ID: AMA-07-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		140		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead	RE1	14,000		300	"	"	"	12/05/14	6010C/SOP503
Sample ID: AMA-07-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	930		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead	RE2	19,000		30	"	"	"	12/03/14	6010C/SOP503
Lab ID: 1411010-04 Soil - Sampled: 07/30/14 16:05									
Sample ID: AMA-10-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		20		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		130		3	"	"	"	"	6010C/SOP503
Sample ID: AMA-10-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	200		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		190		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-05 Soil - Sampled: 07/30/14 16:00									
Sample ID: AMA-11-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		23		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		39		3	"	"	"	"	6010C/SOP503
Sample ID: AMA-11-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	380		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		110		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-06 Soil - Sampled: 07/30/14 10:45									
Sample ID: AMD-01 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		15	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		12		3	"	"	"	"	6010C/SOP503
Sample ID: AMD-01 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	110		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		32		3	"	"	"	11/21/14	6010C/SOP503



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Project: Argonaut Mine 2014 Site Inspection

Brownfields and Site Assessment Section

75 Hawthorne Street

San Francisco CA, 94105

SDG: 14310A

Reported: 12/12/14 10:34

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411010-06									Soil - Sampled: 07/30/14 10:45
Lab ID: 1411010-07									Soil - Sampled: 07/29/14 11:35
Sample ID: AMD-04									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		30		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		2.2	CI, J	3	"	"	"	"	6010C/SOP503
Sample ID: AMD-04									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	340		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		9.0		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-08									Soil - Sampled: 07/31/14 10:45
Sample ID: AMD-06									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		10	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		9.5		3	"	"	"	"	6010C/SOP503
Sample ID: AMD-06									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	620		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		55		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-09									Soil - Sampled: 07/31/14 10:05
Sample ID: AMD-07									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		8.3	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		7.8		3	"	"	"	"	6010C/SOP503
Sample ID: AMD-07									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	64		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		22		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-10									Soil - Sampled: 07/29/14 16:00
Sample ID: ARA-03-0									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		9.5	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		3.7		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-03-0									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	33		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		9.1		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-11									Soil - Sampled: 07/29/14 16:00
Sample ID: ARA-03-1									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		12	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		30		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-03-1									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	100		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		39		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-12									Soil - Sampled: 07/31/14 17:00
Sample ID: ARA-07-0									Analysis of In Vitro Gastric Digestion Extracts
Arsenic		8.0	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		14		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-07-0									Metals by EPA 6000/7000 Series Methods



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Brownfields and Site Assessment Section

SDG: 14310A

Project Number: R15S17

75 Hawthorne Street

Reported: 12/12/14 10:34

Project: Argonaut Mine 2014 Site Inspection

San Francisco CA, 94105

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411010-12							Soil - Sampled: 07/31/14 17:00		
Sample ID: ARA-07-0							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE1	65		2	mg/kg	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		34		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-13							Soil - Sampled: 07/31/14 17:00		
Sample ID: ARA-07-1							Analysis of In Vitro Gastric Digestion Extracts		
Arsenic		17		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		13		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-07-1							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE1	160		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		33		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-14							Soil - Sampled: 07/31/14 17:10		
Sample ID: ARA-08-0							Analysis of In Vitro Gastric Digestion Extracts		
Arsenic		8.7	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		4.4		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-08-0							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE1	59		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		14		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-15							Soil - Sampled: 07/31/14 11:00		
Sample ID: ARA-09-0							Analysis of In Vitro Gastric Digestion Extracts		
Arsenic		27		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		ND	U	3	"	"	"	"	6010C/SOP503
Sample ID: ARA-09-0							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE1	1,400		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		240		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-16							Soil - Sampled: 07/31/14 11:00		
Sample ID: ARA-09-2							Analysis of In Vitro Gastric Digestion Extracts		
Arsenic		430		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		3,600		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-09-2							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE2	33,000		40	"	B14K060	11/18/14	12/05/14	6010C/SOP503
Lead		3,100		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-17							Soil - Sampled: 07/31/14 10:40		
Sample ID: ARA-10-0							Analysis of In Vitro Gastric Digestion Extracts		
Arsenic		19		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		45		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-10-0							Metals by EPA 6000/7000 Series Methods		
Arsenic	RE1	150		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		89		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-18							Soil - Sampled: 07/31/14 10:40		
Sample ID: ARA-10-2							Analysis of In Vitro Gastric Digestion Extracts		



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Project: Argonaut Mine 2014 Site Inspection

Brownfields and Site Assessment Section
75 Hawthorne Street
San Francisco CA, 94105

SDG: 14310A
Reported: 12/12/14 10:34

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411010-18		Soil - Sampled: 07/31/14 10:40							
Sample ID: ARA-10-2		Analysis of In Vitro Gastric Digestion Extracts							
Arsenic		6.7	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		5.7		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-10-2		Metals by EPA 6000/7000 Series Methods							
Arsenic	REI	640		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		49		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-19		Soil - Sampled: 07/31/14 11:20							
Sample ID: ARA-12-2		Analysis of In Vitro Gastric Digestion Extracts							
Arsenic		8.3	B1, J	2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		4.7		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-12-2		Metals by EPA 6000/7000 Series Methods							
Arsenic	REI	66		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		18		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411010-20		Soil - Sampled: 07/31/14 11:30							
Sample ID: ARA-13-0		Analysis of In Vitro Gastric Digestion Extracts							
Arsenic		39		2	mg/kg	B14K066	11/25/14	12/02/14	6010C/SOP503
Lead		55		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-13-0		Metals by EPA 6000/7000 Series Methods							
Arsenic	REI	380		2	"	B14K060	11/18/14	12/01/14	6010C/SOP503
Lead		200		3	"	"	"	11/21/14	6010C/SOP503



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Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch B14K060 - 3050B Std Acid Dig - Metals by 6010

Prepared: 11/18/14 Analyzed: 11/21/14

Metals by EPA 6000/7000 Series Methods - Quality Control

Blank (B14K060-BLK1)

Arsenic	ND	U		2 mg/kg						
Lead	ND	U		3 "						

Blank (B14K060-BLK2)

Arsenic	ND	U		2 mg/kg						
Lead	ND	U		3 "						

Matrix Spike (B14K060-MS1)

Source: 1411010-07

Lead	113			3 mg/kg	100	9.03	104	75-125		20
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Matrix Spike (B14K060-MS2)

Source: 1411010-07RE1

Arsenic	777			2 mg/kg	400	338	110	75-125		20
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Matrix Spike Dup (B14K060-MSD1)

Source: 1411010-07

Lead	113			3 mg/kg	99.0	9.03	105	75-125	0.06	20
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Matrix Spike Dup (B14K060-MSD2)

Source: 1411010-07RE1

Arsenic	774			2 mg/kg	396	338	110	75-125	0.4	20
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Reference (B14K060-SRM1)

Lead	56.8			3 mg/kg	57.1		99	72.8-127		
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Reference (B14K060-SRM2)

Arsenic	265			2 mg/kg	254		104	60.9-139		
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Batch B14K066 - In Vitro Gastric Extraction - In Vitro
Extraction, ICP, Sample Basis

Prepared: 11/25/14 Analyzed: 12/02/14

Analysis of In Vitro Gastric Digestion Extracts - Quality Control

Blank (B14K066-BLK1)

Lead	ND	U		3 mg/kg						
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Blank (B14K066-BLK2)

Lead	ND	U		3 mg/kg						
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Blank (B14K066-BLK3)

Arsenic	3.3	C1		2 mg/kg						
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Blank (B14K066-BLK4)

Arsenic	2.4	C1		2 mg/kg						
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LCS (B14K066-BS1)

Arsenic	2,140			2 mg/kg	2000		107	80-120		200
Lead	515			3 "	500		103	80-120		200

Duplicate (B14K066-DUP1)

Source: 1411010-07

Arsenic	27.5			2 mg/kg		29.7			8	20
Lead	2.1	C1, J		3 "		2.2			5	20

Matrix Spike (B14K066-MS1)

Source: 1411010-07

Arsenic	4,190			2 mg/kg	3920	29.7	106	75-125		20
Lead	943			3 "	980	2.2	96	75-125		20

Reference (B14K066-SRM1)

Arsenic	75.4			2 mg/kg	89.0		85	0-200		
Lead	1,140			3 "	1300		87	0-200		



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SDG: 14310A

Reported: 12/12/14 10:34

Qualifiers and Comments

J The reported result for this analyte should be considered an estimated value.

C1 The reported concentration for this analyte is below the quantitation limit.

B1 The concentration of this analyte found in this sample was less than five times the concentration found in the associated method blank.

U Not Detected

NR Not Reported

RE1, RE2, etc: Result is from a sample re-analysis.



**United States Environmental Protection Agency
Region 9 Laboratory**

**1337 S. 46th Street Building 201
Richmond, CA 94804**

Date: 12/12/2014

Subject: Analytical Testing Results - Project R15S17
SDG: 14310B

From: Duane James, Acting Director
EPA Region 9 Laboratory
MTS-2

To: Leslie Ramirez
Brownfields and Site Assessment Section
SFD-6-1

Attached are the results from the analysis of samples from the **Argonaut Mine 2014 Site Inspection** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Eugenia McNaughton at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Richard Bauer, the Lab Project Manager at (510)412-2300.

Electronic CC: Paul Jones, Ecology and Environment
Howard Edwards, Ecology and Environment

Analyses included in this report:

Analysis of In Vitro Gastric Extracts by ICP

Metals by ICP



United States Environmental Protection Agency
Region 9 Laboratory

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Phone: (510) 412-2300 Fax: (510) 412-2302

Project Manager: Leslie Ramirez

Brownfields and Site Assessment Section

SDG: 14310B

Project Number: R15S17

75 Hawthorne Street

Reported: 12/12/14 10:44

Project: Argonaut Mine 2014 Site Inspection

San Francisco CA, 94105

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
ARA-13-1	1411011-01	Soil	07/31/14 11:30	10/29/14 11:30
ARA-14-0	1411011-02	Soil	07/31/14 10:00	10/29/14 11:30
ARA-14-1	1411011-03	Soil	07/31/14 10:00	10/29/14 11:30
ARA-15-0	1411011-04	Soil	07/31/14 09:10	10/29/14 11:30
ARA-15-1	1411011-05	Soil	07/31/14 09:10	10/29/14 11:30
ARA-16-0	1411011-06	Soil	07/31/14 09:15	10/29/14 11:30
ARA-16-1	1411011-07	Soil	07/31/14 09:15	10/29/14 11:30
ARA-17-0	1411011-08	Soil	07/31/14 09:20	10/29/14 11:30
ARA-17-2	1411011-09	Soil	07/31/14 09:20	10/29/14 11:30
ARA-18-0	1411011-10	Soil	07/31/14 08:30	10/29/14 11:30
ARA-18-1.5	1411011-11	Soil	07/31/14 08:30	10/29/14 11:30
ARA-19-1	1411011-12	Soil	07/31/14 08:15	10/29/14 11:30
ARA-20-0	1411011-13	Soil	07/31/14 13:30	10/29/14 11:30
ARA-21-0	1411011-14	Soil	07/31/14 14:00	10/29/14 11:30
ARA-22-0	1411011-15	Soil	07/31/14 14:25	10/29/14 11:30
ATA-03-0	1411011-16	Soil	07/29/14 12:25	10/29/14 11:30
ATA-03-2	1411011-17	Soil	07/29/14 12:25	10/29/14 11:30
ATA-04-0	1411011-18	Soil	07/29/14 11:30	10/29/14 11:30
ATA-04-2	1411011-19	Soil	07/29/14 11:30	10/29/14 11:30
ATA-05-1.5	1411011-20	Soil	07/29/14 12:55	10/29/14 11:30

SDG ID 14310B

All samples were dried and sieved through a 250 um sieve prior to digestion and analysis.

Metals: For invitro digestion samples, the blank had a concentration of arsenic above the quantitation limit. All samples with results less than five times the amount found in the blank were flagged as estimated.



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SDG: 14310B

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Work Order(s)

1411011

In-Vitro bioaccessibility calculation

SAMPLENAME	LABSAMPID	METHODCODE	ANALYTE	Result	UNITS	Percent available
ARA-13-1	1411011-01	In Vitro metals	Arsenic	116	mg/kg	9.9%
ARA-13-1	1411011-01	Total metals	Arsenic	1170	mg/kg	-
ARA-13-1	1411011-01	In Vitro metals	Lead	17.0	mg/kg	6.2%
ARA-13-1	1411011-01	Total metals	Lead	276	mg/kg	-
ARA-14-0	1411011-02	In Vitro metals	Arsenic	14.8	mg/kg	5.9%
ARA-14-0	1411011-02	Total metals	Arsenic	249	mg/kg	-
ARA-14-0	1411011-02	In Vitro metals	Lead	4.97	mg/kg	12.6%
ARA-14-0	1411011-02	Total metals	Lead	39.6	mg/kg	-
ARA-14-1	1411011-03	In Vitro metals	Arsenic	5.17	mg/kg	8.9%
ARA-14-1	1411011-03	Total metals	Arsenic	58.4	mg/kg	-
ARA-14-1	1411011-03	In Vitro metals	Lead	ND	mg/kg	ND
ARA-14-1	1411011-03	Total metals	Lead	9.26	mg/kg	-
ARA-15-0	1411011-04	In Vitro metals	Arsenic	17.4	mg/kg	12.7%
ARA-15-0	1411011-04	Total metals	Arsenic	137	mg/kg	-
ARA-15-0	1411011-04	In Vitro metals	Lead	467	mg/kg	75.9%
ARA-15-0	1411011-04	Total metals	Lead	615	mg/kg	-
ARA-15-1	1411011-05	In Vitro metals	Arsenic	38.5	mg/kg	12.9%
ARA-15-1	1411011-05	Total metals	Arsenic	299	mg/kg	-
ARA-15-1	1411011-05	In Vitro metals	Lead	339	mg/kg	71.5%
ARA-15-1	1411011-05	Total metals	Lead	474	mg/kg	-
ARA-16-0	1411011-06	In Vitro metals	Arsenic	12.6	mg/kg	9.3%
ARA-16-0	1411011-06	Total metals	Arsenic	136	mg/kg	-
ARA-16-0	1411011-06	In Vitro metals	Lead	78.1	mg/kg	50.7%
ARA-16-0	1411011-06	Total metals	Lead	154	mg/kg	-
ARA-16-1	1411011-07	In Vitro metals	Arsenic	14.6	mg/kg	8.7%
ARA-16-1	1411011-07	Total metals	Arsenic	167	mg/kg	-
ARA-16-1	1411011-07	In Vitro metals	Lead	76.7	mg/kg	54.8%
ARA-16-1	1411011-07	Total metals	Lead	140	mg/kg	-
ARA-17-0	1411011-08	In Vitro metals	Arsenic	13.8	mg/kg	10.7%
ARA-17-0	1411011-08	Total metals	Arsenic	129	mg/kg	-
ARA-17-0	1411011-08	In Vitro metals	Lead	34.7	mg/kg	84.8%
ARA-17-0	1411011-08	Total metals	Lead	40.9	mg/kg	-
ARA-17-2	1411011-09	In Vitro metals	Arsenic	2.87	mg/kg	2.6%
ARA-17-2	1411011-09	Total metals	Arsenic	109	mg/kg	-
ARA-17-2	1411011-09	In Vitro metals	Lead	4.00	mg/kg	33.3%
ARA-17-2	1411011-09	Total metals	Lead	12.0	mg/kg	-
ARA-18-0	1411011-10	In Vitro metals	Arsenic	30.5	mg/kg	10.0%
ARA-18-0	1411011-10	Total metals	Arsenic	305	mg/kg	-



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SDG: 14310B

Project Number: R15S17

75 Hawthorne Street

Reported: 12/12/14 10:44

Project: Argonaut Mine 2014 Site Inspection

San Francisco CA, 94105

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411011-01 Soil - Sampled: 07/31/14 11:30									
Sample ID: ARA-13-1 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		120		2	mg/kg	B14K067	11/25/14	12/02/14	6010C/SOP503
Lead		17		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-13-1 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	1,200		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		280		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-02 Soil - Sampled: 07/31/14 10:00									
Sample ID: ARA-14-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		15		2	mg/kg	B14K067	11/25/14	12/02/14	6010C/SOP503
Lead		5.0		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-14-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	250		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		40		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-03 Soil - Sampled: 07/31/14 10:00									
Sample ID: ARA-14-1 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		5.2	B1, J	2	mg/kg	B14K067	11/25/14	12/02/14	6010C/SOP503
Lead		ND	U	3	"	"	"	"	6010C/SOP503
Sample ID: ARA-14-1 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	58		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		9.3		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-04 Soil - Sampled: 07/31/14 09:10									
Sample ID: ARA-15-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		17		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		470		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-15-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	140		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		620		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-05 Soil - Sampled: 07/31/14 09:10									
Sample ID: ARA-15-1 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic		39		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		340		3	"	"	"	"	6010C/SOP503
Sample ID: ARA-15-1 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	300		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		470		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-06 Soil - Sampled: 07/31/14 09:15									
Sample ID: ARA-16-0 Analysis of In Vitro Gastric Digestion Extracts									
Arsenic	RE1	13		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		78		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-16-0 Metals by EPA 6000/7000 Series Methods									
Arsenic	RE1	140		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503



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Project Manager: Leslie Ramirez	Brownfields and Site Assessment Section	SDG: 14310B
Project Number: R15S17	75 Hawthorne Street	Reported: 12/12/14 10:44
Project: Argonaut Mine 2014 Site Inspection	San Francisco CA, 94105	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411011-06									Soil - Sampled: 07/31/14 09:15
Sample ID: ARA-16-0									Metals by EPA 6000/7000 Series Methods
Lead		150		3	mg/kg	B14K061	11/18/14	11/21/14	6010C/SOP503
Lab ID: 1411011-07									Soil - Sampled: 07/31/14 09:15
Sample ID: ARA-16-1									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	15		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		77		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-16-1									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	170		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		140		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-08									Soil - Sampled: 07/31/14 09:20
Sample ID: ARA-17-0									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	14		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		35		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-17-0									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	130		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		41		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-09									Soil - Sampled: 07/31/14 09:20
Sample ID: ARA-17-2									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	2.9	B1, J	2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		4.0		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-17-2									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	110		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		12		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-10									Soil - Sampled: 07/31/14 08:30
Sample ID: ARA-18-0									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	31		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		17		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-18-0									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	310		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		54		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-11									Soil - Sampled: 07/31/14 08:30
Sample ID: ARA-18-1.5									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	79		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		60		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-18-1.5									Metals by EPA 6000/7000 Series Methods
Arsenic	RE1	500		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		150		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-12									Soil - Sampled: 07/31/14 08:15
Sample ID: ARA-19-1									Analysis of In Vitro Gastric Digestion Extracts
Arsenic	RE1	3.6	B1, J	2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503



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SDG: 14310B

Reported: 12/12/14 10:44

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1411011-12								Soil - Sampled: 07/31/14 08:15	
Sample ID: ARA-19-1								Analysis of In Vitro Gastric Digestion Extracts	
Lead		3.2		3	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Sample ID: ARA-19-1								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	57		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		8.6		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-13								Soil - Sampled: 07/31/14 13:30	
Sample ID: ARA-20-0								Analysis of In Vitro Gastric Digestion Extracts	
Arsenic	RE1	29		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		7.0		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-20-0								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	250		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		22		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-14								Soil - Sampled: 07/31/14 14:00	
Sample ID: ARA-21-0								Analysis of In Vitro Gastric Digestion Extracts	
Arsenic	RE1	4.2	B1, J	2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		4.1		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-21-0								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	58		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		12		3	"	"	"	11/21/14	6010C/SOP503
Lab ID: 1411011-15								Soil - Sampled: 07/31/14 14:25	
Sample ID: ARA-22-0								Analysis of In Vitro Gastric Digestion Extracts	
Arsenic	RE1	91		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		18		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ARA-22-0								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	750		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		51		3	"	"	"	11/22/14	6010C/SOP503
Lab ID: 1411011-16								Soil - Sampled: 07/29/14 12:25	
Sample ID: ATA-03-0								Analysis of In Vitro Gastric Digestion Extracts	
Arsenic	RE1	93		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		1.5	C1, J	3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ATA-03-0								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	2,600		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		150		3	"	"	"	11/22/14	6010C/SOP503
Lab ID: 1411011-17								Soil - Sampled: 07/29/14 12:25	
Sample ID: ATA-03-2								Analysis of In Vitro Gastric Digestion Extracts	
Arsenic	RE1	63		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		2.3	C1, J	3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ATA-03-2								Metals by EPA 6000/7000 Series Methods	
Arsenic	RE1	490		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		7.4		3	"	"	"	11/22/14	6010C/SOP503

Lab ID: 1411011-18

Soil - Sampled: 07/29/14 11:30

1411011 FINAL 12 12 14 1044



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Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Sample ID: ATA-04-0									
						Analysis of In Vitro Gastric Digestion Extracts			
Arsenic	RE1	24		2	mg/kg	B14K067	11/25/14	12/03/14	6010C/SOP503
Lead		2.5	Cl, J	3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ATA-04-0									
						Metals by EPA 6000/7000 Series Methods			
Arsenic	RE1	340		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		7.3		3	"	"	"	11/22/14	6010C/SOP503
Lab ID: 1411011-19									
						Soil - Sampled: 07/29/14 11:30			
Sample ID: ATA-04-2									
						Analysis of In Vitro Gastric Digestion Extracts			
Arsenic	RE2	19		2	mg/kg	B14K067	11/25/14	12/05/14	6010C/SOP503
Lead		2.5	Cl, J	3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ATA-04-2									
						Metals by EPA 6000/7000 Series Methods			
Arsenic	RE1	210		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		5.9		3	"	"	"	11/22/14	6010C/SOP503
Lab ID: 1411011-20									
						Soil - Sampled: 07/29/14 12:55			
Sample ID: ATA-05-1.5									
						Analysis of In Vitro Gastric Digestion Extracts			
Arsenic	RE2	25		2	mg/kg	B14K067	11/25/14	12/05/14	6010C/SOP503
Lead		9.9		3	"	"	"	12/03/14	6010C/SOP503
Sample ID: ATA-05-1.5									
						Metals by EPA 6000/7000 Series Methods			
Arsenic	RE1	300		2	"	B14K061	11/18/14	12/01/14	6010C/SOP503
Lead		32		3	"	"	"	11/22/14	6010C/SOP503



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Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B14K061 - 3050B Std Acid Dig - Metals by 6010						Prepared: 11/18/14 Analyzed: 11/21/14 Metals by EPA 6000/7000 Series Methods - Quality Control				
Blank (B14K061-BLK1)										
Arsenic	1.6	J		2 mg/kg						
Lead	ND	U		3 "						
Blank (B14K061-BLK2)										
Arsenic	ND	U		2 mg/kg						
Lead	ND	U		3 "						
Matrix Spike (B14K061-MS1)		Source: 1411011-18								
Lead	110			3 mg/kg	100	7.34	103	75-125		20
Matrix Spike (B14K061-MS2)		Source: 1411011-18RE1								
Arsenic	776			2 mg/kg	400	343	108	75-125		20
Matrix Spike Dup (B14K061-MSD1)		Source: 1411011-18								
Lead	105			3 mg/kg	99.0	7.34	99	75-125	4	20
Matrix Spike Dup (B14K061-MSD2)		Source: 1411011-18RE1								
Arsenic	778			2 mg/kg	396	343	110	75-125	0.2	20
Reference (B14K061-SRM1)										
Lead	53.1			3 mg/kg	57.2		93	72.8-127		
Reference (B14K061-SRM2)										
Arsenic	278			2 mg/kg	254		109	60.9-139		
Batch B14K067 - In Vitro Gastric Extraction - In Vitro Extraction, ICP, Sample Basis						Prepared: 11/25/14 Analyzed: 12/02/14 Analysis of In Vitro Gastric Digestion Extracts - Quality Control				
Blank (B14K067-BLK1)										
Lead	ND	U		3 mg/kg						
Blank (B14K067-BLK2)										
Lead	ND	U		3 mg/kg						
Blank (B14K067-BLK3)										
Arsenic	2.3	C1		2 mg/kg						
Blank (B14K067-BLK4)										
Arsenic	1.7	C1, J		2 mg/kg						
LCS (B14K067-BS1)										
Arsenic	2,010			2 mg/kg	2000		100	80-120		200
Lead	480			3 "	500		96	80-120		200
Duplicate (B14K067-DUP1)		Source: 1411011-17								
Lead	2.25	C1, J		3 mg/kg		2.27			0.8	20
Duplicate (B14K067-DUP2)		Source: 1411011-17RE1								
Arsenic	61.2			2 mg/kg		63.1			3	20
Matrix Spike (B14K067-MS1)		Source: 1411011-17								
Lead	1,020			3 mg/kg	980	2.27	104	75-125		20
Matrix Spike (B14K067-MS2)		Source: 1411011-17RE1								
Arsenic	3,810			2 mg/kg	3920	63.1	95	75-125		20
Reference (B14K067-SRM1)										
Arsenic	67.6			2 mg/kg	89.0		76	0-200		



United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager: Leslie Ramirez

Project Number: R15S17

Project: Argonaut Mine 2014 Site Inspection

Brownfields and Site Assessment Section

75 Hawthorne Street

San Francisco CA, 94105

SDG: 14310B

Reported: 12/12/14 10:44

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B14K067 - In Vitro Gastric Extraction - In Vitro Extraction, ICP, Sample Basis						Prepared: 11/25/14 Analyzed: 12/02/14				
Reference (B14K067-SRM1)						Analysis of In Vitro Gastric Digestion Extracts - Quality Control				
Lead	1,090			3 "	1300		84	0-200		



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Reported: 12/12/14 10:44

Project: Argonaut Mine 2014 Site Inspection

San Francisco CA, 94105

Qualifiers and Comments

J The reported result for this analyte should be considered an estimated value.

C1 The reported concentration for this analyte is below the quantitation limit.

B1 The concentration of this analyte found in this sample was less than five times the concentration found in the associated method blank.

U Not Detected

NR Not Reported

RE1, RE2, etc: Result is from a sample re-analysis.

ATTACHMENT 4

Maps Showing Locations of Residential Properties and Jackson Junior High School where Arsenic Contaminated Surface Soils Exceed the Action Level



0 Scale in Feet 400

PREPARED BY:
 Region 9, START
 Weston Solutions, Inc.
 1340 Treat Blvd, Suite 210
 Walnut Creek, CA 94597

PREPARED FOR:
 EPA Region 9
 Pacific
 Southwest



FIGURE
PLANNED REMOVAL AREAS
 Argonaut Mine Tailings Area
 Residential Removal Assessment
 Jackson, Amador County, California



0 Scale in Feet 80

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FIGURE 1
SURFACE SOIL ARSENIC RESULTS
Argonaut Mine Tailings Area
Residential Removal Assessment
Jackson, Amador County, California



0 Scale in Feet 80

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FIGURE 3
SURFACE SOIL ARSENIC RESULTS
Argonaut Mine Tailings Area
Residential Removal Assessment
Jackson, Amador County, California



0 Scale in Feet 80

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FIGURE 5
SURFACE SOIL ARSENIC RESULTS
Argonaut Mine Tailings Area
Residential Removal Assessment
Jackson, Amador County, California



ATTACHMENT 5

Enforcement Confidential Addendum