

**Deer Creek Site  
Nevada County, California  
Removal Site Evaluation Report  
Final**

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**Prepared by:  
Weston Solutions, Inc.  
428 Thirteenth Street, 6<sup>th</sup> Floor, Suite B  
Oakland, California 94612**



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## LIST OF ACRONYMS

µg/kg	microgram per kilogram
µg/L	microgram per liter
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
BLM	Bureau of Land Management
BMI	benthic macroinvertebrates
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
EPT	Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly)
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
NOAA	National Oceanic and Atmospheric Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
RMC	Risk Management Criteria
RSE	Removal Site Evaluation
RSL	Regional Screening Level
RWQCB	California Environmental Protection Agency, Central Valley Regional Water Quality Control Board
SQuiRTs	Screening Quick Reference Tables
USGS	U.S. Geological Survey
WESTON	Weston Solutions, Inc.



## **1.0 INTRODUCTION**

The United States Bureau of Land Management (BLM) tasked Weston Solutions, Inc. (WESTON®) to conduct a Removal Site Evaluation (RSE) following a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Non-Time Critical Removal Process for the Deer Creek site (Site), under contract AG91S8C090037. The site is located in the Nevada City Mining District of western Nevada County, California.

The remainder of this report consists of Section 2.0 Site Description, Section 3.0 Environmental Release Assessment, Section 4.0 Streamlined Risk Assessment, Section 5.0 Basis for Removal Action, Section 6.0 Preliminary Removal Action Objectives and Goals, and Section 7.0 Data Gaps and Areas of Additional Investigation. Section 8.0 provides references used in the preparation of the RSE report.

This RSE report summarizes sample data collected by the WESTON. The purpose of this RSE is to assess the potential threat to human health and the environment, and to determine if there is a need for further action. The objectives of this investigation are as follows:

- Identify and characterize sources of contamination at the Site,
- To determine whether or not sources of contamination at the site pose a viable threat to human health or the environment,
- To identify the presence of potential migration pathways of contamination at the Site, and
- Recommend further actions if needed.

## **2.0 SITE DESCRIPTION**

### **2.1 Location and Topography**

The Site is located on Champion Mine Road in the Nevada City Mining District approximately 1 mile west from the town of Nevada City, California and approximately one mile north of Grass Valley, California. The Site location is shown in Figure 2-1. The Site is located in Nevada County in the 1895 Smartsville 30 minute USGS Quadrangle. The Site is located in the 1950 to 2000 Nevada City 7.5 minute USGS Quadrangle. The Site, including the Woods Ravine and Stocking Flats areas, is approximately 70 acres. The Site lies at an elevation of 2177 feet above sea level. Deer Creek runs directly through the Site. Deer Creek is a tributary to the Yuba River, which flows into the Feather River. The Feather River is a major tributary to the Sacramento River.

### **2.2 Climate**

The climate in the area of the Site is characterized by moderate temperature and precipitation. Average annual precipitation is 54 inches and occurs mainly from November to March each year. Nevada City receives an average of 29 inches of snow per year. Average maximum and minimum daily temperatures in Nevada City were 68 degrees Fahrenheit and 40 degrees Fahrenheit, respectively (Western Regional Climate Center, 2010).

### **2.3 Geology and Soils**

The rock stratigraphic unit at the Site is the Mesozoic era, Jurassic system, and Jurassic series. Jurassic granite rocks are present at the Site. Soil at the Site includes tailings, Dukabella, Boomer, Sites, and Chaix variant. Tailings extend up to 5 feet in depth at parts of the Site and are considered coarse-grained gravels. Dukabella soils are very gravelly clay loam for the first 9 inches below ground surface (bgs), very cobbly clay from 9 to 20 inches bgs, and bedrock from 20 feet bgs. Boomer soils are loam and clay loam from zero to 46 inches bgs, and bedrock from 46 to 51 inches bgs. Sites soils are cobbly loam, cobbly clay loam, and cobbly clay from zero to 77 inches bgs and bedrock from 77 to 81 inches bgs. Chaix variant soils are loam, sandy loam, and clay loam from zero to 44 inches bgs and bedrock from 44 to 48 inches bgs. All soils in the vicinity of the Site are well-drained (Appendix C).

## **2.4 Hydrology and Hydrogeology**

The Site is located in the Deer Creek Watershed. Deer Creek is a tributary to the Yuba River. The Yuba River flows into the Feather River, which is a tributary to the Sacramento River. The Site lies in a 100-year flood zone (Appendix C).

The Site is located within the boundaries of the Sierra Nevada geomorphic province, an area characterized by metamorphosed sedimentary, volcanic, and intrusive rock. Soils at the Site discussed in Section 2.3 have moderate to slow infiltration rates with the exception of tailings, which has a high infiltration rate (Appendix C).

## **2.5 Vegetation and Wildlife**

The Site lies in the Hot Summer Mediterranean climate within the Sierra Nevada Mountain Range. Vegetation includes mixed woodland, which includes grey pine, blue oak, and valley oak. Chaparral is located throughout the area. The Site also contains blackberry bushes, which are not native to the area. A private organization, American Rivers, is removing the blackberry bushes and replacing them with native grapevines.

WESTON did not note signs of wildlife at the Site during RSE activities.

## **2.6 Cultural Resources**

A cultural resources survey has not been conducted by the BLM at the Site and is not currently planned. The site does not currently have man-made structures. Champion Road leads through the Woods Ravine area of the Site. The Stocking Flats area is located off of Champion Road behind a private locked gate on a private dirt road. The Site Layout is shown in Figure 2-2.

The Stocking Flats area contains bridge abutments. However, a bridge was not actually built at the Site. Rusted metal debris that may have originally been part of the bridge lie near the former bridge area on the north side of Deer Creek. American Rivers, a private conservation group, removed a berm in 2009 within Deer Creek directly downstream of the former bridge area. The berm previously obstructed water during high flow from flowing into a flood plain that occupies the north side of Deer Creek at the Site. The area is shown as Stocking Flats in Figure 2-2. Additionally, American Rivers has graded the Stocking Flats area and placed straw as erosion control on a sloped section. American Rivers has also removed non-native species at the Site including blackberries from the banks of Deer Creek and was in the process of replacing the non-native species at the Site with native riparian species (AR 2010).

To the south of Deer Creek at the Site, there are several piles of what may be tailings or waste rock. The piles are shown in photographs 11 through 15 in Appendix A. Piles consist of rounded stones and fine-grained soils as well as rocks that are angular. Based upon past dredging activities at the Site that occurred from at least 1992 to 2003, the rounded stones and fine-grained soils may be dredged materials. Additionally, sharp angular rocks could have been dredged as well as the Site is downstream of mining operations that allowed tailings to erode directly into Deer Creek. Two of the piles directly border and appear to erode into Deer Creek. Other piles, ranging from less than one foot to approximately ten feet high, appear are located throughout the open area shown in Figure 2-2. A small section, approximately 2 feet long, of what may have been rail tracks leads to one of the larger piles on the bank of Deer Creek. No other tracks were apparent during RSE sampling activities conducted in May 2010.

At the Woods Ravine area, a small area north of Champion Mine road contains a clearing surrounded by trees that may have been used as a cooking area, processing area, or burn area. Mason jars and rusted metal are scattered around what appears to be a small campfire sized burn area. There were no other indications of mining operations found in the Woods Ravine area and it is not clear that the burn area was used for mining operations.

## **2.7 Land Use and Population**

The nearest city to the Site is Nevada City, which is approximately 1 mile to the east. Nevada City has a population of approximately 2,500. The primary land use is recreation. In the future, a public trail, the Deer Creek Tribute Trail, scheduled to be completed by May 2011, will have a trail leading to the Stocking Flats portion of the Site, increasing tourism for the surrounding areas (AR 2010).

## **2.8 Mine History and Description**

In the late 1800s, the Auroral Star Mine was located on the Site. In 1941, the Auroral Star Mine was listed in the Table of Quartz Mines and Prospects, Nevada County in the 37<sup>th</sup> Report of the State Mineralogist. Based on Notices of Location, numerous unpatented mining claims were located on or near the Site beginning in the 1960s. Based on Proofs of Labor, these claims were worked intermittently throughout the years. Mining operations at the Site mainly involved road work, excavation, and sluicing, including gravel sluicing. Dredging operations were conducted at the Site from at least 1982 to 2003. In 2002, a Mill was located on the Site. In 2010, only one claim, the Clearwater Mining Claim, was considered active by the BLM. It is possible that waste rock or mine tailings were deposited at the Site during mining activities at the Site. The Stocking

Flats area is directly downstream from the Champion and Providence Mines. The Champion mine is a former hard rock mine and is located on private property. The Providence mine is a former placer mine and is located on private property. During RSE activities, WESTON viewed what appeared to be tailings eroding directly into Deer Creek from the private land previously occupied by the Providence Mine. Additionally, the Site is downstream from numerous mines in the Nevada City Mining District that may contribute to contamination within the Deer Creek watershed (TLI, 2010).

## **2.9 Sources**

Major potential sources of contamination at the Site are the Providence and Champion mines located upstream of the Stocking Flats area. Additionally, what appears to be waste rock or mine tailings are located on the southwestern portion of the Stocking Flats area. Photographs in Appendix A document site conditions during the May 2010 site investigation by WESTON. Contaminated sediment is present in Deer Creek within the confines of the Stocking Flats area.

## **3.0 ENVIRONMENTAL RELEASE ASSESSMENT**

### **3.1 Previous Environmental Investigations**

Approximately five surface water samples were previously collected by the BLM at the Site. Arsenic was detected at a maximum concentration of 3 micrograms per liter ( $\mu\text{g/L}$ ). Lead was detected at a maximum concentration of 2.5  $\mu\text{g/L}$ . Mercury was non-detect in the surface water samples (BLM, 2009).

### **3.2 Removal Site Evaluation**

Weston conducted a RSE sampling event at the Site on May 11, 2010 and May 12, 2010. A total of 13 soil samples were collected including two background samples and one duplicate. Sample soil samples were collected at locations that were deemed by WESTON most likely to contain metals at concentrations significantly above background based on visual observation. Additionally, soil samples were collected in several areas that had recently been graded on Stocking Flats in order to determine whether contaminated soil was made available for release. “Significantly above background” is defined as three times the background concentration for all media. If the background concentration is below the analytical quantitation limit, then the default background level is the background sample quantitation limit; “significantly above background”

for this scenario is defined as a detect in the media where the analyte was not detected in the background media. All sample locations are shown in Figure 3-1. A total of five surface water and sediment samples were collected at the Site including one background sample and one duplicate. One field blank sample was collected. Three water biota samples were collected including one water biota sample collected at the surface water/sediment background location. The analytical data report is included in this report as Appendix B – Analytical Data.

Soil samples collected from the site were submitted for CAM 17 metals analysis via United States Environmental Protection Agency (EPA) Method 6010B/7470A. Sediment and surface water samples were submitted to a laboratory for analysis of CAM 17 metals by EPA Method 6010B/7470A series and for methyl mercury via EPA method 1630. Water biota samples were collected at three of the surface water/sediment sample locations. Additionally, the water quality parameters temperature, pH, conductivity, turbidity, and dissolved oxygen were measured on-site for each surface water sample collected.

**Soil Sample Results:**

Soil sample results are shown in Table 3-1. All metals detected at concentrations significantly above background were detected in the same sample, DC-SS-10, in the Woods Ravine area at a small burn area that may have been used as a cooking area, processing area, or burn area. The burn area, shown in Photograph 18 (Appendix A), contains rusted metal and mason jars. Mercury was detected in at a concentration significantly above background one soil sample at a maximum concentration of 10.1 milligrams per kilogram (mg/kg). Lead was detected at a concentration above background in one soil sample at a maximum concentration of 1,750 mg/kg. Zinc was detected in one soil sample at a concentration significantly above background sample at a maximum concentration of 9,170 mg/kg.

**Surface Water Sample Results:**

Surface Water Sample Results are shown in Table 3-2. Mercury and methyl mercury were not detected at concentrations significantly above background in any surface water samples collected at the Site. Copper was detected at a concentration significantly above background in one sample at a maximum concentration of 2.3 µg/L. Lead was detected at a concentration significantly above background in one sample at a maximum concentration of 3.3 µg/L. Vanadium was detected at a concentration significantly above background in one sample at an estimated concentration of 2.9 µg/L. Zinc was detected at a concentration significantly above background at an estimated concentration of 6.6 µg/L.

**Sediment Sample Results:**

Sediment Sample Results are shown in Table 3-3. Methyl mercury was detected in all four sediment samples collected, including the field duplicate sample at concentrations significantly above background. Methyl mercury was detected at a maximum concentration of 8.3 micrograms per kilogram (µg/kg). Mercury was detected at a concentration significantly above background in one sample at a maximum concentration of 0.62 mg/kg. Antimony was detected in one sample at a concentration significantly above background of 19.5 mg/kg. Arsenic was detected at concentrations significantly above background in two samples at a maximum concentration of 135 mg/kg. Barium was detected at a concentration significantly above background in one sample at a maximum concentration of 346 mg/kg. Cadmium was detected at concentrations significantly above background in two samples at a maximum concentration of 2.8 mg/kg. Chromium was detected at a concentration significantly above background in one sample at a

maximum concentration of 39.2 mg/kg. Copper was detected at concentrations significantly above background in two samples at a maximum concentration of 87.2 mg/kg. Lead was detected at concentrations significantly above background in two samples at a maximum concentration of 160 mg/kg. Nickel was detected at a concentration significantly above background in one sample at a maximum concentration of 44 mg/kg. Selenium was detected at a concentration significantly above background in one sample at a maximum concentration of 1.2 mg/kg. Vanadium was detected at a concentration significantly above background in one sample at a maximum concentration of 128 mg/kg. Zinc was detected at concentrations significantly above background in two samples at a maximum concentration of 251 mg/kg.

### **Water Biota Sample Results:**

Water Biota sample results are shown in Table 3-4. Water biota samples were colocated with surface water and sediment samples with the exception of DC-SW-3. WESTON began collecting a water biota sample at the DC-SW-3 location but realized that the area, a pool, was not suitable for water biota collection.

A taxonomic listing of the benthic macroinvertebrates (BMI) collected at the Deer Creek survey sites is presented in Table 3-4. All three sample locations were dominated by mayflies (Ephemeroptera) and all had sensitive taxa present. The sample locations had a good diversity of BMI and feeding strategies, which indicated that all three sample locations were in good ecological health.

Five biological metrics, shown in Table 3-5, were selected to provide a basis for comparing the biotic integrity of the sample locations. Each of these metrics increase with increasing biotic integrity. Taxa richness of the three sample locations ranged from nine unique taxa at the DC-WB-BG1 site to 19 at the DC-WB-2 site. Intolerant (sensitive) taxa (tolerance value of 0, 1, or 2) were collected at all of the sites and ranged from three (DC-WB-BG1) to six different taxa (DC-WB-2). Two of the Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) (EPT) taxa, Ephemeroptera and Trichoptera, were well represented at each site and ranged from five taxa (DC-WB-BG1 and DC-WB-1) to ten taxa (DC-WB-2). Coleoptera taxa were collected at one of the sites, represented by the riffle beetle *Cleptelmis*. The number of predator taxa ranged from one at the DC-WB-BG1 site to four at the DC-WB-2 site.

Based on the biological metrics of the BMI communities, the DC-WB-2 site had the highest biotic integrity, followed by the DC-WB-1 site. The DC-WB-BG1 site was of notably lower

biotic integrity than the other two sites. It is, however, important to note that all three sites had a substantial number of BMI that are highly sensitive to water quality impairment. The differences in BMI community assemblages may have been due to physical habitat factors and/or natural biological variability and not water quality.

Water Quality parameters are shown in Table 3-6. Values for pH ranged from 6.77 to 7.19. The value for pH at the background location was 7.19 compared to pH values collected downstream of the Champion and Providence Mines within the Stocking Flats area, which ranged from 6.77 to 6.88. Other water quality parameter values did not vary significantly between the background and Stocking Flat areas. Dissolved oxygen ranged from 11.39 milligrams per liter to 11.79 milligrams per liter. Temperature ranged from 9.33 degrees Celsius to 11.44 degrees Celsius. Conductivity ranged from 36 microSiemens per second to 40 microSiemens per second. Turbidity ranged from 0.8 Nephelometric Turbidity Units to 4.1 Nephelometric Turbidity Units.

#### **4.0 STREAMLINED RISK ASSESSMENT**

According to Section 300.410 (b) of the National Contingency Plan (NCP), a removal site evaluation includes evaluation by agencies of the threat to public health, and evaluation of the magnitude of risk. WESTON has conducted streamlined surface water and soil pathway risk assessments in accordance with EPA's guidance for conducting non-time critical removal actions (EPA, 1993).

The objective of this section is to perform a streamlined risk assessment for the site and to establish the potential risk to human health and wildlife. As discussed in Section 3.2, the action levels to establish an on-site source in are concentrations that are significantly above background concentrations. In order to evaluate the potential threat to human health and the environment, soil and sediment sample results have been compared against secondary action levels. Sediment, surface water, and soil sample results have been compared against EPA Regional Screening Levels (RSLs) for industrial soil, National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs) Threshold Effect Levels, the California Environmental Protection Agency, Central Valley Regional Water Quality Water Control Board (RWQCB) water quality objectives for the Site, which are State of California Maximum Contaminant Levels (MCLs), EPA Ambient Water Quality Criteria (AWQC), and applicable Risk Management Criteria (RMC) for Metals at BLM Mining Sites. Chemical concentrations above the secondary action levels do not automatically designate the Site as "contaminated" or

trigger a response action. However, exceeding a secondary action level suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate.

#### **4.1 Risk Assessment Results**

##### **Soil:**

Soil samples results are shown in Table 3-1. A total of 13 surface soil samples were collected at the Site. Mercury was detected in all samples at concentrations ranging from 0.055 mg/kg to 10.1 mg/kg. One soil sample contained mercury at concentrations above the BLM Median Wildlife RMC of 8 mg/kg at a concentration of 10.1 mg/kg. Lead was detected in one sample at a concentration of 1,750 mg/kg, which is above the BLM Median Wildlife RMC of 125 mg/kg, the BLM Recreational Camper RMC of 1,000 mg/kg, and the EPA RSL for industrial soil of 800 mg/kg. Zinc was detected above the BLM Median Wildlife RMC of 307 mg/kg at a concentration of 9,170 mg/kg in the same sample containing the lead exceedances. All metals detected at concentrations above BLM RMCs and/or EPA RSLs were collected from the same sample, DC-SS-10, in the Woods Ravine area at an area that may have been used as a cooking area, processing area, or burn area.

##### **Surface Water:**

Surface Water sample results are shown in Table 3-2. Five surface water samples were collected at the Site. Methyl mercury was not detected above the EPA AWQC Chronic value of 0.0028 µg/L in any sample collected at the Site. Mercury was not detected in samples above EPA AWQC Chronic value of 0.77 µg/L or the BLM Recreational Camper RMC value of 93 µg/L. Lead was detected in one sample above the EPA AWQC Chronic value of 2.5 µg/L at a concentration of 3.3 µg/L. Surface water sample results did not exceed State of California MCLs, which are water quality objectives outlined for the Site in the California Environmental Protection Agency, Central Valley Regional Water Quality Water Control Board Quality Control Plan Sacramento River and San Joaquin River Basins (BLM 2004, NOAA 2008; RWQCB, 1998).

##### **Sediment:**

Mercury was detected above the NOAA SQuiRTs Threshold Effects Level of 0.174 mg/kg in two sediment samples collected at the Site at a maximum concentration of 0.62 mg/kg. In addition, arsenic, chromium, copper, nickel, and zinc were detected at respective concentrations

above the NOAA SQuiRTs Threshold Effects Levels. Arsenic was detected in all samples collected, including the background location, at concentrations ranging above the Threshold Effects Level of 5.9 mg/kg at a maximum concentration of 135 mg/kg. Chromium was detected in one sample above the NOAA SQuiRTs Threshold Effects Level of 37.3 mg/kg at a concentration of 39.2 mg/kg. Copper was detected in two samples above the NOAA SQuiRTs Threshold Effects Level of 35.7 mg/kg at a maximum concentration of 87.2 mg/kg. Nickel was detected in two samples above the NOAA SQuiRTs Threshold Effects Level of 18 mg/kg at a maximum concentration of 44 mg/kg. Zinc was detected in two samples above the NOAA SQuiRTs Threshold Effects Level of 123 mg/kg at a maximum concentration of 251 mg/kg (BLM 2008, NOAA 2008).

Mercury and all other metals were not detected above respective BLM Recreational Camper RMC values. Criteria are included in Tables 3-1, 3-2, and 3-3 for reference when applicable (BLM 2004, NOAA 2008).

The streamlined risk screening indicates that several State and Federal criteria/goals established for mercury as well as other contaminants in soil, surface water, and sediment are exceeded at the Site. Potential waste rock or tailings located in the southwest of the Site do not appear to be sources of contamination as soil samples collected from those piles do not contain metals at concentrations significantly above background and are not above BLM RMC or EPA RSL values. Criteria/goal values are mainly exceeded in sediment samples. Of the sediment samples, the sample and duplicate sample collected at sample location DC-SW-1 contained the highest levels of most metals. This sample was collected near the eastern boundary of the Site, which is the closest sample collected downstream of the Champion and Providence mines. Recreational and ecological receptors are subject to potential exposure via ingestion and/or dermal contact.

#### **4.2 Regulatory Framework Conclusions**

According to Section 300.410 (b) of the National Contingency Plan (NCP), a removal site evaluation includes evaluation by agencies of factors necessary to determine whether a removal action is necessary. In addition, a determination must be made as to whether a non-federal party is responsible for undertaking or assisting with a cleanup.

The BLM is using its delegated authority under CERCLA to assess impacts to human health and the environment posed by the tailings and to determine whether a removal action is warranted. BLM has elected to use its CERCLA authority for the Site to determine if a release of hazardous substances has occurred or if potential exists for a release or threat of a release of CERCLA hazardous substances. In accordance with Section 300.415(b)(2)(i-viii) of the NCP, a removal action is selected when one of the following criteria is satisfied:

- Actual or potential exposure to nearby populations, animals or the food chain from hazardous substances, pollutants or contaminants:

There is a viable potential for exposure to mercury by human (recreational) and aquatic receptors. Sediment at the Site contains methyl mercury and mercury at concentrations significantly above background. Mercury was detected in one sample at a concentration above the NOAA SQuiRTs Threshold Effects Level of 0.174 mg/kg.

- Actual or potential contamination of drinking water supplies or sensitive ecosystems:

There is analytical evidence of methyl mercury and mercury contamination within Deer Creek sediment at the Site. Deer Creek is a tributary to the Yuba River. The Yuba River flows into the Feather River, which is a tributary of the Sacramento River. The Sacramento River is used for drinking water.

- Hazardous substances in drums, barrels, tanks or other bulk containers that may pose a threat of release:

There is no evidence of containers at the Site.

- High levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface that may migrate:

Metals in soil samples collected at the Site were not detected at concentrations significantly above background with the exception of a small area in the Woods Ravine area of the Site. The soil sample location, DC-SS-10, was collected from a small area that may have been used as a cooking area, processing area, or burn area. Mercury, lead, and zinc concentrations detected in soil sample DC-SS-10 exceed BLM Median Wildlife RMC Criteria. The lead concentration in soil sample DC-SS-10 exceeds the BLM Recreational Camper RMC as well as the EPA RSL.

- Weather conditions that may promote migration of hazardous substances:

Sampling was conducted by WESTON on May 11, 2010 and May 12, 2010 approximately one

week after a storm in the area. The 2009 -2010 winter was considerably wetter than past years in the area of the Site. Water flow had increased considerably since WESTON was on the Site in December 2009. It is likely that sampling activities conducted at the Site in May 2010 captured a relatively high flow event at the Site.

- Threat of fire or explosion:

There is no known threat of fire or explosion.

- Availability of other appropriate Federal or State response mechanisms to respond to the release:

Developed partnerships include the United States Geological Survey-Geologic Division. Local watershed stakeholder groups American Rivers and Friends of Deer Creek also support the project.

- Other situations or factors that may pose threats to public health, welfare or the environment:

In order to prevent ongoing releases of mercury to the Deer Creek Watershed, measures should be taken to prevent further metal contamination migration off of the Site. Potential remediation activities to reduce mercury in the Stocking Flats area include sediment excavation. This may include localized retention of sediment that has previously discharged from the mine sites and is now in Deer Creek. Recreational use does not occur at the Site. However, a public trail is planned to run through the Site in the Stocking Flats area, sponsored by Nevada City, American Rivers, Friends of Deer Creek, and other local interest groups. The public would have increased incentive to come into contact with contaminated surface water and sediment at the Site in the case that the trail is built. It is recommended that a non-time critical action be taken for the Deer Creek site and that an Engineering Evaluation/Cost Analysis (EE/CA) be prepared to fully develop remedial action objectives, alternatives, and feasibility.

## **5.0 BASIS FOR REMOVAL ACTION**

Mercury in sediment at the Site poses a threat to human health and ecological receptors. Ingestion of mercury-impacted fauna also poses a threat to human health and other ecological receptors. Sediment and soil at the Site contain mercury above soil screening concentrations for protection of potential ecological receptors. Potential impacts to human and ecological receptors due to exposure to mercury are described below, followed by a summary of removal action criteria from the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) that are met at the Site.

### **5.1 Potential Human Impacts of Mercury Exposure**

Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, uncoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage. Effects of exposure to mercury on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Methyl mercury and metallic mercury vapors are more harmful than other forms, because mercury in these forms more readily reaches the brain. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation (ATSDR 1999).

### **5.2 Potential Ecological Impacts of Mercury Exposure**

In the environment, inorganic mercury can be methylated by microorganisms to produce methyl mercury. Methyl mercury will accumulate in the tissues of organisms. The animals at the top of the food chain tend to accumulate the most methyl mercury in their bodies. Any source of mercury release to the environment may, therefore, lead to increased levels of methyl mercury in tissues of large fish, reptiles, birds, and mammals. Mercury affects the reproduction and foraging ability of fish and is also neurotoxic to fish. Exposure to mercury can impair reproduction of birds, cause mortality of bird eggs, and is related to the impaired feeding ability of birds. Exposure effects of mammals to mercury are similar to effects in humans and include lethargy, tremors, convulsions, and mortality (ASTDR 1999).

### **5.3 NCP Removal Action Criteria**

*The potential risks to humans and ecological receptors described above document attainment of the following NCP removal action factors found at 40 Code of Federal Regulations (CFR) Section 300.415(b)(2):*

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.
- Actual or potential contamination of drinking water supplies or sensitive ecosystems.
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.
- Weather conditions that may cause hazardous substances or pollutants to migrate or be released.

Based upon these three NCP factors, a removal action is recommended at the Site to reduce human and ecological exposure to high levels of mercury, to reduce accumulation of mercury in the food chain, and to reduce the continued migration of mercury from the Site into the Deer Creek watershed.

## 6.0 PRELIMINARY REMOVAL ACTION OBJECTIVES AND GOALS

This section of the RSE report identifies removal action objectives and associated clean up levels, statutory limits on removal, the removal action scope, and a preliminary removal action schedule. These objectives and goals will be finalized after the evaluation of applicable or relevant and appropriate requirements (ARAR) completed as part of the EE/CA.

*Removal Action Objective:* Removal action objectives are intended to remove the site conditions that create the NCP factors for a removal action. These factors are:

- 1) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants. Humans are exposed to high levels of mercury when they disturb site soils or sediment in the Deer Creek Watershed during recreational activities, which may increase when the Deer Creek Public Trail is completed.
- 2) Actual or potential contamination of drinking water supplies or sensitive ecosystems. Mercury containing sediment from the site is located in Deer Creek, which is part of the Deer Creek watershed. Deer Creek is a tributary to the South Yuba River. Surface water at the Site contains methyl-mercury. Sediment at the Site contains methyl mercury and mercury at concentrations significantly above background as well as above the NOAA SQuiRTs Threshold Effects Level.

Based on these NCP removal action factors the following removal action objectives are identified for the Site:

- 1) Minimize the hazards associated with sediment containing elevated levels of mercury. Currently, sediment at the Site contains mercury at concentrations above the above the NOAA SQuiRTs Threshold Effects Level.

Attaining these objectives is expected to result in mitigation of NCP removal action factors, protection of human and ecological receptors, and protection of water quality at the Site. Sources contributing contamination to the Site appear to be upstream in Deer Creek and may include the Providence and Champion mines located on private property. There are no known specific cleanup levels applicable to the Site. Therefore, the removal action will reduce the amount of methyl mercury as well as mercury in sediment available for transport, dissolution, volatilization, methylation, and bioaccumulation.

Statutory Limits on Removal Action. Statutory limitations on response are found at Section 104 of the CERCLA. Limitations at CERCLA Section 104(a)(3) prevent removal actions in response to a release or threat of release:

(A) Of naturally occurring substances in their unaltered form (or that have been altered solely through natural processes);

(B) From products which are part of the structure of and result in exposure within, residential buildings or business or community structures;

(C) Into public or private drinking water supplies due to deterioration of the system through ordinary use.

None of the preceding statutory limitations apply to the Site. Limitations at CERCLA Section 104(c)(1) prohibit expenditure of more than \$2,000,000.00 or a removal duration of more than 12 months for Time Critical actions funded out of the Superfund account. This limit on funds and duration does not apply to removal actions at the Site because this action is not financed by the Superfund account. However, time limits are generally used to help determine Time Critical Removal Actions.

The NCP at Section 300.410(b)(3) provides for the completion of an EE/CA whenever a planning period of at least 6 months exists before on-site activities must be initiated. BLM intends to complete an EE/CA for removal actions at Site.

The NCP at Section 300.410(f) specifies that if the removal action does not fully address threats posed by the release, an orderly transition from removal to remedial response activities will be provided. BLM will provide for an orderly transition to remedial response if removal actions do not fully address threats posed by the release.

The NCP at Section 300.410(i) requires that Fund financed removal actions attain ARARs to the extent practicable and considering the exigencies of the situation. While this is not a Superfund financed action, this requirement is normally adhered to for removal actions completed under the NCP.

The NCP at Section 300.410(k) encourages provision for post-removal site controls for Superfund financed removal actions. The purpose of post-removal site controls includes actions necessary to ensure the effectiveness and integrity of the Time Critical removal action after completion, or after the \$2,000,000 and 12 month limits are reached. While this is not a

Superfund financed action, post removal site controls are normally applied after removal actions completed under the NCP

Removal Action Scope. The removal action is intended to address methyl mercury and mercury discharging from sediment at the Site as well as to remove threats to ecological receptors and humans from the mine tailings located at the Site. To effectively address mercury in sediment, the sources of mercury need to be removed or release mechanisms interrupted. The actual methods used to attain removal action objectives will be identified in an EE/CA.

Removal Action Schedule. A removal action schedule will be available pending the completion of an EE/CA.

## **7.0 DATA GAPS AND AREAS OF ADDITIONAL INVESTIGATION**

For the purpose of the Deer Creek RSE a data gap is information needed to assess whether a release to the environment has occurred at the Site as well as information required to delineate the source area. In addition, data that is required to quantify the volume of the source is discussed below.

As it appears that the source of contamination is upstream in Deer Creek of the Site, a release to the Site may continue to occur if the off-site source is not controlled. Analytical results show sediment on-site is contaminated with mercury. Further sampling is required to quantify sediment contamination at the Site and potentially downstream of the Site.

Appropriate data was collected per EPA CERCLA requirements to document a release to soil, surface water, and sediment. Based on soil sampling results, a source does not appear to be present on-site. A small burn area within the Woods Ravine area exceeds some Criteria but may not warrant removal. If the burn area does require removal, additional sampling is required to determine the volume to be removed.

## 8.0 REFERENCES

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## **Appendix A**

### **Site Photographs**

Photo 1: Sample Location DC-SW/SD-1.



Photo 2: Sample Location DC-SW/SD-2.



Photo 3: Additional mine tailings.



Photo 4: Former Deer Creek Bridge Area.



Photo 5: Former Deer Creek Bridge Area.



Photo 6: Sample Location DC-SD-2 collected at Stocking Flats area.



Photo 7: Sample Location DC-SD-3 collected at Stocking Flats area.



Photo 8: Sample Location DC-SD-4 collected at Stocking Flats area.



Photo 9: Water Biota collection at sample location DC-WB-2, collocated with sample location DC-SW/SD-2.



Photo 10: Overview of potential waste rock/tailings area facing north.



Photo 11: Sample location DC-SS-5



Photo 12: Sample location DC-SS-6



Photo 13: Sample location DC-SS-7/DC-SS-11. The pile is eroding into Deer Creek.



Photo 14: Sample location DC-SS-7/DC-SS-11. The pile is eroding into Deer Creek.



Photo 15: View of pile eroding into Deer Creek from north bank of Deer Creek. This picture was taken during the site walk in December 2009 when the Deer Creek flow was lower.



Photo 16: Possible railings leading to large pile at Site. Sample DC-SS-9 was collected at the pile.



Photo 17: Water biota sample collected at DC-WB-3 sample location, collocated with DC-SW/SD-3 sample location. The area, a pool, did not contain areas for water biota collection.



Photo 18: Water biota background sample location DC-WB-BG1, collocated with sample location DC-SW/SD-BG1.



Photo 19: Sample location DC-SS-10. Mason jars and rusted metal are scattered around what appears to be a small campfire sized burn area.

