

# STATE OF COLORADO

John W. Hickenlooper, Governor  
Christopher E. Urbina, MD, MPH  
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.      Laboratory Services Division  
Denver, Colorado 80246-1530      8100 Lowry Blvd.  
Phone (303) 692-2000      Denver, Colorado 80230-6928  
Located in Glendale, Colorado      (303) 692-3090

<http://www.cdphe.state.co.us>



Colorado Department  
of Public Health  
and Environment

## Covenant Information:

**Covenant ID**      HMCOV00088

**Covenant Date**      6/20/2012

**Self Reporting**     

### **Media of Concern:**

**Surface Water:**     

**Ground Water:**     

**Air:**     

**Soil:**     

**Other:**     

### Site Contact Information:

**Owner Corp:**      Resurrection Mining Company

**Contact Name:**      Director of Reclamation and Closure

**Contact Address:**      Resurrection Mining Company

**Contact City:**      Greenwood Village

**Contact State:**      CO

**Contact Zip:**      80111

**Contact Phone:**

### **Contaminants of Concern:**

lead, arsenic, cadmium, zinc

### **Property Restrictions:**

- 1: No residential use, day care centers or schools.
- 2: No parks or open space designated or intended to provide play or recreation area for children.
- 3: No use of untreated groundwater from wells on property for drinking, domestic, or agriculture unless treated to then-applicable state standard.
- 4: No uses of activities that would disturb caps, covers, revegetated areas, etc.
- 5:

## Site Information:

**ID:**      CAL OU 0

**Name:**      Resurrection Zone A 065

**Address:**      ~ 0-4 Miles SE of Leadville, CO

**City:**

**State:**      CO

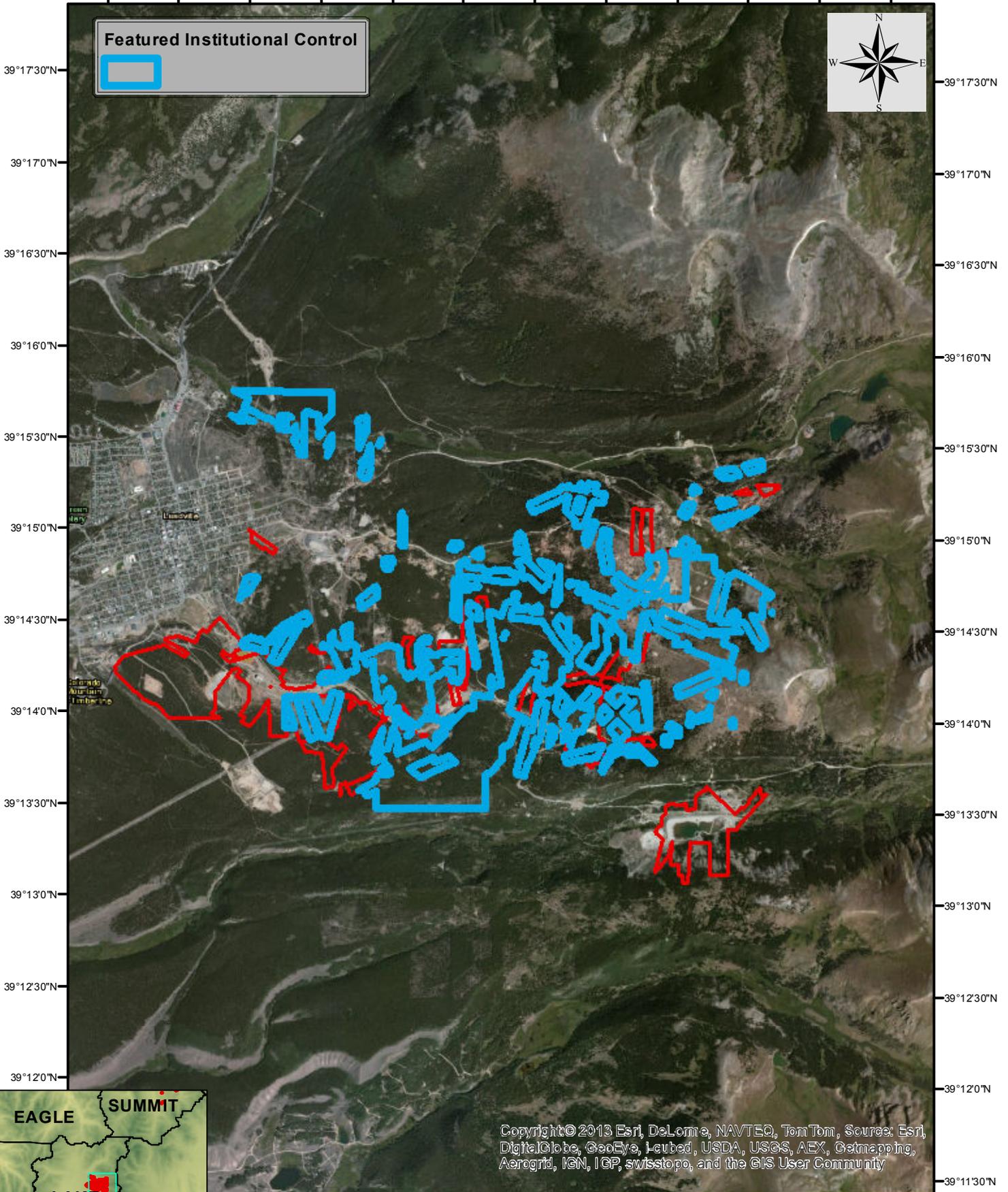
**Zip:**

**Legal Description:**

See covenant

# RESURRECTION ZONE A 065

106° 18' 0" W 106° 17' 30" W 106° 17' 0" W 106° 16' 30" W 106° 16' 0" W 106° 15' 30" W 106° 15' 0" W 106° 14' 30" W 106° 14' 0" W 106° 13' 30" W 106° 13' 0" W 106° 12' 30" W



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## HMC0V00088





Environmental Covenant for Zone A Property

**This property is subject to an Environmental Covenant held by the Colorado Department of Public Health and Environment pursuant to section 25-15-321, C.R.S.**

**ENVIRONMENTAL COVENANT**

Resurrection Mining Company ("Resurrection") grants an Environmental Covenant ("Covenant") this 5<sup>TH</sup> day of APRIL, 2011 to the Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and the Environment ("the Department") pursuant to § 25-15-321 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq.* The Department's address is 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

WHEREAS, Resurrection is the owner of certain property situated in Lake County, Colorado, more particularly described in Attachment 1, attached hereto and incorporated herein by reference as though fully set forth (hereinafter referred to as "the Property"); and

WHEREAS, pursuant to that Consent Decree among Resurrection, Newmont USA Limited ("Newmont"), the State of Colorado and the United States, which was entered by the U.S. District Court for the District of Colorado on August 29, 2008 in *State of Colorado v. Asarco Incorporated, et al.* ("Consent Decree"), Resurrection has agreed to grant an Environmental Covenant in accordance with the terms thereof.

NOW, THEREFORE, Resurrection hereby grants this Environmental Covenant to the Department, with EPA as a third party beneficiary, and declares that the Property as described in Attachment 1 shall hereinafter be bound by, held, sold, and conveyed subject to the requirements set forth below, which shall run with the Property in perpetuity and be binding on Resurrection, its heirs, successors and assigns, and any persons using the land, as described herein. As used in this Environmental Covenant, the term "Owner" means the record owner of the Property and any other person or entity otherwise legally authorized to make decisions regarding the transfer of the Property or placement of encumbrances on the Property, other than by the exercise of eminent domain.

1) Use Restrictions.

- a. No Residential Use, Day Care Centers or Schools, as defined in Section 10, shall be allowed on the property. No portions of Parks or Open Space (as defined in Section 10 below) that are designed or intended to provide a designated play or recreation area for children shall be allowed. Prohibited play or recreation areas



include designated picnic areas, playgrounds, ball fields, sand boxes and similar areas, but do not include trail systems or walkways.

- b. No use of untreated groundwater from wells located on the property for drinking, domestic, or agricultural purposes shall be allowed. This covenant does not restrict the use of groundwater that is treated to meet then applicable State water quality standards for the beneficial use to which the water is being applied. Treatment must meet any applicable State standards that are in place at the time of use.

2) Inspections.

The Department and EPA as the named third party beneficiary shall have the right of entry to the Property at reasonable times with prior notice for the purpose of determining compliance with the terms of this Covenant. Nothing in this Covenant shall impair any other authority the Department may otherwise have to enter and inspect the Property.

3) Termination.

This Covenant runs with the land and is perpetual, unless terminated or modified pursuant to this Section or Section 4. Owner may request that the Department approve a termination or modification of this Covenant. Consistent with C.R.S. 25-15-319(1)(h), the Department shall terminate this Environmental Covenant in whole or in part when, in addition to satisfying the requirements of C.R.S. 25-15-321(3) and (5), Owner provides the following applicable showings to the Department:

- a. Restrictions on Residential Use and other uses specified in Section 1.a shall be terminated on all or part of the property if Owner demonstrates to the Department that the concentration of lead in the upper 6 inches of soils on the property for which termination is sought does not exceed 3500 parts per million (ppm), and the concentration of arsenic in the upper 6 inches of soils on the property for which termination is sought does not exceed 340 ppm. Such demonstration can be made based on sampling analysis or evidence that the subject property is not impacted by any releases or threatened releases of hazardous substances. Any soil sampling conducted for purposes of terminating this Environmental Covenant shall be conducted in accordance with Attachment 2.
- b. Restrictions on using untreated groundwater from wells located on all or part of the property for drinking, domestic, and agricultural purposes shall be terminated if Owner demonstrates to the Department that concentrations of the constituents listed in Table 1 of Attachment 3 in the subject groundwater do not exceed State water quality standards for drinking, domestic, and agricultural purposes existing at the time of application. Current water quality standards are set forth in Table 1 of Attachment 3. Any ground water sampling conducted for purposes of terminating this Environmental Covenant shall be conducted in accordance with Attachment 3.



- c. In addition to the grounds for termination set forth in Sections 3.a and 3.b, the Environmental Covenants shall also be terminated as to all or part of the Property if it is demonstrated to the Department that the proposed termination will ensure protection of human health and the environment, in accordance with C.R.S. 25-15-319(1)(h).

Consistent with C.R.S. 25-15-321(6), the Department shall provide to Owner a written determination on all applications to terminate an Environmental Covenant within 60 days after receipt of such application.

4) Modifications.

Consistent with C.R.S. 25-15-319(1)(h), the Department shall modify this Environmental Covenant in whole or in part when, in addition to satisfying the requirements of C.R.S. 25-15-321(3) and (5), Owner provides the following applicable showings to the Department:

- a. Restrictions on Residential Use and other uses specified in Section 1.a shall be modified on all or part of the property if Owner demonstrates to the Department that portions of the subject property, where either soil lead levels exceed 3500 ppm or soil arsenic levels exceed 340 ppm, will be covered by a minimum of two inches of asphalt, pavement or concrete, or other structures that prevent human exposure to the soil.
- b. Restrictions on using untreated groundwater from wells located on all or part of the property for drinking, domestic, or agricultural uses shall be modified to eliminate the restriction against one or more of these uses, if Owner demonstrates to the Department that concentrations of the constituents listed in Table 1 of Attachment 3 in the subject groundwater do not exceed State water quality standards in existence at the time of the application for the beneficial use that would be allowed under the modification. Current water quality standards are set forth in Table 1 of Attachment 3. Any ground water sampling conducted for purposes of modifying this Environmental Covenant shall be conducted in accordance with Attachment 3.
- c. In addition to the grounds for modification set forth in Sections 4.a and 4.b, the Environmental Covenants shall also be modified as to all or part of the Property if it is demonstrated to the Department that the proposed modification will ensure protection of human health and the environment, in accordance with C.R.S. 25-15-319(1)(h).

Consistent with C.R.S. 25-15-321(6), the Department shall provide Owner a written determination on all applications to modify an Environmental Covenant within 60 days after receipt of such application.



- 5) Conveyances. Within thirty days (30) after any grant, transfer or conveyance of any interest in any or all of the Property, the transferring Owner shall notify the Department and EPA as the named third party beneficiary of such grant, transfer or conveyance.
- 6) Notice to Lessees. Owner agrees to incorporate either in full or by reference the restrictions of this Covenant in any leases, licenses, or other instruments granting a right to use the Property.
- 7) Notification for proposed construction and land use. Owner shall notify the Department and EPA as the named third party beneficiary simultaneously when submitting any application to a local government for a building permit or change in land use that would authorize a use prohibited under Section 1.a.
- 8) No Liability. The Department does not acquire any liability under State law by virtue of accepting this Covenant.
- 9) Enforcement. The Department and EPA as the named third party beneficiary may enforce the terms of this Covenant pursuant to §25-15-322. C.R.S., and may file suit in district court to enjoin actual or threatened violations of this Covenant.
- 10) Notices. Any document or communication required under this Covenant shall be sent or directed to:

Notices to the Department shall be provided to:

*[appropriate Program Manager or Unit leader]*  
Hazardous Materials and Waste Management Division  
Colorado Department of Public Health and the Environment  
4300 Cherry Creek Drive South  
Denver, Colorado 80246-1530

Notices to EPA shall be provided to:

EPA Remedial Project Manager  
California Gulch Superfund Site  
United States Environmental Protection Agency, Region 8  
(8EPR-SR)  
1595 Wynkoop Street  
Denver, CO 80202-1129



Notices to Resurrection shall be provided to:

Law Department  
Resurrection Mining Company  
6363 South Fiddlers Green Circle, Suite 800  
Greenwood Village, CO 80111

And

Director of Reclamation and Closure  
Resurrection Mining Company  
6363 South Fiddlers Green Circle, Suite 800  
Greenwood Village, CO 80111

Either party may change its designated notice recipient upon 5 days prior to notice to the other party.

11) Definitions.

**“Day Care Center”** means facilities that provide care, protection and supervision for children on a regular basis away from their primary residence for less than 24 hours per day.

1) Examples. Examples of Day Care Centers include preschools, nursery schools, and latch key programs. "Child Care Centers," as defined in C.R.S. §26-6-102(1), are classified as "day care" uses.

2) Exceptions. Day Care Centers do not include facilities operated in connection with an employment use, shopping center or other principal use, where children are cared for while parents or guardians are visiting the premises or in the immediate vicinity for a limited period of time.

**“Parks and Open Spaces”** means areas consisting mostly of vegetative landscaping or outdoor recreation, community gardens, or public squares, and include open areas designed and developed for use by the occupants of a proposed development and by other persons for uses including but not limited to recreation, parks, and greenbelts. The lands tend to have few structures.

1) Examples. Examples of Parks and Open Space include parks, golf courses, public squares, plazas, playgrounds, ballfields, recreation areas, botanical gardens, and nature preserves.

**“Residential Use”** means structures or facilities used for Household Living or Group Living, as defined below.

1) Household Living.



- A) Household Living is characterized by the residential occupancy of a dwelling unit by a household. Tenancy is arranged on a month-to-month or longer basis.
  - B) Examples. Uses include living in houses, duplexes, triplexes, fourplexes and other multidwelling structures, retirement center apartments, manufactured housing and other structures with self-contained dwelling units.
  - C) Exceptions. Lodging in a dwelling unit or where less than two thirds of the units are rented on a monthly or longer basis is considered a hotel or motel use and not residential.
- 2) Group Living.
- A) Group Living is characterized by the residential occupancy of a structure by a group of people who do not meet the definition of Household Living. Tenancy is arranged on a monthly or longer basis, and the size of the group may be larger than a family.
  - B) Examples. The Group Living category includes assisted living facilities, treatment facilities, nursing homes and other institutions and arrangements providing care or boarding for a group of unrelated individuals.
  - C) Exceptions.
    - 1) Lodging where tenancy is generally arranged for periods of less than 30 days is not considered to be residential.
    - 2) Facilities for people who are under judicial detainment and under the supervision of sworn officers are not considered residential.

“**Schools**” means public and private schools at the primary, elementary, middle, junior high, or high school level that provide state-mandated basic education, including associated play areas, recreational and sport facilities, and before- and after-school care facilities. The term shall include daytime schools, boarding schools and military academies. The term shall not include business or trade schools.

12) Property Modification. Pursuant to the Consent Decree, this Environmental Covenant is intended to cover only that portion of the Property on which the Settling Defendants own the entire fee title. If Resurrection and the Department hereafter agree that, as of the date of this Environmental Covenant, the Settling Defendants did not own the entire fee title in any portion of the Property, the Department will modify Attachment 1 hereto to exclude that portion of the Property from coverage under this Environmental Covenant.



Resurrection has caused this instrument to be executed this 5<sup>th</sup> day of April, 2011.

Resurrection Mining Company

By: Stephen P. Gifford

Title: Vice President

STATE OF Colorado )

COUNTY OF Arapahoe ) ss:

The foregoing instrument was acknowledged before me this 5<sup>th</sup> day of April, 2011 by Stephen P. Gifford on behalf of Resurrection Mining Company

Maria L. Dawson  
Notary Public

6363 So. Fiddlers Green Circle, Ste. 800  
Address

Greenwood Village, CO 80111

My commission expires: May 1, 2011



Accepted by the Colorado Department of Public Health and Environment this 20<sup>th</sup> day of June, 2012.

By: Gary W. Baughman

Title: Director, H&WMTD



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7/31/2012 10:54 AM  
COV R\$239.50 D\$0.00

Patricia Berger  
Lake County Recorder

STATE OF COLORADO )

COUNTY OF DENVER )

ss:

The foregoing instrument was acknowledged before me this 20 day of June, 2012 by GARY W BAUSHMAN on behalf of the Colorado Department of Public Health and Environment.

Claudette M. Ferris  
Notary Public

4300 Cherry Creek Ln S  
Address

Denver, CO 80246

My commission expires: October 21, 2015





**ATTACHMENT 1  
TO ENVIRONMENTAL COVENANT  
THE PROPERTY**

<b>Mineral Survey Number</b>	<b>Claim Name</b>
216	Lime
218	Rock
232	Bulls Eye
236	Dome
278	H.D. Tract Sub "A"
281	T.S. Wells & Wm. Moyer Placer Tract A
281	T.S. Wells & Wm. Moyer Placer Tract C
327	Oro La Plata
350	Nevada
363	Imes
404	Snowstorm
425	Comstock No. 1
444	Gardiner
454	Maud Hicks
463	Little Forepaugh
467	Independent
471	Eclip
489	Great Hope
494	Alice
498	Everett
504	Little Bertha
508	Tankerstown
516	Tribune
531	Prospect
543	San Jose
544	Titan
549	Jesse Clark
559	William Reddick
560	Lingula
561	Maria
589	Ballard
591	Enterprise
595	Silent Friend
596	Little Vinnie
619	Badger State
625	Hawkeye
653	Buckeye
668	Irene
671	Silver Wave
689	Archer
701	Florence
713	Walnut
716	Glengary
732	Donovan
735	McDermith Placer Tract B
735	McDermith Tract A
735	McDermith Tract D
735	McDermith Tract E



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R\$239.50 D\$0.00

Patricia Berger  
Lake County Recorder

**Mineral Survey Number**

**Claim Name**

743	John Mitchell
783	Hartford Tract Sub B
802	Yates
823	Mahanoy
849	Bazoo
862	Unknown Claim Name
883	Triumph
893	White Cap
895	Forfeit
905	Honey Comb
909	Across The Ocean
996	Kathleen
1005	Delta
1006	Eagle
1018	Ishperming
1028	Ruby
1030	Silver Nugget
1066	A. P. Willard
1095	Olathe Placer
1120	Royal
1125	Adelphia
1161	Ocean Wave
1253	City
1271	St. Teresa
1319	Red Head
1323	St. Joseph
1350	Minnie Lee
1359	Mineral Farms
1444	Ravenna
1451	Mabel
1455	Humboldt (Producing Claim)
1461	Steel Spring
1481	Antelope
1488	Bangkok
1491	Yellow Jacket
1501	Little Nellie
1532	Little Daisy
1542	Unknown Claim Name
1543	Hog Eye
1552	Star of the West
1584	Sequin
1588	Vining
1593	Phat Purse
1594	Ottawa (Producing Claim)
1654	Elk
1772	Rattling Jack
1803	Oriole
1907	Deer
1912	Carlton
1918	Bessie Wilgus
1928	Smasher
1935	Revenue Cutter
2334	Colonel Sellers



**Mineral Survey Number**

**Claim Name**

2633  
2651  
2678  
2688  
2715  
2717  
2730  
2840  
2887  
2920  
3092  
3111  
3141  
3154  
3155  
3156  
3161  
3162  
3166  
3168  
3169  
3217  
3437  
3487  
3630  
3822  
3877  
4163  
4167  
4244  
4253  
4254  
4299  
4337  
4542  
4624  
4626  
4893  
5596  
5631  
6269  
6918  
8036  
8514  
8521  
8727  
8982  
8990  
8990  
8990  
9099  
9261  
9522

S.T.X.  
Minnesota  
Ulster  
Elva Elma (Producing Claim)  
Kayserine  
Rebel  
Fluddin  
Minnie  
A.B  
Old Rye  
L.M.  
Nettie L.  
Daniel O'Connell  
Sedalia  
Bob Ingersol  
N. Rollins  
Milton  
Ontario  
Pauline  
Satellite  
Ida & Alice  
Lillie  
Edith Tangent  
Leo  
Red Porphyry  
Bulldozer  
Old Maid  
Unknown Claim Name  
Unknown Claim Name  
General Grant  
Frank  
Laurel W.  
K.R.L  
Baby  
Mosquito  
My Day  
Hermes  
Triangle  
Hidden Treasure  
Triangle  
Unknown Claim Name  
Midland  
Margaret (Producing Claim)  
Unknown Claim Name  
Scraps  
Sheridan  
Grover Cleveland  
Terrible No. 1  
Terrible No. 2  
Terrible No. 4  
Lincoln & Joiner  
Unknown Claim Name  
Whip



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Patricia Berger  
Lake County Recorder

**Mineral Survey Number**

**Claim Name**

9530		Eclipse
<del>9530</del>	(duplicate)	<del>Eclipse</del>
9958		Smuggler
10087		Little May
11187		Onondago
12343		Intermural (Producing Claim)
13448		G.T.M.
13761		Ralph
16064		Greater New York B (Producing Claim)
17972		Unknown Claim Name
18112		F.X.O.
18184		Lost Team
18417		Unknown Claim Name
18710		Unknown Claim Name
19621		West Fraction
19634		Franklin
2137A		Little Delaware
3672 A.B.		Wilson
377A		Modest Girl
5711 A.M.		Cornelius
872 A.M.		Thunderbolt

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**ATTACHMENT 2  
TO ENVIRONMENTAL COVENANT  
SOIL SAMPLING PROCEDURES**

**Soil Sampling and Analysis Plan**

This attachment specifies the soil sampling procedures for purposes of terminating an Environmental Covenant restricting Residential Uses or other uses specified in paragraphs A.2.a or A.3.a of Appendix F1. Those restricted uses are collectively referred to herein as “Uses.” For purposes of this protocol, a “property” is defined as a portion of a claim, an individual claim or contiguous claims on which an Environmental Covenant restricting Uses is proposed to be terminated. A portion of the subject property proposed for Uses may also be subdivided for purposes of terminating or modifying an Environmental Covenant for only the subdivided portion of the property. The following sections describe the soil sampling requirements, methods, sample analysis, and quality assurance to support termination of the Environmental Covenant. Alternate soil sampling protocols and analysis methods may be proposed in a site-specific sampling plan for the property, subject to approval by the State.

**1.1 Soil Sampling Requirements and Protocols**

Soil samples will be collected to a total depth of six inches, except in areas that are covered or will be covered with a minimum 2-inch thick layer of asphalt or concrete or other structures that prevent human exposure to soil, or will be covered within a minimum thickness of six inches of imported clean soil. Soil samples will be collected at two depth intervals: one from 0-2 inches deep and one from 2-6 inches deep. Each of these two soil samples will consist of a composite collected from three subsamples from the same depth interval, as described in Section 1.2 below.

Composite samples for each depth interval (0-2 inches and 2-6 inches) will be collected at four locations per acre, with not less than four composite samples collected for each depth interval a property. The composite samples will be equally spaced within the property. Each composite sample will consist of three subsamples of approximately equal amounts of soil collected from the same depth interval. At each composite sample location, the subsamples will be collected in a triangular pattern with the subsamples spaced approximately five feet apart. The composite sample will consist of the three subsamples collected from the same depth interval.

If any deposits of mining, milling, or smelting related materials (waste rock, tailing, or slag) are known or suspected to be present within the property, the footprint of these areas will be defined as separate sampling areas not to exceed 10,000 square feet each (100 feet by 100 feet). A composite sample (minimum of three subsamples) will be collected from the materials within each sampling area to a single sampling depth of 0-6 inches, or less, if the materials are shallower.

Imported soil shall be sampled as defined below to demonstrate that the imported soil has lead and arsenic concentrations less than 3,500 mg/Kg and 340 mg/Kg, respectively, for Residential Use.



Prior to soil sampling, a site sampling plan will be developed and the sampling areas and sampling locations will be plotted on a site plan. The site sampling plan will show the property boundaries and any existing residential structures, commercial facilities, or improvements. The sampling areas and sampling locations will be identified on the site sampling plan. In addition, any known or suspected deposits of mine, mill or smelter related materials (tailing, waste rock, or slag) will also be delineated on the site sampling plan with sampling locations identified.

## **1.2 Soil Sample Collection and Handling Procedures**

Soil samples will be collected using a plastic or stainless steel trowel, soil probe, hand auger, spade or drive sampler. A pick or spade may be utilized, as necessary, to loosen the soil for sample collection. The specific sampling tool utilized will be dependent on the soil composition and density. Additional sampling equipment may include stainless steel bowls, measuring tape, hand-held GPS, plastic sample bags, camera, log book, pen, pencil, and marker.

At each composite sample location, a subsample will be collected at each apex of a triangle spaced approximately five feet apart. At each subsample location, any loose debris and any sod or dense vegetation will be removed from an area approximately six inches in diameter. Samples will not be collected under or immediately adjacent to trees, shrubs and or structures. A soil sample will be collected at the same subsample location to a depth of 0-2 inches and then 2-6 inches using the sampling tool. Approximately the same volume of soil should be collected at each subsample location for each depth. The soil from each subsample will be collected into a separate clean plastic bag or stainless steel bowl for each sample depth interval. For each composite sample, combine the subsamples from the same depth interval together in a sealed plastic bag and mix by hand in the sealed bag. Label the plastic bag with the property identification, sampling area, depth interval, and date of collection. A chain of custody form will be maintained for all soil samples from the time of collection until its final deposition.

All equipment used for soil sampling will be dedicated or will be decontaminated prior to sample collection. Decontamination equipment will include, pump sprayers, spray bottles, deionized water, phosphate free soap solution, scrub brushes, buckets, disposable gloves, etc. Field personnel will wear disposable polyethylene gloves to avoid sample cross contamination during the collection of soil samples.

## **1.3 Imported Soil**

Soil imported to a property for use within the upper six inches of the final ground surface will be sampled to demonstrate that the lead and arsenic concentrations achieve acceptable concentrations for residential use and that the lead concentrations achieve acceptable concentrations for commercial use, as defined in Appendix F1. For up to 1,000 cubic yards of imported soil delivered to a property, a sample will be collected every 250 cubic yards. For volumes greater than 1,000 cubic yards, a sample of the imported soil will be collected for every 500 cubic yards.

## **1.4 Equipment Decontamination**

Sampling equipment will be decontaminated between sample collection points, if the equipment is not disposable, in order to avoid cross contamination between samples. Field personnel will



wear disposable gloves while decontaminating equipment. The following procedures will be followed to ensure that sampling equipment is decontaminated:

- 1) Visually inspect sampling equipment for soil; a stiff brush will be used to remove any visible material
- 2) Wash the field equipment with phosphate free soap and water, rinse with distilled water, and air dry or wipe with disposable paper towels
- 3) Water used for decontamination will be disposed of on site. All disposable items such as, paper towels, disposable gloves and wash cloths, will be deposited into a garbage bag and disposed of in a solid waste landfill

### **1.5 Soil Sample Documentation**

Field sampling information will be recorded in a field logbook or field sampling forms. Information that will be recorded at each composite soil sampling location will include the location (e.g. determined by hand-held GPS or measured to a defined reference point) and sampling depth interval. The documents to be completed for each composite sample in each sampling area are:

- Site Plan (Plot Plan)
- Chain-of-Custody transmittal form
- Sample tag and/or label
- Sample master log

All pertinent sampling information will be recorded on a field logbook. Entries will be made in the field documents in indelible ink, with all corrections consisting of initialed line-out deletions. Each day's entries will be initialed and dated at the end of each day by the field sampling crew.

At minimum, entries in the field log shall include:

- Date and time
- Site description (i.e., physical address and assessor parcel number)
- Description of weather conditions
- Names of field sampling crew
- Description of site conditions and any unusual circumstances
- Location of sample site, including map reference
- Equipment identification
- Details of actual work effort, particularly any deviations from the aforementioned methods
- Field observations
- Details of photo documentation, if any



## **1.6 Soil Sample Packaging and Shipping**

Each sample container will be properly labeled in the field. All containers will be checked for proper seal and entered by sample number on the chain of custody form. After collection, composite samples will be placed in an insulated cooler for storage in the field. Samples will be shipped to the laboratory in a cooler with ice. The ice in the cooler will be double-bagged. One copy of the chain of custody form will be enclosed in a plastic bag in each cooler containing the samples identified on the form. The cooler will be taped shut and custody seals will be attached to the outside of the cooler to ensure that the cooler cannot be opened without breaking the seal. The cooler will be shipped using an authorized shipping service to the laboratory for analysis.

## **1.7 Soil Sampling Quality Control**

Duplicate samples will be collected and submitted to the laboratory to evaluate the precision and reproducibility of sampling and analysis procedures. Duplicate samples will be collected at a minimum of one for every 10 soil composite samples. The duplicate samples will be collected, preserved, packaged, and handled in the same manner as the soil samples. No equipment blanks or field blanks will be collected.

## **1.8 Laboratory Analytical Protocols**

The soil samples will be analyzed by the laboratory using methods detailed in Test Methods for Evaluating Solid Waste, Revised Methods, SW-846. The laboratory shall be accredited by the Colorado Certification Program. For Residential Development, samples will be analyzed for arsenic and lead. For Commercial Development, soil samples will be analyzed for lead. Soil samples will be digested in accordance with SW-846 EPA Method 3050. After digestion, all samples will be analyzed by EPA Method 6010B.

The report of analytical results will include a cover letter from the laboratory identifying the sample group and any non-complaint quality control results together with the affected samples. Attached to the cover letter will be a summary of sample results and a summary of quality control results. The summary of quality control results will include instrument performance results such as standard recoveries and blanks results; matrix QC results such as spikes, duplicates and procedural blanks; and laboratory control standard recoveries.



**ATTACHMENT 3  
TO ENVIRONMENTAL COVENANT  
GROUNDWATER SAMPLING PROTOCOLS**

**Groundwater Sampling and Analysis Plan**

This attachment specifies the groundwater sampling procedures for purposes of terminating or modifying an Environmental Covenant for groundwater use restrictions, as specified in Appendix F1. For purposes of the protocol, a “property” is defined as a portion of a claim, an individual claim or contiguous claims not exceeding 35 acres in total area for which the groundwater use restrictions of an aquifer are to be terminated. The followings sections describe the groundwater sampling requirements, methods, sample analysis, and quality assurance that will support such termination or modification. Alternate groundwater sampling procedures and analysis methods for a property may be proposed in a site-specific sampling plan for the property, subject to approval by the State.

**1.9 Groundwater Sampling Requirements**

One groundwater sample will be collected from a well completed in the aquifer of the hydrogeologic unit (alluvial, unconsolidated sedimentary deposits, or bedrock) proposed for beneficial use underlying each property. For alluvial or unconsolidated sedimentary deposits, the hydrogeologic unit is defined as the aquifer with the same lithology and within the same surface water hydrologic divide. The bedrock hydrogeologic unit is defined as the aquifer within the same geologic formation and structure. The groundwater use restrictions will be terminated or modified for a property for only that aquifer of the hydrologic unit in which the well is completed.

The groundwater sample from the well will be analyzed for constituents that are relevant to the California Gulch Superfund Site for which numeric groundwater quality standards have been established by the State for the proposed beneficial use at the time of the application for termination or modification of the Environmental Covenant, hereafter referred to as the Numeric Standards. The constituents that are relevant to the California Gulch Superfund Site and the current Numeric Standards are presented in Table 1 for drinking/domestic or agricultural uses. The groundwater in the aquifer will be determined acceptable for the proposed use, and the Environmental Covenant restricting groundwater will be terminated for the property or modified to allow a particular beneficial use, if the constituent concentrations of the sample from the well are less than the Numeric Standards for all beneficial uses (in the event of termination) or the particular beneficial use (in the event of modification).

**1.10 Groundwater Sampling Methods**

The groundwater sample from the well will be collected according to the methods described in SOP No. 4-Ground Water Well Sampling. Non-dedicated or non-disposable sampling equipment will be decontaminated prior to collection of the sample according to the methods described in SOP No. 1-Decontamination. Sample collection documentation, sample



containment, preservation, identification, labeling and shipping will be performed according to the procedures described in SOP No. 7- Sample Handling, Documentation, and Analysis.

**1.11 Laboratory Analytical Methods**

Samples will be analyzed for the parameters for which Numeric Standards have been established for the proposed beneficial use. Sample container, preservation, and holding times are provided in SOP No. 7-Sample Handling, Documentation, and Analysis. The laboratory will be required to process all samples submitted according to the specific protocols for sample custody, holding times, analysis, reporting and associated laboratory quality assurance. Laboratory quality assurance checks will include the use of blank, spiked, split, and duplicate samples, calibration checks, and internal standards. Designated laboratory personnel will be required to ensure that QA/QC procedures are achieved. The laboratory or laboratories for constituent analysis must be accredited by the Colorado Certification Program. Laboratory calculations and data review will be performed by the laboratory in accordance with the procedures described by the analytical method. The laboratory will review the results of the laboratory QC analyses, instrument calibration and maintenance records, calculations, and the record of sample custody (including holding times) within the laboratory.

**Table 1 Groundwater Standards for Beneficial Use**

<b>Parameter</b>	<b>Domestic Water Supply and Drinking Water Standards</b>	<b>Agricultural Standards</b>
Antimony-dissolved	0.006 mg/L	
Aluminum-dissolved		5 mg/L
Arsenic-dissolved	0.01 mg/L	0.1 mg/L
Barium-dissolved	2.0 mg/L	
Beryllium-dissolved	0.004 mg/L	0.1 mg/L
Cadmium-dissolved	0.005 mg/L	0.01 mg/L
Chloride-dissolved	250 mg/L	
Chromium-dissolved	0.1 mg/L	0.1 mg/L
Copper-dissolved	1.0 mg/L	0.2 mg/L
Fluoride-dissolved	4.0 mg/L	2 mg/L
Iron-dissolved	0.3 mg/L	5 mg/L
Lead-dissolved	0.05 mg/L	0.1 mg/L
Manganese-dissolved	0.05 mg/L	0.2 mg/L
Mercury-dissolved	0.002 mg/L	0.01 mg/L
Molybdenum-dissolved	0.035 mg/L	
Nickel-dissolved	0.1 mg/L	0.2 mg/L
Selenium-dissolved	0.05 mg/L	0.02 mg/L
Silver-dissolved	0.05 mg/L	
Sulfate-dissolved	250 mg/L	
Thallium-dissolved	0.002 mg/L	
Zinc-dissolved	5 mg/L	2 mg/L



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pH	6.5 – 8.5	6.5-8.5
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## **SOP-1**

*SOP Date: February 2008*

# **DECONTAMINATION**

## **1.0 INTRODUCTION AND TYPES OF CONTAMINATION**

The purpose of this document is to define the standard procedure for decontamination associated with environmental investigation for the California Gulch Superfund Site. This procedure is intended to be used with other SOPs.

### **1.1 Site and/or Sample Cross-Contamination**

The overall objective of multimedia sampling programs is to obtain samples which accurately depict the chemical, physical, and/or biological conditions at the sampling site. Extraneous contaminant materials can be brought onto the sampling location and/or introduced into the medium of interest during the sampling program (e.g., by contacting water with equipment previously contaminated at another sampling site). Trace quantities of these contaminant materials can thus be captured in a sample and lead to false positive analytical results and, ultimately, to an incorrect assessment of the contaminant conditions associated with the site. Decontamination of non-dedicated or non-disposable sampling equipment (e.g., bailers, pumps, and tubing) and field support equipment (e.g., drill rigs, vehicles) is required. To ensure that sampling cross-contamination is prevented, and that on site contaminants are not carried off site.

## **2.0 PROCEDURES**

### **2.1 Equipment List**

The following is a list of equipment that may be needed to perform decontamination:

- Brushes
- Wash tubs
- Buckets
- Scrapers
- Steam cleaner or high-pressure washer
- Paper towels
- Alconox detergent (or equivalent)
- Potable water
- Deionized or distilled water
- Garden type water sprayers
- Clean plastic sheeting and/or trash bags

### **2.2 Decontamination**



### **2.2.1 Sampling Equipment**

The following steps will be used to decontaminate non-dedicated or non-disposable sampling equipment (including reusable filter apparatus):

Personnel will dress in suitable safety equipment to reduce personal exposure (e.g., latex gloves, safety glasses, etc.).

Gross contamination on equipment will be scraped off at the sampling or construction site.

Equipment that will not be damaged by water will be washed with an Alconox solution or low-sudsing detergent and potable water and scrubbed with a bristle brush or similar utensil (if possible). Equipment will be triple rinsed with potable water followed by a triple rinse with deionized or distilled water.

Following decontamination, equipment will be placed in a clean area, on or in clean plastic sheeting to prevent contact with contaminated soil. If the equipment is not used immediately, the equipment will be covered or wrapped in plastic sheeting or heavy duty trash bags to minimize potential airborne contamination.

### **2.2.2 Submersible Pumps**

If non-dedicated submersible pumps are used they will be decontaminated between wells. The outside of the pump and hose will be tripled rinsed with deionized or distilled water. Deionized or distilled water will be pumped through the pump and hose. The volume of deionized or distilled water pumped through will be at a minimum equal to three times the volume of fluid that could be contained by the pump and hose.

### **2.2.3 Water Level Probes**

Electric water level probes will be decontaminated by rinsing with deionized or distilled water or by wiping the probe during removal with paper towels wetted with deionized or distilled water. The water level probe will be placed in a plastic bag after decontamination.

### **2.2.4 Sensitive Equipment**

Sensitive equipment that may be damaged by water will be carefully wiped clean using paper towels and detergent water or spray bottle and towel and rinsed with deionized or distilled water. Care will be taken to prevent any equipment damage.

### **2.2.5 Drilling and Heavy Equipment**

Drilling and heavy equipment will be decontaminated at a designated decontamination area for large equipment. The following steps will be used to decontaminate drilling and heavy equipment:

Personnel will dress in suitable safety equipment to reduce personal exposure (e.g., gloves, safety glasses or splash shields, etc.).



Equipment showing gross contamination or having drill cuttings caked on will be scraped off with a flat-bladed scraper at the sampling or construction site.

Equipment, such as drill rigs, augers, drill bits, and shovels will be sprayed with potable water by a high-pressure washer. Care should be taken to adequately clean the insides of the hollow-stem augers and backhoe buckets.

Following decontamination, drilling equipment will be placed on the clean drill rig and moved to a clean area. If the equipment is not used immediately, it should be stored in a designated clean area.

### **2.2.6 Equipment Leaving the Site**

Vehicles used for non-intrusive activities shall be cleaned on an as needed basis. Construction equipment such as earth moving equipment, trucks, drilling rigs, backhoes, trailers, etc., will be pressure washed at the designated decontamination area before the equipment is removed from the site.

### **2.2.7 Wastewater**

Used wash and rinse solutions may be discharged to the ground at the sampling site

### **2.2.8 Other Wastes**

Solid wastes such as paper towels and used filters will be sealed in plastic garbage bags and disposed of in a sanitary landfill.

## **2.3 Documentation**

Sampling personnel will be responsible for documenting the decontamination of sampling and drilling equipment. The documentation will be recorded with waterproof ink in the sampler's field notebook with consecutively numbered pages. The information entered in the field book concerning decontamination should include the following:

- Decontamination personnel
- Date
- Decontamination observations



## **SOP-4**

*SOP Date: February 2008*

# **GROUNDWATER WELL SAMPLING**

## **1.0 PURPOSE AND SCOPE**

The purpose of this document is to define the standard procedure for collecting groundwater samples from wells for the California Gulch Superfund Site. This procedure gives descriptions of equipment, field procedures, and QA/QC procedures necessary to collect groundwater samples from wells. The sample locations and frequency of collection are specified in the QAPP.

This procedure is intended to be used together with several other SOPs, as applicable, including:

SOP 1 Decontamination

SOP 7 Sample Handling, Documentation, and Analysis

## **2.0 WATER SAMPLING PROCEDURES**

### **2.1 Equipment List**

Sample bottles, preservatives, sample labels will be obtained from the analytical laboratory. Several extra sample bottles will be obtained in case of breakage or other problems. Sample bottles can be either pre-preserved or preservatives can be added in the field.

Equipment that may be used during well evacuation:

- Well keys
- Electronic water level probe
- Assorted tools (knife, screwdriver, etc.)
- PVC, Teflon, or stainless-steel bailer (bottom filling)
- PVC hand pump
- Nylon or polypropylene rope
- Bailer tripod
- PVC pump discharge hose
- Gas-powered electric generator
- Stainless-steel submersible pump
- pH meter (with automatic temperature compensation)
- Specific conductivity meter
- Plastic squeeze bottle filled with deionized water
- Polyethylene or glass container (for field parameter measurements)
- Chemical-free paper towels or Kimwipes



- Calculator
- Field notebook
- Waterproof pen
- Plastic sheeting (for placing around well)
- Appropriate health and safety equipment

Equipment that may be used during well sampling:

- Electronic water level measurement probe
- PVC, Teflon, or stainless-steel bailers (bottom filling)
- Stainless-steel submersible pump
- PVC pump discharge hose
- Electric generator
- Nylon or polypropylene rope or twine
- Bailer tripod
- pH meter (with automatic temperature compensation)
- Specific conductivity meter
- Plastic squeeze bottle filled with deionized water
- Sample bottles
- Dedicated jug for holding sample for filtering
- Cooler with ice
- Polyethylene or glass jar for field measurement samples
- Sample labels

Equipment used during sample filtration:

- Disposable filterware with 0.45-micron filter
- Hand pump or peristaltic pump
- Tygon or silicon tubing (2- to 4 ft lengths)

Equipment used during decontamination:

- Deionized or distilled water
- Decontamination buckets/pails
- Paper towels
- Plastic brushes
- Sprayers

## 2.2 Sampling Procedures

This section gives the step-by-step procedures for collecting samples in the field. Observations made during sample collection should be recorded in the field notebook and field data sheet as specified in Section 2.4 of this SOP.

### 2.2.1 Decontaminate Equipment



Before any evacuation or sampling begins, all well probes, bailers, and other sampling devices shall be decontaminated. If dedicated equipment is used, it should be rinsed with deionized water. Dedicated downhole pumps will not be decontaminated. A discussion of equipment and personnel decontamination is contained in SOP No. 1, Decontamination, and in the site Health and Safety Plan.

### **2.2.2 Instrument Calibration**

Electronic equipment used during sampling includes a pH meter with temperature scale, a conductivity meter and a turbidity meter. Before going into the field, the sampler shall verify that all of these are operating properly. The pH and conductivity meters require calibration and calibration checks every day prior to use. The turbidity meter requires a calibration check by reading measurements cells of a known value. Calibration times and readings will be recorded in a notebook and/or on Calibration Data Sheet, which are to be kept by the field sampler.

### **2.2.3 Evacuate Well**

The purpose of well purging is to remove stagnant water from the well to obtain representative water from the geologic formation being sampled while minimizing disturbance to the collected samples. Before a sample is taken, the well will be purged until a minimum of three well casing volumes have been removed and field parameters have stabilized, or until a maximum of five well volumes have been removed. Purging will be considered completed if the well is pumped or bailed dry. A well should be pumped at a rate no faster than approximately 1 gallon per minute if it has a tendency to dry up prior to evacuating three casing volumes. Evacuated well water may be disposed of at the well site in a manner that does not cause runoff.

Before well purging begins, the following procedures are to be performed at each well:

- Note the condition of the outer well casing, concrete well pad, protective posts (if present), and any other unusual conditions in the area around the well.

- If bailing place clean plastic sheeting around the well.

- Open the well.

- Note the condition of the inner well cap and casing.

- Measure (to nearest 0.01 foot) and record depth of static water level from the measuring point on the well casing and indicate time. Record what the measuring point is (i.e., notch on north side, top of PVC well casing).

- Calculate volume of water in the well casing in gallons based on feet of water and casing diameter. (See Section 2.4.3 for calculation of volumes.)

- From the above calculation, calculate the three casing volumes to be evacuated.

- Obtain an initial sample (which is not retained) from the bailer or purge pump for field measurements (temperature, conductivity, and pH measurements) and observation of water quality.



Evacuate three volumes of water in casing with a bailer or pump. Take temperature, specific conductance, and pH measurements after evacuation of each well volume to confirm that the water chemistry has stabilized. Generally, pH values within  $\pm 0.2$  pH unit and conductivity and temperature readings within  $\pm 10$  percent between consecutive readings indicate good stability of the water chemistry. If the chemistry is not stable, continue purging up to a maximum of five well volumes, measuring pH and specific conductance after each one half well volume.

When evacuating a well using a pump, the pump intake should be placed:

for low recovery wells (wells that can be pumped dry), place pump intake at bottom of screened interval.

for high recovery wells (little drawdown with pumping), place pump at or slightly above the middle of the screened interval to ensure the removal of stagnant water from the well bore.

If the well is bailed or pumped dry during evacuation, it can be assumed that the purpose of removing 3 well volumes of water has been accomplished, that is, removing all stagnant water that had prolonged contact with the well casing or air. If recovery is very slow, samples may be obtained as soon as sufficient water is available.

#### **2.2.4 Obtain Water Samples**

Obtain samples for chemical analysis within 2 hours after purging is completed, if possible. For slow recovering wells, the sample shall be collected immediately after a sufficient volume is available (water has recovered to screened interval). The water quality samples shall be taken from within the well screen interval.

The following sampling procedure is to be used at each well:

1. Assemble decontaminated sampling equipment. If bailers are used, new nylon or polypropylene rope will be used for each well for each sampling event. Assemble the filtering apparatus.
2. Make sure that sample labels have been filled out for each well.
3. Lower the bailer slowly and gently into contact with the water in the well. Lower the bailer to the same depth in the well each time, within the screened interval. Retrieve the bailer smoothly and empty the water in a slow steady stream into the containers. If submersible or bladder pumps are utilized to collect samples, start the pump and fill the sample bottles as described below.
4. Triple rinse the sample containers with sample water and then fill the sample bottles. If not enough sample water is available to perform the triple rinse, then at a minimum a single rinse will be performed and will be recorded in the field logbook and/or data sheet. Cap the sample containers quickly. If sample bottles are pre-preserved, fill the sample bottles without rinsing. Add preservative if the bottle is not pre-preserved. Do not allow the sample containers with preservatives to overflow. See Section 2.2.5 for details on field filtering.



5. Slowly pour an unfiltered portion into the sample container for field parameter (pH, specific conductance, temperature, and turbidity) analyses and perform the in-field analyses and record.
6. Place samples on ice in a cooler.
7. Record time of sampling.
8. Replace and lock well cap.
9. Complete field documentation.

### **2.2.5 Filtering Samples**

Samples for metals analyses will be filtered during the field sampling event by using a disposable filter apparatus and peristaltic or hand vacuum pump.

The following procedure is to be used for filtering:

Assemble filter device according to manufacturer's instructions.

Prior to the collection of aliquots, flush the filter with approximately 100 to 200 milliliters of groundwater. Filter sample either by pouring sample in the top portion of filter unit or pumping through an in line filter using a peristaltic pump. Sample may also be filtered by attaching the in-line filter to the submersible pump discharge.

Triple rinse the sample containers with filtered sample water and then fill the sample bottles. If not enough sample water is available to perform the triple rinse, then at a minimum a single rinse will be performed and will be recorded in the field logbook and/or data sheet. Cap the sample containers quickly. If sample bottles are pre-preserved, fill the sample bottles without rinsing. Add preservative if the bottle is not pre-preserved. Do not allow the sample containers with preservatives to overflow.

Place the used filter membrane or disposable filter equipment in a Ziploc<sup>®</sup> bag for disposal with the personal protective equipment.

Any reusable filtering equipment will be decontaminated in accordance with SOP No. 1.

### **2.3 Sample Handling**

Sample containers and preservatives are specified in SOP No. 7, Sample Handling, Documentation and Analysis. Samples will be labeled and handled as described in SOP No. 7.

### **2.4 Documentation**

#### **2.4.1 Groundwater Data Sheet**

A groundwater data sheet for groundwater samples (Appendix A) will be completed at each sampling location. The data sheet will be completely filled in. If items on the sheet do not apply



to a specific location, the item will be labeled as not applicable (NA). The information on the data sheet includes the following:

- Well number
- Date and time of sampling
- Person performing sampling
- Depth to water before sampling
- Volume of water evacuated before sampling
- Conductivity, temperature, and pH during evacuation (note number of well volumes)
- Time samples are obtained
- Number of samples taken
- Sample identification number(s)
- Preservation of samples
- QC samples taken (if any)
- How the samples were collected (i.e., bailer, pump, etc.)

### 2.4.2 Field Notes

Field notes shall be kept in a bound field book. The following information will be recorded using waterproof ink:

- Names of personnel
- Weather conditions
- Date and time of sampling
- Location and well number
- Condition of the well
- Decontamination information
- Initial static water level and total well depth
- Calculations (e.g., calculation of evacuated volume)
- Calibration information
- Sample methods, or reference to the appropriate SOP

### 2.4.3 Well Volume Calculations

The following equation shall be used to calculate the volume of water to be removed during well evacuation.

For 2 inch well:

$$\text{Evacuation Volume [gal]} = (\text{Total Depth [ft]} - \text{Water Level Depth [ft]}) \times 0.1632 \text{ gal/ft}$$

$$= \text{gallons/well casing volume}$$

For 4-inch well:

$$\text{Evacuation Volume [gal]} = (\text{Total Depth [ft]} - \text{Water Level$$



Depth [ft]) x 0.6528 gal/ft

For 6-inch well: = gallons/well casing volume

Evacuation Volume [gal] = (Total Depth [ft] - Water Level  
Depth [ft]) x 1.4688 gal/ft  
= gallons/well casing volume

Multiply the volume of one well casing volume by 3 to obtain the minimum volume of water to be evacuated.



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**APPENDIX A  
GROUNDWATER DATA SHEET**





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Was a rinsate sample collected?  
)

Yes  No  (sample control number \_\_\_\_\_)

Notes: \_\_\_\_\_



## **SOP-7**

*SOP Date: February 2008*

# **SAMPLE HANDLING, DOCUMENTATION, AND ANALYSIS**

## **1.0 PURPOSE AND SCOPE**

The purpose of this document is to define the standard protocols for sample handling, documentation, and analysis for the California Gulch Superfund Site. This procedure is intended to be used together with other SOPs and is referenced in all SOPs that apply to sampling.

## **2.0 PROCEDURES FOR SAMPLE HANDLING, DOCUMENTATION, AND ANALYSIS**

### **2.1 Sample Identification and Labeling**

Samples collected during monitoring, investigations, or remediation activities will be assigned unique sample identification numbers. Each sample identification number will identify the organization collecting the sample or the program under which it is collected, sampling location, type of sample, and sampling sequence for each sample. These numbers are required for tracking the handling, analysis, and verification or validation status of all samples collected during monitoring. In addition, the sample identification numbers will be input into the project database to identify analytical results received from the laboratory.

Sample identification numbers that are assigned will be divided into four fields as shown in the following example:

M-CGW1-01-900423

The first field is one character in length and identifies the company conducting the sampling. The second field is an alphanumeric code identifying the location of the sample and the last letter of this field indicates the matrix (e.g., CGM1 indicates California Gulch Well No. 1, the second W indicates a water matrix). The next field identified is the type of sample being collected; this is used to identify whether the sample is a primary or grab sample, a composite sample, field duplicate, field blank, or equipment rinsate. The final field contains the date in a year-month-day format. For example, the sample identified above was collected on April 23, 1990.

Each sample that is collected in the field will be labeled for future identification. Sample labels will be filled out as completely as possible by a member of the sampling team prior to the start of the day's field sampling activities. The date, time, sampler's signature, and the last field of the sample identification number should not be completed until the sample is actually collected. All sample labels will be filled out using waterproof ink. At a minimum, each label will contain the following information:



Sampler's company affiliation;  
Site location;  
Sample identification;  
Date and time of sample collection;  
Method of preservation used;  
Sample matrix; and  
Sampler's initials.

## **2.2 Sample Containers, Preservatives, and Holding Times**

### **2.2.1 Sample Containers**

Proper sample preparation practices will be observed to minimize sample contamination and potential repeat analyses due to anomalous analytical results. Prior to sampling, commercially-cleaned sample containers will be obtained from the analytical laboratory. The bottles will be labeled as described in the previous section to indicate the type of sample and sample matrix to be collected. Sample bottles can be either pre-preserved from the laboratory or preservatives can be added in the field during sample collection.

### **2.2.2 Sample Preservation**

Samples are preserved in order to prevent or minimize chemical changes that could occur during transit and storage. Sample preservation should be performed immediately upon sample collection to ensure that laboratory results are not compromised by improper coordination of preservation requirements and holding times. Samples will be preserved immediately and stored on ice in coolers prior to shipping. Sample preservation requirements are based on the most current publication of 40 CFR, Part 136.3 and are provided in Table 1.

### **2.2.3 Sample Holding Times and Analyses**

Sample holding times are established to minimize chemical changes in a sample prior to analysis and/or extraction. A holding time is defined as the maximum allowable time between sample collection and analysis and/or extraction, based on the nature of the analyte of interest and chemical stability factors. Holding times applicable for analytes are listed in Table 1. Samples should be sent to the laboratory as soon as possible after collection by hand delivery or an overnight courier service to minimize the possibility of exceeding holding times.

For most samples, preservation by cooling to 4°C is required immediately after collection while the samples are held for shipment and during shipment to the laboratory.

## **2.3 Sample Preparation and Shipping**

After collection, samples will be labeled and prepared as described in the previous discussion, and placed on ice in an insulated cooler. The sample containers will be placed in re-closeable plastic storage bags. Samples will then be placed right side up in a cooler with ice for delivery to the laboratory. The ice in the cooler will be double-bagged. The coolers will be taped shut and



chain-of-custody seals will be attached to the outside of the cooler to ensure that the cooler cannot be opened without breaking the seal. Final packaging and shipping will be conducted in compliance with current IATA Resolution 618 and DOT 49 CFR Part 171 Regulations.

All samples will be shipped for laboratory receipt and analysis within the holding times specified in Table 2. This may require daily shipment of samples with short holding times.

## **2.4 Sample Documentation and Tracking**

This section describes the information that should be provided in field notes and sample Chain-of-Custody documentation.

### **2.4.1 Field Notes**

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, and a permanent record of field activities. Field observations and data collected during routine monitoring activities will be recorded with waterproof ink in a permanently bound weatherproof field log book with consecutively numbered pages or on field data sheets as specified in the project SOPs.

Field notebook and/or data sheet entries will, at a minimum, include the information listed below. Relevant SOPs should be consulted to supplement this list.

- Project name;
- Location of sample;
- Data and time of sample collection;
- Sample identification numbers;
- Description of sample (matrix sampled);
- Sample depth (if applicable);
- Sample methods, or reference to the appropriate SOP;
- Field observations;
- Results of any field measurements, such as depth to water, pH, temperature, specific conductance; and
- Personnel present.

Changes or deletions in the field book or on the data sheets should be recorded with a single strike mark, and remain legible. Sufficient information should be recorded to allow the sampling event to be reconstructed without having to rely on the collector's memory.

All field books will be signed on a daily basis by the person who has made the entries. Anyone making entries in another person's field book will sign and date those entries.

### **2.4.2 Sample Chain-Of-Custody**

During field sampling activities, traceability of the sample must be maintained from the time the samples are collected until laboratory data are issued. Establishment of traceability of data is



crucial for resolving future problems if analytical results are called into question and for minimizing the possibility of sample mix-up. Initial information concerning collection of the samples will be recorded in the field log book or on data sheets as described above. Information on the custody, transfer, handling and shipping of samples will be recorded on a Chain-of-Custody (COC) form.

The sampler is responsible for initiating and filling out the COC form. The COC will be signed by the sampler when he or she relinquishes the samples to anyone else. A COC form will be completed for each set of water quality samples collected, and will contain the following information:

- Sampler's signature and affiliation
- Project number
- Date and time of collection
- Sample identification number
- Sample type
- Analyses requested
- Number of containers
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times
- Method of shipment
- Shipping air bill number (if the samples are shipped)
- Any additional instructions to the laboratory.

The person responsible for delivery of the samples to the laboratory will sign the COC form, retain the third copy of the form, document the method of shipment, and send the original and the second copy of the form with the samples. Upon arrival at the laboratory, the person receiving the samples will sign the COC form and return the second copy to the Project Manager. Copies of all COC documentation will be compiled and maintained in the central files. The original COC forms will remain with the samples until the time of final disposition. After returning samples for disposal, the laboratory will send a copy of the original COC to the Operator. This will then be incorporated into the central files.



**Table 1 Sample Containers, Preservation Methods, and Holding Times**

Analyte	Container <sup>(1)</sup>	Filtration <sup>(2)</sup>	Preservation	Holding Time <sup>(3)</sup>
pH	P,G	No	Cool, 4°C	7 days <sup>(4)</sup>
Specific conductance	P,G	No	Cool, 4°C	28 days
Total alkalinity (as CaCO <sub>3</sub> )	P,G	Yes	Cool, 4°C	7 days <sup>(4)</sup>
Total dissolved solids	P,G	Yes	Cool, 4°C	7 days
Total suspended solids	P,G	No	Cool, 4°C	7 days
Chloride	P,G	Yes	None required	28 days
Mercury	P,G	Yes	HNO <sub>3</sub> to pH<2	28 days
Nitrate as N	P,G	Yes	Cool, 4°C	2 days
Nitrite	P	No	Cool, 4°C	48 hours
Nitrate-Nitrite	P	No	H <sub>2</sub> SO <sub>4</sub> to pH <2	28 days
Total Phosphorus	P,G	Yes	Cool, 4°C, H <sub>2</sub> SO <sub>4</sub> to pH <2	28 days
Orthophosphate	P	Yes	Cool, 4°C	48 hours
Radionuclides (total)	P,G	No	HNO <sub>3</sub> to pH <2	6 months
Radionuclides (dissolved)	P,G	Yes	HNO <sub>3</sub> to pH <2	6 months
Silica	P	Yes	Cool, 4°C	28 days
Sulfate	P,G	Yes	Cool, 4°C	28 days
Dissolved metals	P,G	Yes	Cool, 4°C, HNO <sub>3</sub> to pH <2	6 months
Total metals	P,G	No	Cool, 4°C, HNO <sub>3</sub> to pH <2	6 months
Total recoverable metals	P,G	No	Cool, 4°C, HNO <sub>3</sub> to pH <2	6 months

(1) Bottle code: P=polyethylene bottle with polyethylene-lined lid. G=glass bottle with Teflon-lined polyethylene lid.  
(2) Samples requiring filtration must be filtered in the field using a 0.45 µm membrane filter before preservative is added.  
(3) Holding times start at date of sample collection.  
(4) Sample pH and alkalinity should be analyzed as soon as possible after collection. However, for practical purposes, the holding times have been set at seven days. The 14 day holding time specified in 40 CFR 136.3, Table II, is considered to be inappropriate for the high carbonate waters of the system.



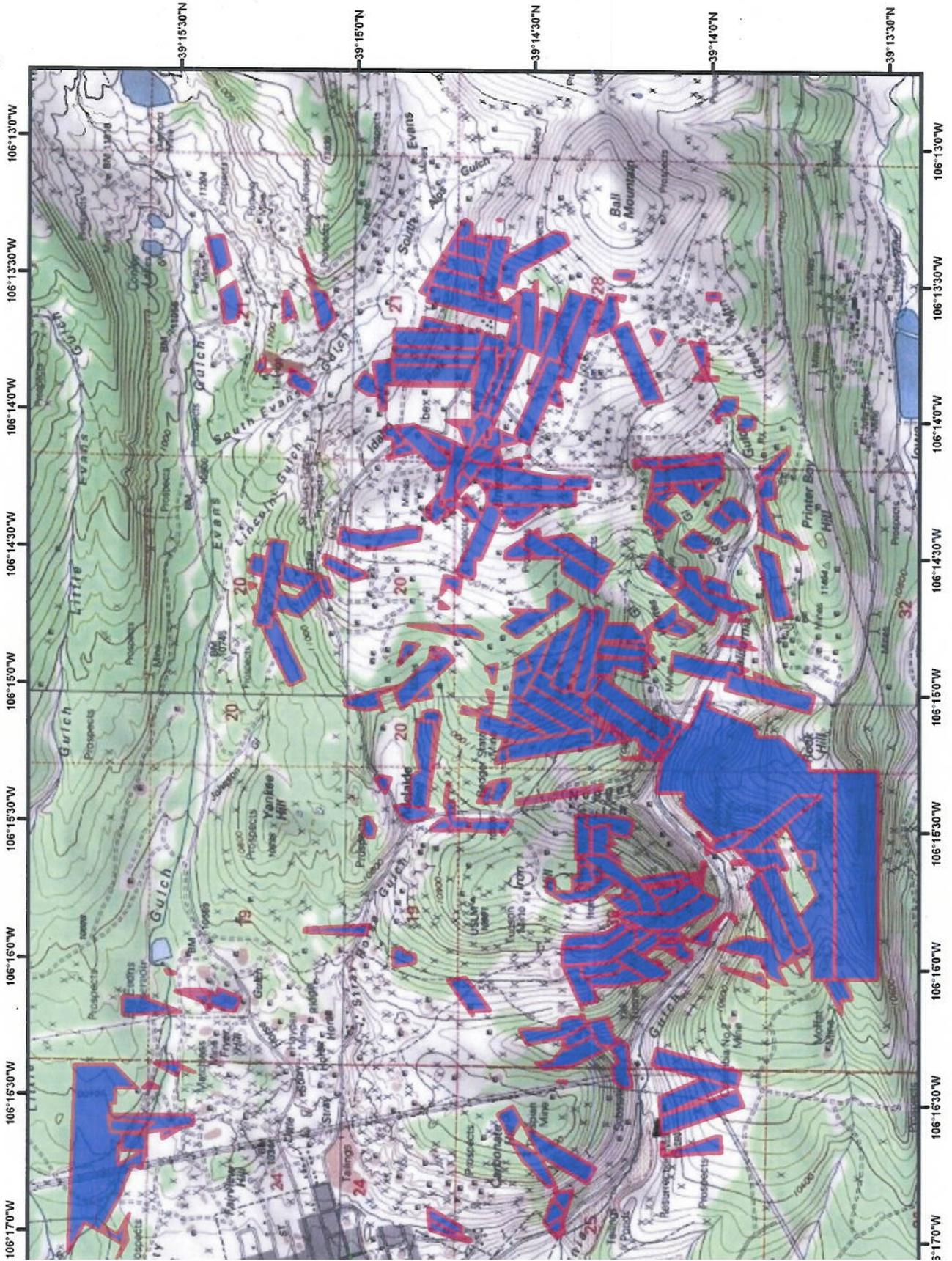
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Patricia Berger  
Lake County Recorder



# A Zone



2 Kilometers

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