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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO

STATE OF COLORADO, *Plaintiff,* v. ASARCO INCORPORATED, *et al.*, *Defendants and Third-Party Plaintiffs,* v. LEADVILLE CORPORATION, *et al.*, Third-Party Defendants	Civil Action No. 83-C-2388
UNITED STATES OF AMERICA, *Plaintiff,* v. APACHE ENERGY AND MINERALS COMPANY, *et al.*, *Defendants.*	Civil Action No. 86-C-1675

FINAL CONSENT DECREE WITH NEWMONT USA LIMITED AND RESURRECTION MINING COMPANY

TABLE OF CONTENTS

I.	BACKGROUND	1
II.	JURISDICTION	3
III.	PARTIES BOUND	3
IV.	DEFINITIONS	3
V.	GENERAL PROVISIONS	8
VI.	PERFORMANCE OF THE OU1 WORK BY SETTLING DEFENDANTS	11
VII.	PERFORMANCE OF THE OUS 4, 8, AND 10 WORK BY SETTLING DEFENDANTS	12
VIII.	PERFORMANCE OF WORK AT THE BLACK CLOUD MINE BY SETTLING DEFENDANTS	14
IX.	OFF-SITE SHIPMENTS	17
X.	REMEDY REVIEW	17
XI.	QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS	18
XII.	ACCESS AND INSTITUTIONAL CONTROLS	19
XIII.	REPORTING REQUIREMENTS	22
XIV.	EPA APPROVAL OF PLANS AND OTHER SUBMISSIONS	23
XV.	PROJECT COORDINATORS	24
XVI.	PERFORMANCE GUARANTEE FOR WORK AT OU1	25
XVII.	PERFORMANCE GUARANTEE FOR WORK AT OUS 4, 8, AND 10	28
XVIII.	PERFORMANCE GUARANTEE FOR RECLAMATION OF BLACK CLOUD MINE	31
XIX.	CERTIFICATION OF COMPLETION	36
XX.	EMERGENCY RESPONSE	38
XXI.	PAYMENTS FOR RESPONSE COSTS	38
XXII.	PAYMENTS FOR NATURAL RESOURCE DAMAGES	43
XXIII.	INDEMNIFICATION AND INSURANCE	44
XXIV.	FORCE MAJEURE	45
XXV.	DISPUTE RESOLUTION	46
XXVI.	STIPULATED PENALTIES	49
XXVII.	COVENANTS NOT TO SUE BY PLAINTIFFS	56
XXVIII.	COVENANTS NOT TO SUE BY PLAINTIFFS FOR NATURAL RESOURCE DAMAGES	60
XXIX.	COVENANTS BY SETTLING DEFENDANTS	61

XXX. EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION 62
XXXI. ACCESS TO INFORMATION 63
XXXII. RETENTION OF RECORDS 64
XXXIII. NOTICES AND SUBMISSIONS 65
XXXIV. EFFECTIVE DATE 68
XXXV. RETENTION OF JURISDICTION 68
XXXVI. APPENDICES 68
XXXVII. COMMUNITY RELATIONS 68
XXXVIII MODIFICATION 69
XXXIX. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT 69
XL. SIGNATORIES/SERVICE 69
XLI. FINAL JUDGMENT 70

I. BACKGROUND

A. On August 6, 1986, the United States of America ("United States"), at the request of the United States Environmental Protection Agency ("EPA"), filed a complaint against, among others, Newmont Mining Corporation (now known as Newmont USA Limited) ("Newmont") and Resurrection Mining Company ("Resurrection") (collectively, "Settling Defendants") pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606, 9607. The complaint sought injunctive relief for performance of response actions and for reimbursement of costs incurred and to be incurred by the United States in response to the release or threat of release of hazardous substances at the California Gulch Superfund Site located in and around Leadville, Colorado.

B. On December 9, 1983, the State of Colorado filed a complaint against Resurrection and others under Section 107 of CERCLA, 42 U.S.C. § 9607, for injury, destruction, or loss of natural resources associated with the release of hazardous substances and the cost of assessment of such injury from the Yak Tunnel and associated mine workings. The State amended its complaint on April 8, 1985, to include additional claims under Section 107 of CERCLA, 42 U.S.C. § 9607, for reimbursement of costs incurred and to be incurred in response to the release or threat of release of hazardous substances at the Yak Tunnel, associated mine workings, California Gulch, and portions of the Arkansas River.

C. The federal and state actions were consolidated on February 3, 1987. Asarco and Settling Defendants asserted counter-claims for contribution against the United States and State in the consolidated action.

D. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List ("NPL") on September 8, 1983. For ease of administration, the Site was divided into 12 operable units ("OUs"), numbered one through 12. EPA has selected a remedy for each OU at the Site except OU12.

E. On July 25, 1988, EPA issued a Unilateral Administrative Order ("UAO") (No. CERCLA VIII 88-11), superseded on March 19, 1989 by UAO No. CERCLA VIII 89-20 (collectively, the "Yak Tunnel UAOs"), requiring Settling Defendants (and others) to implement the selected remedy for OU 1, including the construction, operation and maintenance of a surge pond and water treatment plant near the portal of the Yak Tunnel to treat acid mine drainage before its discharge into California Gulch.

F. On August 26, 1994, the U.S. District Court for the District of Colorado approved and entered a Consent Decree (the "1994 Decree") in United States v. Apache Energy and Minerals Co., *et al.*, Civil Action No. 86-C-1675 (consolidated with State of Colorado v. ASARCO Inc., *et al.*, Civil Action No. 83-C-2388) ("the Federal Lawsuit"). As part of the 1994 Decree, Settling Defendants agreed to undertake response actions at OUs 4, 8, and 10. In return, the United States and the State provided certain covenants not to sue to the Settling Defendants. The Plaintiffs' claims for natural resource damages and assessment costs (natural resource damages or "NRDs") and liability with respect to OUs 1, 11, and 12 were not resolved by the 1994 Decree. The Federal Lawsuit was placed on administrative closure.

G. Much of the work required under the 1994 Decree with respect to OUs 4, 8, and 10 has been completed while operation and maintenance work is continuing. The remedial action for OU1 has been implemented, and operations and maintenance work continues at OU 1 pursuant to the Yak Tunnel UAOs.

H. EPA has completed a Remedial Investigation report, and a draft Feasibility Study report is under consideration, for OU 12 (addressing site-wide water quality matters). EPA anticipates issuing a proposed remedial action plan for OU12 within the next year. EPA will then select a remedy for OU12, which will be described in a record of decision.

I. The Colorado Mined Land Reclamation Act requires mining operators to obtain a permit from the State of Colorado and to reclaim areas disturbed by mining operations. In 1979, the Colorado Mined Land Reclamation Board and the Colorado Division of Reclamation, Mining and Safety (f/k/a the Division of Minerals and Geology and the Mined Land Reclamation Division) issued a permit (permit number M-1977-218-UG) to Asarco Incorporated, n/k/a Asarco LLC for its mining operations at the Black Cloud Mine, a/k/a Leadville Unit. Asarco LLC posted a financial warranty in the form of a corporate surety in the amount of $ 2,233,400 and a cash bond in the amount of $3,263.84 to ensure reclamation of the Black Cloud Mine. In addition, Asarco LLC recorded a deed of trust in the clerk and recorder's office in Lake County, Colorado, in favor of the Mined Land Reclamation Board as to all Resurrection-Asarco joint venture property. Although some reclamation has been conducted, the majority of reclamation of the Black Cloud Mine has not been performed. In addition, the State believes that the corporate surety bond, the cash bond and the deed of trust are not adequate to meet bonding requirements of the Colorado Mined Land Reclamation Act. Pursuant to a separate agreement with Asarco LLC, the Settling Defendants have agreed to assume the responsibility of reclaiming the Black Cloud Mine subject to the terms of this Consent Decree. Based on the information presently available, the Mined Land Reclamation Board and the Division of Reclamation, Mining and Safety believe that reclamation of the Black Cloud Mine will be properly and promptly conducted by the Settling Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

J. Based on the information currently available to EPA, EPA believes that the Work at the Site will be properly and promptly conducted by the Settling Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

K. Solely for the purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the Work to be performed at the Site by the Settling Defendants under this Consent Decree shall constitute a response action taken or ordered by the President.

L. The Settling Defendants and their affiliates, directors, officers and employees do not admit any liability to the Plaintiffs or any other persons arising out of the transactions or occurrences alleged in the consolidated actions, nor do they acknowledge that the release or threatened release of hazardous substances at or from the Site constitutes an imminent or substantial endangerment to the public health or welfare or the environment.

M. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith, that implementation of this

Consent Decree will expedite the cleanup and reclamation of the Site and further the restoration of the Upper Arkansas River Basin, and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345 and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over the Settling Defendants. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have to jurisdiction of the Court or to venue in this District. Settling Defendants shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and the State and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate status of a Settling Defendant including but not limited to any transfer of assets or real or personal property shall in no way alter such Settling Defendant's responsibilities under this Consent Decree.

3. Settling Defendants shall provide a copy of this Consent Decree to each contractor hired to perform the Work required by this Consent Decree and to each person representing any Settling Defendant with respect to the Site or the Work and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Defendants or their contractors shall provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the Work required by this Consent Decree. Settling Defendants shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work contemplated herein in accordance with this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with the Settling Defendants within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or the Colorado Mined Land Reclamation Act or in regulations promulgated under CERCLA or the Colorado Mined Land Reclamation Act shall have the meaning assigned to them in CERCLA or the Colorado Mined Land Reclamation Act respectively or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:

"1994 Decree" shall mean the consent decree entered by the United States District Court for the District of Colorado on August 26, 1994 in the consolidated matters of United States v.

Apache Energy and Minerals Co., *et al.*, Civil Action No. 86-C-1675, and Colorado v. ASARCO Inc., *et al.*, Civil Action No. 83-C-2388.

"2007 Dollars" shall mean, for any dollar amount expressed as such in this Consent Decree, the nominal value of such amount as it existed in the year 2007. When determined in any year after 2007, a value that is expressed in this Consent Decree as being in "2007 Dollars" shall be inflated to such later -year dollars by means of the Consumer Price Index – All Urban Consumer (CPI-U), U.S. City Average, all items, base period 1982-84=100, as published by the U.S. Department of Labor, Bureau of Labor Statistics. Such values shall be converted to later-year dollars by multiplying the 2007 dollar value times a fraction whose numerator is the CPI-U for the most recent full calendar year at the date of calculation and whose denominator is the CPI-U for the year 2007. This can be expressed by the formula: Future Value = 2007 dollar amount x (most recent future year CPI-U / 2007 CPI-U). In the event the CPI-U ceases to be published or is materially altered, the Parties shall mutually agree upon an alternative index comparable to the CPI-U.

"Black Cloud Mine" shall mean that mine located in the vicinity of, but not included in, the California Gulch Superfund Site and in or around the Leadville Mining District east of Leadville, Colorado and that is described in Section 1 of the Reclamation Plan and Schedule and is depicted on Figure 1 thereto.

"California Gulch Superfund Site" shall mean the California Gulch Superfund Site, which consists of approximately 18 square miles in and around Leadville, Colorado, and is depicted generally on the map attached as Appendix C.

"CDPHE" shall mean the Colorado Department of Public Health and Environment and any successor departments or agencies of the State.

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601, *et seq.*

"Consent Decree" shall mean this Decree and all appendices attached hereto (listed in Section XXXVI Appendices). In the event of conflict between this Decree and any appendix, this Decree shall control.

"Day" shall mean a calendar day unless expressly stated to be a Working Day. "Working Day" shall mean a day other than a Saturday, Sunday, or Federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or Federal holiday, the period shall run until the close of business of the next Working Day.

"DOI" shall mean the United States Department of Interior and any successor departments or agencies.

"DRMS" shall mean the Colorado Division of Reclamation, Mining and Safety, formerly known as the Division of Minerals and Geology and as the Mined Land Reclamation Division, and any successor departments or agencies of the State.

"Effective Date" shall be the effective date of this Consent Decree as provided in Paragraph 143.

"EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

"Future Oversight Costs" shall mean all costs, direct and indirect, that the Plaintiffs incur on or after the date of lodging this Consent Decree in monitoring and supervising Settling Defendants' performance of Work at OUs 1, 4, 8 and 10 to determine whether such performance is consistent with the requirements of this Consent Decree, including costs incurred in reviewing plans, reports or other documents submitted pursuant to this Consent Decree, as well as costs incurred in overseeing implementation of such Work and enforcing this Consent Decree. Future Oversight Costs shall include but not be limited to payroll costs, contractor costs, travel costs, laboratory costs, as well as the costs incurred pursuant to Sections X (Remedy Review), XII (Access and Institutional Controls), and XX (Emergency Response), and Paragraphs 13(b) (Modification of the OU1 Work Plan), 17(b) (Modification of the O&M Plan for OUs 4, 8, and 10), and 122 (Work Takeover).

"Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

"MLRA" shall mean the Mined Land Reclamation Act, Colorado Revised Statutes at 34-32-101, *et seq* and regulations promulgated thereunder.

"MLRB" shall mean the Colorado Mined Land Reclamation Board and any successor Board.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"Natural Resource" or "Natural Resources" shall mean land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States or the State of Colorado.

"Natural Resource Damages" shall mean any damages recoverable by the United States or the State on behalf of the public for injury to, destruction of, loss of, loss of use of, or impairment of Natural Resources including: (i) the costs of assessing such injury, destruction, loss or impairment arising from or relating to a release of hazardous substances; (ii) the costs of restoration, rehabilitation, or replacement of injured or lost Natural Resources or of acquisition of equivalent Natural Resources; (iii) the costs of planning such restoration activities; (iv) compensation for injury, destruction, loss, loss of use, or impairment of Natural Resources; and (v) each of the categories of recoverable damages described in 43 C.F.R. § 11.15.

"NRDAR Fund" shall mean DOI's Natural Resource Damage Assessment and Restoration Fund.

"NRDR Fund" shall mean the State's Natural Resource Damage Recovery Fund.

"O&M Plan for OUs 4, 8, and 10" shall mean the work plan for implementing O&M at OUs 4, 8, and 10, as set forth in Appendix D, and any modifications thereto made in accordance with this Consent Decree.

"Operation and Maintenance" or "O&M" shall mean all activities required under the O&M Plan for OUs 4, 8 & 10 and to maintain the effectiveness of the Remedial Action as required under the OU1 Work Plan, and any modifications thereto made in accordance with this Consent Decree.

"OU1" shall mean Operable Unit 1 at the California Gulch Superfund Site, which includes the Yak Tunnel and Yak Water Treatment Plant as depicted on the map attached as Appendix C and the work that addresses the discharge of acid mine drainage from the Yak Tunnel into California Gulch. The facilities within OU1 include the entire length of the Yak Tunnel; the Yak Tunnel portal; the bulkhead within the Yak Tunnel; external Yak Tunnel flow conveyance channels, ditches and pipelines; existing and future monitoring wells; the surge pond and Yak Water Treatment Plant.

"OU1 ROD" shall mean the EPA Record of Decision relating to Operable Unit 1 at the Site signed on March 29, 1988, by the Regional Administrator, EPA Region 8, or his/her delegate, and all attachments thereto, as modified by a ROD modification on March 23, 1989 and an "Explanation of Significant Differences" or "ESD" signed by EPA on October 22, 1991.

"OU1 Work Plan" shall mean the work plan set forth in Appendix A and any modifications thereto made in accordance with this Consent Decree.

"OU12" shall mean that operable unit encompassing the California Gulch Superfund Site surface waters and shallow alluvial aquifer not to exceed a depth of 250 feet or contact with bedrock, whichever is the lesser depth below the ground surface.

"OUs 4, 8 and 10" shall mean the operable units as defined in Appendix B and generally depicted on the map attached as Appendix C as operable units 4, 8 and 10.

"Paragraph" shall mean a portion of this Consent Decree identified by an Arabic numeral or an upper case letter.

"Parties" shall mean the United States, the State of Colorado, and the Settling Defendants.

"Past Response Costs" shall mean all costs, including but not limited to, direct and indirect costs, that the Plaintiffs have paid in connection with the Site through the date of lodging, plus accrued Interest on all such costs through such date.

"Performance Standards" shall mean the cleanup and reclamation standards and other measures of achievement set forth in the OU1 Work Plan, the O&M Plan for OUs 4, 8 and 10, and the Reclamation Plan and Schedule.

"Plaintiffs" shall mean the United States, on behalf of EPA and DOI, and the State of Colorado on behalf of CDPHE, all State natural resource trustees, DRMS and MLRB.

"RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901 *et seq.* (also known as the Resource Conservation and Recovery Act).

"Reclamation Plan and Schedule" shall mean the approved reclamation plan and schedule to be implemented at the Black Cloud Mine set forth in Appendix E to this Consent Decree and any modification made thereto in accordance with this Consent Decree.

"Records of Decision" or "RODs" shall mean the records of decision and any amendments or explanations of significant differences thereto for OUs 4, 8 and 10.

"Remedial Action" shall mean those activities, except for Operation and Maintenance, to be undertaken by the Settling Defendants at the Site to implement the OU1 Work Plan, including any work required in the event a contingency is triggered under the OU1 Work Plan.

"Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

"Settling Defendants" shall mean Newmont USA Limited (formerly known as Newmont Mining Corporation) and Resurrection Mining Company and their successors and assigns. For purposes of the Covenants not to Sue in Sections XXVII and XXVIII only, Settling Defendants shall include Settling Defendants' officers, directors and employees but only to the extent that the liability of such officers, directors, and employees arises solely from their status as officers, directors, or employees.

"Site" shall mean the California Gulch Superfund Site, the Black Cloud Mine, and any other areas where Waste Material from the California Gulch Superfund Site has come to be located. For purposes of the NRD covenants not to sue only, the Site shall mean the California Gulch Superfund Site, the Black Cloud Mine and (a) the 500-year flood plain of Iowa Gulch beginning at the Black Cloud Mine and extending down to the confluence with the Arkansas River, and (b) all areas where releases of hazardous substances from the Yak Tunnel specifically, and the California Gulch Superfund Site generally, have come to be located within the Arkansas River drainage to and including the Pueblo Reservoir.

"State" shall mean, unless otherwise indicated, the State of Colorado, including CDPHE, the State Natural Resource Trustees, MLRB, and DRMS.

"Supervising Contractor" shall mean the principal contractor, if any, retained by Settling Defendants to supervise, manage and direct the implementation of the Work under this Consent Decree. Any contractors that Settling Defendants retain to perform Work where the contractors' activities are supervised, managed, or directed by Settling Defendants shall not constitute a Supervising Contractor.

"United States" shall mean the United States of America.

"Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); and (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities Settling Defendants are required to perform under this Consent Decree, including reclamation of the Black Cloud Mine, excluding those activities required by Section XXXII (Retention of Records).

"Yak Water Treatment Plant" shall mean the current water treatment plant situated in California Gulch, any modification or expansion of such plant, and any satellite or additional water treatment plant constructed in California Gulch for purposes of treating water that must be managed pursuant to this Consent Decree, including the OU1 Work Plan, the O&M Plan for OUs 4, 8 and 10, and the Reclamation Plan and Schedule.

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health, welfare, and the environment at the Site by the design and implementation of response actions by the Settling Defendants, to reimburse response costs of the Plaintiffs, to reimburse Plaintiffs for Natural Resource Damages, to satisfactorily reclaim the Black Cloud Mine by implementation by the Settling Defendants of the Reclamation Plan and Schedule, and to resolve the claims of Plaintiffs against Settling Defendants as provided in this Consent Decree.

6. Commitments by Settling Defendants.

a. Settling Defendants shall finance and perform the Work in accordance with this Consent Decree, the OU1 Work Plan, the O&M Plan for OUs 4, 8, and 10, and the Reclamation Plan and Schedule. Settling Defendants shall also reimburse Plaintiffs for Past Response Costs, Future Oversight Costs, and Natural Resource Damages as provided in this Consent Decree.

b. The obligations of Settling Defendants to finance and perform the Work, pay amounts owed the United States and the State, and provide Performance Guarantees for the Work under this Consent Decree are joint and several. In the event of the insolvency or other failure of any Settling Defendant to implement the requirements of this Consent Decree, the remaining Settling Defendant shall complete all such requirements.

7. Compliance With Applicable Law. All activities undertaken by Settling Defendants pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Defendants must also comply with all applicable or relevant and appropriate requirements of all Federal and State environmental laws as set forth in the OU1 Work Plan, the O&M Plan for OUs 4, 8, and 10, and the Reclamation Plan and Schedule. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be considered to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(e) of the NCP, and except as provided in Paragraph 8.d below for the Black Cloud Mine, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal or state permit or approval, Settling Defendants shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. The Settling Defendants may seek relief under the provisions of Section XXIV (Force Majeure) of this Consent Decree for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit required for the Work.

c. The permit issued by the MLRB and DRMS to Asarco Incorporated, n/k/a Asarco LLC pertaining to reclamation of the Black Cloud Mine (Permit No. M-1977-218-UG) will be terminated or otherwise released upon the request of Asarco LLC and the corporate surety, cash bond and deed of trust provided by Asarco Incorporated n/k/a Asarco LLC and referenced in the Background Paragraph I above shall be released promptly upon the posting of a Performance Guarantee by the Settling Defendants acceptable to the MLRB and DRMS as specified in this Consent Decree. Reclamation of the Black Cloud Mine by the Settling Defendants shall be regulated and performed pursuant to and in accordance with this Consent Decree and appendices.

d. At least 30 days prior to the proposed transfer date, Resurrection Mining Company ("Resurrection") and Asarco LLC shall submit to CDPHE a completed permit transfer form transferring to Resurrection Colorado Discharge Permit System Permit No. CO-0000591 for discharges, if any, from the Black Cloud Mine and Mill to Iowa Gulch. The State shall thereafter confirm transfer of Permit No. CO-0000591 to Resurrection. This Permit shall govern discharges from the Black Cloud Mine and Mill other than treatment and discharge of water through the Yak Water Treatment Plant which shall be subject to Section 121(e) of CERCLA, 42 U.S.C. § 9621(e).

e. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

9. Notice to Successors-in-Title.

a. With respect to property within the Site that is now owned or controlled by Settling Defendants or subsequently acquired by Settling Defendants from Asarco LLC pursuant to that Settlement Agreement and Mutual Release dated July 16, 2007 by and among Asarco LLC, the Res-Asarco Joint Venture and Settling Defendants (hereinafter "Asarco Settlement"), within 20 days after the entry of this Consent Decree (or in the case of subsequently acquired property, within 20 days of the acquisition of such property), Settling Defendants shall submit to EPA and the State for review and approval a notice to be filed with the Clerk and Recorder's Office, Lake County, State of Colorado, which shall provide notice to all successors-in-title that the property is part of the Site and that Settling Defendants have

entered into a Consent Decree requiring completion of the Work. Such notice shall identify the United States District Court in which the Consent Decree was filed, the name and civil action number of the case, and the date the Consent Decree was entered by the Court. The Settling Defendants shall record the notice within 10 days of EPA's and the State's approval of the notice. The Settling Defendants shall provide EPA and the State with a certified copy of the recorded notice within 10 days of recording such notice.

b. At least 30 days prior to conveying any interest in property located within the Site including but not limited to fee interests, leasehold interests, and mortgage interests, Settling Defendants shall give the grantee written notice of (i) this Consent Decree, (ii) any instrument that confers a right of access to such property (hereinafter referred to as "access agreements") pursuant to Section XII (Access and Institutional Controls), and (iii) any instrument that confers a right to enforce restrictions on the use of such property (hereinafter referred to as "environmental covenants") pursuant to Section XII (Access and Institutional Controls). At least 30 days prior to such conveyance, the Settling Defendants conveying the interest shall also give written notice to EPA and the State of the proposed conveyance, including the name and address of the grantee and the date on which notice of this Consent Decree, access agreements, and environmental covenants were given to the grantee.

c. In the event of any such conveyance, Settling Defendants' obligations under this Consent Decree, including, but not limited to, their obligation to provide or secure access and institutional controls, as well as abide by such institutional controls, pursuant to Section XII (Access and Institutional Controls) of this Consent Decree, shall continue to be met by the Settling Defendants. In no event shall the conveyance release or otherwise affect the liability of the Settling Defendants to comply with all provisions of this Consent Decree, absent the prior written consent of EPA and the State. If the United States and the State approve, the grantee may perform some or all of the Work under this Consent Decree.

10. Selection of Supervising Contractor.

a. Any aspect of the Work to be performed by Settling Defendants pursuant to Sections VI (Performance of the OU1 Work by Settling Defendants), X (Remedy Review), XI (Quality Assurance, Sampling and Data Analysis), and XX (Emergency Response) of this Consent Decree may be under the direction and supervision of a Supervising Contractor, the selection of which shall be subject to disapproval by EPA after a reasonable opportunity for review and comment by the State. If Settling Defendants intend to use a Supervising Contractor, Settling Defendants shall notify EPA and the State in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor before proceeding with activities the Supervising Contractor is being retained to perform. With respect to any contractor proposed to be a Supervising Contractor, Settling Defendants shall demonstrate that the proposed contractor has a quality system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan (QMP). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA will issue a notice of disapproval or an authorization to proceed. If at any time

thereafter, Settling Defendants propose to change a Supervising Contractor, Settling Defendants shall give such notice to EPA and the State and must obtain an authorization to proceed from EPA, after a reasonable opportunity for review and comment by the State, before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling Defendants in writing. Settling Defendants shall submit to EPA and the State a list of contractors, including the qualifications of each contractor, that would be acceptable to them within 30 days of receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization to proceed with respect to any of the other contractors. Settling Defendants may select any contractor from that list that is not disapproved and shall notify EPA and the State of the name of the contractor selected within 21 days of EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents the Settling Defendants from meeting one or more deadlines in a plan approved by the EPA pursuant to this Consent Decree, Settling Defendants may seek relief under the provisions of Section XXIV (Force Majeure).

VI. PERFORMANCE OF THE OU1 WORK BY SETTLING DEFENDANTS

11. OU1 Work Plan. The OU1 Work Plan, attached as Appendix A, is incorporated into and enforceable under this Consent Decree. Settling Defendants shall implement at their sole expense (subject to possible partial reimbursement pursuant to Paragraph 12 below) all activities required under the OU1 Work Plan. Settling Defendants acknowledge that these activities will require long-term O&M.

12. Reimbursement from Environmental Trust. The United States shall attempt to secure funding from the "Environmental Trust" established in the Consent Decree between the United States, Asarco LLC and Southern Peru Holdings Corporation (No. CV 02-2079-PHX-RCB) to reimburse Settling Defendants for 50 percent of the costs they incur in implementing the OU1 Work Plan. If the United States is successful in securing funding from the Environmental Trust, Settling Defendants may seek reimbursement of eligible costs pursuant to the process established under the Environmental Trust. The right to seek reimbursement from the Environmental Trust and the United States' obligation to seek funding from the Environmental Trust pursuant to this Paragraph shall end as soon as (i) the Asarco LLC Environmental Trust terminates, or (ii) Asarco LLC pays to Settling Defendants the payments agreed to under that Settlement Agreement and Mutual Release dated July 16, 2007 by and among Asarco LLC, the Res-Asarco Joint Venture and Settling Defendants, whichever occurs first.

13. Modification of the OU1 Work Plan

a. If EPA, after consultation with the State, determines that modification to the work specified in the OU1 Work Plan is necessary to achieve and maintain the Performance Standards set forth in the OU1 Work Plan or to carry out and maintain the effectiveness of the remedy set forth in the OU1 ROD, EPA shall provide Settling Defendants and the State with a

written notice explaining such determination. Within 30 days after Settling Defendants' receipt of such notice, Settling Defendants shall, unless they invoke dispute resolution pursuant to Section XXV (Dispute Resolution), submit to EPA and the State a proposed modification to the OU1 Work Plan that addresses the issues described in EPA's notice. EPA shall review the proposed modification in accordance with Section XIV (EPA Approval of Plans and Other Submissions) and may require that such modification be incorporated into the OU1 Work Plan; provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the remedy selected in the OU1 ROD, and is either (a) necessary to achieve and maintain Performance Standards in the OU1 Work Plan or (b) necessary to carry out and maintain the effectiveness of the remedy set forth in the OU1 ROD. EPA may not, however, require a modification to the OU1 Work Plan based predominantly on changed conditions directly resulting from work or activities by or on behalf of any Plaintiff. Additional modifications consistent with the scope of the remedy selected in the OU1 ROD could include, for example, requirements to address tunnel failure or elevated mine pool levels triggered by the Contingency Plan, which is incorporated in the OU1 Work Plan.

b. If Settling Defendants object to any notice by EPA under Paragraph 13(a) or any modification determined by EPA to be necessary pursuant to this Paragraph, they may seek dispute resolution pursuant to Section XXV (Dispute Resolution), Paragraph 98 (record review). In such event, Settling Defendants shall not be required to implement any disputed portion of an OU1 Work Plan modification unless and until a final, non-appealable decision has been issued upholding such modifications. The OU1 Work Plan shall be modified in accordance with final resolution of the dispute. In the event that EPA implements any part of a modification to the OU1 Work Plan that Settling Defendants have disputed, and EPA prevails in the dispute, Settling Defendants shall pay the costs incurred by EPA in implementing the modification to the OU1 Work Plan as a Future Oversight Cost pursuant to Paragraph 81 (Payments for Future Oversight Costs). If Settling Defendants dispute EPA's determination that a plan modification is required, and EPA prevails in such dispute, Settling Defendants shall within 30 days of such final decision submit a proposed modification in accordance with Paragraph 13(a).

c. Settling Defendants shall implement any work required by any modifications incorporated in the OU1 Work Plan in accordance with this Paragraph.

d. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

14. Settling Defendants acknowledge and agree that nothing in this Consent Decree, the OU1 Work Plan, or any work plan developed under the OU1 Work Plan constitutes a warranty or representation of any kind by Plaintiffs that compliance with the work requirements set forth in the OU1 Work Plan or any work plan developed under the OU1 Work Plan will achieve the Performance Standards.

VII. PERFORMANCE OF THE OUS 4, 8, AND 10 WORK BY SETTLING DEFENDANTS

15. Settling Defendants shall continue to perform O&M for OUs 4, 8 and 10 pursuant to the O&M Plan for OUs 4, 8 and 10. The Parties agree that the remedial action for OU10 is complete, and that the remedial action for OUs 4 and 8 will be complete upon execution and

recording of the Environmental Covenants or enactment of Governmental Controls in accordance with Section XII.

16. The O&M Plan for OUs 4, 8, and 10, attached as Appendix D, is incorporated into and enforceable under this Consent Decree. Settling Defendants shall implement at their sole expense all activities required under the O&M Plan for OUs 4, 8 and 10, including managing the seep from the Oregon Gulch tailings as provided for therein. Settling Defendants acknowledge that the remedies implemented at OUs 4, 8, and 10 include engineered structures that leave Waste Material in place and that these remedies will require long-term O&M.

17. Modification of the O&M Plan for OUs 4, 8, and 10

a. If EPA, after consultation with the State, determines that modification to the work specified in the O&M Plan for OUs 4, 8, and 10 is necessary to achieve and maintain the Performance Standards set forth in the O&M Plan for OUs 4, 8, and 10 or to carry out and maintain the effectiveness of the remedy set forth in the RODs for OUs 4, 8, and 10, EPA shall provide Settling Defendants and the State with a written notice explaining such determination. Within 30 days after Settling Defendants' receipt of such notice, Settling Defendants shall, unless they invoke dispute resolution pursuant to Section XXV (Dispute Resolution), submit to EPA and the State a proposed modification to the O&M Plan for OUs 4, 8, and 10 that addresses the issues described in EPA's notice. EPA shall review the proposed modification in accordance with Section XIV (EPA Approval of Plans and Other Submissions) and may require that such modification be incorporated into the O&M Plan for OUs 4, 8, and 10; provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the remedy selected in the RODs for OUs 4, 8, and 10, and is either (a) necessary to achieve and maintain Performance Standards in the O&M Plan for OUs 4, 8, and 10 or (b) necessary to carry out and maintain the effectiveness of the remedy set forth in the RODs for OUs 4, 8, and 10. EPA may not, however, require a modification to the O&M Plan for OUs 4, 8, and 10 based predominantly on changed conditions directly resulting from work or activities by or on behalf of any Plaintiff. Any modification of the O&M Plan for OUs 4, 8 & 10 may only modify the O&M requirements for OUs 4, 8 and 10, and may not require any additional remedial actions, including any additional source control.

b. If Settling Defendants object to any notice by EPA under Paragraph 17(a) or any modification determined by EPA to be necessary pursuant to this Paragraph, they may seek dispute resolution pursuant to Section XXV (Dispute Resolution), Paragraph 98 (record review). In such event, Settling Defendants shall not be required to implement any disputed portion of a modification to the O&M Plan for OUs 4, 8, and 10 unless and until a final, non-appealable decision has been issued upholding such modifications. The O&M Plan for OUs 4, 8, and 10 shall be modified in accordance with final resolution of the dispute. In the event that EPA implements any part of a modification to the O&M Plan for OUs 4, 8, and 10 that Settling Defendants have disputed, and EPA prevails in the dispute, Settling Defendants shall pay the costs incurred by EPA in implementing the modification to the O&M Plan for OUs 4, 8, and 10 as a Future Oversight Cost pursuant to Paragraph 81 (Payments for Future Oversight Costs). If Settling Defendants dispute EPA's determination that a plan modification is required, and EPA prevails in such dispute, Settling Defendants shall within 30 days of such final decision submit a proposed modification in accordance with Paragraph 17(a).

c. Settling Defendants shall implement any work required by any modifications incorporated in the O&M Plan for OUs 4, 8, and 10 in accordance with this Paragraph.

d. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

VIII. PERFORMANCE OF WORK AT THE BLACK CLOUD MINE BY SETTLING DEFENDANTS

18.

a. Subject to the limitations in this Section VIII, Settling Defendants shall perform reclamation of the Black Cloud Mine in accordance with this Consent Decree and with the Performance Standards established in the Reclamation Plan and Schedule set forth in the appendices. Upon approval of DRMS or MLRB, changes proposed by the Settling Defendants may be made to the Reclamation Plan and Schedule. Such a change will be considered a "major modification" if it (i) results in a change in post-mining land use, (ii) results in an increase in the acreage of land affected in executing the Reclamation Plan and Schedule or (iii) if the DRMS and Settling Defendants otherwise agree the proposal will require a significant change in the design of a constructed reclamation feature. All other changes to the Reclamation Plan and Schedule will be considered minor modifications. If Settling Defendants and DRMS disagree as to whether a proposed change constitutes a major modification in accordance with this Paragraph, such dispute shall be resolved in accordance with the dispute resolution provisions under Paragraphs 96 and 100. The Settling Defendants shall pay to DRMS $4,025 each time they apply for a major modification and shall pay $1,000 each time they apply for a minor modification to the Reclamation Plan and Schedule. Settling Defendants shall pay $1,150 each year on or before December 1 until the MLRB releases the Performance Guarantee for the Black Cloud Mine, to help defray the administrative costs incurred by DRMS under this Consent Decree. The annual $1,150 payments shall count against the Reclamation Cap (defined below). All funds paid under this paragraph shall be deposited into the mined land reclamation fund created by C.R.S., § 34-32-127.

b. Minor modifications to the Reclamation Plan and Schedule shall be approved, denied or approved with conditions by DRMS. Major modifications to the Reclamation Plan and Schedule, shall be approved, denied, or approved with conditions by the MLRB during a formal public hearing. Once Settling Defendants' have applied for a major modification and have been notified in writing by DRMS that consideration of the major modification has been scheduled for hearing before the MLRB, Settling Defendants shall cause notice of the MLRB hearing to be made as follows: (i) Mailing notice by certified mail to the Lake County Commissioners, the Lake County Soil Conservation District, and the Leadville Mayor, and (ii) Publishing notice in a newspaper of general circulation in Leadville once a week for two (2) consecutive weeks prior to the hearing. Settling Defendants shall provide proof of these notifications to MLRB.

c. If conditions are encountered during the implementation of the Reclamation Plan and Schedule that DRMS determines require modification to the Reclamation Plan and Schedule in order to meet the Performance Standards set forth in the Reclamation Plan

and Schedule, DRMS shall provide written notice of such determination to the Settling Defendants, which notice shall include a description of the basis for DRMS' determination. Within 60 days after receipt of such notice; Settling Defendants shall submit a proposed modification of the Reclamation Plan and Schedule for DRMS approval, unless the Settling Defendants invoke the dispute resolution provisions of Paragraphs 96 and 100. If, during the implementation of the Reclamation Plan and Schedule and as part of the Work associated with reclaiming the Black Cloud Mine, the Settling Defendants cause disturbance to areas outside the Black Cloud Mine that is not authorized by the Reclamation Plan and Schedule, Settling Defendants shall reclaim such areas as required by DRMS and the costs of such reclamation shall not be credited against the Reclamation Cap.

19. The Settling Defendants shall complete the requirements of the Reclamation Plan and Schedule, including any approved modification thereto, provided that the total cost of completing such Work does not exceed $4,820,098 ("Reclamation Cap").

20. Settling Defendants shall use good faith efforts consistent with general industry standards to complete the Reclamation Plan and Schedule within the Reclamation Cap.

21. Reclamation Cap

a. To count against the Reclamation Cap, Settling Defendants' costs must be (i) reasonable, (ii) adequately documented, and (iii) incurred by Settling Defendants implementing the Reclamation Plan and Schedule. Such costs may include the pro rata share of salaries and benefits paid to employees who are conducting work pursuant to the Reclamation Plan and Schedule, costs paid to contractors, costs paid for the purchase of materials, costs paid for leasing or acquisition of equipment, transportation and haulage costs and any other costs meeting the requirements of the previous sentence. However, salaries and benefits paid to Settling Defendants' employees for reclamation administration and management, job superintendent, contract preparation, and project engineering shall only count against the Reclamation Cap up to the amounts set forth in the following table.

Year 1	25 percent	$94,064.00
Year 2	20 percent	$75,251.00
Year 3	13 percent	$48,913.15
Year 4	13 percent	$48,913.15
Year 5	9 percent	$33,862.70
Years 6 through 9	5 percent per year	$18,812.75
Total for nine years	100 percent	$376,255

Any amount of these annual caps that is not charged against in any year will carry over and may be charged against in subsequent years. Charges incurred by Settling Defendants that exceed the annual cap in any year may be carried forward and charged against the annual caps in subsequent years.

Additionally, costs charged against the Reclamation Cap for structural demolition and debris disposal may not exceed $614,000.

At least annually, Settling Defendants shall submit to DRMS, a notice setting forth the costs they have incurred for Black Cloud reclamation and an explanation of why these costs are consistent with the Reclamation Plan and Schedule. Based on the information submitted by Settling Defendants, DRMS will decide whether the costs meet all of the required conditions of this Paragraph. Within 45 days of receipt of the written request, DRMS will approve or deny such request, or may schedule an inspection of the reclamation performed. If DRMS conducts an inspection, it shall complete such inspection promptly and shall issue its written decision within 15 days of such inspection. In the event DRMS fails to provide its decision within such time frames, the costs set forth in Settling Defendants' notice shall be deemed to be creditable against the Reclamation Cap.

b. If DRMS agrees with the costs being assessed against the cap, it will so inform the Settling Defendants in writing. If DRMS finds that any of the conditions for approval are not satisfied, it will so inform the Settling Defendants in writing.

c. If Settling Defendants disagree with DRMS' notice that the requested credits do not meet all of the required conditions, Settling Defendants may seek to resolve the dispute in accordance with the dispute resolution provisions of Paragraphs 96 and 100. If, as a result of that dispute resolution process, the MLRB partially disagrees with DRMS, thereby only partially resolving the dispute, the appropriate non-disputed credit shall be allowed against the Reclamation Cap, and Settling Defendants may seek judicial review of MLRB's determination as to the remaining disputed amount.

d. If Settling Defendants choose to purchase soil for reclamation of the Black Cloud Mine, rather than use the borrow sources identified in the Reclamation Plan and Schedule, a maximum of $ 565,325.00 for the cost of purchasing such soil and delivering it to the Black Cloud Mine may be charged against the Reclamation Cap.

22. Beginning December 1 of the calendar year of the Effective Date of this Consent Decree, and each year thereafter until Settling Defendants' Performance Guarantee for the Black Cloud Mine reclamation is released, Settling Defendants shall provide the MLRB with 10 copies of an annual written report by December 1 detailing (i) the reclamation work completed during the previous 12 month period, (ii) a comparison of the work completed to the schedule set forth in the Reclamation Plan and Schedule and an explanation of any discrepancies, (iii) the reclamation work projected to be completed for the upcoming calendar year, and (iv) groundwater analytical data required to be collected under the Reclamation Plan and Schedule since the previous report. In addition to the report, Settling Defendants shall appear before the Board at its regularly scheduled meeting each December to present the report to the MLRB.

23. Settling Defendants may execute and deliver to DRMS an access agreement in the form of Appendix I granting DRMS access to borrow soil located on the Robinson/Chapman placer and access to the Kids' First soil stockpiled at the Yak Treatment Plant. The borrow soil and Kids' First soil would be used by DRMS in the event DRMS must perform the reclamation. If Settling Defendants provide such access agreement, the amount of the Performance Guarantee required under Paragraph 67 shall be reduced from $5,500,000 to $4,820,098.

IX. OFF-SITE SHIPMENTS

24. Settling Defendants shall, prior to any off-site shipment of Waste Material from the Site to an out-of-state waste management facility, provide written notification to the appropriate state environmental official in the receiving facility's state and to the EPA and State Project Coordinators of such shipment of Waste Material. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards.

25. Settling Defendants shall include in the written notification the following information, where available: (A) the name and location of the facility to which the Waste Material is to be shipped; (B) the type and quantity of the Waste Material to be shipped; (C) the expected schedule for the shipment of the Waste Material; and (D) the method of transportation. Settling Defendants shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

26. Before shipping any Waste Material from the Site to an off-site location, Settling Defendants shall obtain EPA's certification that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3), 42 U.S.C. § 9621(d)(3), and 40 C.F.R. 300.440. Settling Defendants shall only send Waste Material from the Site to an off-site facility that complies with the requirements of the statutory provision and regulations cited in the preceding sentence.

X. REMEDY REVIEW

27. Periodic Review. Settling Defendants shall conduct any studies and investigations as requested by EPA, in order to permit EPA to conduct reviews of whether the Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c), 42 U.S.C. § 9621(c), of CERCLA and any applicable regulations.

28. EPA Selection of Further Response Actions. If EPA determines, at any time, that the Remedial Action is not protective of human health or the environment, EPA may select further response actions for the California Gulch Superfund Site in accordance with the requirements of CERCLA and the NCP. Settling Defendants shall be obligated to perform further response actions selected by EPA but only to the extent provided in Paragraph 30 below.

29. Opportunity To Comment. Settling Defendants and, if required by Sections 113(k)(2) or 117 of CERCLA, 42 U.S.C. §§ 9613(k)(2) or 9617, the public, will be provided with an opportunity to comment on any further response actions proposed by EPA as a result of the review conducted pursuant to Section 122(c) of CERCLA, 42 U.S.C. § 9621(c), and to submit written comments for the record during the comment period.

30. Settling Defendants' Obligation To Perform Further Response Actions at OU1. If EPA selects further response actions relating to OU1 at the Site, Settling Defendants shall undertake such further response actions to the extent that the reopener conditions in Paragraph 116 (United States' Reservations of Liability for OU1 and Black Cloud Mine Based On Unknown Conditions or New Information) are satisfied. Settling Defendants may invoke the

procedures set forth in Section XXV (Dispute Resolution) to dispute (1) EPA's determination that the reopener conditions of Paragraph 116 are satisfied, (2) EPA's determination that the Remedial Action is not protective of human health or the environment, or (3) EPA's selection of the further response actions. Disputes pertaining to whether the Remedial Action is protective or to EPA's selection of further response actions shall be resolved pursuant to Paragraph 98 (record review).

31. Submissions of Plans. If Settling Defendants are required to perform the further response actions pursuant to Paragraph 30, they shall submit a plan for such work to EPA for approval in accordance with the procedures set forth in Section XIV (EPA Approval of Plans and Other Submissions) and shall implement the plan approved by EPA in accordance with the provisions of this Decree.

XI. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

32. Except as otherwise expressly provided in the OU1 Work Plan, Settling Defendants shall use quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance and monitoring samples related to the conduct of Work at the California Gulch Superfund Site in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R5)" (EPA/240/B-01/003, March 2001) "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/600/R-98/018, February 1998), and subsequent amendments to such guidelines upon notification by EPA to Settling Defendants of such amendment. Amended guidelines shall apply only to procedures conducted after such notification. Prior to the commencement of any monitoring project under this Consent Decree, Settling Defendants shall submit to EPA for approval, after a reasonable opportunity for review and comment by the State, a Quality Assurance Project Plan ("QAPP") that is consistent with the OU1 Work Plan, the NCP and applicable guidance documents. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Decree. Settling Defendants shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Defendants in implementing this Consent Decree. In addition, Settling Defendants shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Settling Defendants shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods which are documented in the "Contract Lab Program Statement of Work for Inorganic Analysis" dated February 1988, Methods for Chemical Analysis of Water and Wastes, March 1983, and SW-846, Test methods for Evaluating Solid Waste, Physical/Chemical Methods. In addition, for those biological analyses required for the Yak Water Treatment Plant effluent, the Settling Defendants shall use the methods for testing required under the OU1 Work Plan, and any modifications made thereto during the course of the implementation of this Decree. However, upon approval by EPA, after opportunity for review and comment by the State, the Settling Defendants may use other analytical methods which are as stringent as or more stringent than the CLP-approved methods. Settling Defendants shall ensure that all laboratories they use for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA equivalent QA/QC program. Settling Defendants shall only use laboratories that have a documented Quality System which

complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)," (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program (NELAP) as meeting the Quality System requirements. Settling Defendants shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Decree will be conducted in accordance with the procedures set forth in the QAPP approved by EPA. The provisions of this Paragraph 32 do not apply to Work at the Black Cloud Mine. As to the Black Cloud Mine, the Reclamation Plan and Schedule to be performed by the Settling Defendants includes a ground water monitoring plan for Iowa Gulch and a point of compliance and numeric protection limits for ground water quality. The Reclamation Plan and Schedule includes requirements for quarterly sampling and a QA/QC program that Settling Defendants shall comply with.

33. Upon request, Settling Defendants shall allow split or duplicate samples collected within the California Gulch Superfund Site or at the Black Cloud Mine to be taken by EPA or the State or their authorized representatives. Settling Defendants shall notify EPA and the State not less than 14 days in advance of any sample collection activity unless shorter notice is agreed to by EPA, or the State for samples collected at the Black Cloud Mine. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State shall allow Settling Defendants to take split or duplicate samples taken as part of the Plaintiffs' oversight of Settling Defendants' implementation of the Work.

34. Settling Defendants shall submit two copies each to EPA and the State of the results of all sampling, tests or other data obtained or generated by or on behalf of Settling Defendants with respect to the Site or implementation of this Consent Decree or both unless EPA and the State otherwise agrees.

35. Notwithstanding any provision of this Consent Decree, the United States and the State hereby retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XII. ACCESS AND INSTITUTIONAL CONTROLS

36. With respect to property within the Site that is now owned or controlled by Settling Defendants or subsequently acquired by Settling Defendants as part of the Asarco Settlement, Settling Defendants shall:

a. commencing on the date of lodging of this Consent Decree (or date of acquisition in the case of property acquired from ASARCO LLC), provide the United States, the State, and their representatives, including EPA and its contractors, with access at all reasonable times to such property for the purpose of conducting any activity related to this Consent Decree including, but not limited to, the following:

(1) Monitoring the Work;

(2) Verifying any data or information submitted to the United States or the State;

(3) Conducting investigations relating to contamination at or near the Site;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional reclamation or response actions at or near the Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved work plans;

(7) Implementing the Work pursuant to the conditions set forth in Paragraphs 70 and 122 (Work Takeover) of this Consent Decree;

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendant or its agents, consistent with XXXI (Access to Information);

(9) Assessing Settling Defendants' compliance with this Consent Decree; and

(10) Determining whether the property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted, by or pursuant to this Consent Decree. The United States, the State and their representatives shall use reasonable efforts to provide Settling Defendants with advance notice of any activities that require access under this Paragraph.

b. Commencing on the date of lodging of this Consent Decree, refrain from using such property, in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of the response actions already performed or instituted at the Site, or the response actions or reclamation work to be performed or instituted pursuant to this Consent Decree.

37. Environmental Covenants. Except as otherwise provided in Paragraph 38, Settling Defendants shall execute and record in the Clerk and Recorder's Office of Lake County, State of Colorado, Environmental Covenants in accordance with the terms of Appendix F1 on those properties listed in Appendix F2 to which Settling Defendants own the entire fee title upon completing the property transfer with Asarco LLC pursuant to the Settlement Agreement among Settling Defendants, Asarco LLC and the Res-Asarco Joint Venture. If the Settling Defendants, the State and EPA subsequently agree that as the result of completing the property transfer with Asarco LLC, Settling Defendants own the entire fee title in other claims that are not listed in Appendix F2, and (i) such claims are situated entirely within the boundaries of the California Gulch Superfund Site or (ii) the claim is listed on Attachment 3 to Appendix F1, Settling Defendants will provide an Environmental Covenant on such claims, which will contain the

applicable terms as set forth in Section A of Appendix F1. At least 60 days prior to the expiration of the second anniversary of the Effective Date of this Consent Decree, Settling Defendants shall submit to EPA and the State for their review and approval draft Environmental Covenants, in substantially the same forms as the draft Environmental Covenant(s) attached hereto as Appendix G. Settling Defendants shall execute and record such Environmental Covenants within 30 days following notice of EPA and the State's approval of the draft forms.

38. Settling Defendants' Obligations In The Event That Governmental Controls Are In Place. The requirements under Paragraph 37 shall not apply if local laws, regulations, ordinances or other governmental controls (hereinafter "Governmental Controls") are in place for the property described in Paragraph 37, which are at least as protective, as determined by EPA and the State, as the restrictions and requirements set forth in Appendix F1. If Settling Defendants conclude that such controls are in place, they shall provide notice to EPA and the State at least 60 days prior to expiration of the second anniversary of the Effective Date and the timeframe for filing Environmental Covenants under Paragraph 37 shall not apply. If EPA, after consultation with the State, determines that such governmental controls are not sufficient to meet the requirements of Appendix F, EPA shall notify Settling Defendants in writing. In such event, Settling Defendants shall within 20 days after receipt of such a notice either submit draft Environmental Covenants to EPA and the State as required under Paragraph 37 or seek Dispute Resolution pursuant to Section XXV. Dispute Resolution of this issue may not be invoked if Settling Defendants were provided notice prior to enactment of the Governmental Controls that EPA or the State did not consider the proposed Governmental Controls to be as protective as the restrictions and requirements set forth in Appendix F1. In the event Settling Defendants seek dispute resolution, they shall not be required to provide Environmental Covenants unless and until issuance of a final nonappealable decision holding that the existing Governmental Controls do not meet the requirements of Appendix F1. In such case, Settling Defendants shall within 20 days after service of such decision submit draft Environmental Covenants to EPA and the State as required under Paragraph 37, and shall execute and record those covenants within 30 days following notice of EPA and the State's approval of the draft forms. In the event Defendants do not seek dispute resolution, they shall execute and record Environmental Covenants within 30 days following EPA and the State's approval of the draft forms. If Governmental Controls are later repealed, suspended or otherwise invalidated, Settling Defendants shall within six months of the repeal, suspension, or invalidation of those Governmental Controls provide draft Environmental Covenants pursuant to Paragraph 37 and Appendix F1, and execute and record those Environmental Covenants within 30 days of approval by EPA and the State.

39. If the property within the Site where access or land/water use restrictions are needed to implement the OU1 Work Plan or the O&M Plan for OUs 4, 8, and 10 is owned or controlled by persons other than any of the Settling Defendants, Settling Defendants shall:

a. use their best efforts to secure from such persons an agreement to provide access thereto for Settling Defendants, the United States on behalf of EPA, and the State as well as their representatives (including contractors) for the purpose of implementing the OU1 Work Plan and the O&M Plan for OUs 4, 8, and 10; and

b. cooperate with EPA and State to secure Environmental Covenants or other agreements consistent with the provisions of Appendices F1 and G.

40. For the purposes of Paragraph 39(a) of this Consent Decree, "best efforts" includes the payment of reasonable sums of money in consideration of access.

41. If EPA or the State determines that land/water use restrictions in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement the remedy selected in the RODs, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Settling Defendants shall cooperate with EPA and State efforts to secure such governmental controls.

42. Notwithstanding any provision of this Consent Decree, the United States and the State retain all of their access authorities and rights, as well as all of their rights to require land/water use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA, MLRA and any other applicable statute or regulations.

XIII. REPORTING REQUIREMENTS

43. Settling Defendants shall submit three copies each of all plans, reports, and data required by the OU1 Work Plan, the O&M Plan for OUs 4, 8, and 10, and any other approved plans to EPA and the State in accordance with the schedules set forth in such plans. Upon request by EPA or the State, Settling Defendants shall submit in electronic form all portions of any report or other deliverable Settling Defendants are required to submit pursuant to the provisions of this Consent Decree.

44. If requested by EPA or the State, Settling Defendants shall also provide briefings for EPA and the State to discuss the progress of the Work.

45. Upon the occurrence of any event during performance of the Work that Settling Defendants are required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-Know Act (EPCRA), 42 U.S.C. § 11004, Settling Defendants shall within 24 hours of the onset of such event orally notify the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator or Alternate EPA Project Coordinator is available, the Emergency Response Section, Region 8, United States Environmental Protection Agency, and the State Project Coordinator. These reporting requirements are in addition to the reporting required by CERCLA Section 103, 42 U.S.C. § 9603, or EPCRA Section 304, 42 U.S.C. § 11004.

46. Within 20 days of the onset of such an event, Settling Defendants shall furnish to Plaintiffs a written report, signed by Settling Defendants' Project Coordinator, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within 30 days of the conclusion of such an event, Settling Defendants shall submit a report setting forth all actions taken in response thereto.

47. All reports and other documents submitted by Settling Defendants to EPA and to the State which purport to document Settling Defendants' compliance with the terms of this Consent Decree shall be signed by an authorized representative of Settling Defendants.

XIV. EPA APPROVAL OF PLANS AND OTHER SUBMISSIONS

48. After review of any plan, report or other item which is required to be approved by EPA pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by the State, shall: (a) approve, in whole or in part, the submission; (b) approve the submission upon specified conditions; (c) modify the submission to cure the deficiencies; (d) disapprove, in whole or in part, the submission, directing that Settling Defendants modify the submission; or (e) any combination of the above. However, EPA shall not modify a submission without first providing Settling Defendants at least one notice of deficiency and an opportunity to cure within 14 days, except where to do so would cause serious disruption to the Work or where previous submission(s) have been disapproved due to material defects and the deficiencies in the submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

49. In the event of approval, approval upon conditions, or modification by EPA, pursuant to Paragraph 48(a), (b), or (c), Settling Defendants shall proceed to take any action required by the plan, report, or other item, as approved or modified by EPA subject to their right to invoke the Dispute Resolution procedures set forth in Section XXV (Dispute Resolution) and Paragraphs 13(b) and 17(b), if applicable, with respect to the modifications or conditions made by EPA.

50. Resubmission of Plans

a. Upon receipt of a notice of disapproval pursuant to Paragraph 48(d), Settling Defendants shall, within 14 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other item for approval. Any stipulated penalties applicable to the submission, as provided in XXVI (Stipulated Penalties), shall accrue during the 14-day period or otherwise specified period but shall not be payable unless the resubmission is disapproved or modified due to a material defect.

b. Notwithstanding the receipt of such notice of disapproval, Settling Defendants shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission. Implementation of any non-deficient portion of a submission shall not relieve Settling Defendant of any liability for stipulated penalties under Section XXVI (Stipulated Penalties) for the outstanding deficiencies.

c. In the event that a resubmitted plan, report or other item, or portion thereof, is disapproved by EPA, EPA may again require Settling Defendants to correct the deficiencies, in accordance with the preceding Paragraphs. EPA also retains the right to modify or develop the plan, report or other item. Settling Defendants shall implement any such plan, report, or item as modified or developed by EPA, subject to their right to invoke the procedures set forth in Section XXV (Dispute Resolution) and Paragraphs 13(b) and 17(b), if applicable.

d. If upon resubmission, a plan, report, or item is disapproved or modified by EPA due to a material defect, Settling Defendants shall be deemed to have failed to submit such plan, report, or item timely and adequately unless Settling Defendants invoke the dispute resolution procedures set forth in Section XXV (Dispute Resolution) and EPA's action is

overturned pursuant to that Section. Except as otherwise provided in Paragraphs 13(b) and 17(b) (modification of work plans), the provisions of Section XXV (Dispute Resolution) and Section XXVI (Stipulated Penalties) shall govern the implementation of the Work and accrual and payment of any stipulated penalties during Dispute Resolution. If EPA's disapproval or modification is upheld, stipulated penalties shall accrue for such violation from the date on which the initial submission was originally required, as provided in Section XXVI (Stipulated Penalties).

51. All plans, reports, and other items required to be approved by EPA under this Consent Decree shall, upon approval or modification by EPA, be enforceable under this Consent Decree. In the event EPA approves or modifies a portion of a plan, report, or other item required to be submitted to EPA under this Consent Decree, the approved or modified portion shall be enforceable under this Consent Decree, subject to Settling Defendants' right to invoke the dispute resolution procedures set forth in Section XXV (Dispute Resolution) and Paragraphs 13(b) and 17(b), if applicable.

XV. PROJECT COORDINATORS

52. Within 20 days of lodging this Consent Decree, Settling Defendants, the State, and EPA will notify each other, in writing, of the name, address and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least 5 working days before the change occurs, unless impracticable, but in no event later than the actual day the change is made. The Settling Defendants' Project Coordinator shall be subject to disapproval by EPA and the State upon a finding that the proposed Project Coordinator lacks the technical expertise sufficient to adequately oversee all aspects of the Work. The Settling Defendants' Project Coordinator shall not be an attorney for any of the Settling Defendants in this matter. The Settling Defendants' Project Coordinator may assign other representatives, including other contractors, to serve as representatives for oversight of performance of daily operations during the performance of Work at all or portions of the Site.

53. The EPA and State may designate other representatives, including, but not limited to, EPA and State employees, and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager (RPM) and an On-Scene Coordinator (OSC) by the National Contingency Plan, 40 C.F.R. Part 300. In addition, EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the National Contingency Plan, to halt any Work at the Site required by this Consent Decree and to take any necessary response action when s/he determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

54. EPA's Project Coordinator, the State's Project Coordinator and the Settling Defendants' Project Coordinator will meet, at EPA's discretion by telephone or in person, at a minimum on an annual basis.

XVI. PERFORMANCE GUARANTEE FOR WORK AT OU1

55. Within 30 days of the Effective Date, Settling Defendants shall establish and maintain a Performance Guarantee (the "OU1 Performance Guarantee") for the benefit of EPA in an amount sufficient to complete the OU1 work as provided in this Section.

a. The amount of the OU1 Performance Guarantee shall equal the net present value of the estimated cost of the OU1 work for the 100-year period following the date that the amount of the OU1 Performance Guarantee is determined or adjusted pursuant to this Section. The initial amount of the OU1 Performance Guarantee shall be fourteen million five hundred thousand dollars ($14,500,000). The amount of the OU1 Performance Guarantee shall be updated or adjusted in accordance with Appendix H.

b. The Parties shall reevaluate the amount of the OU1 Performance Guarantee every five years as part of the periodic review process described in Section X (Remedy Review). In the event of a significant change in circumstances, any party may request a reevaluation of the amount of the OU1 Performance Guarantee at an earlier time.

c. Following any reevaluation of the amount of the OU1 Performance Guarantee pursuant to Paragraph 55(b), EPA shall, in consultation with the State and Settling Defendants, determine whether, pursuant to the model and formula described in Appendix H, an adjustment to the amount of the OU1 Performance Guarantee is appropriate. EPA's decision may be disputed pursuant to Section XXV (Dispute Resolution). Settling Defendants shall provide the amount of the OU1 Performance Guarantee in accordance with EPA's determination pursuant to Appendix H or, if such determination is disputed, then in accordance with the final administrative or judicial decision resolving such dispute.

56. Settling Defendants shall provide the OU1 Performance Guarantee required by this Section in one or more of the following forms to be selected by Settling Defendants, which must be satisfactory in both form and substance to EPA and the State:

a. A surety bond unconditionally guaranteeing payment that is issued by a surety company among those listed as acceptable sureties on Federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. One or more irrevocable letters of credit, payable to or at the direction of EPA, that is issued by one or more financial institution(s) (i) that has the authority to issue letters of credit and (ii) whose letter-of-credit operations are regulated and examined by a U.S. Federal or State agency. Any irrevocable letter of credit provided pursuant to this Section must be issued for a period of at least one year and provide that the expiration date will be automatically extended for a period of at least one year unless the issuing institution notifies Settling Defendants, EPA, and the State, no less than 120 days before the current expiration date, by certified mail of a decision not to extend the letter of credit beyond the expiration date. If Settling Defendants do not establish an alternative Performance Guarantee satisfactory to EPA as specified in this Section at least 30 days before the expiration date of the letter of credit (as set forth in the issuing institution's initial notice or as may be extended by the issuing institution), EPA may draw the full amount of the letter of credit and deposit those funds into the California

Gulch Superfund Site Special Account for EPA's unconditional use in implementing the OU1 remedy at the Site. In the event Settling Defendants subsequently provide an alternative Performance Guarantee satisfactory to EPA, EPA shall within 60 days thereafter refund to Settling Defendants the amount of unexpended cash from the previously drawn letter of credit less any unpaid stipulated penalties; or

c. A trust fund established for the benefit of EPA that is administered by a trustee (i) that has the authority to act as a trustee and (ii) whose trust operations are regulated and examined by a U.S. Federal or State agency.

57. Settling Defendants have selected as an initial OU1 Performance Guarantee one or more irrevocable letters of credit, payable to or at the direction of EPA, meeting the requirements of Paragraph 56(b). Within 30 days after the Effective Date, Settling Defendants shall execute or otherwise finalize all instruments or other documents required in order to make the selected OU1 Performance Guarantee legally binding and such Performance Guarantee shall thereupon be fully effective. Within 45 days of the Effective Date, Settling Defendants shall submit all executed and otherwise finalized instruments or other documents required in order to make the selected OU1 Performance Guarantee legally binding to the EPA Financial Analyst listed in Section XXXIII (Notices and Submissions), with a copy to the United States, EPA, and the State as specified in that Section.

58. The commencement of any Work Takeover pursuant to Paragraph 122 of this Consent Decree with respect to the OU1 work shall trigger EPA's right to receive the benefit of any Performance Guarantee(s) in effect as of such time, as provided pursuant to Paragraph 55, and at such time EPA shall have immediate access to resources guaranteed under any such Performance Guarantee(s), whether in cash or in kind, as needed to continue and complete the Work assumed by EPA under the Work Takeover. If for any reason EPA is unable, after making a request for payment on the Performance Guarantee, to promptly secure the resources guaranteed under any such Performance Guarantee(s), whether in cash or in kind, necessary to continue and complete the Work assumed by EPA under the Work Takeover, Settling Defendant shall within three Working Days of written demand from EPA deposit into an account specified by EPA, in immediately available funds and without setoff, counterclaim, or condition of any kind, a cash amount equal to the amount of the OU1 Performance Guarantee. In the event Settling Defendants subsequently resume with EPA's approval the required Work for OU1 and provide a Performance Guarantee satisfactory to EPA, EPA shall refund to Settling Defendants the unexpended amount of the prior Performance Guarantee or other payments by Settling Defendants under this Paragraph less any unpaid stipulated penalties.

59. In the event that EPA determines that a Performance Guarantee provided by any Settling Defendant pursuant to this Section no longer satisfies the requirements set forth in this Section, whether due to an increase in the Estimated Cost of the OU1 Work or for any other reason, or in the event that any Settling Defendant becomes aware of information indicating that a Performance Guarantee provided pursuant to this Section no longer satisfies the requirements set forth in this Section, whether due to an increase in the Estimated Cost of the OU1 Work or for any other reason, Settling Defendants, within 30 days of receipt of notice of EPA's determination or, as the case may be, within 30 days of any Settling Defendant becoming aware of such information, shall obtain and present to EPA for approval a proposal for a revised or

alternative form of Performance Guarantee listed in Paragraph 56 of this Consent Decree that satisfies all requirements set forth in this Section. If Settling Defendants dispute EPA's determination, Settling Defendants shall follow the dispute resolution procedures set forth in Section XXV (Dispute Resolution) of this Agreement. In seeking approval for a revised or alternative form of Performance Guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 60(b) of this Consent Decree. Settling Defendants' inability to post a Performance Guarantee for the Estimated Cost of the OU1 Work shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of Settling Defendant to complete the Work in strict accordance with the terms hereof.

60. Change of Form of Performance Guarantee and Release

a. If, after entry of this Consent Decree, Settling Defendants desire to change the form or terms of any Performance Guarantee(s) provided pursuant to this Section, Settling Defendants may, within 30 days of any anniversary date of entry of this Consent Decree, or at any other time agreed to by the Parties, petition EPA in writing to request a change in the form of the Performance Guarantee(s) provided hereunder. Settling Defendants may challenge any decision by EPA denying a petition to change the form of the Performance Guarantee for OU1 pursuant to Section XXV (Dispute Resolution), provided (i) the form of Performance Guarantee requested by Settling Defendants is one of the forms listed in Paragraph 56 above, and (ii) Settling Defendants shall maintain an EPA-approved OU1 Performance Guarantee during the period of dispute resolution.

b. Settling Defendants shall submit a written proposal for a revised or alternative form of Performance Guarantee to EPA and the State which shall specify, at a minimum, the Estimated Cost of the remaining OU1 Work to be performed, the basis upon which such cost was calculated, and the proposed revised form of Performance Guarantee, including all proposed instruments or other documents required in order to make the proposed Performance Guarantee legally binding. The proposed revised or alternative form of Performance Guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Defendants shall submit such proposed revised or alternative form of Performance Guarantee to the EPA Financial Analyst listed in Section XXXIII (Notices and Submissions) of this Consent Decree, with a copy to the State. EPA shall notify Settling Defendants in writing of its decision to accept or reject a revised or alternative Performance Guarantee submitted pursuant to this subparagraph. Within 15 days after receiving a written decision approving the proposed revised or alternative Performance Guarantee(s), Settling Defendants shall execute and/or otherwise finalize all instruments or other documents required to make the selected Performance Guarantee(s) legally binding in a form substantially identical to the documents submitted to EPA as part of the proposal, and such Performance Guarantee(s) shall thereupon be fully effective. Settling Defendants shall submit all executed and otherwise finalized instruments or other documents required in order to make the selected Performance Guarantee(s) legally binding to the EPA Financial Analyst listed in Section XXXIII (Notices and Submissions) within 30 days of receiving a written decision approving the proposed revised or alternative Performance Guarantee(s) in accordance with Section XXXIII (Notices and Submissions) of this Consent Decree and to the United States, EPA, and the State as specified in Section XXXIII (Notices and Submissions).

c. If Settling Defendants receive written notice from EPA in accordance with Paragraph 73 that the Work at OU1 has been fully and finally completed in accordance with the terms of this Consent Decree, or if EPA, after consultation with the State, otherwise so notifies Settling Defendants in writing, Settling Defendants may thereafter release, cancel, or discontinue the Performance Guarantee(s) provided pursuant to this Section. Settling Defendants shall not release, cancel, or discontinue any Performance Guarantee provided pursuant to this Section except as provided in this subparagraph. In the event of a dispute, Settling Defendants may release, cancel, or discontinue the Performance Guarantee(s) required hereunder only in accordance with a final administrative or judicial decision resolving such dispute.

XVII. PERFORMANCE GUARANTEE FOR WORK AT OUs 4, 8, AND 10

61. In order to ensure the full and final completion of the Work at OUs 4, 8, and 10, Settling Defendants shall establish and maintain, within 30 days of the Effective Date, a Performance Guarantee for the benefit of EPA in the amount of $600,000 in one or more of the following forms, which must be satisfactory in form and substance to EPA:

a. A surety bond unconditionally guaranteeing payment that is issued by a surety company among those listed as acceptable sureties on Federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. One or more irrevocable letters of credit, payable to or at the direction of EPA, that is issued by one or more financial institution(s) (i) that has the authority to issue letters of credit and (ii) whose letter-of-credit operations are regulated and examined by a U.S. Federal or State agency;

c. A trust fund established for the benefit of EPA that is administered by a trustee (i) that has the authority to act as a trustee and (ii) whose trust operations are regulated and examined by a U.S. Federal or State agency;

d. A policy of insurance that (i) provides EPA with acceptable rights as a beneficiary thereof; and (ii) is issued by an insurance carrier (a) that has the authority to issue insurance policies in the applicable jurisdiction(s) and (b) whose insurance operations are regulated and examined by a State agency;

e. A demonstration that one or more of the Settling Defendants meet the financial test criteria of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the OUs 4, 8 and 10 Work, provided that all other requirements of 40 C.F.R. § 264.143(f) are satisfied; or

f. A written guarantee to fund or perform the OU 4, 8 and 10 Work executed in favor of EPA by one or more of the following: (i) a direct or indirect parent company of Settling Defendants, or (ii) a company that has a "substantial business relationship" (as defined in 40 C.F.R. § 264.141(h)) with Settling Defendants; provided, however, that any company providing such a guarantee must demonstrate to the satisfaction of EPA that it satisfies the financial test requirements of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the OUs 4, 8 and 10 Work that it proposes to guarantee hereunder.

62. Settling Defendants may, at their election, establish a single Performance Guarantee covering all or portions of their obligations under Sections XVI and XVII provided such Guarantee meets all of the requirements of each applicable Section.

63. If at any time during the effective period of this Consent Decree, a Settling Defendant provides a Performance Guarantee for completion of the Work at OUs 4, 8, and 10 by means of a demonstration or guarantee pursuant to Paragraph 61(e) or Paragraph 61 (f) above, the Settling Defendant shall also comply with the other relevant requirements of 40 C.F.R. §264.143(f), 40 C.F.R. § 264.151(f), and 40 C.F.R. § 264.151(h)(1) relating to these methods unless otherwise provided in this Consent Decree, including but not limited to (i) the initial submission of required financial reports and statements from the relevant entity's chief financial officer and independent certified public accountant; (ii) the annual re-submission of such reports and statements within 90 days after the close of each such entity's fiscal year; and (iii) the notification of EPA within 90 days after the close of any fiscal year in which such entity no longer satisfies the financial test requirements set forth at 40 C.F.R. § 264.143(f)(1). For purposes of the Performance Guarantee methods specified in this Section (Performance Guarantee for Work at OUs 4, 8, and 10), references in 40 C.F.R. Part 264, Subpart H, to "closure," "post-closure," and "plugging and abandonment" shall be deemed to refer to the Work required by this Consent Decree for OUs 4, 8, and 10, and the terms "current closure cost estimate" "current post-closure cost estimate," and "current plugging and abandonment cost estimate" shall be deemed to refer to the Estimated Cost of the OUs 4, 8 and 10 Work.

64. In the event that EPA determines at any time that a Performance Guarantee provided by any Settling Defendant pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the Estimated Cost of the OUs 4, 8, and 10 Work or for any other reason, or in the event that any Settling Defendant becomes aware of information indicating that a Performance Guarantee provided pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the Estimated Cost of the OUs 4, 8, and 10 Work or for any other reason, Settling Defendants, within 30 days of receipt of notice of EPA's determination or, as the case may be, within 30 days of any Settling Defendants becoming aware of such information, shall obtain and present to EPA for approval a proposal for a revised or alternative form of Performance Guarantee listed in Paragraph 61 of this Consent Decree that satisfies all requirements set forth in this Section. If Settling Defendant disputes EPA's determination, Settling Defendants shall follow the dispute resolution procedures set forth in Section XXV (Dispute Resolution) of this Agreement. In seeking approval for a revised or alternative form of Performance Guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 66(b)(2) of this Consent Decree. Settling Defendants' inability to post a Performance Guarantee for the Estimated Cost of the OUs 4, 8, and 10 Work shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of Settling Defendants to complete the Work in strict accordance with the terms hereof.

65. The commencement of any Work Takeover pursuant to Paragraph 122 of this Consent Decree shall trigger EPA's right to receive the benefit of any Performance Guarantee(s) in effect as of such time, as provided pursuant to Paragraph 61, and at such time EPA shall have immediate access to resources guaranteed under any such Performance Guarantee(s), whether in

cash or in kind, as needed to continue and complete the Work assumed by EPA under the Work Takeover. If for any reason EPA is unable, after making a request for payment on the Performance Guarantee, to promptly secure the resources guaranteed under any such Performance Guarantee(s), whether in cash or in kind, necessary to continue and complete the Work assumed by EPA under the Work Takeover, or in the event that the Performance Guarantee involves a demonstration of satisfaction of the financial test criteria pursuant to Paragraph 61(e), Settling Defendant shall within three Working Days of written demand from EPA deposit into an account specified by EPA, in immediately available funds and without setoff, counterclaim, or condition of any kind, a cash amount up to but not exceeding the Estimated Cost of the OUs 4, 8, and 10 Work based on the remaining Work to be performed as of such date, as determined by EPA after consultation with the State. In the event Settling Defendants subsequently resume with EPA's approval the required Work for OUs 4, 8, and 10 and provide a Performance Guarantee satisfactory to EPA, EPA shall promptly refund to Settling Defendants the unexpended amount of the prior Performance Guarantee or other payments by Settling Defendants under this Paragraph, less any unpaid stipulated penalties.

66. Modification of Amount and/or Form of Performance Guarantee

a. Reduction of Amount of Performance Guarantee. If Settling Defendants believe that the estimated cost to complete the remaining OU 4, 8 and 10 Work that Settling Defendants are obligated to complete has diminished below the amount of the current Performance Guarantee, Settling Defendants may, within 30 days of any anniversary date following the Effective Date, or at any other time agreed to by the Parties, petition EPA in writing to request a reduction in the amount of the Performance Guarantee(s) provided pursuant to this Section so that the amount of the Performance Guarantee is equal to the current Estimated Cost of the OUs 4, 8 and 10 Work for the remaining Work to be performed. Settling Defendants shall submit a written proposal for such reduction to EPA and the State that shall specify, at a minimum, the cost of the remaining OUs 4, 8 and 10 Work to be performed and the basis upon which such cost was calculated. In seeking approval for a revised or alternative form of Performance Guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 66(b)(2) of this Consent Decree. If EPA, after consultation with the State, decides to accept such a proposal, EPA shall notify the Settling Defendants and the State of such decision in writing. After receiving EPA's written acceptance, Settling Defendants may reduce the amount of the Performance Guarantee in accordance with and to the extent permitted by such written acceptance. In the event of a dispute, Settling Defendants may reduce the amount of the Performance Guarantee required hereunder only in accordance with a final administrative or judicial decision resolving such dispute. No change to the form or terms of any Performance Guarantee provided under this Section, other than a reduction in amount, is authorized except as provided in Paragraph 64 or 66(b) of this Consent Decree.

b. Change of Form of Performance Guarantee

(1) If, after entry of this Consent Decree, Settling Defendants desire to change the form or terms of any Performance Guarantee(s) provided pursuant to this Section, Settling Defendants may, within 30 days of any anniversary date of entry of this Consent Decree, or at any other time agreed to by the Parties, petition EPA in writing to request a change in the form of the Performance Guarantee(s) provided hereunder. The submission of such proposed

revised or alternative form of Performance Guarantee shall be as provided in Paragraph 66(b)(2) of this Consent Decree. Any decision made by EPA on a petition submitted under this subparagraph (b)(1) shall be made in EPA's sole and unreviewable discretion after consultation with the State, and such decision shall not be subject to challenge by Settling Defendants pursuant to the dispute resolution provisions of this Consent Decree or in any other forum.

(2) Settling Defendants shall submit a written proposal for a revised or alternative form of Performance Guarantee to EPA and the State which shall specify, at a minimum, the Estimated Cost of the remaining OUs 4, 8, and 10 Work to be performed, the basis upon which such cost was calculated, and the proposed revised form of Performance Guarantee, including all proposed instruments or other documents required in order to make the proposed Performance Guarantee legally binding. The proposed revised or alternative form of Performance Guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Defendants shall submit such proposed revised or alternative form of Performance Guarantee to the EPA Financial Analyst listed in Section XXXIII (Notices and Submissions) of this Consent Decree. EPA shall notify Settling Defendants in writing of its decision to accept or reject a revised or alternative Performance Guarantee submitted pursuant to this subparagraph. Within 15 days after receiving a written decision approving the proposed revised or alternative Performance Guarantee(s), Settling Defendants shall execute and/or otherwise finalize all instruments or other documents required to make the selected Performance Guarantee(s) legally binding in a form substantially identical to the documents submitted to EPA as part of the proposal, and such Performance Guarantee(s) shall thereupon be fully effective. Settling Defendants shall submit all executed and/or otherwise finalized instruments or other documents required in order to make the selected Performance Guarantee(s) legally binding to the EPA Financial Analyst listed in Section XXXIII (Notices and Submissions) within 30 days of receiving a written decision approving the proposed revised or alternative Performance Guarantee(s) in accordance with Section XXXIII (Notices and Submissions) of this Consent Decree and to the United States and EPA as specified in Section XXXIII (Notices and Submissions).

c. Release of Performance Guarantee. If Settling Defendants receive written notice from EPA in accordance with Paragraph 73 that the Work at OUs 4, 8, and 10 has been fully and finally completed in accordance with the terms of this Consent Decree, or if EPA, after consultation with the State, otherwise so notifies Settling Defendant in writing, Settling Defendants may thereafter release, cancel, or discontinue the Performance Guarantee(s) provided pursuant to this Section. Settling Defendants shall not release, cancel, or discontinue any Performance Guarantee provided pursuant to this Section except as provided in this subparagraph 66.c. In the event of a dispute, Settling Defendants may release, cancel, or discontinue the Performance Guarantee(s) required hereunder only in accordance with a final administrative or judicial decision resolving such dispute.

XVIII. PERFORMANCE GUARANTEE FOR RECLAMATION OF BLACK CLOUD MINE

67. Within 30 days from the Effective Date of this Consent Decree, the Settling Defendants shall provide a Performance Guarantee to the MLRB and DRMS in the total sum of $5,500,000 (or $4,820,098 if Settling Defendants provide an access agreement pursuant to

Paragraph 23) in one or more of the following forms, which must be acceptable in form and substance to the MLRB and DRMS:

a. A surety bond issued by a corporate surety authorized to do business in the State of Colorado;

b. An irrevocable letter of credit in the form approved by MLRB issued by a bank authorized to do business in the United States. The letter of credit must be issued for a period of at least one year and must provide that the expiration date will be automatically extended for a period of at least one year unless the issuing bank notifies the Settling Defendants and DRMS no less than 120 days before the current expiration date by certified mail of a decision not to extend the expiration date. If the Settling Defendants do not submit an acceptable alternate Performance Guarantee as specified in this Section and obtain DRMS and MLRB's approval of such alternate Performance Guarantee at least 30 days prior to the expiration date of the Letter (as set forth in the issuing bank's initial notice or as may be extended by the issuing bank), DRMS and the MLRB may draw the full amount of the letter of credit and deposit those funds in an account with the State Treasury. Such amount shall be held as and constitute a Performance Guarantee in the form of cash as provided in this Section. Settling Defendants may subsequently seek approval of an alternative form of Performance Guarantee under Paragraph 69. In addition, the Settling Defendants must provide evidence that the bank issuing the letter of credit has a credit rating of "a" or better. This documentation shall be provided by the Settling Defendants annually as part of the Settling Defendants' annual report required in Paragraph 22. The letter of credit shall be executed on the issuing bank's letterhead;

c. A certificate of deposit from a financial institution located in the State of Colorado. The Certificate shall be assigned to the State of Colorado/Mined Land Reclamation Board. The Certificate shall be automatically renewed. The account in which the Certificate is held shall be a public funds account. The Certificate shall be issued by an eligible public depository under the Public Deposit Protection Act as required by Colorado Revised Statute 11-10.5-101, *et seq*;

d. A cash bond which shall be cash or certified funds assigned to the MLRB. Such cash or certified funds shall be held in trust by the Colorado Treasurer's Office. All interest shall accrue to the DRMS and MLRB and used for reclamation of the Black Cloud Mine in the event the DRMS must perform reclamation.

e. No later than 30 days from the Effective Date of this Consent Decree, the Settling Defendants shall submit to DRMS and the MLRB the required Performance Guarantee. DRMS and MLRB shall issue a decision approving or denying the Performance Guarantee within 45 days after submission by the Settling Defendants. Upon acceptance by DRMS and MLRB of the Performance Guarantee, the MLRB shall promptly release the existing corporate surety and the cash bond posted by Asarco Incorporated, n/k/a Asarco LLC and the recorded deed of trust on the Resurrection-Asarco joint venture property.

68. In the event DRMS determines at any time that the Performance Guarantee provided by the Settling Defendants no longer satisfies the requirements set forth in this Section, or in the event that any Settling Defendant becomes aware of information indicating that a

Performance Guarantee provided pursuant to this Section no longer satisfies the requirements set forth in this Section, Settling Defendants, within 30 days of receipt of notice of DRMS's determination or, as the case may be, within 30 days of any Settling Defendant becoming aware of such information, shall obtain and present to DRMS for approval a revised or alternate form of Performance Guarantee that satisfies the requirements set forth in this Section. If the Settling Defendants dispute DRMS' determination, the Settling Defendants may seek dispute resolution in accordance with Paragraphs 96 and 100. Settling Defendant's inability to post a Performance Guarantee for completion of the Reclamation Plan and Schedule shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of Settling Defendant to complete the Reclamation Plan and Schedule in strict accordance with the terms hereof.

69. Modification of Amount or Form of Performance Guarantee

a. Reduction of Amount of Performance Guarantee. If Settling Defendants believe that the estimated cost to complete remaining work under the Reclamation Plan and Schedule has diminished below the amount set forth in Paragraph 67 above, Settling Defendants may, within 30 days of the date that the Annual Report in Paragraph 22 is due, or at any other time agreed to by the Parties, petition DRMS and MLRB in writing to request a reduction in the amount of the Performance Guarantee(s) provided pursuant to this Section so that the amount of the Performance Guarantee is equal to the estimated cost of the remaining work under the Reclamation Plan and Schedule. Settling Defendants shall submit a written proposal for such reduction to DRMS and MLRB that shall specify, at a minimum, the cost of the remaining Reclamation Plan and Schedule work to be performed and the basis upon which such cost was calculated. In seeking approval of a reduced Performance Guarantee, Settling Defendants shall follow the procedures set forth in Paragraph 69(c) of this Consent Decree. If DRMS and MLRB decide to accept such a proposal, DRMS shall notify the Settling Defendants of such decision in writing. After receiving DRMS's written acceptance, Settling Defendants may reduce the amount of the Performance Guarantee in accordance with and to the extent permitted by such written acceptance. In the event of a dispute, Settling Defendants may reduce the amount of the Performance Guarantee required hereunder only in accordance with a final administrative or judicial decision, as applicable, resolving such dispute pursuant to Paragraphs 96 and 100. No change to the form or terms of any Performance Guarantee provided under this Section, other than a reduction in amount, is authorized except as provided in this Paragraph or Paragraph 68 of this Consent Decree.

b. If, after entry of this Consent Decree, Settling Defendants desire to change the form or terms of any Performance Guarantee(s) to a form or terms other than as provided pursuant to this Section, Settling Defendants may, within 30 days of any anniversary date of entry of this Consent Decree, or at any other time agreed to by the Parties, petition DRMS in writing to request a change in the form of the Performance Guarantee(s) provided hereunder. The submission of such proposed revised or alternative form of Performance Guarantee shall be as provided in Paragraph 69(c) of this Consent Decree.

c. Settling Defendants shall submit a written proposal for a revised or alternative form of Performance Guarantee to DRMS which shall specify, at a minimum, the estimated cost of the remaining reclamation work to be performed, the basis upon which such

cost was calculated, and the proposed revised form of Performance Guarantee, including all proposed instruments or other documents required in order to make the proposed Performance Guarantee legally binding. The proposed revised or alternative form of Performance Guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Defendants shall submit such proposed revised or alternative form of Performance Guarantee to the DRMS Project Coordinator and the Administrator of the MLRB listed in Section XXXIII (Notices and Submissions) of this Consent Decree. DRMS shall notify Settling Defendants in writing of its decision to accept or reject a revised or alternative Performance Guarantee submitted pursuant to this subparagraph. Within ten days after receiving a written decision approving the proposed revised or alternative Performance Guarantee(s), Settling Defendants shall execute and/or otherwise finalize all instruments or other documents required in order to make the selected Performance Guarantee(s) legally binding in a form substantially identical to the documents submitted to DRMS as part of the proposal, and such Performance Guarantee(s) shall thereupon be fully effective. Settling Defendants shall submit all executed and/or otherwise finalized instruments or other documents required in order to make the selected Performance Guarantee(s) legally binding to the DRMS contact listed in Section XXXIII (Notices and Submissions) within 30 days of receiving a written decision approving the proposed revised or alternative Performance Guarantee(s) in accordance with Section XXXIII (Notices and Submissions) of this Consent Decree, with copies provided to the United States and the EPA. Settling Defendants may challenge any decision by DRMS denying a proposal to change the form of the Performance Guarantee for Black Cloud reclamation pursuant to Paragraphs 96 and 100, provided (i) the form of Performance Guarantee requested by Settling Defendants is one of the forms listed in Paragraph 67 above, and (ii) Settling Defendants shall maintain a DRMS-approved Performance Guarantee during the period of dispute resolution.

d. Release of Performance Guarantee. If Settling Defendants receive written notice from DRMS and MLRB that (i) the Reclamation Plan and Schedule has been fully and finally completed in accordance with the terms of this Consent Decree, or (ii) Settling Defendants have met the Reclamation Cap, or if DRMS and MLRB otherwise so notify Settling Defendant in writing, Settling Defendants may thereafter release, cancel, or discontinue the Performance Guarantee(s) provided pursuant to this Section. Settling Defendants shall not release, cancel, or discontinue any Performance Guarantee provided pursuant to this Section except as provided in this subparagraph. In the event of a dispute, Settling Defendants may release, cancel, or discontinue the Performance Guarantee(s) required hereunder only in accordance with a final administrative or judicial decision, as applicable, resolving such dispute.

70. Work Takeover. In the event DRMS and MLRB determine that Settling Defendants (i) have ceased implementation of any portion of the Work required under the Reclamation Plan and Schedule; (ii) are seriously or repeatedly deficient or late in their performance of the Reclamation Plan and Schedule, or (iii) are implementing the Reclamation Plan and Schedule in a manner which may cause an endangerment to human health or the environment, DRMS may assume the performance of all or any portions of the Reclamation Plan and Schedule as DRMS determines necessary. The commencement of any Work Takeover pursuant to this Paragraph shall trigger DRMS and MLRB's right to receive the benefit of any Performance Guarantee(s) provided under this Section XVIII in effect as of such time, and DRMS and MLRB shall have immediate access to resources guaranteed under such Performance Guarantee(s) as needed to continue and complete the Reclamation Plan and Schedule assumed

by DRMS and the MLRB, except that five percent of the Performance Guarantee shall be deposited in the mined land reclamation fund, created in C.R.S., § 34-32-127, to cover the administrative costs incurred by DRMS in performing the reclamation. If for any reason DRMS and MLRB are unable, after making a request for payment on the Performance Guarantee, to promptly secure the resources guaranteed under any such Performance Guarantee(s) necessary to continue and complete the Reclamation Plan and Schedule, Settling Defendants shall within 3 Working Days after receiving written demand from DRMS deposit into an account specified by DRMS in immediately available funds and without setoff, credit, counterclaim or condition of any kind, a cash amount up to but not exceeding the estimated cost, as determined by DRMS, of continuing and completing the Reclamation Plan and Schedule subject to the Reclamation Cap, and upon such deposit, Settling Defendants shall be deemed to have satisfied the Reclamation Cap. Settling Defendants may invoke the procedures set forth in Paragraphs 96 and 100, to dispute DRMS and MLRB's determination that takeover of the Reclamation Plan and Schedule is warranted under this Paragraph.

71. Certification of Complete Performance under Reclamation Plan and Schedule

a. Within 90 days after Settling Defendants conclude that the Reclamation Plan and Schedule have been fully performed and the Performance Standards have been attained or that the Reclamation Cap has otherwise been satisfied, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants and the DRMS Project Coordinator. If, after the pre-certification inspection, Settling Defendants still believe that the Reclamation Plan and Schedule has been fully performed and the Performance Standards have been attained or that the Reclamation Cap has otherwise been satisfied, they shall within 30 days of the inspection submit a written report to DRMS requesting certification of completion of the Reclamation Work. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state that the Reclamation Plan and Schedule has been completed in full satisfaction of the requirements of this Consent Decree, or that the Reclamation Cap has otherwise been satisfied. The written report shall include as-built drawings signed and stamped by a professional engineer documenting the completed reclamation. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

b. If, after completion of the pre-certification inspection and receipt and review of the written report, DRMS determines that the Reclamation Plan and Schedule has not been completed or that the Reclamation Cap has not been satisfied, DRMS will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Reclamation Plan and Schedule or otherwise satisfy the Reclamation Cap; provided, however, that DRMS may require Settling Defendants to perform such activities pursuant to this Paragraph only to the extent that such activities are consistent with the scope of the Reclamation Plan and Schedule and the Reclamation Cap. DRMS will set

forth in the notice a reasonable schedule for performance of such activities consistent with the Consent Decree or require Settling Defendants to submit a schedule to DRMS for its approval. Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph. If Settling Defendants disagree with DRMS' determination, the Settling Defendants may seek dispute resolution in accordance with Paragraphs 96 and 100.

c. If DRMS and the MLRB conclude, based on the initial or any subsequent request for Certification of Completion by Settling Defendants that the Reclamation Plan and Schedule has been performed in accordance with this Consent Decree or the Reclamation Cap has otherwise been satisfied, DRMS and MLRB will so notify Settling Defendants in writing.

d. Upon completion of the Reclamation Plan and Schedule or satisfaction of the Reclamation Cap satisfactory to the DRMS and MLRB, the MLRB shall promptly release the Settling Defendants from further reclamation obligations at the Black Cloud Mine and release the Performance Guarantee.

XIX. CERTIFICATION OF COMPLETION

72. Completion of the Remedial Action

a. Within 90 days after Settling Defendants conclude that the Remedial Action has been fully performed and the Performance Standards have been attained under the OU1 Work Plan, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA, and the State. If, after the pre-certification inspection, Settling Defendants still believe that the Remedial Action has been fully performed and the Performance Standards have been attained for OU1, they shall within 30 days of the inspection submit a written report to EPA, with a copy to the State, pursuant to Section XIV (EPA Approval of Plans and Other Submissions), requesting certification of completion of the Remedial Action for OU1. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state that the Remedial Action for OU1 has been completed in full satisfaction of the requirements of this Consent Decree. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after completion of the pre-certification inspection and receipt and review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that the Remedial Action for OU1 has not been completed in accordance with this Consent Decree, or that the Performance Standards for such OU have not been achieved, EPA will, within 30 days, notify Settling Defendants in writing of the activities that must be undertaken by Settling

Defendants pursuant to this Consent Decree to complete the Remedial Action and achieve the Performance Standards; provided, however, that EPA may require Settling Defendants to perform such activities pursuant to this Paragraph only to the extent that such activities are consistent with the this Consent Decree and the OU1 Work Plan. EPA will set forth in the notice a reasonable schedule for performance of such activities consistent with this Consent Decree and the OU1 Work Plan or require Settling Defendants to submit a schedule to EPA for approval pursuant to Section XIV. Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph, subject to the applicable cost caps and subject to their right to invoke the dispute resolution procedures set forth in Section XXV (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the State, that the Remedial Action for OU1 has been performed in accordance with this Consent Decree and that the Performance Standards have been achieved, EPA will so certify in writing to Settling Defendants. This certification shall constitute the Certification of Completion of the Remedial Action for the OU for purposes of this Consent Decree. Certification of Completion of the Remedial Action for OU1 shall not affect Settling Defendant's obligations at any other OUs under this Consent Decree.

73. Completion of the Work

a. Within 90 days after Settling Defendants conclude that all phases of the Work at the California Gulch Superfund Site (including O&M), have been fully performed, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA, and the State. If, after the pre-certification inspection, Settling Defendants still believe that the Work has been fully performed, Settling Defendants shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If, after review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Work; provided, however, that EPA may require Settling Defendants to perform such activities pursuant to this Paragraph only to the extent that such activities are consistent with the scope of the response actions set forth in the OU1 Work Plan and the O&M Plan for OUs 4, 8, and 10. EPA will set forth in the notice a reasonable schedule for performance of such activities consistent with the Consent Decree and the OU1 Work Plan or require Settling Defendant to submit a

schedule to EPA for approval pursuant to Section XIV. Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to the applicable expenditure caps and subject to their right to invoke the dispute resolution procedures set forth in Section XXV (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent request for Certification of Completion of the Work by Settling Defendants and after a reasonable opportunity for review and comment by the State, that the Work has been performed in accordance with this Consent Decree, EPA will so notify Settling Defendants in writing.

XX. EMERGENCY RESPONSE

74. In the event of (i) any action or occurrence within OU1 during the performance of the Work or (ii) any failure of the constructed remedies in OUs 4, 8 or 10, any of which causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendants shall, subject to Paragraph 75 immediately take all appropriate action to prevent, abate, or minimize such release or threat of release and shall immediately notify the EPA's and the State's Project Coordinators, or, if EPA's Project Coordinator is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, Settling Defendants shall notify the EPA National Response Center at 1-800-424-8802. Settling Defendants shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the work plans, including the OU1 Contingency Plan, and any other applicable plans or documents approved pursuant to this Consent Decree. In the event that Settling Defendants fail to take appropriate response action as required by this Section, and EPA or, as appropriate, the State take such action instead, Settling Defendants shall reimburse EPA and the State all costs of the response action not inconsistent with the NCP pursuant to Section XXI (Payments for Response Costs).

75. Nothing in the preceding Paragraphs or in this Consent Decree shall be deemed to limit any authority of the United States or the State a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, subject to Section XXVII (Covenants Not to Sue by Plaintiffs).

XXI. PAYMENTS FOR RESPONSE COSTS

76. Payment of United States' Past Response Costs

a. Within 30 days of the Effective Date, Settling Defendants shall pay to EPA $1,813,200, plus an additional sum for Interest on that amount calculated from the date of lodging this Consent Decree through the date of payment, as full payment for Past Response Costs.

b. Payment shall be made in accordance with the provisions of Paragraph 80 below.

c. The total amount to be paid by Settling Defendants pursuant to subparagraph 76(a) shall be deposited in the California Gulch Superfund Site Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the EPA Hazardous Substance Superfund.

77. Payment of State's Past Response Costs. Within 30 days of the Effective Date, Settling Defendants shall pay to the State $186,800, plus an additional sum for Interest on the amount calculated from the date of lodging this Consent Decree through the date of payment, as full payment for State Past Response Costs. Payment shall be made by (a) Electronic Funds Transfer to the State of Colorado pursuant to instructions provided to Settling Defendants by the State following lodging of the Consent Decree or (b) certified or cashier's check or checks payable to "Treasurer, State of Colorado" and sent to Mr. Joe E. Montoya, Office of the Attorney General, Natural Resources & Environment Section, 1525 Sherman Street, 7th Floor, Denver, Colorado 80203.

78. Cash Out Payment for OU 12 and Additional Source Control in OUs 4, 8 & 10.

a. Within 30 days of the Effective Date, Settling Defendants shall pay to EPA $1,000,000 for OUs 4, 8 & 10 and $2,500,000 for OU 12 (for a total of $3,500,000), plus an additional sum for Interest on the amount calculated from the date of lodging through the date of payment.

b. Payment shall be made in accordance with the provisions of Paragraph 80.

c. The total amount to be paid by Settling Defendants pursuant to Subparagraph 78(a) shall be deposited in the California Gulch Superfund Site Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the EPA Hazardous Substance Superfund.

79. Cash Out Payment for OU11.

a. Within 30 days of the Effective Date, Settling Defendants shall pay to EPA $3,000,000, plus an additional sum for Interest on the amount calculated from the date of lodging through the date of payment.

b. Payment shall be made in accordance with the provisions of Paragraph 80.

c. The total amount to be paid by Settling Defendants pursuant to this Paragraph shall be deposited in the California Gulch Superfund Site OU 11 Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with Operable Unit 11 or to be transferred by EPA to the EPA Hazardous Substance Superfund.

80. Payment Instructions for Past Costs and Cash Out Payments.

a. Settling Defendants shall pay the amounts set forth in Paragraphs 76, 78 & 79 by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice account in accordance with current EFT procedures referencing EPA Site/Spill ID Number 08-29 and DOJ Case Number 90-11-3-138. EFT instructions will be provided to the Settling Defendants by the Financial Litigation Unit of the United States Attorney's Office for the District of Colorado following lodging of the Consent Decree. Any payments received by the Department of Justice after 4:00 p.m. (Eastern Time) will be credited to the next business day.

b. At the time of payment, Settling Defendants shall send notice that payment has been made to the United States, to EPA and to the Regional Financial Management Officer, in accordance with Section XXXIII (Notices and Submissions).

81. Payments for Future Oversight Costs

a. Settling Defendants shall pay to EPA all Future Oversight Costs not inconsistent with the NCP. On a periodic basis, the United States will send Settling Defendants a bill requiring payment that includes a regionally-prepared financial summary, which shall serve as the basis for payment demands. Settling Defendants shall make all payments within 30 days of Settling Defendants' receipt of each bill requiring payment, except as otherwise provided in Paragraph 83. Settling Defendants shall make all payments required by this Paragraph by certified or cashier's check(s), wire transfer or on-line payment made payable to "EPA Hazardous Substance Superfund," referencing the name and address of Settling Defendants and EPA Site/Spill ID number 08-29 and DOJ Case Number 90-11-3-138.

For certified or cashier's check(s), payment must be received by 11:00 AM Eastern Time for same day credit and should be forwarded to one of the following addresses:

REGULAR MAIL
US Environmental Protection Agency
Superfund Payments
Cincinnati Finance Center
PO Box 979076
St. Louis, MO 63197-9000

EXPRESS MAIL
U.S. Bank
1005 Convention Plaza
Mail Station SL-MO-C2GL
St. Louis, MO 63101
Contact: Natalie Pearson
314-418-4087

Wire transfers should be directed to the Federal Reserve Bank of New York:

Federal Reserve Bank of New York
ABA: 021030004
Account: 68010727
SWIFT address: FRNYUS33
33 Liberty Street
New York, NY 10045

Field Tag 4200 of the Fedwire message should read " D 68010727 Environmental Protection Agency "

ONLINE PAYMENT
WWW.PAY.GOV
Enter sfo 1.1 in the search field
Open EPA Miscellaneous Payments form and complete required fields.

b. At the time of payment, Settling Defendants shall send notice that payment has been made by email to acctsreceivable.cinwd@epa.gov, and to:

Dana Anderson, NWD
EPA Cincinnati Finance Office
26 Martin Luther King Drive
Cincinnati, Ohio 45268

c. At the time of payment, Settling Defendants shall also send notice that payment has been made to:

Enforcement Specialist 8ENF-RC
California Gulch Superfund Site
U.S. Environmental Protection Agency
Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Martha Walker, FMO
Financial Management Program
U.S. Environmental Protection Agency
Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

d. The total amount to be paid by Settling Defendants pursuant to Subparagraph 81(a) shall be deposited in the California Gulch Superfund Site Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Site or to be transferred by EPA to the EPA Hazardous Substance Superfund.

e. Settling Defendants shall reimburse the State for all State Future Oversight Costs not inconsistent with the NCP. On a periodic basis, the State will send Settling Defendants a bill requiring payment and a cost summary, which includes direct and indirect costs incurred by the State and its contractors. Settling Defendants shall make all payments within 30 days of Settling Defendants' receipt of each bill requiring payment, except as otherwise provided in Paragraph 83. Settling Defendants shall make all payments to the State required by this Paragraph by certified or cashier's check or checks made payable to "Treasurer, State of Colorado," referencing the name and address of the party making the payment for Response Costs for the California Gulch Superfund Site. Settling Defendants shall send the check(s) to Mr. Joe E. Montoya, Office of the Attorney General, Natural Resources & Environment Section, 1525 Sherman Street, 7th Floor, Denver, Colorado 80203.

82. The Parties agree that they will, to the extent practicable, minimize oversight costs and avoid duplication. As part of this effort, the Parties agree, as part of the annual meeting set out in Paragraph 54, they will discuss work at the Site, goals, and expectations for the coming year, the opportunity to transfer oversight to one lead agency, and other measures to minimize Future Oversight Costs.

83. Settling Defendants may contest payment of any Future Oversight Costs under Paragraph 81 if they determine that the United States or the State has made an accounting error or if they allege that a cost item that is included (a) does not meet the definition of Future Oversight Costs, or (b) represents costs that are inconsistent with the NCP. Such objection shall be made in writing within 30 days of receipt of the bill and must be sent to the United States (if the United States' accounting is being disputed) or the State (if the State's accounting is being disputed) pursuant to Section XXXIII (Notices and Submissions). Any such objection shall specifically identify the contested Future Oversight Costs and the basis for objection. In the event of an objection, Settling Defendants shall within the 30-day period pay all uncontested Future Oversight Costs to the United States or the State in the manner described in Paragraph 81. Simultaneously, Settling Defendants shall establish an interest-bearing escrow account in a federally-insured bank duly chartered in the State of Colorado and remit to that escrow account funds equivalent to the amount of the contested Future Oversight Costs. Settling Defendants shall send to the United States, as provided in Section XXXIII (Notices and Submissions), and the State a copy of the transmittal letter and check paying the uncontested Future Oversight Costs and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, Settling Defendants shall initiate the Dispute Resolution procedures in Section XXV (Dispute Resolution). If the United States or the State prevails in the dispute, within 5 days of the resolution of the dispute, Settling Defendant shall pay the sums due (with accrued interest) to the United States or the State, if State costs are disputed, in the manner described in Paragraph 81. If Settling Defendants prevail concerning any aspect of the contested costs, Settling Defendants shall pay that portion of the costs (plus associated accrued Interest) for which it did not prevail to the United States or the State, if State costs are disputed, in the manner described in Paragraph 81; Settling Defendants shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XXV (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Settling

Defendants' obligation to reimburse the United States and the State for their Future Oversight Costs.

84. In the event that the payments required by Paragraph 81 are not made within 30 days of Settling Defendants' receipt of the bill, Settling Defendants shall pay Interest on the unpaid balance. The Interest on Future Oversight Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Settling Defendants' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of Settling Defendants' failure to make timely payments under this Section. Settling Defendants shall make all payments required by this Paragraph in the manner described in Paragraph 81.

XXII. PAYMENTS FOR NATURAL RESOURCE DAMAGES

85. Payment to the United States for Natural Resource Damages. Within 30 days of the Effective Date, Settling Defendants shall pay to the United States $5,250,000, plus accrued Interest from the date of lodging through the date of payment, for Natural Resource Damages relating to the Site. This money will be used by DOI for the assessment, planning, restoration, rehabilitation, replacement or acquisition of the equivalent Natural Resources injured by releases of hazardous substances from the Site, and long-term management of Natural Resources in accordance with a final restoration plan to be developed by the State and DOI. The total amount to be paid by Settling Defendants pursuant to this Paragraph shall be managed as part of, and held in a distinct account within, DOI's NRDAR Fund. The payment required by this Paragraph shall be made by FedWire EFT to the U.S. Department of Justice account in accordance with current EFT procedures, referencing DOJ Case Number 90-11-3-138, NRDAR Account No. 14X5198, and "Natural Resource Damages in California Gulch Superfund Site." Payment shall be made in accordance with instructions provided to Settling Defendants following lodging by the Financial Litigation Unit of the U.S. Attorney's Office for the District of Colorado. Any payments received by the Department of Justice after 4:00 p.m. (Eastern Time) will be credited on the next business day. At the time of payment, Settling Defendants shall send written notice of payment and a copy of any transmittal documentation to Plaintiffs in accordance with Section XXXIII (Notices and Submissions).

86. Payment to the State for Natural Resource Damages. Within 30 days of the Effective Date, Settling Defendants shall pay to the State $5,250,000, plus accrued Interest from the date of lodging through the date of payment, for Natural Resource Damages relating to the Site. This money will be used by the State for the planning, restoration, rehabilitation, replacement or acquisition of the equivalent Natural Resources injured by releases of hazardous substances from the Site, and long-term management of Natural Resources in accordance with a final restoration plan or plans to be developed by the State and DOI. The total amount to be paid by Settling Defendants pursuant to this Paragraph shall be deposited by the State in a segregated sub-account of the State's NRDR Fund.

87. Settling Defendants shall make payment by Electronic Funds Transfer to the State of Colorado pursuant to instructions provided to Settling Defendants by the State following lodging of the Consent Decree.

XXIII. INDEMNIFICATION AND INSURANCE

88. Settling Defendants' Indemnification of the United States and the State

a. The United States and the State do not assume any liability by entering into this agreement or by virtue of any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Settling Defendants shall indemnify, save and hold harmless the United States, the State, and their officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Further, the Settling Defendants agree to pay the United States and the State all costs they incur including, but not limited to, attorneys fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf and under their control, in carrying out activities pursuant to this Consent Decree. Neither the United States nor the State shall be held out as a party to any contract entered into by or on behalf of Settling Defendants in carrying out activities pursuant to this Consent Decree. Neither Settling Defendants nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Defendants notice of any claim for which the United States or the State plans to seek indemnification pursuant to this Paragraph and shall consult with Settling Defendants prior to settling such claim.

89. Settling Defendants waive all claims against the United States and the State for damages or reimbursement or for set-off of any payments made or to be made to the United States or the State, arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Settling Defendants shall indemnify and hold harmless the United States and the State with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of the Settling Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

90. No later than 15 days after the Effective Date of the Consent Decree , Settling Defendants shall secure, and shall maintain until the second anniversary of EPA's Certification of Completion of the Remedial Action pursuant to Subparagraph 72(b) of Section XIX and until the MLRB releases the Performance Guarantee for the Reclamation Plan and Schedule for the Black Cloud Mine comprehensive general liability insurance with limits of one (1) million dollars, combined single limit, and automobile liability insurance with limits of one (1) million dollars, combined single limit, naming the United States and the State as additional insureds. In addition, for the duration of this Consent Decree, Settling Defendant shall satisfy, or shall ensure

that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Defendants in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Defendants shall provide to EPA and the State certificates of such insurance and a copy of each insurance policy. Settling Defendants shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Defendants demonstrate by evidence satisfactory to EPA and the State that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendants need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

XXIV. FORCE MAJEURE

91. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of Settling Defendants, of any entity controlled by Settling Defendants, or of Settling Defendants' contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendants' best efforts to fulfill the obligation. The requirement that Settling Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any potential force majeure event (1) as it is occurring and (2) following the potential force majeure event, such that the delay is minimized to the greatest extent possible. "Force Majeure" does not include financial inability to complete the Work or a failure to attain the Performance Standards.

92. If any event occurs or has occurred that may delay or prevent the performance of any obligation under this Consent Decree, whether or not caused by a force majeure event, Settling Defendants shall (i) with respect to an event affecting obligations involving the California Gulch Superfund Site notify orally EPA's and the State's Project Coordinators or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Assistant Regional Administrator, Office of Ecosystems Protection and Remediation, EPA Region 8, and (ii) with respect to an event affecting Settling Defendants' obligations involving the Black Cloud Mine, the State's Project Coordinator within seven days of when Settling Defendants first knew that the event might cause a delay. Within seven days thereafter, Settling Defendants shall provide in writing to EPA and the State, as applicable, an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Settling Defendants' rationale for attributing such delay to a force majeure event if it intends to assert such a claim; and a statement as to whether, in the opinion of Settling Defendants, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Settling Defendants shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude Settling Defendants from asserting any claim of force majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. Settling Defendants shall be deemed to know of any

circumstance of which Settling Defendants, any entity controlled by Settling Defendants, or Settling Defendants' contractors knew or should have known.

93. If EPA, in the case of an obligation involving the California Gulch Superfund Site, or the State in the case of an obligation involving the Black Cloud Mine, agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Consent Decree that are affected by the force majeure event will be extended for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. If EPA or the State, as applicable, does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, EPA or the State will notify Settling Defendants in writing of its decision. If EPA or the State agrees that the delay is attributable to a force majeure event, EPA or the State will notify Settling Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

94. If Settling Defendants elect to invoke the dispute resolution procedures set forth in Section XXV (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's or the State's notice. In any such proceeding, Settling Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendants complied with the requirements of Paragraphs 91 and 92, above. If Settling Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Settling Defendants of the affected obligation of this Consent Decree identified to EPA or the State and the Court.

XXV. DISPUTE RESOLUTION

95. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States or the State to enforce obligations of the Settling Defendants that have not been disputed in accordance with this Section. Disputes involving the California Gulch Superfund Site will be resolved in accordance with Paragraphs 96 through 99. Disputes involving the Black Cloud Mine will be resolved in accordance with Paragraphs 96 and 100.

96. Any dispute which arises under or with respect to this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

97. Statements of Position

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, the position advanced by EPA shall be considered binding unless, within 21 days after the conclusion of the 20-day informal negotiation period, Settling Defendants invoke the formal dispute resolution procedures of this Section by serving on the United States a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis or opinion supporting that position and any supporting documentation relied upon by the Settling Defendants. The Statement of Position shall specify the Settling Defendants' position as to whether formal dispute resolution should proceed under Paragraph 98 or Paragraph 99.

b. Within 21 days after receipt of Settling Defendants' Statement of Position, EPA after consultation with the State will serve on Settling Defendants with a copy to the State its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 98 or 99. Within 14 days after receipt of EPA's Statement of Position, Settling Defendants may submit a Reply.

c. If there is disagreement between EPA and the Settling Defendants as to whether dispute resolution should proceed under Paragraph 98 or 99, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if the Settling Defendants ultimately appeal to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the provisions set forth in Paragraphs 98 and 99.

98. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation: (1) the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree; and (2) the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendants regarding the validity of the provisions of the RODs.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Assistant Regional Administrator for the Office of Ecosystems Protection and Remediation, EPA Region 8, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 98(a). This decision shall be binding upon the parties to the dispute, subject only to the right of Settling Defendant to seek judicial review pursuant to Paragraph 98(c) and (d).

c. Any administrative decision made by EPA pursuant to Paragraph 98(b) shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by the Settling Defendants with the Court and served on all parties to the dispute within 21 days of receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States and the State may file a response to Settling Defendants' motion within 21 days after service of the motion, and Settling Defendants may file a reply to any response within 14 days after service of the response.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendants shall have the burden of demonstrating that the decision of the Assistant Regional Administrator for the Office of Ecosystems Protection and Remediation is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 98(a).

99. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendants' Statement of Position submitted pursuant to Paragraph 97, the Assistant Regional Administrator for the Office of Enforcement, Compliance and Environmental Justice, EPA Region 8, will issue a final decision resolving the dispute. The decision of the Assistant Regional Administrator for the Office of Enforcement, Compliance and Environmental Justice shall be binding on the parties to the dispute unless, within 21 days of receipt of the decision, the Settling Defendants file with the Court and serves on the parties to the dispute a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendants' motion within 21 days after service of the motion, and Settling Defendants may file a reply to any response within 14 days after service of the response.

b. Notwithstanding Paragraph K of Section I (Background) of this Consent Decree, judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

100. Formal dispute resolution for disputes as to the Black Cloud Mine shall be governed by this paragraph. In the Event Settling Defendants and DRMS cannot resolve a dispute by informal negotiations under Paragraph 96, the position advanced by DRMS shall be considered binding unless, within 21 days after the conclusion of the 20-day informal negotiation period, Settling Defendants apply in writing to the DRMS Director to be heard before the MLRB. Such application will be set for the MLRB's next regularly scheduled meeting that is thirty days or more beyond the date of the Settling Defendants' written application. At the MLRB meeting, DRMS and the Settling Defendants will present their positions to the MLRB. If the MLRB disagrees with DRMS, the matter will be considered resolved in favor of Settling Defendants. If the MLRB agrees with DRMS, the decision of the MLRB shall be binding on the

Settling Defendants unless, within 21 days of Settling Defendants' receipt of the MLRB's written decision, the Settling Defendants file with the Court and serve on the parties to the dispute a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The DRMS and MLRB may file a response to Settling Defendants' motion within 21 days after service of the motion, and Settling Defendants may file a reply to any response within 14 days after service of the response. The invocation of formal dispute resolution procedures under this Paragraph shall not extend, postpone or affect in any way any obligation of the Settling Defendants under this Consent Decree, not directly in dispute, unless DRMS, the MLRB or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 111. Notwithstanding the stay of payment, any applicable stipulated penalties shall accrue as provided in Section XXVI below. In the event that the Settling Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XXVI (Stipulated Penalties).

XXVI. STIPULATED PENALTIES

101. Settling Defendants shall be liable for stipulated penalties associated with the California Gulch Superfund Site in the amounts set forth in Paragraphs 102 through 105 below (in 2007 Dollars) to the United States and the State, to be divided equally between EPA and CDPHE, for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XXIV (Force Majeure).

102. The following Tier I stipulated penalties shall be payable per violation per day for any noncompliance identified in Paragraph 102(b):

a. Tier I Amounts

Penalty Per Violation Per Day	Period of Noncompliance
$2,000	1st through 15th day
$7,500	16th through 30th day
$15,000	31st day and beyond

b. Tier I Violations

i. Failure to meet effluent limitations in Table 1 of the OU 1 Work Plan;

ii. Failure to pay response costs as described in Section XXI (Payments for Response Costs);

iii. Failure to pay Natural Resource Damages as described in Section XXII (Payments for Natural Resource Damages);

iv. Failure to perform work as provided in Section X (Remedy Review) after 45 days notice from EPA of such failure;

v. Failure to provide access to the United States, the State, or their authorized representatives to property owned or controlled by a Settling Defendant within the California Gulch Superfund Site as provided in Section XII (Access and Institutional Control); and

vi. Failure to establish and maintain the Performance Guarantee as required in Sections XVI (Performance Guarantee for Work at OU1), provided that any such penalty shall not be payable if the Plaintiffs call in the Performance Guarantee for OU1.

103. The following Tier II stipulated penalties shall be payable per violation per day for any noncompliance identified in Paragraph 103(b):

a. Tier II Amounts

Penalty Per Violation Per Day	Period of Noncompliance
$750	1st through 15th day
$2,000	16th through 30th day
$7,000	31st day and beyond

b. Tier II Violations

i. Failure to execute and record approved Environmental Covenants within the timeframes set out in Section XII;

ii. Failure to submit timely or adequate deliverables as specified in the OU1 Work Plan, the O&M Plan for OUs 4, 8, and 10, and any other work plan approved pursuant to this Consent Decree;

iii. Failure to follow the approved Standard Operating Procedures (SOP) in sampling or reporting sampling data to the extent required in the OU1 Work Plan;

iv. Failure to maintain insurance or worker's compensation coverage as provided in Section XXIII (Indemnification and Insurance); and

v. Failure to establish and maintain the Performance Guarantee as required in Section XVII (Performance Guarantee for Work at OUs 4, 8, and 10), provided that any such penalty shall not be payable if the Plaintiffs call in the Performance Guarantee for the subject OU.

104. In the event that EPA assumes performance of a portion or all of the Work in OU1 pursuant to Paragraph 122 (Work Takeover), Settling Defendants shall be liable for, in addition to the Future Oversight Costs referenced in Paragraph 122 and in lieu of any penalty under Paragraphs 102 and 103, a stipulated penalty as follows:

a. For each day the EPA performs the Work in OU1 pursuant to Paragraph 122, an amount equal to $10,000 (in 2007 dollars) until the earlier of (i) 180 days or (ii) such time that Settling Defendants resume performance of the Work;

b. If Settling Defendants have not resumed performance of the Work within 180 days after EPA assumed performance of the Work, Settling Defendants shall pay a lump sum amount equal to 25% of the most current OU1 Performance Guarantee amount established pursuant to Section XVI (Performance Guarantee for Work at OU1), less the amount that Settling Defendants have already paid pursuant to Paragraph 104(a).

105. In the event that EPA assumes performance of a portion or all of the Work in OUs 4, 8, and 10 pursuant to Paragraph 122 (Work Takeover), Settling Defendants shall be liable for, in addition to the Future Oversight Costs referenced in Paragraph 122 and in lieu of any penalty under Paragraphs 102 and 103, a stipulated penalty as follows:

a. For each day the EPA performs the Work in OUs 4, 8, and 10 pursuant to Paragraph 122 (Work Takeover), an amount equal to $500 (in 2007 dollars) until the earlier of (i) 180 days or (ii) such time that Settling Defendants resume performance of the Work;

b. If Settling Defendants have not resumed performance of the Work within 180 days after EPA assumed performance of the Work, Settling Defendants shall pay a lump sum amount equal to 25% of the most current amount of the Performance Guarantee for OUs 4, 8, and 10 established pursuant to Section XVII (Performance Guarantee for Work at OUs 4, 8, and 10), less the amount that Settling Defendants have already paid pursuant to Paragraph 105(a).

106. Settling Defendants shall be liable for stipulated penalties to the State associated with the Black Cloud Mine in the amounts set forth in this Paragraph, for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XXIV (Force Majeure).

a. The following Tier I stipulated penalties shall be payable to the State per violation per day for any noncompliance identified in Paragraph 106(a)(ii):

i. Tier I Amounts

Penalty Per Violation Per Day	Period of Noncompliance
$500	1st through 15th day
$1,000	16th through 30th day
$2,000	31st day and beyond

ii. Tier I Violations

a. Failure to provide access to DRMS or their authorized representatives to property owned or controlled by a Settling Defendant within the Black Cloud Mine as provided in Section XII (Access and Institutional Controls);

b. Failure to establish and maintain the Performance Guarantee as required in Section XVIII (Performance Guarantee for Reclamation of Black Cloud Mine); and

c. Failure to complete reclamation Work within the deadlines provided in Section 6.1 of the Reclamation Plan and Schedule.

b. The following Tier II stipulated penalties shall be payable to DRMS per violation per day for any noncompliance identified in Paragraph 106(b)(ii):

i. Tier II Amounts

Penalty Per Violation Per Day	Period of Noncompliance
$100	1st through 15th day
$500	16th through 30th day
$1,000	31st day and beyond

ii. Tier II Violations

a. Failure to submit a timely or complete annual report as required by the Reclamation Plan and Schedule;

b. Failure to collect required ground water monitoring samples and submit those samples for laboratory analysis as provided in the Reclamation Plan and Schedule; and

c. If, during the implementation of the Reclamation Plan and Schedule and as part of the Work associated with reclaiming the Black Cloud Mine, the Settling Defendants cause disturbance to areas outside the Black Cloud Mine that is not authorized by the Reclamation Plan and Schedule, Tier II penalties shall be payable for the following:

(i) Failure to stabilize the disturbance by (a) November 15 of the calendar year in which the disturbance occurred, or such other date agreed to by DRMS and Settling Defendants, if the disturbance occurred between June 1 and November 1; or (b) the date agreed to by the DRMS and Settling Defendants if the disturbance occurred between November 2 and May 31; and

(ii) Failure to reclaim the disturbance as required by DRMS prior to DRMS and MLRB's release of the Black Cloud Mine Performance Guarantee.

c. Any stipulated penalties that accrue under Subparagraph 106(a)(ii)(c) shall be capped at 30 days, provided that Settling Defendants submit to DRMS, by December 15 of the calendar year in which the violation occurs, a proposed modification to the reclamation schedule set forth in the Reclamation Plan and Schedule, which modification provides for completion of the overdue reclamation Work. If Settling Defendants fail to submit such a proposed modification within such period, the stipulated penalties that accrue under Subparagraph 106 (a)(ii)(c) shall be capped at 90 days. In any event, if the Settling Defendants cure the violation prior to either the end of the 30 day or 90 day cap period, as applicable, stipulated penalties under Subparagraph 106(a)(ii)(c) shall be payable only for the number of days that the violation occurred.

107. Subject to Paragraph 108 below, all penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (1) with respect to a deficient submission under Section XIV (EPA Approval of Plans and Other Submissions), during the period, if any, beginning on the day after EPA's receipt of such submission until the date that EPA notifies Settling Defendant of any deficiency; (2) with respect to a decision by the Assistant Regional Administrator for the Office of Ecosystems Protection and Remediation, EPA Region 8, under Paragraph 98(b) or 99(a) of Section XXV (Dispute Resolution), during the period, if any, beginning on the day after the date that Settling Defendant's reply to EPA's Statement of Position is received until the date that the Assistant Regional Administrator issues a final decision regarding such dispute; or (3) with respect to judicial review by this Court of any dispute under Section XXV (Dispute Resolution), during the period, if any, beginning on the day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

108. Following EPA's determination, or the State's determination with respect to the Black Cloud Mine, that Settling Defendants have failed to comply with a requirement of this Consent Decree, EPA or the State, as applicable, will give Settling Defendants written notification of the same and describe the noncompliance. EPA and the State may send the Settling Defendants a written demand for the payment of penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA or the State has notified the Settling Defendants of a violation, provided however, that if Settling Defendants did not have actual knowledge of a violation and could not have reasonably known of such violation until being notified that a violation occurred by EPA or the State, then stipulated penalties shall not accrue until Settling Defendants receives such notice.

109. All penalties accruing under this Section shall be due and payable to the United States and the State within 30 days of the Settling Defendants' receipt from EPA of a demand for payment of the penalties, unless Settling Defendants invoke the Dispute Resolution procedures under Section XXV (Dispute Resolution).

a. Settling Defendants shall make all payments to the United States required by this Paragraph by a certified check(s) or wire transfer payment made payable to "EPA Hazardous Substance Superfund," referencing the name and address of Settling Defendants, EPA Site/Spill ID number 08-29 and DOJ Case Number 90-11-183, and indicating the payment is for stipulated penalties.

For certified check, payment must be received by 11:00 AM Eastern Time for same day credit and should be forwarded to one of the following addresses:

REGULAR MAIL
US Environmental Protection Agency
Superfund Payments
Cincinnati Finance Center
P.O. Box 979076
St. Louis, MO 63197-9000

EXPRESS MAIL
U.S. Bank
1005 Convention Plaza
Mail Station SL-MO-C2GL
St. Louis, MO 63101
Contact: Natalie Pearson
314-418-4087

or to such other address as EPA may designate in writing.

Wire transfers should be directed to the Federal Reserve Bank of New York:

Federal Reserve Bank of New York
ABA: 021030004
Account: 68010727
SWIFT address: FRNYUS33
33 Liberty Street
New York, NY 10045

Field Tag 4200 of the Fedwire message should read " D 68010727 Environmental Protection Agency "

b. At the time of payment, notice that payment has been made, copies of check payment(s) paid pursuant to this Section, and any accompanying transmittal letter(s), shall be sent to the United States and EPA as provided in XXXIII (Notices and Submissions).

c. All payments to the State under Paragraphs 102 through 105 should be made by certified or cashier's check or checks made payable to "Treasurer, State of Colorado," referencing the name and address of the party making the payment for the California Gulch Superfund Site, stipulated penalties. Settling Defendants shall send the check(s) to Mr. Joe E. Montoya, Office of the Attorney General, Natural Resources & Environment Section, 1525 Sherman Street, 7th Floor, Denver, Colorado 80203. All payments to the State regarding the Black Cloud Mine under Paragraph 106 shall be made payable to the State of Colorado, Mined Land Reclamation Board and shall be paid by certified or cashier's check.

110. The payment of penalties shall not alter in any way Settling Defendants' obligation to complete the performance of the Work required under this Consent Decree.

111. Except as provided in Paragraphs 107 and 108, Penalties shall continue to accrue as provided in Paragraph 107 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA or the MLRB that is not appealed to this Court, accrued penalties determined to be owed shall be paid to EPA and the State, as applicable, within 15 days of the agreement or the end of the appeal period;

b. If the dispute is appealed to this Court and the United States or the State prevails in whole or in part, Settling Defendants shall pay all accrued penalties determined by the Court to be owed to EPA and the State within 60 days of receipt of the Court's decision or order, except as provided in Subparagraph c below;

c. If the District Court's decision is appealed by any Party, Settling Defendant shall pay all accrued penalties determined by the District Court to be owed to the United States and the State into an interest-bearing escrow account within 60 days of receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days of receipt of the final appellate court decision, the escrow

agent shall pay the balance of the account to EPA and the State, as applicable, or to Settling Defendant to the extent that it prevails.

112. If Settling Defendants fail to pay stipulated penalties when due, the United States or the State may institute proceedings to collect the penalties, as well as interest. Settling Defendants shall pay Interest on the unpaid balance, which shall begin to accrue on the date of demand made pursuant to Paragraph 109.

113. Except as otherwise provided in this Paragraph, nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States or the State to seek any other remedies or sanctions available by virtue of Settling Defendant's violation of this Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA; provided, however, that (i) the United States or the State shall not seek civil penalties pursuant to Section 122(l) of CERCLA for any violation for which a stipulated penalty is provided herein, except in the case of a willful violation of the Consent Decree, and (ii) the amount of any other penalties required to be paid shall be offset by the amount of Stipulated Penalties paid by Settling Defendants. DRMS and MLRB may not seek penalties for any violation of the requirements of this Consent Decree relating to the Black Cloud Mine, including the requirements under the Reclamation Plan and Schedule, except for the stipulated penalties provided in Paragraph 106.

114. Notwithstanding any other provision of this Section, the United States and the State may, in their unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXVII. COVENANTS NOT TO SUE BY PLAINTIFFS

115. United States' Covenant Not To Sue For Response Costs Or Response Actions.

a. In consideration of the actions that will be performed and the payments that will be made by Settling Defendants under the terms of this Consent Decree, and except as specifically provided in Paragraphs 116 and 121 of this Section, the United States covenants not to sue or to take administrative action against Settling Defendants pursuant to (i) Sections 106, 107(a), or 113(f) of CERCLA, 42 U.S.C. §§ 9606, 9607(a), or 9613(f), and (ii) Section 7003 of RCRA, 42 U.S.C. § 6973, for response costs or response actions relating to the Site.

b. This covenant not to sue shall take effect upon the receipt by EPA of the payments required by Paragraphs 76 (Payment of United States' Past Response Costs), 78 (Cash Out Payment for OU12 and Additional Source Control at OUs 4, 8 & 10), 79 (Cash Out Payment for OU11) and 85 (Payment to the United States for Natural Resource Damages), and are conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. This covenant not to sue extends only to Settling Defendants and does not extend to any other person.

116. United States' Reservations of Liability for OU1 and Black Cloud Mine Based On Unknown Conditions or New Information. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to

institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants:

a. to perform further response actions relating to OU1 or the Black Cloud Mine, or

b. to reimburse the United States for additional costs of response incurred in connection with OU1 or the Black Cloud Mine

if:

i) conditions at OU1 or the Black Cloud Mine, previously unknown to EPA, are discovered, or

ii) information, previously unknown to EPA, is received, in whole or in part,

and EPA determines that these previously unknown conditions or this information together with any other relevant information indicates that the Remedial Action at OU1 or the reclamation at the Black Cloud Mine is not protective of human health or the environment.

117. For purposes of Paragraph 116, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date of lodging this Consent Decree with the Court as set forth in the OU1 ROD, the administrative record supporting the OU1 ROD and the post-ROD administrative record, and all other documents or data in the possession of EPA or the State prior to the date of lodging.

118. State's Covenants Not to Sue.

a. In consideration of the actions that will be performed and the payments that will be made by the Settling Defendants under the terms of the Consent Decree, and except as specifically provided below in Paragraphs 119 and 121 of this Section, the State covenants not to sue or to take administrative action against Settling Defendants pursuant to (i) Sections 106, 107(a), or 113(f) of CERCLA, 42 U.S.C. §§ 9606, 9607(a), or 9613(f); (ii) Section 7003 of RCRA, 42 U.S.C. § 6973; (iii) the State's authority under the Clean Water Act; (iv) Title 25, article 8, part 6 of the Colorado Revised Statute; and (v) the common law, for violations, response costs or response actions relating to the Site.

b. The covenants provided under Paragraphs 118(a)(iii) and 118(a)(iv) do not apply to any claims relating to any activities that Settling Defendants undertake at the Site after the Effective Date. In any action brought by the State against Settling Defendants under the authorities referenced in Paragraphs 118(a)(iii) and 118(a)(iv), Settling Defendants shall bear the burden of proving that any new discharges or changes in the water quality of discharges at the Site are not related to activities undertaken by Settling Defendants after the Effective Date.

c. The covenants provided under Paragraphs 118(a)(iii) and 118(a)(iv) do not apply to the Black Cloud Mine. Discharges of pollutants from the Black Cloud Mine to Iowa Gulch, if any, are subject to regulation under the Clean Water Act (e.g. Colorado Discharge

Permit No. CO-0000591). The State reserves all of its water quality authorities with respect to any changed conditions, new information, new activities, or new standards relating to any such discharges after the date of lodging this Consent Decree with the Court.

d. In consideration of full and satisfactory performance of the Black Cloud Mine Reclamation Plan and Schedule or satisfaction of the Reclamation Cap by the Settling Defendants under the terms of this Consent Decree, and except as specifically provided in this Paragraph and Paragraph 121 (General Reservations of Rights), DRMS and the MLRB covenant not to sue or to take judicial or administrative action against the Settling Defendants pursuant to their authority under the MLRA in regard to reclamation of the Black Cloud Mine. DRMS and MLRB agree that enforcement of Settling Defendants' reclamation obligations at the Black Cloud Mine shall be pursuant to the terms of this Consent Decree. This covenant does not include any liability for violation of any state or federal law during or after implementation of the Reclamation Plan and Schedule by Settling Defendants.

e. These covenants not to sue shall take effect upon the receipt by the State of the payments required by Paragraphs 77 (Payment of State's Past Response Costs) and 86 (Payment to the State for Natural Resource Damages), and are conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. These covenants not to sue extend only to Settling Defendants and do not extend to any other person.

119. States' Reservations for OU1. Notwithstanding any other provision of this Consent Decree, the State reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action seeking to compel Settling Defendants:

a. to perform further response actions relating to OU1, or

b. to reimburse the State for additional costs of response incurred in connection with OU1

if:

i) conditions at OU1, previously unknown to the State, are discovered, or

ii) information, previously unknown to the State, is received, in whole or in part,

and the State determines that these previously unknown conditions or this information together with any other relevant information indicates that the Remedial Action at OU1 is not protective of human health or the environment.

120. For purposes of Paragraph 119, the information and the conditions known to the State shall include only that information and those conditions known to the State as of the date of lodging this Consent Decree with the Court as set forth in the OU1 ROD, the administrative record supporting the OU1 ROD and the post-ROD administrative record, and all other documents or data in the possession of the State or EPA prior to the date of lodging.

121. General Reservations of Rights of the United States and the State. The United States and the State reserve, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all matters not expressly included within Plaintiffs' covenant not to sue. Notwithstanding any other provision of this Consent Decree, the United States and the State reserve all rights against Settling Defendants with respect to:

a. claims based on a failure by Settling Defendants to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site;

c. liability based upon the Settling Defendants' future operations at the Site or upon Settling Defendants' transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the Consent Decree or other documents governing Settling Defendants' response actions and reclamation at the Site or as otherwise ordered by EPA or the State, after the Effective Date;

d. criminal liability; and

e. liability for violations of federal or state law which occur during or after implementation of Settling Defendants' response actions or reclamation activities, except as otherwise expressly provided in the United States' and the State's covenants not to sue.

122. Work Takeover.

a. In the event EPA determines that Settling Defendants (i) have ceased implementation of any portion of the Work at the California Gulch Superfund Site, (ii) are seriously or repeatedly deficient or late in their performance of the Work at the California Gulch Superfund Site, or (iii) are implementing the Work at the California Gulch Superfund Site in a manner which may cause an endangerment to human health or the environment, EPA may assume the performance of all or any portions of that Work as EPA determines necessary. Settling Defendants may invoke the procedures set forth in Section XXV (Dispute Resolution), Paragraph 98, to dispute EPA's determination that takeover of the Work is warranted under this Paragraph. Costs incurred by the United States in performing the Work pursuant to this Paragraph shall be considered Future Oversight Costs that Settling Defendants shall pay pursuant to Section XXI (Payments for Response Costs), only to the extent such costs are not covered by any performance guarantee that EPA or the State calls in.

b. After commencement and for the duration of any Work Takeover, EPA shall have immediate access to and benefit of any performance guarantee provided pursuant to this Consent Decree.

123. Notwithstanding any other provision of this Consent Decree, the United States retains all authority and reserves all rights to take any and all response actions authorized by law.

XXVIII. COVENANTS NOT TO SUE BY PLAINTIFFS FOR NATURAL RESOURCE DAMAGES

124. Except as specifically provided in Paragraphs 125 and 126, Plaintiffs covenant not to sue or to take civil or administrative action against Settling Defendants under Section 107 of CERCLA, 42 U.S.C. § 9607, Section 311(f) of the Federal Water Pollution Control Act ("Clean Water Act"), 33 U.S.C. § 1321(f), or other federal, State or common law for Natural Resource Damages occurring in the Site resulting from the release of hazardous substances at or from the Site. This covenant not to sue shall take effect on the Effective Date and is conditioned on the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. This covenant not to sue extends only to Settling Defendants and does not extend to any other person.

125. Plaintiffs' Reservations of Rights. Notwithstanding any other provision of this Consent Decree, Plaintiffs reserve the right to institute proceedings against Settling Defendants in this action or in a new action for recovery of Natural Resource Damages with respect to (a) Iowa Gulch between the Black Cloud Mine and its confluence with the Arkansas River and (b) the Pueblo Reservoir. Any claim under Paragraph 125(a) may be brought only where it is (i) based on injury to, destruction of, or loss of natural resources resulting from conditions that were unknown to the Plaintiffs as of the date of lodging of this Consent Decree or that materially change after the date of lodging of this Consent Decree ("Unknown or Changed Conditions") or (ii) based on information received by Plaintiffs after the date of lodging of this Consent Decree that indicates that there is injury to, destruction of, or loss of Natural Resources of a type unknown to Plaintiffs as of the date of lodging of this Consent Decree ("New Information"). No condition shall be deemed an "Unknown Condition" if the condition is identified in, or could be reasonably determined from, documents and data in the possession of CDPHE, the Colorado Department of Natural Resources, DOI, or EPA on or before the date of lodging of this Consent Decree, including any information developed by one or more of the Plaintiffs based thereon. No information shall be "New Information" if the information is contained in, or could be reasonably determined from, documents and data in the possession of CDPHE, Colorado Department of Natural Resources, DOI or EPA on or before the date of lodging of this Consent Decree, including any information developed by one or more of the Plaintiffs based thereon. "Unknown or Changed Conditions" or "New Information" shall not include or pertain to a change only in Plaintiffs' quantification of Natural Resource Damages resulting from past and/or continuing releases of hazardous substances at and/or from the Site. Any claim under Paragraph 125(b) may be brought only in the event the Pueblo Reservoir ceases to be operated as a reservoir and human or other biological receptors are exposed to sediments within the Pueblo Reservoir attributable to the Site in a manner that creates health or environmental risks.

126. Notwithstanding any other provision of this Consent Decree, the covenant not to sue in Paragraph 124 shall apply only to matters addressed in that Paragraph and specifically shall not apply to the following claims:

a. claims for recovery of Natural Resource Damages in any area outside of the Site;

b. claims based on a failure by Settling Defendants to satisfy any requirement imposed upon them by this Consent Decree;

c. claims for criminal liability;

d. claims arising from any active disposal of hazardous substances at or from the Site after the date of lodging of this Consent Decree other than as explicitly authorized pursuant to any EPA approved work plan, or otherwise explicitly directed or approved by EPA; and

e. claims arising from the disposal of hazardous substances at any place that does not fall within the definition of the Site.

XXIX. COVENANTS BY SETTLING DEFENDANTS

127. Covenant Not to Sue. Subject to the reservations in Paragraph 128, Settling Defendants hereby covenant not to sue and agree not to assert any claims or causes of action against the United States or the State with respect to the Site, the Reclamation Plan and Schedule, Past Response Costs and Future Oversight Costs and Natural Resource Damages as defined herein or this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112, 113, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, 9613, or any other provision of law;

b. any claims against the United States or the State, including any department, agency or instrumentality of the United States or the State under CERCLA Sections 107 or 113, 42 U.S.C. §§ 9607 or 9613, related to the Site;

c. any claims arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the Colorado Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law; or

d. any direct or indirect claim for disbursement from the California Gulch Superfund Special Account, except as provided in Paragraph 135 (Waiver of Claim Splitting Defenses), these covenants not to sue shall not apply in the event that the United States or the State brings a cause of action or issues an order pursuant to the reservations set forth in Paragraphs 116, 119 or 121(b) – (d), but only to the extent that Settling Defendants' claims arise from the same response action, response costs, or damages that the United States or the State is seeking pursuant to the applicable reservation.

128. The Settling Defendants reserve, and this Consent Decree is without prejudice to, claims against the Plaintiffs, subject to the provisions of Chapter 171 of Title 28 of the United States Code, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States or State while acting within the scope of his office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, any such claim shall not include a claim for any damages caused in whole by the act or omission of any person, including any contractor, who is

not a federal employee as that term is defined in 28 U.S.C. § 2671 or a State employee; nor shall any such claim include a claim based on EPA's selection of response actions, or the oversight or approval of the Settling Defendant's plans or activities. The foregoing applies only to claims which are brought pursuant to any statute other than CERCLA and for which the waiver of sovereign immunity is found in a statute other than CERCLA.

129. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. §300.700(d).

XXX. EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION

130. This Consent Decree supersedes and replaces the 1994 Decree and all prior EPA and State orders or other directives to Settling Defendants or the Res-Asarco Joint Venture with respect to the Site.

131. Except as encompassed by the definition of "Settling Defendants", nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. The preceding sentence shall not be construed to waive or nullify any rights that any person not a signatory to this decree may have under applicable law. Each of the Parties expressly reserves any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

132. The Parties agree, and by entering this Consent Decree this Court finds, that the Settling Defendants are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by CERCLA Section 113(f)(2), 42 U.S.C. § 9613(f)(2) for matters addressed in this Consent Decree. For purposes of this Consent Decree, "matters addressed in this Consent Decree" are defined as all response actions taken or to be taken and all response costs incurred or to be incurred by the United States or any other person, with respect to the Site, as well as natural resource damages resulting from releases of hazardous substances at or from the Site. The "matters addressed" in this settlement do not include those damages, response costs or response actions as to which the United States or the State has reserved its rights under this Consent Decree (except for claims for failure to comply with this Decree), in the event that the United States or the State asserts rights against Settling Defendants coming within the scope of such reservations.

133. The Settling Defendants agree that with respect to any suit or claim for contribution brought by them for matters related to this Consent Decree they will notify in writing the United States and the State no later than 60 days prior to the initiation of such suit or claim.

134. The Settling Defendants also agree that with respect to any suit or claim for contribution brought against them for matters related to this Consent Decree they will notify in writing the United States and the State within 15 days of service of the complaint on them. In addition, Settling Defendants shall notify the United States and the State within 15 days of

service or receipt of any Motion for Summary Judgment and within 15 days of receipt of any order from a court setting a case for trial.

135. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claimsplitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXVII (Covenants Not to Sue by Plaintiffs).

XXXI. ACCESS TO INFORMATION

136. Settling Defendants shall provide to EPA and the State, upon request, copies of all documents and information within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Settling Defendants shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

137. Business Confidential and Privileged Documents

a. Settling Defendants may assert business confidentiality claims covering part or all of the documents or information submitted to Plaintiffs under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA, or if EPA has notified Settling Defendants that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such documents or information without further notice to Settling Defendants.

b. With respect to documents and information submitted to the State, Settling Defendants may assert confidentiality claims covering part or all of those documents or information submitted to Plaintiffs under this Consent Decree to the extent permitted by and in accordance with the Colorado Open Records Act at Colorado Revised Statutes, 24-72-201, *et seq.* Documents or information determined by the State to be confidential will be afforded the protection specified in such Act. If no claim of confidentiality accompanies documents or information when they are submitted to the State, or if the State has notified Settling Defendants that the documents or information are not confidential, the public may be given access to such documents or information without further notice to Settling Defendants.

c. Settling Defendants may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege in lieu of providing documents, they shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the contents of the document, record, or information; and (6) the privilege asserted by Settling Defendants. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

138. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXXII. RETENTION OF RECORDS

139. Until 10 years after the Settling Defendants' receipt of EPA's notification pursuant to Paragraph 73(b) and, for records and documents relating to the Black Cloud Mine, until 10 years after receipt of MLRB's notice of the release of the Performance Guarantee for reclamation of the Black Cloud Mine each Settling Defendant shall preserve and retain all non-identical copies of records and documents (including records or documents in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Site; provided, however, that Settling Defendants must retain, in addition, all documents and records that relate to the liability of any other person under CERCLA with respect to the Site. Each Settling Defendant must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any documents or records (including documents or records in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work, provided, however, that each Settling Defendant (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned documents required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

140. At the conclusion of this document retention period, Settling Defendants shall notify the United States and the State at least 90 days prior to the destruction of any such records or documents, and, upon request by the United States or the State delivered within 90 days after receipt of such notice, Settling Defendants shall deliver any such records or documents to EPA or the State. Settling Defendants may assert that certain documents, records and other information are privileged under the attorney client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege, they shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by Settling

Defendants. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

141. Each Settling Defendant hereby certifies that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA requests for information pursuant to Section 104(e) and 122(e) of CERCLA, 42 U.S.C. 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. 6927.

XXXIII. NOTICES AND SUBMISSIONS

142. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State, and the Settling Defendants, respectively.

As to the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DJ # 90-11-3-138

And

Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
United States Environmental Protection Agency
Region 8
(8EPR)
1595 Wynkoop Street
Denver, CO 80202-1129

As to EPA:

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

With copies to:

EPA Enforcement Specialist
California Gulch Superfund Site
United States Environmental Protection Agency, Region 8
(8ENF-RC)
1595 Wynkoop St.
Denver, CO 80202-1129

And

EPA Site Attorney
California Gulch Superfund Site
United States Environmental Protection Agency, Region 8
(8ENF-L)
1595 Wynkoop Street
Denver, CO 80202-1129

Notice Regarding Financial Assurance:

Financial Analyst
California Gulch Superfund Site
United States Environmental Protection Agency, Region 8
(8ENF-RC)
1595 Wynkoop St.
Denver, CO 80202-1129

Notice Regarding Payments:

Regional Financial Management Officer
Martha Walker, FMO
Financial Management Program
U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

As to the State:

For CERCLA matters:

State Project Manager
California Gulch Superfund Site
Colorado Department of Public Health and the Environment
Hazardous Materials & Waste Management Division
4300 Cherry Creek Drive South
Denver, CO 8022-1530

Counsel of Record
California Gulch Superfund Site
Office of the Attorney General
Natural Resource and Environment Section
1525 Sherman Street, 5th Floor
Denver, CO 80203

For Black Cloud Mine Reclamation:

DRMS Project Coordinator
Division of Reclamation, Mining and Safety
1313 Sherman St., Room 215
Denver, CO 80203

Administrator for MLRB
1313 Sherman St., Room 215
Denver, CO 80203

As to Settling Defendants:

Law Department
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

And

Director of Reclamation and Closure
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

XXXIV. EFFECTIVE DATE

143. The effective date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court, except as otherwise provided herein.

XXXV. RETENTION OF JURISDICTION

144. This Court retains jurisdiction over both the subject matter of this Consent Decree and the Settling Defendants for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XXV (Dispute Resolution) hereof.

XXXVI. APPENDICES

145. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is the OU1 Work Plan.

"Appendix B" is the definition of OUs 4, 8, and 10.

"Appendix C" is a map of the California Gulch Superfund Site and the OUs.

"Appendix D" is the O&M Plan for OUs 4, 8, and 10

"Appendix E" is Black Cloud Mine Reclamation Plan and Schedule

"Appendix F" is a description of the zones and prescriptions for Environmental Covenants.

"Appendix G" are the draft Environmental Covenants referenced in Paragraph 37.

"Appendix H" describes the model that has been and will be used for calculating and updating the amount of the Performance Guarantee for OU1.

"Appendix I" is the form Access Agreement for granting DRMS access to borrow sites for reclamation of the Black Cloud Mine

XXXVII. COMMUNITY RELATIONS

146. Settling Defendants shall cooperate with EPA and the State in providing information regarding the Work to the Public. As requested by EPA or the State, Settling Defendants shall participate in preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA or the State to explain activities at or relating to the Site.

XXXVIII. MODIFICATION

147. Schedules and work plans specified in this Consent Decree for completion of the Work at the California Gulch Superfund Site may be modified by agreement of EPA and Settling Defendants. All such modifications shall be made in writing. The Black Cloud Mine Reclamation Plan and Schedule may be modified by agreement of MLRB, DRMS and Settling Defendants as provided in this Consent Decree.

148. Except as provided in Paragraph 13 (Modification of the OU1 Work Plan), Paragraph 17 (Modification of the O&M Plans for OUs 4, 8, and 10) and the OU1 Contingency Plan, no material modifications shall be made to any work plan governing Work at the California Gulch Superfund Site without written notification to and written approval of the United States, Settling Defendants, and the Court, if such modifications fundamentally alter the basic features of the selected remedy within the meaning of 40 C.F.R. 300.435(c)(2). Prior to providing its approval to any modification, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification. Modifications to any work plan that do not materially alter that document, or material modifications to any work plan that do not fundamentally alter the basic features of the selected remedy within the meaning of 40 C.F.R.300.435(c)(2), may be made by written agreement between EPA, after providing the State with a reasonable opportunity to review and comment on the proposed modification, and the Settling Defendants.

149. Nothing in this Decree shall be deemed to alter the Court's power to enforce, supervise or approve modifications to this Consent Decree.

XXXIX. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

150. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States and the State reserve the right to withdraw or withhold their consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

151. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XL. SIGNATORIES/SERVICE

152. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis.

153. Each undersigned representative of a Settling Defendant to this Consent Decree, each undersigned representative of the State, and the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice certifies that he or she

is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

154. Each Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States or the State has notified the Settling Defendants in writing that it no longer supports entry of the Consent Decree.

155. Each Settling Defendant shall identify, on the attached signature page, the name, address and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants hereby agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. The parties agree that Settling Defendants need not file an answer to the complaint in this action unless or until the court expressly declines to enter this Consent Decree.

XLI. FINAL JUDGMENT

156. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the parties with respect to the settlement embodied in the Consent Decree. The parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Consent Decree.

157. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States, the State and Settling Defendants. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS ____ DAY OF _____, 2008.

_____
United States District Judge

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR THE UNITED STATES OF AMERICA:

U.S. DEPARTMENT OF JUSTICE

RONALD J. TENPAS
Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

26 JUNE 2008
Date

JEREL ("JERRY") L. ELLINGTON
MARK C. ELMER
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
1961 Stout Street, 8th Floor
Denver, CO 80294

6/26/2008
Date

UNITED STATES ATTORNEY'S OFFICE
FOR THE DISTRICT OF COLORADO

TROY A. EID
United States Attorney

Stephen D. Taylor
Assistant United States Attorney
District of Colorado
U.S. Department of Justice
1225 Seventeenth Street, Suite 700
Denver, CO 80202

6/24/08
Date

U.S. ENVIRONMENTAL PROTECTION AGENCY

By: _____ 6/18/08
BILL MURRAY, Director — Date
Superfund Remedial Response Program
Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region 8

By: _____ 6/24/08
MATTHEW D. COHN, Legal Supervisor — Date
Legal Enforcement Program
U.S. Environmental Protection Agency, Region 8

By: _____ 6/24/08
SHARON L. KERCHER, Director — Date
Technical Enforcement Program
U.S. Environmental Protection Agency, Region 8

Page 74
Intentionally Omitted

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR THE STATE OF COLORADO

John W. Suthers — 6/24/08

JOHN W. SUTHERS
Attorney General as State Natural Resource Trustee — Date

Victoria L. Peters — 6/23/08

VICTORIA L. PETERS, Counsel of Record
Senior Assistant Attorney General
Hazardous and Solid Waste/CERCLA Litigation Unit
Natural Resources and Environment Section
1525 Sherman Street, 7th Floor
Denver, CO 80203 — Date

JAMES B. MARTIN
Executive Director
Colorado Department of Public Health & Environment,
and State Natural Resource Trustee — Date

RONALD W. CATTANY
Director, Division of Reclamation, Mining and Safety,
And State Natural Resource Trustee — Date

Chair of the MLRB — Date

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR THE STATE OF COLORADO

JOHN W. SUTHERS
Attorney General as State Natural Resource Trustee

Date

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6/23/08
Date

RONALD W. CATTANY
Director, Division of Reclamation, Mining and Safety,
And State Natural Resource Trustee

Date

Chair of the MLRB

Date

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR THE STATE OF COLORADO

JOHN W. SUTHERS
Attorney General as State Natural Resource Trustee

Date

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Date

/Ronald W. Cattany

RONALD W. CATTANY
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And State Natural Resource Trustee

June 24, 2008
Date

Chair of the MLRB

06-24-2008
Date

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR NEWMONT USA LIMITED:

June 26, 2008

BRITT D. BANKS
Chairman of the Board

Date

Agent Authorized to Accept Service on Behalf of Above-signed Party:

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THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. Asarco Inc., *et al.*, relating to the California Gulch Superfund Site.

FOR RESURRECTION MINING COMPANY:

DAVID A. BAKER
President

June 26, 2008
Date

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APPENDIX A
TO CONSENT DECREE

Work Plan for Operable Unit 1
California Gulch Superfund Site
Leadville, Colorado
May 2008

Project No. 180885/37

May 2008

TABLE OF CONTENTS

LIST OF ACRONYMS 1

1.0 PURPOSE 3

2.0 HISTORY 4

3.0 DEFINITIONS 6

4.0 REMEDIAL ACTION COMPONENTS 9

4.1 Influent Raw Water Sources and Support Systems 9

4.1.1 Yak Tunnel Bulkhead 9

4.1.1.1 Bulkhead Water Quantity and Quality 11

4.1.2 Conveyance of Yak Tunnel Water 11

4.1.3 Surge Pond 13

4.1.3.1 Surge Pond Water Quantity and Quality 15

4.1.4 Hillside Spring 16

4.1.4.1 Hillside Spring Water Quantity 16

4.1.5 Yak Tunnel Blockage Pumping System 16

4.1.5.1 Blockage Pump Water Quantity and Quality 17

4.1.6 Oregon Gulch Seep Water 17

4.1.6.1 Oregon Gulch Water Quantity and Quality 17

4.1.7 Potable Water Supply 18

4.1.8 Fire-Protection Pumping Equipment 18

4.2 Influent Pre-Treatment System 18

4.3 Primary Treatment Process 18

4.3.1 Neutralization and Alkalization Tanks 18

4.3.2 Flocculation Tank 20

4.4 Effluent System 20

4.4.1 Thickeners 20

4.4.2 Sludge Dewatering 20

4.4.3 Filtrate Effluent Filtration 21

4.4.4 Filtrate Effluent pH Adjustment 21

4.4.5 Effluent Discharge 21

4.5 Sludge Disposal and Repository 22

4.6 Potential Expansion of or Addition to Existing Treatment Facilities 22

5.0 SAMPLING AND ANALYSIS PLAN/QUALITY ASSURANCE PROJECT PLAN 24

5.1 Water Treatment Plant 24

5.1.1 WTP Effluent Discharge Point, Sampling Location, and Effluent Limitations 24

5.1.2 Flow Monitoring 26

5.1.3 Filter Cake 26

5.2 Surge Pond 26

5.2.1 Sampling Location 27

5.2.2 Water Level Monitoring 27

5.2.3 Flow Monitoring 27

5.3 Yak Tunnel Bulkhead 27

5.3.1 Sampling Location 27

5.3.2 Water Level Monitoring 27

5.3.3 Flow Monitoring 28

5.4 Yak Tunnel Blockage Pumping System 28

5.4.1 Sampling Location 28
5.4.2 Water Level Monitoring 28
5.4.3 Flow Monitoring 28
5.5 Laboratory Analytical Methods, Detection Limits, and Reporting Limits 29
5.6 Field Measurements and Sampling Procedures 30
5.6.1 Equipment Calibration, Operation, and Maintenance 30
5.6.2 Sample Identification and Labeling 30
5.6.3 Sample Containers, Preservatives, and Holding Times 31
5.6.3.1 Sample Containers 31
5.6.3.2 Sample Preservation 31
5.6.3.3 Sample Holding Times 31
5.6.3.4 Sample Preparation and Shipping 32
5.6.4 Sample Documentation and Tracking 32
5.6.4.1 Field Notes 32
5.6.4.2 Sample Chain-of-Custody 32
5.7 Quality Assurance/Quality Control 33
5.7.1 Quality Assurance/Quality Control Samples 33
5.7.2 Data Management 34
5.7.3 Data Validation 34
5.8 Document Control and Reporting 35
5.8.1 Document Management and Retention 35
5.8.2 Document Distribution 37
5.8.3 Reporting 38
5.8.3.1 Monthly Reports 38
5.8.3.2 Annual Reports 39

6.0 PROPER OPERATION AND MAINTENANCE 40
6.1 Solid Waste Management 40

7.0 COMPLIANCE 41
7.1 Performance Standards 41
7.2 Twenty-Four Hour Reporting 42
7.3 Inspection and Entry 42
7.4 Duty to Mitigate 42
7.5 Bypass 42
7.6 Upset Conditions 43

8.0 SITE SAFETY PLAN 44
8.1 Employee's Responsibilities 45
8.2 Telephone Numbers 46
8.3 Potential Hazards 47
8.3.1 Confined Spaces, Sewers, and Trenches 47
8.3.2 Electrical Hazards 47
8.3.3 Mechanical Equipment Hazards 48
8.3.4 Explosion and Fire Hazards 49
8.3.5 Sulfuric Acid Hazards 49
8.3.6 Oxygen Deficiency and Noxious Gases 50
8.3.7 Laboratory Hazards 51
8.3.8 Safety Equipment 51
8.3.9 Process Chemical Handling 51
8.3.10 Fall Protection 52
8.3.11 Portable Ladder Safety 53

8.3.12 Cold Stress 53
8.3.13 Heat Stress 55
9.0 GENERAL REQUIREMENTS 58
9.1 Planned Changes 58
9.2 Signatory Requirements 58
10.0 CONTINGENCY PLAN AND ROUTINE MONITORING PLAN 59
11.0 REFERENCES 60

LIST OF TABLES

Table 1 Effluent Limitations and Analyses and Influent Analyses
Table 2 Laboratory Analytical Methods, Detection Limits and Reporting Limits
Table 3 Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature
Table 4 Cold Stress Conditions
Table 5 Heat Stress Conditions
Table 6 Suggested Guidelines when Wearing PPE

FIGURES

Figure 1 Overview of OU1 Remedies
Figure 2 Bulkhead Design
Figure 3 Bulkhead Flow Through Pipe Design
Figure 4 Yak Tunnel Conveyance System
Figure 5 Surge Pond, Pipeline System, and Outfall 001
Figure 6 Hillside Spring
Figure 7 Blockage Conveyance System
Figure 8 Yak Water Treatment Plant Treatment Process

LIST OF APPENDICES

Appendix A Standard Operating Procedures
Appendix B Monthly Progress Report Format
Appendix C Discharge Monitoring Report (DMR) Format
Appendix D Routine Monitoring Plan
Appendix E Contingency Plan

LIST OF ACRONYMS

Ag	silver
Al	aluminum
amsl	above mean sea level
As	arsenic
AS or Acid Sol.	acid soluble
BIL	blockage influent line
$CaCO_3$	calcium carbonate
Cd	cadmium
CDPHE	Colorado Department of Public Health and Environment
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	chain-of-custody
CONT	continuous
CP	Contingency Plan
Cr	Chromium
Cu	copper
DMR	discharge monitoring report
EPA	United States Environmental Protection Agency
Fe	iron
GIL	gravity-influent line
gpm	gallons per minute
HDPE	High Density Polyethylene
Hg	Mercury
HMI	human machine interface
kg/day	kilograms day
lbs	pounds
lbs/day	pounds per day
MDL	Method Detection Limit
MGD	million gallons per day
mg/L	milligrams per liter
mg eq.	milligram equivalent
Mn	Manganese

O&M	Operation and Maintenance
OU1	Operable Unit 1 of the California Gulch Superfund Site
Pb	Lead
PLC	process logic controller
PQL	Practical Quantitation Limit
PVC	poly-vinyl chloride
QA	Quality assurance
QC	Quality control
%R	percent recovery
RMP	Routine Monitoring Plan
ROD	Record of Decision
RPD	relative percent difference
SAP	Sampling and Analysis Plan
Se	Selenium
SPIL	surge pond influent line
SOP	Standard Operating Procedure
State	State of Colorado
s.u.	standard units
T	Total
TCLP	Toxicity Characteristic Leaching Procedure
TR or TOTAL REC	total recoverable
TSS	total suspended solids
UAO	Unilateral Administrative Order
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
VFD	variable frequency drive
WET	Whole Effluent Toxicity
WTP	Yak Tunnel Water Treatment Plant
Zn	Zinc

1.0 PURPOSE

The purpose of this plan is to provide a single document that presents and describes the completed remedial action work and controls that have been implemented to address the selected remedy for Operable Unit 1 of the California Gulch Superfund Site (OU1), and provide procedures for performance of operations and maintenance (O&M) of the OU1 remedy. This plan further sets forth the procedures for addressing future changes in hydrologic conditions within the Yak Tunnel Hydrologic System. This plan shall be implemented in accordance with the Consent Decree by and among the United States, State of Colorado, Newmont USA Limited, and Resurrection Mining Company, to which this Work Plan is appended.

OU1 remedies are described in Section 4.0 and include the following:

1) Influent Raw Water Sources and Support Systems
2) Influent Pre-Treatment System
3) Primary Treatment Process
4) Effluent System

The Routine Monitoring Plan (RMP) (MFG, 2008a) and Contingency Plan (CP) (MFG, 2008b), which are appended to and incorporated into this plan, provide further details governing routine monitoring, planning, and decision-making. The RMP and CP are generally discussed in Section 10.0.

The O&M manuals, listed in Section 6.0, are incorporated into this plan. The O&M manuals provide further details on the operation and maintenance of the OU1 remedy.

2.0 HISTORY

The California Gulch site, which includes OU1, was placed on the National Priorities List (NPL) in 1983. Since that time, a number of actions have been taken to control releases and protect human health and the environment. Some of the more important documents regarding the response actions at OU1 include the following:

1) Phase I Remedial Investigation Report, Feasibility Study Report, Proposed Remedial Action Plan (CH2M Hill, 1987a; CH2M Hill, 1987b; EPA, 1987)
2) The Record of Decision (ROD) (EPA, 1988a)
3) Administrative Order for Surge Pond and Interim Treatment Facility (EPA, 1988b)
4) Modification to the ROD (EPA, 1989a)
5) Unilateral Administrative Order (UAO) (EPA, 1989b)
6) Explanation of Significant Differences (EPA, 1991b)
7) First and second amendments to the UAO (EPA, 1993a; EPA, 1993b)
8) Final Sampling and Analysis Plan (SAP) (Baker, 1993)
9) Draft Final Yak Tunnel Water Treatment Plant Discharge Control Mechanism and Statement of Basis – Redline Version (Res-ASARCO, 1994)
10) Routine Monitoring Plan (Revision 1) (MFG, 1999a)
11) Contingency Plan, Revision 1 (MFG, 1999b)
12) Enhanced Monitoring Program (ASARCO, 2002)
13) EPA Letter reducing WTP Yak Water Treatment Plant sampling from weekly to monthly and Whole Effluent Toxicity testing to semi-annually (EPA, 2002)
14) Additional Investigation Work Plan (MFG, 2004)

Based on the ROD, UAO, and other governing documents, the facilities described below were constructed and placed into operation.

Construction of the surge pond and interim treatment facility were completed in 1989. The surge pond was constructed to collect water from the Yak Tunnel as well as surface water from the site area and to equalize flows for the treatment plant. The interim treatment facility consisted of a four cell, multi-media filter designed to remove suspended solids after lime addition prior to discharge of water to California Gulch. The filter building still exists next to the surge pond, and is used for storage and electrical system distribution, but the filters have been removed.

The Yak Tunnel Water Treatment Plant (WTP) was constructed and placed into operation in 1992. The WTP was constructed to treat water from the Yak Tunnel and surface water from the site. Currently, the treatment plant also treats Yak Tunnel blockage water pumped from the Black Cloud Mine and water

collected at Oregon Gulch (OU10). Ancillary facilities associated with the WTP include untreated and treated water conveyances, a potable water pump station, and a fire-flow pump station, which are described in Section 4.0.

The Yak Tunnel bulkhead was constructed and placed into operation in 1994. The bulkhead was constructed to prevent surges to California Gulch and to equalize and control flows to the WTP.

The Yak Tunnel blockage pumps were installed in the Black Cloud mine shaft to draw down water levels that were increasing behind the blockage, and a conveyance pipeline from the pumps to the WTP was completed in 2005. Operation of the Yak Tunnel blockage pumps began in March of 2006.

3.0 DEFINITIONS

Unless otherwise defined below, terms used in this Work Plan shall have the meaning assigned to them in CERCLA or the National Contingency Plan. Whenever any of the terms listed below are used in this Work Plan, the following definitions shall apply:

The "7-day (and weekly) average" is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week, which begins on Sunday and ends on Saturday, shall be used for purposes of reporting monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

The "30-day (and monthly) average" is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. The calendar month shall be used for purposes of reporting monitoring data on discharge monitoring report forms.

"Acid Soluble Aluminum" means that portion of aluminum in a sample which will pass through a 0.45 micron membrane filter following acidification to pH 1.5-2.0 with ultrapure nitric acid.

"Acute Toxicity" as it applies to whole effluent toxicity (WET) testing, is indicated when 50 percent or more mortality is observed for either Ceriodaphnia or fathead minnow species at any effluent concentrations. Mortality in the control must be 10 percent or less for the effluent results to be considered valid.

"Bypass" means the intentional diversion of influent or Waste Streams from any portion of the WTP. Bypass does not include flows or discharges that are authorized under Section 7.1 below.

"Composite samples" shall be flow proportioned. The composite sample shall, at a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours or more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

- Constant time interval between samples, sample volume proportional to flow rate at time of sampling.

- Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used.
- Constant sample volume, time interval between samples proportional to flow (i.e. sample taken every "X" gallons of flow).
- Continuous collection of sample, with sample collection rate proportional to flow rate.

"Daily Maximum" ("Daily Max") is the maximum constituent value determined by any single sample or instantaneous measurement.

A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

The term "influent" means a source of non-potable and untreated water that flows, or is pumped, to the Yak Tunnel Water Treatment Plant.

An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

"Total Metals" or "Total Recoverable Metals" means that portion of a water and suspended sediment sample measured by the total or total recoverable analytical procedure described in "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, most recent version, or its equivalent.

"Quality assurance" (QA) is defined as the integrated program designed for assuring reliability of monitoring and measurement data.

"Quality control" (QC) is defined as the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

"State" means the State of Colorado Department of Public Health and the Environment, and any successor agency.

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with the effluent limitations because of factors beyond the reasonable control of the operator. An Upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

"Waste Stream" means waste derived from the treatment process in the treatment facility that exceeds effluent limitations.

"Yak Tunnel Conveyance System" means a series of ditches and pipelines used to convey water from the Yak Tunnel Portal, behind the Yak Tunnel blockage, Hillside seep and surge pond to the WTP as described in Sections 4.1.2, 4.1.3, 4.1.4 and 4.1.5 and any future influent sources from the Yak Tunnel Hydrologic System.

"Yak Tunnel Hydrologic System" means the subsurface flow system that consists of the entire length of the Yak Tunnel and groundwater which flows to or from the Yak Tunnel.

4.0 REMEDIAL ACTION COMPONENTS

The WTP treats water from several sources before discharging the treated water to California Gulch. The plant removes metals from the influent water through a combination of oxidization, pH adjustment, and flocculation. The plant and associated processes are run by a process logic controller (PLC) and a human machine interface (HMI). The HMI allows an operator to change process, flows, etc. in the plant without having to change the programming in the PLC. The HMI allows monitoring of the various processes in the plant and ancillary facilities and will send out an alarm if the processes deviate from set standards. The following subsections describe the various influent sources, WTP facilities, support facilities and the processes that comprise the treatment system.

The water treatment facility is primarily composed of the following components:

- Influent raw water sources and support systems
- Influent pre-treatment system
- Primary treatment process
- Effluent system

Figure 1 presents a simplified diagram of the WTP facility components and treatment process. The following sections describe these components in detail.

4.1 Influent Raw Water Sources and Support Systems

The WTP influent sources include water from the Yak Tunnel bulkhead, WTP surge pond, Yak Tunnel blockage pumps currently located in the Black Cloud shaft, OU-10 Oregon Gulch seepage collection system, and the Hillside spring. The raw water from these sources is brought to the WTP by the Yak Tunnel Conveyance System and the Oregon Gulch seep conveyance system. In addition, other water pipelines and support systems are required to either provide potable water, or facility protection, or to transmit WTP effluent to California Gulch. Each of these sources and systems are discussed below.

4.1.1 Yak Tunnel Bulkhead

The Yak Tunnel was constructed as a drain for mines in the area. Approximately 1,678 feet upgradient from the Yak Tunnel Portal, the Yak Tunnel Bulkhead was constructed to control flow from the tunnel. The bulkhead was designed to manage Yak Tunnel mine water so that surges and other rapid increases or decreases in flow within the tunnel can be controlled. The bulkhead is an engineered dam within the Yak Tunnel and allows for the passage of controlled flow rates through the bulkhead down to the WTP. The bulkhead is fitted with three pipe outlets, one of which serves as the actual outlet for the transfer of water

from behind the bulkhead, the second and third of which are spares or backup outlet pipes. Under baseline flow conditions, the bulkhead is designed to allow sediment settling and water staging within the tunnel. Sediment deposition is controlled by the bulkhead design and the outlet pipe placement 12 inches off the tunnel floor. Sediment deposition below this 12-inch level does not interfere with flow through the lower two outlet pipe(s) and is considered acceptable. The third outlet pipe is 32 inches above the tunnel floor and is used as an emergency overflow should the lower pipes become plugged. Figures 2 and 3 show the bulkhead design and flow through pipes, respectively.

Yak Tunnel mine water flows through one of two pipes installed in the bulkhead and flow rates are controlled by the operation of the manual and electric flow control valves. The electric flow control valve may be either manually controlled or controlled from the treatment plant HMI. During a power failure, the electric flow control valve will automatically close and water will collect behind the bulkhead. Water elevations behind the bulkhead are monitored and reported by a pressure transducer and transmitter installed at the bulkhead.

If the water elevation behind the bulkhead rises above the set point, as measured by the pressure transducer, an alarm will be sent by the HMI system to the operators.

Water transmitted through the flow control valves flows from the bulkhead through a 12-inch High Density Polyethylene (HDPE) pipeline to the tunnel portal and is then transferred into an open rip-rapped lined channel which conveys the water from the bulkhead to the WTP diverter box, as described in Section 4.1.2. To prevent unauthorized access, the Yak Tunnel Portal is secured with a closed, locked steel gate.

The major components of the Yak Tunnel Bulkhead System include:

- Yak Tunnel
- Upstream steel debris grizzly
- Bulkhead
- Flow through pipes (2)
- Manual and electric control valves
- Compressed air line (through the bulkhead)
- Milltronics Micro Ranger II (Pressure Transducer)
- Rosemount pressure transmitter
- Manway through the bulkhead
- Ventilation fan
- 12 inch HDPE Pipeline

All bulkhead control and monitoring parameters are integrated into the WTP control system, allowing the existing alarm and callout systems to be utilized.

4.1.1.1 Bulkhead Water Quantity and Quality

Typically, infiltration and flows into the Yak Tunnel increase in the late spring and decrease in early to mid summer. The bulkhead water level should be at or near its allowed low point (20 ft) in late April to early May in order to provide capacity for storage of snow melt. This will allow more retention time for managing higher flows to the Yak Tunnel during the spring. The water level behind and related flows through the bulkhead can be controlled by opening and closing the automatic or manual valves.

Seasonal flows from the Yak Tunnel will vary depending on snow pack and precipitation. In 2007, the flow rates from the Yak Tunnel ranged from a maximum of approximately 700 gpm in early June to shutting the valves and stopping flow in the winter. In 2006, the flow rates from the Yak Tunnel ranged from a maximum of approximately 600 gpm in mid May to less than 65 gpm in the winter. Generally, Yak Tunnel influent pH ranges from 5.5 to 6.5 s.u. with specific electrical conductivity ranging from 1400 to 1600 microsiemens per centimeter (μS/cm) and zinc concentrations ranging from 65 to 110 mg/l.

4.1.2 Conveyance of Yak Tunnel Water

As shown on Figure 4, the Yak Tunnel Conveyance System currently includes a series of ditches and pipelines used to convey water from the Yak Tunnel Portal to the WTP or surge pond. Water that accumulates within the tunnel between the portal and the bulkhead is collected along the tunnel floor and flows from the portal entrance through a 30-foot long open rip-rap swale into a 16-foot by 10-foot by 15-foot deep reinforced concrete collection sump located on the north side of California Gulch. The collection sump intake is screened with an expanded steel grate to preclude transfer of deleterious debris (i.e., twigs, branches, etc.). A 24-inch diameter HDPE outflow pipe conveys water a distance of 120 feet from the collection sump, under the California Gulch Channel, to an open rip-rap lined conveyance channel located on the south side of California Gulch. The 24-inch HDPE outflow pipe is located halfway up the south wall of the sump and is connected to the sump with a 25-inch diameter sleeve. Flow from the bulkhead pipeline is piped under the California Gulch Channel to the same open rip-rap lined conveyance channel. The conveyance channel carries the water approximately 900 feet from the 12-inch bulkhead pipeline outflow and 24-inch HDPE pipeline outflow to a pre-cast concrete drop inlet structure called the diverter box.

Water from the diverter box can be either transferred to the WTP or the surge pond. The diverter box is sized to allow settling of coarse particles from the influent feed. Trash screens are also provided to

prevent large debris from entering the water treatment plant. Periodically, the debris and trash must be manually removed from the diverter box. A manual valve installed in the diverter box prevents flow to the plant, if necessary. Overflow from the diverter box flows to the surge pond.

A gravity flow 10-inch HDPE pipeline (gravity-influent line [GIL]) is installed above ground from the diverter box to the WTP. The GIL pipeline has a minimum slope of one percent to the WTP. In order to monitor influent flows to the WTP, a flow meter is installed on the 10-inch pipeline after it enters the WTP. The gravity flow pipe to the WTP is free draining to the WTP, should flow be diverted to the surge pond from the WTP. However, during winter months the pipeline is blown out with compressed air to ensure the pipe does not freeze.

Water flows from the diverter box to the surge pond via a buried 6-inch poly-vinyl chloride (PVC) pipeline, for a distance of approximately 2,400 feet. The 6-inch PVC pipe at the surge pond is located below the grouted rip-rap splash pad, and outflow from the pipeline is emitted below the water surface.

An emergency overflow rip-rap and grouted rip-rap lined channel is constructed downstream of the diverter box structure to carry flows greater than the capacity of the 6-inch pipeline to the surge pond. A grouted rip-rap berm constructed just downstream of the drop inlet separates the emergency overflow channel from the drop inlet structure and prevents normal flows from passing down the emergency overflow channel. In the event that the capacity of the drop inlet structure is exceeded, excess flow will pass over the separating berm, down the emergency overflow channel, through an 18-inch HDPE overflow pipeline and to the surge pond. The 18-inch diameter HDPE overflow pipeline is connected to a 24-inch diameter PVC pipe approximately halfway between the pipe inlet and the surge pond by a sealed annulus, and this joint is encased in concrete. The 24-inch pipe discharges onto a grouted rip-rap splash pad at the east end of the surge pond above the 6-inch diameter inflow line.

A natural spring is located at the base of the hillside south of the emergency Overflow Ditch. A hillside spring collection structure collects seasonal flows from the spring and drains into a 6-inch diameter HDPE drain pipeline. The drain pipeline crosses under the emergency overflow channel and parallels the access road. Approximately 900 feet downstream of the collection structure, the 6-inch pipeline drains into the lower end of the emergency overflow channel, at the grouted rip-rap inlet basin for the 18-inch HDPE pipeline and is then transported to the surge pond. The flow from the spring is generally seasonal, with flow starting during spring runoff and subsiding by July.

The major components of the Yak Tunnel Conveyance System are listed in order from the Yak Tunnel Portal to the WTP and surge pond:

- Yak Portal and portal gate
- Portal swale
- Reinforced concrete sump with intake grate
- 24-inch diameter HDPE drain pipeline
- Open conveyance channel
- Drop inlet structure (Diverter box)
- 10-inch diameter HDPE GIL pipeline – WTP
- 6-inch diameter PVC flow pipeline – surge pond
- Emergency Overflow Channel (rip-rap and grouted rip-rap lined) – surge pond
- 18- and 24-inch diameter HDPE pipeline – surge pond
- 24-inch HDPE pipeline splash pad – surge pond
- Hillside spring collection structure and 6-inch diameter pipeline drain – Surge Pond

Diversion channels have been constructed in California Gulch to collect storm and surface water runoff from the California Gulch watershed and route these waters around the WTP and surge pond. The system is composed of three separate water conveyance structures: the California Gulch diversion channel, South Slope interceptor channel, and South channel. The California Gulch diversion channel is designed to collect water entering the drainage, upstream from California Gulch, and divert this water around the surge pond. The diversion channel is designed for peak flows from a 500-year storm event. The South Slope interceptor channel is located at the base of the south slope adjacent to the emergency overflow channel. Precipitation on the south slope drains into the south slope interceptor channel and is then carried to the California Gulch diversion channel. South channel is located south of the surge pond and provides drainage for precipitation that occurs in this 25-acre area. Flow enters South channel from surface and storm water runoff and constructed side inflow channels. Flow from South channel enters California Gulch diversion channel downstream of the toe of the surge pond buttress.

4.1.3 Surge Pond

As part of the selected remedy, a 20 million gallon capacity, 7.5 acre surge pond was constructed during the 1989 field season at a location approximately one-half mile down valley from the Yak Portal. The pond was designed to collect influent water from the Yak Tunnel and to remove much of the suspended sediment load by sedimentation with supplemental filtration provided by a small filtration plant located adjacent to the pond. After the Yak WTP went into operation, the supplemental filter system was

removed from the filtration plant. The surge pond is built on a surface of reworked mill tailing. The downstream face of the existing tailing embankment was buttressed with mine waste rock and the pond surface was surrounded by a berm of mine waste rock. A channel was constructed at the bottom of the surge pond to divert water in the pond toward the location of the barge mounted pumps. The surge pond bottom and berm are lined with an HDPE geomembrane. Prior to installation of the liner, the inside slopes of the berm were covered with a bedding layer of tailing. The bottom of the new pond was lined with a 60 mil HDPE geomembrane, and the inside slopes of the berm were covered with an 80 mil geomembrane. The liner is overlain on the side slopes with geofabric, sand, and a protective layer and bench of mine waste rock.

A floating barge pump system is located in the southwest corner of the surge pond. The purpose of the barge transfer system is to convey water from the surge pond to the WTP. Either a 500 gpm horizontal, centrifugal pump or a 75 gpm submersible pump can be used to transfer water to the WTP depending on the level of the surge pond, influent water chemistry, and WTP capacity. As shown on Figure 5, surge pond water is pumped from the surge pond to the WTP via a single pipeline when above ground, and a double-contained pipeline where buried. The piping from the pond to the plant is composed of SDR 13.5 HDPE. A flow meter is installed in the pipeline after the pipeline enters the WTP. The carrier pipe is 8-inch in diameter and the containment pipe is 12-inch in diameter where buried. A head frame is located over the pump barge on which an overhead crane is mounted and is used to allow pump maintenance and removal. The barge is attached to a steel walkway supported by steel pontoons. It provides access to the pumps and houses the pipe used for transferring water from the pumps to the WTP. The walkway is anchored near the filter building, and cable stays anchored on either side of the filter building provide stability for the walkway and barge. An aeration system is mounted to the pump barge. The aeration system is operated during the winter months and is used to prevent the formation of ice around the pump barge. In addition, surge pond pumps are re-circulated during winter months to prevent freeze.

An emergency spillway is located at the northwest corner of the surge pond. If the storage capacity of the pond is exceeded, water will overflow through the spillway into the California Gulch Diversion Channel.

A staff gauge is located near the pump barge to record water levels in the pond. Surface monuments are located along the west and north berm to monitor movements. The pond perimeter is enclosed by a 6-foot high chain-link security fence.

Major components of the surge pond are listed below:

- HDPE geomembrane liner system

- Protective geotextile fabric
- Protective sand cover
- Protective mine waste rock cover
- Surface monuments
- Fiberglass staff gauge
- 6-and 24-inch inflow pipelines and splash pads
- Filter backwash pipeline
- Emergency spillway
- Surge pond berm
- Access road
- Pump barge
- Security fence and access gate
- Buttress for existing tailing embankment

The major components of the barge transfer system are:

- One 500 gpm vertical pump and one 75 gpm submersible pump
- Steel pump barge and pontoons
- Steel walkway and pontoons
- 8-inch HDPE influent conveyance pipe
- Pump selector switches and switch gear
- Overhead crane

4.1.3.1 Surge Pond Water Quantity and Quality

Typically, flows into the surge pond increase in May and decrease in late June. The primary sources of water to the surge pond during May and June consist of the Hillside spring and surface runoff from melting snow. The surge pond water level should be at or near its allowed low point in late April in order to provide storage which allows time for treating of higher flow rates to the surge pond during the spring. As described in the preceding section, the water level in the surge pond can be lowered by pumping from either the small or large pumps.

Seasonal flows into the surge pond will vary depending on snow pack and precipitation. In 2006 and 2007, the pumping rates from the surge pond ranged from a maximum of 470 gpm in the spring to no pumping for extended periods in the winter. Generally, surge pond influent pH ranges from 3.2 to 4.2 s.u.

with specific electrical conductivity ranging from 2800 to 3500 µS/cm and zinc concentrations ranging from 80 to 120 mg/l.

4.1.4 Hillside Spring

A natural spring is located at the base of the hillside east of the WTP on the south side of the access road. As presented on Figure 6, the spring is collected in a perforated pipe and concrete sump and then piped to the surge pond as described in Section 4.1.2.

4.1.4.1 Hillside Spring Water Quantity

During much of the year there is no flow from the Hillside spring to the surge pond. However, during snow melt in the spring, flows will begin. In May of 2006 and 2007, flows in excess of 300 gpm were measured. During the late spring and early summer months, capacity will be maintained in the surge pond to accommodate flows from the Hillside spring.

4.1.5 Yak Tunnel Blockage Pumping System

The Yak Tunnel blockage pumping system consists of the blockage pump, currently located in the Black Cloud shaft, and controls which are located within the Black Cloud mine shaft house (shaft house covers the Black Cloud shaft and head frame structure) and the conveyance system which runs from the pump to the WTP. Flows from the Yak Tunnel bulkhead decreased in 2002. In addition, after the suspension of mining and dewatering operations at the Black Cloud mine, groundwater levels rose above the 1330 lateral which connects to the Yak Tunnel. Based on these two events, it is believed that a blockage occurred in the Yak Tunnel in approximately 2002. The water level control program specified in the Additional Investigation Work Plan (MFG, 2004) was implemented in 2005 and 2006. This program consisted of installing submersible pumps in the Black Cloud shaft to dewater the mine pool backed up by the blockage.

The original blockage pumping system consisted of two submersible pumps set approximately at 250 feet and 470 feet below the shaft collar. The installation and maintenance of this system relied on being able to enter the Black Cloud shaft. In November 2007, this pump system failed and a new type of dewatering pump system was installed to preclude future reliance or dependency on re-entering the Black Cloud shaft to service or replace the original submersible pump system.

The installation of a vertical turbine pump in the Black Cloud shaft was completed in January 2008. The bowls of this pump are set at approximately 600 feet below the shaft collar. The pump is controlled by a variable frequency drive (VFD) and is capable of pumping between 500 and 1200 gpm. The VFD and

pump are controlled by a local PLC, dedicated phone line, and the WTP control system. The pump water is transferred to a 10-inch diameter HDPE pipeline at the Black Cloud shaft collar which runs from the Black Cloud mine to the WTP. The HDPE pipe is buried for approximately 4 miles and is above ground for approximately the last one-half mile before it enters the WTP. Above ground pipeline sections are self-draining to the WTP and during winter conditions, the above ground pipeline section is insulated by snow cover. Eleven air-vacuum valves along the pipeline release air and prevent a vacuum from collapsing the pipe. Once the blockage water has been pumped up the Black Cloud shaft, it flows by gravity to the WTP. Figure 7 presents a general map of the Blockage conveyance system.

4.1.5.1 Blockage Pump Water Quantity and Quality

The pumping rate of the blockage pumps is dictated by the treatment capacity of the WTP and flow rates from other influent sources. During the late spring and early summer months, blockage pumping will typically be reduced or stopped while water from the Yak Tunnel bulkhead and surge pond is treated. During the fall, winter and early spring the blockage water will be the primary source of influent to the WTP. As discussed above, the blockage pump cannot be operated below 500 gpm, so if the WTP excess capacity is less than 500 gpm during late spring and early summer, the blockage pumps cannot be operated. Generally, Blockage water influent pH ranges from 6.5 to 7.5 s.u. with specific electrical conductivity ranging from 1500 to 2500 µS/cm. During the short pumping history of Blockage water, the zinc concentration has ranged from 20 to 46 mg/l.

4.1.6 Oregon Gulch Seep Water

As part of ongoing operations and maintenance of the remedy for OU10, seepage water collected at the toe of the Oregon Gulch tailing embankment is pumped to the Oregon Gulch pump station and subsequently to the surge pond. The water is pumped though a buried 6-inch diameter HDPE pipeline that runs from the pump station system through the filter building to the surge pond. When pumping ceases, the pump line is designed to drain to either the Oregon Gulch pump station or the surge pond for most of its length; however, where the line enters the filter building it is nearly horizontal and must be insulated and heat taped.

4.1.6.1 Oregon Gulch Water Quantity and Quality

Flows from Oregon Gulch are extremely low when compared to other influent sources. Since 2006, flow rates have ranged from less than 1 gpm to approximately 10 gpm. Flow rates from Oregon Gulch typically increase during the spring snow melt and after precipitation events. Generally, Oregon Gulch

trench influent pH ranges from 2.7 to 3.1 s.u. and toe seep influent pH ranges from 3.5 to 5.4 s.u., with the specific electrical conductivity for both ranging from 21000 to 26000 µS/cm.

4.1.7 Potable Water Supply

Potable water is supplied to the WTP for general plant use by the Parkville water supply system. Parkville water supply is provided at the potable supply pump station on South Toledo Street. The pump station is serviced by two pumps, pumps number 1 and 2 are used to pump potable water from the station to the WTP. One pump operates continuously and the remaining pump serves as a standby. Both pumps operate at constant speeds. A recirculation line directs a portion of the pumped flow back to the pump suction end to provide continuous flow for cooling the pump when operating at low supply flows to the treatment plant. The potable water pumps are horizontal, centrifugal, and single stage pumps.

4.1.8 Fire-Protection Pumping Equipment

Skid-mounted fire-protection pumping equipment is located in the potable water pumping station. The fire-protection pump supplies water pressure to the WTP fire-suppression sprinkler system and fire hydrants. The fire-protection pump is a horizontal, centrifugal, single-stage pump which is connected to the Parkville water supply system. The fire-protection pump is furnished with a diesel engine back-up generator.

4.2 Influent Pre-Treatment System

Influent flows to the WTP from the Yak Tunnel bulkhead, Conveyance System, and Yak Tunnel blockage pumps by gravity while influent water from the surge pond is pumped. Treatment at the WTP begins with the influent water entering the WTP and flowing into the first stage reactor (see Figure 1). In the first tank (first stage reactor), the influent (feed water) is mixed and reacted with recycled sludge to neutralize the free acid and precipitate ferric iron and aluminum. If the system is saturated with calcium sulfate, a portion of the calcium sulfate will also be precipitated here. The tank is designed so the feed water enters and exits from the top of the tank after flowing through an upcomer.

4.3 Primary Treatment Process

4.3.1 Neutralization and Alkalization Tanks

As shown on Figure 8, the overflow from the first stage reactor flows into the first of two neutralization tanks. Overflow from the first neutralization tank then flows into the second neutralization tank.

The neutralization tanks provide retention time for the precipitation of metals as hydroxides and for oxidation of ferrous iron and manganese. Both tanks are designed so the feed water enters and exits from the tops of the tanks after flowing through an upcomer. The feed water in the tanks is adjusted to between pH 10.3 and 10.5 using a mixture of recycled sludge and lime slurry, and is not normally corrosive.

The lime slurry used to raise the pH in the neutralization tanks is made in automated batches. Two storage bins, each capable of storing 24 tons of lime, are used to store commercial powdered hydrated lime. The powdered lime is mixed with water to form a slurry which is then fed to the neutralization tanks from the alkalization tank. As part of the automated batch process, metered quantities of potable water and hydrated lime are added to the lime slurry tank when levels in the slurry tank drop below a low level set point. The filling of the slurry tank stops once a high level set point is reached.

The pH in the neutralization tanks is managed by a pH controller. The pH controller automatically controls an air valve which adjusts the quantity of lime added to the neutralization tanks to maintain a pH of 10.3 to 10.5. The pH monitor that controls the lime addition is located on the first neutralization tank. A secondary pH monitor is located on the second neutralization tank and can be selected as the control by the operator.

The lime slurry is added to the neutralization tanks after passing through a small tank (i.e., alkalization tank). The alkalization tank allows time for the lime to react with the recycled sludge before entering the neutralization tanks. Lime slurry and recycled sludge enter the bottom of the alkalization tank, are mixed in the tank, and then exit from the top of the tank through an overflow pipe to the first neutralization tank. An auxiliary pipe is provided to allow alkalized sludge to flow to the second neutralization tank. The auxiliary pipe is not normally used but allows the operator additional flexibility and also allows the first neutralization tank to be bypassed.

Two aeration blowers are used to aerate the neutralization tanks and oxidize the ferrous iron and manganese. Each of the blowers is equipped with a pressure safety relief valve and a pressure indicator. They are also equipped with a check valve to prevent feed water from back flowing to the blowers. The normal air flow is 90 cubic feet per minute (cfm) to each neutralization tank and is controlled by the capacity of the positive displacement blowers.

4.3.2 Flocculation Tank

The water treated in the neutralization tanks flows to the flocculation tank. The flocculation tank provides time for reaction of neutralization tank slurry with polymer addition to form a flocculent. The tank is designed so the feed water enters and exits from the top of the tank after flowing through an upcomer.

Polymer is added to the flocculation tank by pumping a liquid polymer from the polymer makeup tank. Batches of liquid polymer are automatically made by feeding a metered volume of powdered polymer from a hopper to the polymer tank and adding a measured volume of potable water. The hopper is filled when needed by the operator by pouring in powdered polymer from 50 pound bags. Polymer feed rates to the flocculation tank are adjusted based on the settling rate of the flocculent, which is measured daily at the flocculation tank.

4.4 Effluent System

4.4.1 Thickeners

The solution from the flocculation tank is split and diverted to two thickeners arranged in parallel for separation of the solid (sludge) and water phases by gravity settling. The solids are then removed from the bottom of the thickener(s), and the treated water overflows from the top of the thickener(s). Both thickeners send the treated water overflows to the mono-media filter system for filtration and small diameter suspended particle separation. The settled sludge at the thickener bottom is mechanically removed by a rake mechanism, which moves the sludge to the thickener center cone and underflow.

Each thickener is equipped with two sludge recycle pumps, one operating and one spare. The sludge recycle pumps transfer sludge in a loop that goes from the bottom of the thickener (i.e., center cone) through the pumps to the first stage reactor, the alkalization tanks, the mechanical filter press feed pump, and finally back to the thickener. A separate loop is provided for each thickener.

4.4.2 Sludge Dewatering

A recessed plate mechanical filter press is provided to dewater the sludge produced by the precipitation of metal hydroxides. Sludge is pumped from the thickener underflow to the filter press, until a minimum filtrate flow rate is achieved. Air is then used to blow out the press feed lines and to push additional water out of the sludge cake.

The press is then opened, and the sludge cake is dropped from the recessed plates to a dumpster below the filter press. After the sludge cake is removed, the press is closed and the filter press cycle is repeated. There are bomb-bay doors under the filter press to catch any dripping during the fill and press cycle.

4.4.3 Filtrate Effluent Filtration

Treated water overflowing the top of the thickeners contains small quantities of suspended solids. The overflow from the thickeners is piped to three gravity flow mono-media filters which remove any suspended solids that the thickeners did not capture. Normally the flow is split evenly between the three filters except during backwash, when the flow is split between two of the filters while the third filter is backwashing.

Filter effluent (filtrate) gravity flows to a clear well tank. Water stored in this tank is used to supply backwash water for the filters. Each filter is backwashed on a daily basis using filtrate water and an air scour. Air is supplied for backwashing from either the primary or backup air blower. Backwash water which contains the removed suspended solids, is collected in a mudwell, which is then pumped back to the first stage reactor. Both the backwash and mudwell systems have primary and backup pumps.

4.4.4 Filtrate Effluent pH Adjustment

Filtrate overflow from the clear well tank gravity flows to the pH adjustment tank. The pH of the water is adjusted in this tank to between 6.5 and 9.0 s.u. prior to discharge to California Gulch. Sulfuric acid is fed to the pH adjustment tank in varying quantities through a pH control loop. The primary pH probe and controller located at the pH adjustment tank are used for pH adjustment. A secondary pH probe and controller are located on the effluent pipeline (discussed below) and can be used for control if the primary system fails.

4.4.5 Effluent Discharge

Effluent from the pH adjustment tank flows to California Gulch through a 10-inch HDPE gravity flow pipeline. The 10-inch pipeline is single-wall within the WTP and is double contained after leaving through the floor of the WTP. Before leaving the WTP, the pipeline tees, with one leg of the tee going to the surge pond and the second leg going to California Gulch. If water leaving the pH adjustment tank is not between a pH of 6.5 and 9.0, the plant effluent valve closes and the effluent is diverted to the surge pond through the tee. The effluent pipeline is fitted with a 10-inch flow meter to record the quantity of effluent discharged from the WTP.

4.5 Sludge Disposal and Repository

As part of WTP operations, either hazardous or non-hazardous sludge cake is produced. The sludge cake is currently disposed at either the Allied Waste Tower Road facility located near Denver (non-hazardous) or the Clean Harbors Deer Trail facility located near Deer Trail (hazardous). Sampling and analysis of the sludge is discussed in Section 5.1.3.

Historically, sludge from the WTP has been disposed of in Colorado, Nevada, or reprocessed at the Black Cloud mine for metal recovery at out of state smelters. As the Deer Trail facility has been closed in the past, and reprocessing at the Black Cloud mine is no longer an option, additional sludge disposal options are needed.

Construction of a sludge disposal facility within the confines of the California Gulch Superfund site or on the Black Cloud tailing facility will be considered and may be approved upon EPA and the State's determination that appropriate design requirements have been met. The sludge disposal sites that may be evaluated include the Homer, Chapman and Robinson placer mining claims, and the Black Cloud mine tailing area.

4.6 Potential Expansion of or Addition to Existing Treatment Facilities

As part of the reclamation of the Black Cloud Mine pursuant to the Consent Decree, it is anticipated that water from the mine site (tailings facility, seeps, etc.) may be transported to the WTP for treatment prior to discharge. Additional treatment capacity may be needed for treatment of Yak Tunnel influent sources and Black Cloud Mine water in a timely and cost effective manner. To manage these waters, expansion of the existing WTP or construction of a satellite facility is authorized provided that:

1) The expansion or additional facilities will not result in discharge at Outfall 001 that exceeds the limits in Table 1.
2) A work plan is prepared and provided to EPA and the State for comment. The work plan will provide, at a minimum, information on the need for the work, results of treatability study data (if applicable), a conceptual design, and preliminary schedule.
3) Within 60 days, EPA and the State will provide comments on the work plan.
4) A draft construction design submittal will be prepared and submitted to EPA and the State for comment and approval. The construction design submittal shall include, at a minimum, design criteria, results of treatability study data (if applicable), results and analysis of field sampling, pre-design work, preliminary plans and drawings, outline specifications, and an updated schedule. The construction design may be submitted as one or more submittals.
5) Within 60 days, EPA and the State will provide their comments to the construction design submittal, and shall promptly approve the submittal once those comments have been addressed to the satisfaction of the EPA and State.

6) A pre-construction submittal will be prepared and submitted to EPA and the State for approval. This submittal shall include, at a minimum, final construction plans and specifications, draft O&M manual, a project Health and Safety plan (if not covered by the OU1 Health and Safety), and a construction quality assurance plan.

7) Within 30 days, EPA and the State will provide their response to the pre-construction submittal, and shall promptly approve the submittal once those comments have been addressed to the satisfaction of the EPA and State.

8) Before startup of the expansion or additional facility, the O&M plan will be finalized and will include as builts.

5.0 SAMPLING AND ANALYSIS PLAN/QUALITY ASSURANCE PROJECT PLAN

This Chapter addresses requirements for sampling, sample analysis, quality assurance, data validation, recordkeeping and reporting associated with O&M of the OU1 remedy. Further requirements for monitoring the hydrologic conditions associated with the Yak Tunnel and Bulkhead for purposes of implementing the CP are set forth in the RMP, which is attached as Appendix D.

5.1 Water Treatment Plant

The Yak Water Treatment Plant consists of the treatment plant and the potable water/fire pumping station and the process and control equipment contained in these buildings.

5.1.1 WTP Effluent Discharge Point, Sampling Location, and Effluent Limitations

WTP effluent discharge is only authorized at Outfall 001 (shown on Figure 5), which is the outfall from the WTP prior to contact or commingling with any surface and groundwater in the Upper California Gulch drainage. The sampling location for Outfall 001 is the sampling port on the 10-inch HDPE pipe between the pH adjustment tank and where the 10-inch pipe exits the WTP through the concrete floor. Table 1 presents the WTP effluent discharge limitations that apply to the discharge at Outfall 001. This table also provides the frequency and type of sample collection. Section 3.0 provides the definitions of terms in this table and Section 5.8 discusses reporting of sample analysis.

Table 1 Effluent Limitations and Analyses and Influent Analyses

Parameter[a]	Effluent Limitations			
	30-Day Average[b]	Daily Max[b]	Frequency[c]	Sample Type[b]
Flow, MGD	Report	Report	Daily	Continuous
pH, s.u.[d]	6.0-9.0	Report	Daily	Continuous
Oil and Grease, mg/L[e]	Report	10.0	Daily/Weekly	Visual/Grab
Total Calcium, mg/L	Report	Report	Monthly	Composite
Total Magnesium, mg/L	Report	Report	Monthly	Composite
Hardness, mg eq. $CaCO_3$/L[f]	Report	Report	Monthly	Composite
TSS, mg/L	20	30	Monthly	Composite
TSS, lbs/day (kg/day)	240 (109)	360 (163)	Monthly	Composite
Ag- TR, µg/L[H]	Report	Report	Monthly	Composite
Ag- TR, lbs/day (kg/day	Report	Report	Monthly	Composite
Al- AS, µg/L	Report	Report	Monthly	Composite
Al- AS, lbs/day (kg/day)	Report	Report	Monthly	Composite
As- TR, µg/L	Report	Report	Monthly	Composite
As- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Cd- TR, µg/L	50	100	Monthly	Composite
Cd- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Cu- TR, µg/L	150	300	Monthly	Composite
Cu- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Fe- TR, µg/L	Report	Report	Monthly	Composite
Fe- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Hg- T, µg/L[H]	1	2	Monthly	Composite
Hg- T, lbs/day (kg/day)	Report	Report	Monthly	Composite
Pb- TR, µg/L	300	500	Monthly	Composite
Pb- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Mn- TR, µg/L	Report	Report	Monthly	Composite
Mn- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Se- TR, µg/day	Report	Report	Monthly	Composite
Se- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Zn- TR, ug/L	750	1500	Monthly	Composite
Zn- TR, lbs/day (kg/day)	Report	Report	Monthly	Composite
Whole Effluent Toxicity, Acute	g	g	Semi-Annual	Composite
There shall be no discharge of floating solids or visible foam in other than trace amounts.				

T = Total, TR = Total Recoverable. AS = Acid Soluble

a -In addition to monitoring the final discharge at Outfall 001, influent samples shall be taken at the locations described in Section 5.0 and analyzed for all listed parameters

b -See Section 3.0 for definition of terms. For reporting of effluent loading calculations, measurements less than the practical quantitation level shall be considered as zero. For reporting of effluent concentrations, the actual concentration will be reported. If the effluent concentration is less than the PQL, a "<" will be used for the concentration. For influent concentrations, individual water sources will be reported separately. For reporting influent loading calculations, measurements less than the practical quantitation level shall be considered as zero. For reporting of influent concentrations, the actual concentration will be reported. If the influent concentration is less than the PQL, a "<" will be used for the concentration.

c –Operator may request and EPA may allow a change in the monitoring frequency.

d -Daily minimum – daily maximum limitation

e -A grab sample shall also be taken from Outfall 001 if a visual sheen is observed.

f -Hardness shall be calculated using the total calcium and magnesium sample analysis from the monthly samples.

g -Semi-annual acute toxicity in the discharge from Outfall 001 is to be conducted. This testing is alternated between Ceriodaphnia and fathead minnow at each semi-annual test.

h - For the purpose of this plan, the practical quantitation level for total recoverable silver and total mercury is considered to be 1.0 µg/L. Analytical values less than 1.0 µg/L shall be reported as "<" and will be considered to be in compliance with the effluent limitations for total mercury and total recoverable silver. For loading calculations of mercury and silver analytical results, measurements less than the practical quantitation level shall be considered to be zero.

5.1.2 Flow Monitoring

The flow rate of effluent from the WTP is monitored on a continuous basis when discharging to California Gulch. In cases of equipment breakdown, continuous monitoring may not be possible. In these cases, until equipment is repaired, effluent flow monitoring will consist of adding the influent sources together and subtracting estimated treatment losses until equipment is repaired. Such repairs will be completed as soon as practicable.

5.1.3 Filter Cake

As discussed in Section 4.4, a filter or sludge cake is produced as part of WTP operations. The filter cake historically has been classified as hazardous, due to cadmium, using the Toxicity Characteristic Leaching Procedure (TCLP) (method 1311). During 2006 and 2007 it was determined that if the ratio of GIL/SPIL to BIL water was less than 25 percent, the filter cake would classify as non-hazardous using TCLP testing. For example, if the BIL was flowing at 500 gpm, the combination of GIL and SPIL water could not exceed 125 gpm. Additional testing has included the Paint Filter Liquid Test (method 9095A), which the filter cake passed in all analytical tests during 2006 and 2007.

Under current WTP operating conditions, the BIL to GIL/SPIL influent ratio can be maintained for most of the year except during part of May and June. A time lag of approximately one week exists from when influent water ratios are changed before the sludge cake will change from characterizing as non-hazardous to hazardous or visa versa.

At a minimum, TCLP testing of the sludge cake will be performed when the influent ratios are changed. Additional testing will be performed if increases in cadmium are noted in the influent waters or when the GIL/SPIL flows exceed 25 percent of the BIL flows. Sludge samples will be collected from the filter press over a three to four day period, roughly equivalent to one 16 cubic yard truck load, homogenized and sent to the analytical laboratory for analysis.

5.2 Surge Pond

The surge pond consists of the pond itself, the floating barge and pumps, the conveyance system to the WTP, and the filter building. The filter building is no longer used for filtration and is now used to store equipment and house controls for the barge pumps.

5.2.1 Sampling Location

Surge pond water samples are collected from the pipeline inside the WTP at the frequency, and analyzed for the constituents, listed in Table 1.0. Samples will be collected directly from a sampling port on the pipeline before the surge pond water mixes with other waters.

5.2.2 Water Level Monitoring

Surge pond water levels will be monitored by manually reading the staff gauge in the surge pond. Standard Operating Procedure 9 (Appendix A) defines the procedures that will be followed for reading the staff gauge. The staff gauge will be read and the reading recorded a minimum of once every week day. Depending on the pond depth and precipitation or runoff occurring, the staff gauge may be read and recorded more frequently. When the surge pond freezes over during severe cold spells, it may not be possible to do daily water levels.

5.2.3 Flow Monitoring

When surge pond water is being pumped to the WTP for treatment, the flow will be monitored on a continuous basis. In cases of equipment breakdown, continuous monitoring may not be possible. In these cases, until equipment is repaired, surge pond flow monitoring will consist of subtracting the other influent sources from the WTP effluent measurements. Such repairs will be completed as soon as practicable.

5.3 Yak Tunnel Bulkhead

The Yak Tunnel bulkhead consists of the bulkhead itself, the level monitoring equipment, the conveyance system to the WTP, and the Yak Tunnel from the portal to the bulkhead.

5.3.1 Sampling Location

Yak Tunnel water samples will be collected from the GIL pipeline inside the WTP at the frequency, and analyzed for the constituents, listed in Table 1.0. Samples will be collected directly from a sampling port on the pipeline before the Yak Tunnel water mixes with other waters.

5.3.2 Water Level Monitoring

Water levels behind the bulkhead are monitored using the pressure transducer installed in the bulkhead. Water levels will be manually recorded at least once daily.

5.3.3 Flow Monitoring

When Yak Tunnel water is flowing to the WTP for treatment, the flow is monitored on a continuous basis. In cases of equipment breakdown, continuous monitoring may not be possible. In these cases, until equipment is repaired, Yak Tunnel flow monitoring will consist of subtracting the other influent sources from the WTP effluent measurements. Such repairs will be completed as soon as practicable.

5.4 Yak Tunnel Blockage Pumping System

The Yak Tunnel blockage pumping system consists of the blockage pump which is currently installed in the Black Cloud shaft, controls which are located in the Black Cloud mine shaft house, and the conveyance system which runs from the blockage pump to the WTP.

5.4.1 Sampling Location

Blockage water samples will be collected from the Blockage Influent Pipeline (BIL) inside the WTP at the frequency, and analyzed for the constituents, listed in Table 1. Samples will be collected directly from a sampling port on the pipeline before the Blockage water mixes with other waters.

5.4.2 Water Level Monitoring

Water levels will be monitored using a pressure transducer within the Black Cloud shaft. On a quarterly basis, the pressure transducer readings will be verified using hand water level measurements following procedures outlined in SOP-2.

5.4.3 Flow Monitoring

When Blockage water is flowing to the WTP for treatment, the flow will be monitored on a continuous basis. In cases of equipment breakdown, continuous monitoring may not be possible. In these cases, until equipment is repaired, Blockage flow monitoring will consist of subtracting the other influent sources from the WTP effluent measurements. Such repairs will be completed as soon as practicable.

5.5 Laboratory Analytical Methods, Detection Limits, and Reporting Limits

Table 2 presents the method for analysis, method detection limit(s) (MDL), and reporting or practical quantitation limit(s) (PQL) for each analyte that is required to be monitored under this plan. Depending on the laboratory used, the laboratory analytical equipment employed to conduct the requested analysis, and the laboratory QA/QC protocol and analysis; the MDL and PQL limits may change over time. The EPA and CDPHE shall be notified of any changes in the analytical laboratory used and any changes in the MDL or PQL limits as discussed in Section 5.7.

Table 2 Laboratory Analytical Methods, Detection Limits and Reporting Limits

Sample ID	Analyte	Method	Method Detection Limit (mg/L)	PQL (mg/L)
Influent	Calcium-Total	200.7	0.2	1
	Magnesium-Total	200.7	0.2	1
	Total Suspended Solids	2540D	5	5
	Aluminum-Acid Soluble	200.7	0.03	0.2
	Arsenic-Total Recoverable	200.8	0.0005	0.003
	Cadmium-Total Recoverable	200.8	0.0001	0.0005
	Copper-Total Recoverable	200.8	0.0005	0.003
	Iron-Total Recoverable	200.7	0.02	0.5
	Lead-Total Recoverable	200.8	0.0001	0.0005
	Manganese-Total Recoverable	200.7	0.005	0.3
	Selenium-Total Recoverable	200.8	0.001	0.005
	Zinc-Total Recoverable	200.7	0.002	0.1
	Chromium-Total Recoverable	200.8	0.0001	0.0005
	Mercury-Total	245.1	0.0002	0.001
	Silver-Total Recoverable	200.8	0.00005	0.001
Effluent	Calcium-Total	200.7	0.2	1
	Magnesium-Total	200.7	0.2	1
	Total Suspended Solids	2540D	5	5
	Aluminum-Acid Soluble	200.7	0.03	0.2
	Arsenic-Total Recoverable	200.8	0.0005	0.003
	Cadmium-Total Recoverable	200.8	0.0001	0.0005
	Copper-Total Recoverable	200.8	0.0005	0.003
	Iron-Total Recoverable	200.7	0.02	0.05
	Lead-Total Recoverable	200.8	0.0001	0.0005
	Manganese-Total Recoverable	200.7	0.005	0.03
	Selenium-Total Recoverable	200.8	0.001	0.005
	Zinc-Total Recoverable	200.8	0.002	0.005
	Chromium-Total Recoverable	200.8	0.0001	0.0005
	Mercury-Total	245.1	0.0002	0.0002
	Silver-Total Recoverable	200.8	0.00005	0.0002

5.6 Field Measurements and Sampling Procedures

The following sections provide a summary of procedures for field measurements and sampling. The SOPs in Appendix A provide more detailed procedures for this work.

5.6.1 Equipment Calibration, Operation, and Maintenance

The equipment used for monitoring the performance of the WTP, surge pond, Bulkhead, and Blockage mine pool, and for collecting field data during routine monitoring of the Yak Tunnel Hydrologic System includes a variety of stationary and portable instruments. Proper maintenance, calibration, and operation of each instrument shall be required of the WTP operational personnel or field technician(s) conducting routine monitoring activities. All instruments and equipment used to implement the selected remedy will be maintained, calibrated, and operated according to the manufacturer's guidelines and recommendations.

Appendix A contains detailed SOPs on calibration, operation, and maintenance for the following:

- Well Water Level Measurement – SOP-2
- Field Instrument Calibration and Operation – SOP-3
- Surface Water Flow Measurement – SOP-5
- Surge pond Staff Gauge – SOP-9
- Water Level Measurement Using Pressure Transducers – SOP-12

For equipment not covered in the SOPs, the operator will refer to the manufacturer's instructions contained in the Yak Tunnel WTP, Bulkhead, or surge pond O&M manuals. Copies of the O&M manuals are managed and retained per Section 5.8.1 Document Management and Retention. At the WTP, the manuals are located on the bookshelf in the control room.

5.6.2 Sample Identification and Labeling

Samples collected during monitoring, investigations, or RMP 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. Detailed procedures for sample identification and labeling are provided in SOP-7, Sample Handling, Documentation, and Analysis in Appendix A.

5.6.3 Sample Containers, Preservatives, and Holding Times

The following sections provide information on sample containers, preservatives, and holding times. Additional information is provided in SOP-7, Sample Handling, Documentation, and Analysis in Appendix A. Sample container size and type, the type of preservative, and holding times should be verified with the analytical laboratory prior to sample collection.

5.6.3.1 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, certified commercially-cleaned sample containers will be obtained from the contract 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. In general, 500 ml glass or polyethylene bottles are recommended for the collection of water samples that will be submitted for analysis of the general chemical constituents, major inorganic constituents, and metals.

5.6.3.2 Sample Preservation

Samples are preserved in order to prevent or minimize chemical changes that could occur during transit and storage. Either use of pre-preserved sample bottles from the contract analytical laboratory or 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 when necessary, stored on ice in coolers prior to shipping. Chemical preservatives will be prepared, measured, and added to the sample bottles by the analytical laboratory prior to sample container shipment or the sampler(s) immediately after sample collection. All preservatives used will be provided by the analytical laboratory and use of the preservative should be coordinated with laboratory personnel.

5.6.3.3 Sample Holding Times

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 the sample collection and analysis and/or extraction, based on the nature of the analyte of interest, the preservation method, and chemical stability factors. 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. General holding time guidelines are provided in SOP-7, Sample Handling, Documentation, and Analysis in Appendix A.

5.6.3.4 Sample Preparation and Shipping

After collection, samples will be labeled and prepared as described in previous sections, and when necessary placed on ice in an insulated cooler. The sample containers will be placed in re-closeable plastic storage bags and wrapped in protective packing material. Samples will then be placed right side up in a cooler with ice (double-bagged using plastic trash bags) for delivery to the laboratory.

Samples will be hand delivered or shipped by overnight express carrier for delivery to the analytical laboratory. All samples must be shipped for laboratory receipt and analysis within holding time(s). This may require daily shipment of samples with short holding times.

5.6.4 Sample Documentation and Tracking

Field notes and chain-of-custody (COC) information are an important part of field measurements and sample collection. The procedures for field notes and COC are discussed below and in SOP-7, Sample Handling, Documentation, and Analysis in Appendix A.

5.6.4.1 Field Notes

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, if appropriate, 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 field log book with consecutively numbered pages or on field data sheets. Specific information to be recorded and documented is contained in SOP-7.

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

5.6.4.2 Sample Chain-of-Custody

During field sampling activities, traceability of the sample must be maintained from the time the sample(s) 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, if these results are used to support litigation, and for minimizing the possibility of sample mix-up.

The primary objective of COC procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the time they are collected through laboratory analysis and their introduction as evidence. Specific procedures to follow and information to be recorded and

documented on COC forms is contained in SOP-7. Copies of all COC documentation will be compiled and maintained in the central files for OU1.

5.7 Quality Assurance/Quality Control

Quality assurance and quality control protocols serve to assure that the data collected pursuant to this plan meet specified standards of precision, accuracy, representativeness, comparability, and completeness.

The operator will utilize one or more laboratories to perform chemical analyses of samples collected during the operation and maintenance of the remedy for OU1. The laboratory contracted for analysis of metal chemical constituents must be accredited by the Colorado Certification Program.

The operator will require the laboratory to process all samples submitted according to the specific protocols for sample custody, holding times, analysis, reporting, and associated laboratory QA/QC. The designated laboratory QA/QC specialist and client services representative will maintain contact with the WTP supervisor to ensure that protocols are followed

The laboratories contracted by the operator will be required to allow access to employees of the EPA and State of Colorado and their authorized representatives at reasonable times to inspect or review equipment, practices, or operations regulated or required under this plan.

Over time, the operator may wish to change laboratories that have been contracted to perform sample analyses. If the new laboratory proposes to use a different method from those specified in this plan or a non-EPA method, the operator will submit all protocols to be used for analysis and reporting to EPA and the State of Colorado for approval at least 30 days prior to the commencement of the change.

5.7.1 Quality Assurance/Quality Control Samples

Quality control of field measurement data will involve (1) the collection of QC samples such as field duplicates, equipment rinsate samples, and field blanks, and (2) adherence to the sampling procedures described in the SOPs provided in Appendix A. Due to the significant quantity of historic data and the controlled environment for samples collected within the WTP, **field** QC samples will not be collected with the monthly influent and effluent samples. Internal laboratory QC analysis checks (e.g., spikes, duplicates, blanks, etc.) will still be performed for the monthly WTP samples.

In addition to the collection of field QC samples, adequate control of field measurements will be maintained through adherence to the equipment calibration, operation, and maintenance procedures described in the SOPs provided in Appendix A. Control of documentation practices will be accomplished

through routine checking of field books or forms, required checking and sign-off on chain-of-custody forms, and random spot checks of sampling activities for conformance to SOPs.

Laboratory QC checks will include the analysis of blank, duplicate, and matrix spike or matrix spike duplicate samples; calibration checks; and internal standards as required by the analytical methods referenced in Section 5.5, in each individual laboratory's QA Plan, or the State of Colorado Certification Program. In the case of matrix spike and matrix spike duplicate samples, predetermined quantities of stock solutions of certain analytes will be added to a sample matrix by the laboratory prior to sample extraction, digestion and analysis. These samples will then be analyzed to assess analyte stability and recovery throughout the entire analytical procedure.

5.7.2 Data Management

Flow, water level, and water quality data collected during WTP operations, routine monitoring, enhanced monitoring, or additional investigations will be input into a project specific database or remedial action/control specific database(s). The database will be maintained on a computer and structured so that all tasks associated with electronic data transfer from the analytical laboratory, data entry, processing, analysis, and reporting can be accomplished in an efficient and verifiable manner. Data and reports will be maintained and retained as described in Section 5.8.1.

5.7.3 Data Validation

An important part of quality assurance is data validation of the analytical results. The quality of data obtained for WTP compliance monitoring purposes will initially be assessed by comparing the data against historic data and looking for significant deviations. Analytical results will be evaluated to ensure that compliance with sampling procedures and documentation practices described in this plan and the SOPs have been met and that the analytical results are complete. Finally, the precision and accuracy of the data will be evaluated by: (1) calculating the relative percent difference and percent spike recovery, (2) ensuring that holding times have been met, (3) reviewing laboratory blank data for contamination, and (4) a review of reporting or practical quantitation limits.

The relative percent difference (RPD) between sample duplicate and matrix spike sample duplicate samples will be calculated and used to assess analytical precision. An RPD of less than 20 will be required to pass validation.

The RPD for each analyte will be calculated as follows:

$$RPD = \frac{|S - D|}{(S + D)/2} x100$$

Where: RPD = Relative Percent Difference
S = First Sample Value (original)
D = Second Sample Value (duplicate)

In matrix spike analyses, predetermined quantities of stock solutions of certain analytes will be added to a sample matrix prior to analysis. Samples will be split into duplicates, spiked, and analyzed. Percent recoveries will be calculated for each of the analytes spiked. The percent of spike recovery will then be used to estimate the accuracy of results for a given analyte. The percent recovery will be dependent on the analyte and method. For analysis at the WTP, the percent recovery should be between 70 and 130 percent to pass data validation. The percent recovery (%R) of a spiked analyte will be computed according to the following equation:

$$\%R = \frac{(SSR - SR)}{SA} X100$$

Where: SSR = Spiked Sample Result or the measured value for the relevant analyte in the matrix spike sample (total concentration of analyte).
SR = Sample Result or the measured value for the required analyte in the sample on which the matrix spike was performed (concentration of analyte originally present).
SA = Spike Added or the value for the concentration of each analyte added to the sample. The same concentration units must be used for spiked sample results, unspiked (original sample) results, and spike added sample results.

Laboratory blank sample analyte(s) should have an analytical result(s) less than the method detection limit. In some cases data may be usable if the blank sample has an analytical result(s) between the method detection limit and the reporting limit, but these data must be evaluated on a case by case basis.

5.8 Document Control and Reporting

The following sections describe the procedures and protocols that will be used for document control and reporting. These sections apply to this plan, the RMP, and the CP.

5.8.1 Document Management and Retention

The operator shall retain records of all monitoring information, including all calibration and maintenance records, copies of reports, and data generated. A document control system comprised of the following elements will be maintained for the duration of the project.

1) Maintenance of a central file containing all documents pertaining to OU1 work
2) Organization of the documents to facilitate retrieval of information
3) Segregation of documents containing information which are claimed to be privileged or confidential
4) Establishment of procedures to ensure that all required documents are routinely placed in the central file

Prior to November 2005, the WTP operator (ASARCO) established a central filing system at the ASARCO Globe Plant office located at 495 East 51st Avenue, Denver, Colorado 80216. Mr. Glen Anderson of ASARCO or his designated representative was responsible for updating and keeping an inventory of the central files. Starting in November 2005, the current operator established a central filing system at the WTP located at 960 County Road 2, Leadville, Colorado 80461. Duplicates of documents generated since November 2005 and the master file list are also kept at MFG, Inc. located at 3801 Automation Way, Fort Collins, Colorado 80525. The operator will retain those files transferred to it from Asarco LLC containing information that is required to be retained pursuant to this subsection. The operator shall notify EPA and the State in the event of any change in the location of these central files.

The inventory of all required documents contained in the central filing system will be periodically updated. In addition, copies of the documents will be made available to the EPA and the State upon request. The inventory for each document will contain the following information:

- Document date
- Authors, including title and affiliation
- Primary Recipient, including title and affiliation
- Document title or subject
- Summary of document contents
- Number of pages in the document

The central filing system will also contain the following documentation:

- All field measurements, log books, daily check sheets, and notebooks
- Laboratory data reports, which may include (but not be limited to) sample tags, chain-of-custody records, copies of sample tracking records, analysts log book pages, instrument log book pages (including instrument conditions), bench sheets, instrument readout records, computer printouts, chromatography charts, laboratory validation reports, raw data summaries, correspondence, memoranda, document inventory

The operator will permit the EPA, the State, and their authorized representatives to inspect and copy all relevant non-privileged records, files, maps and other documents, writings, or depictions. Any trade

secret material claimed as "confidential business information" under 40 Code of Federal Regulations (CFR) Part 2 shall be maintained separately in a locked file. If the EPA, the State, or their authorized representatives view the confidential file, this information will be disclosed to the public only in accordance with 40 CFR Part 2 or Colorado Revised Statute 24-72-204(3)(a)(IV). Such documents are exempt from public access under the Freedom of Information Act and the Colorado Open Records Act.

Adequate records will be maintained to document the process by which project objectives are met. Records kept by the operator will be legible, identifiable, and retrievable and will be protected to the extent possible against loss, damage or deterioration. Access to project files will be restricted to project and other authorized personnel only.

All records in the operator's possession pertaining to OU1 will be preserved for a minimum of ten years after their creation. In the event the operator desires to no longer maintain any such records at the end of the ten-year period, the records will be made available to EPA and the State for inspection and copying at least 90 days prior to such records being discarded.

5.8.2 Document Distribution

All reports or other documents required by this plan to be delivered to the EPA or State shall be transmitted to the following persons:

Distribution List for all notices or other communications required under this plan,

- Remedial Project Manager, U.S. EPA Region 8
- Project Manager, Hazardous Materials and Waste Management Division, Colorado Department of Public Health & Environment
- Case Attorney, Colorado Department of Law
- Yak WTP File

Additional Distribution List for Monthly Discharge Monitoring Report

U.S. EPA Region 8, Policy, Information, Management and Environmental Justice Program (8ENF-PJ), Attention: Director, 1595 Wynkoop, Denver, CO 80202

Any party may change its recipient for notices under this work plan upon 10 days prior written notice to the other parties.

5.8.3 Reporting

Pursuant to this plan, the following reports are required to be prepared and provided to the EPA and the State: monthly progress report, monthly discharge monitoring report (DMR), and annual monitoring report. The required content and format for each of these reports is described below. Distribution of these reports is specified in Section 5.8.2. Reports or other documents required by this plan will be transmitted by United States mail, overnight delivery service, hand delivery, or as otherwise agreed.

5.8.3.1 Monthly Reports

A monthly progress report and discharge monitoring report (DMR) will be prepared and transmitted by the 28th day of the following month. The monthly progress report will be submitted in the format presented in Appendix B and will include the following information:

- A description of major operational activities or changes made during the month, including any changes in activities related to the management of the mine pool and tunnel blockage
- Influent and effluent flow rates, total flows, and analytical analysis
- Chemical usage
- A summary of major mechanical repairs and maintenance activities
- Future or on-going major procurement or engineering projects
- A description of any O&M problems encountered and corrective measures
- Sludge production, management, and the results of analytical testing (if performed)
- On a semi-annual basis, results of acute whole effluent testing
- A copy of monitoring data downloaded tri-annually, as required in the RMP
- For monthly reports that include tri-annually downloaded data, any determination under the CP that enhanced monitoring or additional investigations are required, or that an adverse water condition or hydraulic gradient reversal has occurred.

The monthly DMR will be submitted in the format presented in Appendix C and will include the following information:

- Semi-annual results of acute whole effluent testing submitted on EPA Form 3320-1 Discharge Monitoring Report (DMR)
- Influent and effluent monitoring results and loading calculations for parameters listed in Table 1 submitted on EPA Form 3320-1 Discharge Monitoring Report (DMR)

For both of these reports the concentration and loading calculations and reporting will be performed in the following manner. For reporting of effluent loading calculations, measurements less than the practical quantitation level shall be considered as zero. For reporting of effluent concentrations, the actual

concentration will be reported. If the effluent concentration is less than the PQL, a "<" will be used for the concentration. For influent concentrations, individual water sources will be reported separately. For reporting influent loading calculations, less than the practical quantitation level shall be considered as zero. For reporting of influent concentrations, the actual concentration will be reported. If the influent concentration is less than the PQL, a "<" will be used for the concentration.

For the purpose of this plan, the practical quantitation level for total recoverable silver and total mercury is considered to be 1.0 µg/L. Analytical values less than 1.0 µg/L shall be reported as zero and will be considered to be in compliance with the effluent limitations for total mercury and total recoverable silver. For loading calculations of mercury and silver analytical results, measurements less than the practical quantitation level shall be considered to be zero.

5.8.3.2 Annual Reports

An annual monitoring report will be prepared to address the reporting requirements specified in the RMP, attached as Appendix D and to summarize data collected in OU1 during the previous year. This report will be transmitted within 90 days after the end of the calendar year. This report will include the following information:

- Summary of routine and enhanced monitoring activities
- Summary and evaluation of Yak Tunnel bulkhead data including water levels, flows, and water quality data
- Summary and evaluation of bedrock groundwater levels and quality
- Summary and evaluation of Yak Tunnel blockage pumping data
- Conclusions and recommendations

6.0 PROPER OPERATION AND MAINTENANCE

The operator shall operate and maintain the OU1 remedy in accordance with this plan and the incorporated O&M manuals. Proper operation and maintenance of the WTP also includes operation by or supervision of the WTP operations by a State of Colorado Class B certified water treatment plant operator and adequate laboratory controls and appropriate quality assurance procedures. In the event of a material change in the WTP process, operator certification requirements shall be reevaluated pursuant to the Water and Wastewater Facility Operators Certification Requirements outlined in Regulation No. 100 (5 CCR 1003-2). OU1, including the Yak Tunnel Blockage Pumping System, will be maintained and operated according to manufacturers' instructions and EPA-approved O&M manuals and updates that reflect changes and updates to equipment and processes. The operator will periodically update the O&M manuals. The original O&M manuals are hereby incorporated into this Work Plan and consist of the following:

- WTP - Yak Tunnel WTP Leadville, Colorado Operations and Maintenance Manual, Volumes 1 through 6 (Tetra Technologies, Inc., 1992)
- Surge pond - Operations and Maintenance Manual for the surge pond and Filter Unit, Yak Tunnel Operable Unit, California Gulch Site, Volumes 1 and 2 (Woodward-Clyde, 1990)
- Bulkhead – Draft Yak Tunnel Bulkhead Construction and Completion Report & Bulkhead O&M Manual (Lyntek, 1995)
- Blockage – An Operations and Maintenance Manual for the Blockage Pumping System will be provided to EPA within 90 days after the Effective Date of the Consent Decree.

Changes to the O&M manuals that are or will result in a process or operational change will be submitted to the EPA and the State for approval. If conflicts exist between this document and the O&M manuals for sampling, QA/QC, or reporting, the most recent EPA approved document will control.

The operator will inspect the Yak Tunnel from the portal to the bulkhead semi-annually. The inspection will identify any observable collapses, partial blockages or other conditions that would impede access to the bulkhead. Findings from these inspections will be included in the annual report. The operator will take appropriate actions to maintain access to the bulkhead.

6.1 Solid Waste Management

Solid waste collected as screenings, grit, trash and solids that are not required to be treated under this work plan, but are removed in the course of treatment or other daily operations shall be disposed of at a State of Colorado licensed solid waste landfill in accordance with State rules and regulations.

7.0 COMPLIANCE

7.1 Performance Standards

Discharges from Outfall 001 shall meet the effluent limitations set forth in Table 1. Influent sources to the WTP that do not meet the effluent limitations in Table 1 shall be treated to meet those effluent limitations, prior to discharge at Outfall 001. Influent sources to the WTP that meet effluent limitations (Table 1) without treatment, may be routed around the WTP treatment process and discharged at Outfall 001. With prior written approval from EPA and the State, the operator may treat any influent at its source to the discharge standards in Table 1 and discharge without further treatment at the WTP.

Groundwater elevations behind the Yak Tunnel Bulkhead will be maintained at an elevation of between 20 to 35 feet above the tunnel invert, unless modifications to these elevations are approved by EPA and the State.

The operator is currently pumping water from behind the current blockage in the Yak Tunnel to reduce water levels behind the blockage to a level equal to or less than 10,520 feet above mean sea level (amsl) as measured at the Black Cloud shaft. The operator shall continue to diligently pursue drawdown of the water level behind the blockage until this level is achieved. Once this drawdown has been achieved, and except as provided below, water levels behind the current blockage in the Yak Tunnel described in Section 4.1.5 shall be maintained through dewatering efforts at a level at or less than 10,520 feet amsl as measured at the Black Cloud shaft . These elevations are reflective of water levels at the 1330 lateral (the lateral that connects the Irene shaft to the Yak Tunnel) and represent the best estimate of water levels at the suspected blockage down-tunnel from the Black Cloud/Ibex-Irene/Resurrection-Fortune mine pool.

After drawdown has been achieved, water levels behind the current blockage in the Yak Tunnel may rise above the 10,520 feet amsl when (i) it is necessary to shut down pumps at the Black Cloud shaft for routine or emergency maintenance or replacement procedures, or (ii) it is necessary to slow or stop pumping from the Black Cloud shaft to treat other influent streams. In either event, water levels in the Yak Tunnel behind the current blockage will not exceed 10,684 feet amsl, unless approved in writing by EPA and the State. Emergency situations may include, but are not limited to, pump failure, electrical failure, pipeline problems or treatment plant problems.

If the decision-making process under the CP results in additional response action, this Work Plan shall be amended, as appropriate, to establish O & M requirements and performance standards for such additional response action.

7.2 Twenty-Four Hour Reporting

The operator shall report any release of hazardous substances, pollutants, or contaminates as required under Section XIII of the Consent Decree (Reporting Requirements).

In addition, an unanticipated Bypass, Upset, operational error or other circumstance resulting in the discharge of untreated or insufficiently treated water to California Gulch that exceeds any effluent limitation in Table 1 shall be reported by telephone to EPA, Region 8, Water Permits Unit, Sandy Stavnes at 303-312-6117 and the State of Colorado, HMWMD/Remedial Release and Incident Reporting hotline at (877) 518-5608 as soon as possible, but no later than the first workday following the day the operator becomes aware of the circumstance. Unless waived by the EPA Remedial Project Manager, a written report will be provided within 5 working days following the date of the verbal notice. The report shall be submitted to the Discharge Monitoring Report distribution list in Section 5.8.2. The report will contain a description of the release (including the dates and times of release) and its cause or probable cause.

7.3 Inspection and Entry

The operator shall allow the EPA, the State, and their authorized representative(s), upon the presentation of credentials and other documents as may be required by law, access to facilities constructed as part of the OU1 remedy as provided in Section XII of the Consent Decree (Access and Institutional Controls).

7.4 Duty to Mitigate

The operator shall take all practicable actions to minimize or prevent any discharge in violation of this Work Plan or identified effluent limitations.

7.5 Bypass

The following subsections describe when an anticipated Bypass is allowed and the procedures to follow in the event of unanticipated Bypass.

1) Notice.
    a. Anticipated Bypass. If the operator knows in advance of the need for a Bypass, it shall submit prior notice, if possible, at least 30 days before the date of the Bypass.
    b. Unanticipated Bypass. The operator shall submit notice of an unanticipated Bypass as required under Section 7.2 Twenty-Four Hour Reporting.

2) Prohibition of Bypass.

A Bypass is prohibited unless the operator provides notice as provided in paragraph 1 and the following conditions are met:

i. The Bypass is or was unavoidable to prevent loss of life, personal injury, or severe property damage; and

ii. There are or were no feasible alternatives to the Bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a Bypass which occurred during normal periods of equipment down time or preventative maintenance.

3) Approval of Bypass. EPA, after consultation with the State, may approve a Bypass, after considering its adverse effects, if the EPA determines that it meets the two conditions listed above in paragraph 2 of this section.

7.6 Upset Conditions

The following subsections address Upset conditions at the WTP.

1) **Effect of an Upset**. An Upset constitutes an affirmative defense to action brought for noncompliance with the effluent limitations if the requirements of paragraph 2 of this section are met.

2) **Conditions necessary for a demonstration of Upset.** If the operator wishes to establish the affirmative defense of Upset, it shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An Upset occurred and that the operator can identify the cause(s) of the Upset,

b. The WTP was at the time being properly operated,

c. The operator submitted notice of the Upset as required under Section 7.2, Twenty-four Hour Reporting, and

d. The operator has taken all practicable actions to minimize or prevent any discharge in violation of this Work Plan or identified effluent limitations.

3) **Burden of proof.** In any enforcement proceeding, the operator has the burden of proof to establish the occurrence of an Upset

8.0 SITE SAFETY PLAN

The primary purpose of the safety guidelines in this plan is to help prevent personal injury to workers at the WTP and damage to equipment or ancillary Facilities. Potential hazards at the WTP include physical injury via falls or contact with moving parts or equipment, drowning, electrical shock, burns caused by contact with caustic chemicals, and access to oxygen deficient areas.

Safe operation of the WTP begins with proper management. An authority is needed to ensure that safe practices are used at the treatment plant. The Supervisor for the plant is delegated as the authority for plant safety. However, it is the responsibility of every employee to maintain a safe workplace. The supervisor is responsible for seeing that personnel are knowledgeable of potential health hazards at the plant and are aware of safety rules and safe procedures. The supervisor will meet with new employees, suppliers or vendors (before commencing work or WTP service) and detail the health hazards and safety regulations and procedures at the plant. The responsibilities of the employees will also be described in this meeting.

The names and telephone numbers of the local hospitals, ambulances, and fire service will be posted. The names and telephone numbers of manufacturer's representatives who could answer safety questions on specific equipment will be given to the employee. The names and telephone numbers of contacts in case of an employee complaint about plant safety conditions will also be given and posted.

All employees shall be trained in first aid equivalent to the American Red Cross basic first aid training.

A copy of the safety rules will be supplied to the employees, suppliers or vendors. The locations of the operations and maintenance manuals (supplied by the manufacturer), Material Safety Data Sheets, and Hazardous Material Communication Plan (Worker Right-to-know OSHA 1910.1200) for specific equipment and materials will be given to the employees, suppliers and vendors. When (and if) new processes are installed at the plant, it is the supervisor's responsibility to become acquainted with the safe operation and maintenance of the new equipment, and to relay such information to the employees. Material Safety Data Sheets will be kept with the O&M manuals. Basic first-aid equipment will also be available.

The supervisor is responsible for enforcing safety regulations. Infractions of safety regulations should be documented, and if necessary, appropriate disciplinary action be taken. If an employee reports an unsafe condition or act, the situation should be investigated and documented by the supervisor, and corrective action taken if necessary. In general, substandard work practices or conditions must be corrected as soon as possible; those affecting safety will be corrected immediately.

8.1 Employee's Responsibilities

Management of safety by the supervisor at the WTP does not relieve the employees of their responsibility for conducting safe work practices. The employee should know whom to contact for safety questions, where the O&M manuals for equipment are, whom to contact at the plant for first-aid, and the names, locations and telephone numbers of emergency medical services. In general:

1) All written and oral safety rules should be observed and particular job-associated hazards recognized
2) A job should not be started until proper safety instructions have been received and are understood
3) Any hazardous conditions, unsafe equipment, or unsafe working practice must be reported to the supervisor immediately
4) Employees must perform routine, daily pre-shift workplace inspections before beginning daily operations and record the observations of the inspection
5) All injuries or accidents must be reported to the supervisor within 24 hours of occurrence
6) All water in the plant, other than drinking water coolers or faucets provided for potable use, must be considered contaminated and unsafe to drink
7) Running in the plant, except in case of emergency, is forbidden
8) Moving equipment must not be operated unless instruction in its use has been given
9) Speed limits, traffic signs, and parking regulations must be observed within the plant site
10) Safety devices and safety guards must be in place before operating any equipment
11) Hand tools and special tools must be kept clean and in good repair
12) The correct tool must be used for the particular job in the proper manner
13) Proper protective equipment must be used for particular job conditions
14) Wearing loose clothing shall be avoided because it may be caught in moving equipment
15) Good housekeeping shall be practiced at all times
16) The rules of personal hygiene are to be observed to avoid infection
17) Practical jokes, rowdiness, and "horseplay" are strictly forbidden
18) Reporting under the influence of alcohol or drugs, or bringing them on the premises, is forbidden
19) Under no circumstances is safety to be sacrificed for speed
20) No job is considered to be finished until the safety of the next person to use the equipment or facility has been maximized

The general rules of personal hygiene are:

1) Hands and fingers should be kept from the nose, mouth, eyes, and ears

2) Rubber gloves must be worn when cleaning pumps; handling raw water, screenings, sludge, or grit; or for other work in which an employee comes into direct contact with untreated raw water or sludge

3) Gloves always should be worn when hands are chapped or burned or when the skin is broken

4) Before eating or smoking, and after work, hands must be washed thoroughly with soap and hot water

5) Fingernails should be kept short, and foreign material should be removed from the nails with a stiff soapy brush

6) Fresh work clothes should not be stored in a locker with used work clothes. Usually, two lockers are assigned each employee

7) All cuts and scratches must be reported and be given first-aid treatment

8) A shower should be taken after each work day

8.2 Telephone Numbers

The following list of numbers will be posted at the WTP.

EMERGENCY RESPONSE PHONE NUMBERS

General Emergency Numbers:
Fire
Ambulance
Sheriff

St. Vincent General Hospital
West Fourth and Washington, Leadville

Directions to St. Vincent General Hospital from Yak Tunnel: Drive down South Toledo to Fourth, left at Fourth to Washington.

Poison Control Center:

Corporate Resources:

Operator Yak Water Treatment Project Manager
Name (office)
(cell)
(home)

Treatment Plan Site Supervisor
Name (office)
(cell)
(home)

Certified Operator
Name (office)
(cell)

Other Resources:

National Response Center
Superfund/RCRA Hotline
TSCA Hotline
Centers for Disease Control (Day)
(Night)
U.S. EPA Environmental Response Team
Colorado Department of Health (Office Hours)
(24 Hours)

8.3 Potential Hazards

8.3.1 Confined Spaces, Sewers, and Trenches

Production of toxic or explosive gases (and the corresponding decrease in ambient air oxygen content) associated with organic degradation does not seem possible due to the inorganic nature of the treated or untreated water. However, should access (such as via a manhole, tanks, etc.) to a confined space area become necessary, applicable procedures to ensure human safety when entering the contained area must be followed. Such procedures include gas testing equipment, use of non-sparking tools and explosion-proof portable lights, use of self-contained air breathing apparatus, barricading off-entry areas, use of safety harness and life lines, and having a standby rescue crew ready. Air purging techniques of confined areas must be used when dealing with long-time maintenance work in confined areas. Prior to a confined space entry, a completed and signed "Confined Space Entry Permit" must be completed.

No worker will enter a trench or excavation that is deeper than four feet unless the side walls of the trench or excavation has been properly shored or laid back.

8.3.2 Electrical Hazards

Electricity is used to power most unit processes at the WTP. The supervisor must appoint one trained and qualified person (designated person) to respond to all questions and problems dealing with the electrical systems at the plant. Personnel who have not been trained in electrical procedures will not work on electrical equipment.

Any electrical problems encountered at the plant will be referred to the designated person. The designated person should investigate and document the problem, and repair the problem if possible. If the degree of the problem is such that repair is beyond the capabilities of the designated person, an appropriate outside source should be contacted. General work practices include:

1) All persons working on a process system or electrical installation which is powered or serviced by an electrical service or may provide the sudden release or movement of

mechanical equipment or power sources (water, air, etc) must provide and use lock-out switches and tags at all remote locations or where the electrical disconnect or source of the power is located.

2) No individual will remove another persons electrical or safety lockout. Should such an action occur, the individual removing another individuals safety lockout will be subject to severe disciplinary action which may include termination.
3) Electrical equipment and lines must always be considered as energized unless they are positively proven to be de-energized and properly grounded. If it is not grounded, it is not dead.
4) The use of metal ladders or metal tape measures around electrical equipment must be avoided.
5) Two men must work as a team on energized equipment.
6) Use approved rubber gloves on voltages above 300 V.
7) An electrical control panel must never be opened unless the job requires it.
8) Before work is performed on a line or bus that operates at 440 V or above, it must be de-energized, locked out, and grounded in an approved manner.
9) No part of the body may be used to test a circuit.
10) Personnel must avoid grounding themselves in water or on pipes, drains, or metal objects when working on electrical equipment or wiring.
11) No electrical safety device may be made inoperative or bypassed.
12) When working in close quarters, all energized circuits must be covered with insulating blankets.
13) All electrical hand-tools must have double insulated casings and electrical cords shall be free of insulation damage.
14) All electrical equipment must be free from damage and electrical cords shall be free of insulation damage.
15) Metal-cased flashlights shall never be used with or near electric circuitry.
16) Jewelry should not be worn when working with or near electric circuitry.
17) Rubber mats must be used at all control centers and electrical panels and a 3 foot working space must be maintained around the centers at all times.
18) All electric motors, switches, and control boxes must be kept clean at all times.

8.3.3 Mechanical Equipment Hazards

Moving machine parts shall be guarded to at all times to prevent personal contact with moving parts. In the event, mechanical guards must be removed to service or repair the mechanical equipment the equipment will be deenergized and locked out prior to service.

8.3.4 Explosion and Fire Hazards

Common explosion hazards, seen in wastewater plants treating waste with organic chemicals, are not present in the WTP.

In case of fire at the plant, the fire protection sprinkler system will be activated. Fire detectors are located at key positions throughout the building. The number(s) to call in case of fire are listed in Section 8.2 of this plan. Employees should be informed of their roles in fire prevention and control, and the obvious escape routes from the plant.

8.3.5 Sulfuric Acid Hazards

Sulfuric acid is corrosive and should be handled with care and is an irritant to the eyes, noses and throat. If ingested, it can lead to pulmonary edema or bronchitis. Contact with the skin can lead to emphysema, conjunctivitis, stomatis, dental erosion, tracheobronchitis, skin and eye burns, or dermatitis.

First aid steps include:

- Eye - If sulfuric acid contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.
- Skin - If sulfuric acid contacts the skin, immediately flush the contaminated skin with water, if it penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly.
- Inhalation - If a person breathes large amounts of sulfuric acid vapors, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.
- Swallow - If a person swallows sulfuric acid, get medical attention immediately.
- Spills - Do not attempt to neutralize sulfuric acid spills by flooding with water.

Special protection information and special handling and storage precautions are listed on the Material Safety Data Sheet.

8.3.6 Oxygen Deficiency and Noxious Gases

If dealing with an oxygen deficient environment, or an area where toxic gases are present (carbon monoxide, diesel emissions, etc.), the following precautions should be taken:

1) If working underground in a toxic gas environment: Proper monitoring, confined space entry procedures, warning devices, barriers, barricades, or guard rails should be followed and in place to protect the public and operators before manhole covers or gratings are removed.
2) If working underground: Trucks and other equipment should be placed to present the least impediment or hazard to traffic. If possible, trucks or equipment should be placed between the working area and oncoming traffic. The vehicles should have a rotating warning light in operation.
3) Manhole covers always should be removed and replaced with approved hooks or hoists.
4) An open flame should never be used to melt ice around and below a manhole cover or any other surface cover.
5) Smoking should not be permitted in any enclosure.
6) Before entering any contained area, a confined entry space permit must be completed, tests for oxygen deficiency and the presence of dangerous gas with approved gas indicators.
7) If the atmosphere is normal, a worker with a safety harness attached to a life line may enter the below surface work area.
8) For extended jobs, forced air ventilation should be used and gas tests should be repeated at intervals depending on the circumstances.
9) While work is in progress in a manhole, two men should be stationed at the surface of the opening to handle the life line if necessary.
10) When a gas or oxygen deficiency is found, the below-surface area should be purged by forcing fresh air into the enclosure before entering. Adequate ventilation must be maintained during work, and tests should frequently be repeated.
11) In an emergency, if it becomes necessary for an employee to enter when gas or oxygen deficiency is present, personnel trained with the use of self-contained breathing apparatus must be used.
12) Extreme care should be taken to avoid all sources of ignition if flammable gas is present. Non-spark tools and shoes with rubbers should be used along with safety lights.
13) A portable, non-conductive ladder should be used wherever space allows, otherwise, in-place units may be used.
14) On first entering, a careful inspection for unsafe conditions should be made. Defects such as cracks and loose bricks in the roof, walls, floor ducts and sumps should be reported to the immediate supervisor.
15) Only one employee at a time should be permitted on a manhole ladder. Others should not stand directly under the ladder.
16) Manhole rungs should be checked and weak or faulty rungs should be reported to the immediate supervisor.

17) If a liquid found in a manhole or vault is thought to be flammable, it should be tested by an approved method. If the liquid is found to be flammable, it should be removed before other work is performed.

18) Each employee should wear proper protective clothing such as hard hat, rubber gloves, and rubber boots.

8.3.7 Laboratory Hazards

A laboratory is not present at the WTP; however, pH, conductivity, and turbidity meters are used at the plant. Samples will be sent out for analysis. Health hazards from the field meter are minimal.

8.3.8 Safety Equipment

Safety equipment is available at the WTP. The supervisor shall inform all employees of the locations of the equipment. The following safety equipment will be available:

1) First-aid kits
2) Fire extinguishers
3) Respiratory protection
4) Protective clothing, including safety goggles, face shields, hard hats, gloves, rubber boots, safety shoes, and rain gear
5) Atmospheric testing equipment to identify oxygen deficiencies and explosive, toxic, and combustible gases
6) Portable air blower system
7) Barricades, cones, warning signs, etc.
8) Full restraint equipment
9) Flotation devices

8.3.9 Process Chemical Handling

The following chemicals are used at the WTP:

1) Hydrated lime is used to raise the pH of various processes. A hydrated lime storage system, pre-mix tank, and feed system are present at the plant.
2) Polymer is added to the flocculation tank to help settle the slurry mixture of influent and recycled sludge. A polymer storage system, a pre-mix tank, and feed system are present at the plant.
3) A sulfuric acid storage and feed system, for raising the pH of the effluent, is present at the plant.

In general, polymer is not hazardous to human health. Sulfuric acid is caustic and should be handled with care, see Section 8.3.5.

Hydrated lime and dust from hydrated lime are irritants, affecting the skin, eyes, mucous membranes, and upper respiratory tract. Plant personnel that will be exposed to working with hydrated lime should observe the necessary safety precautions, which include those listed below:

1) Dust from hydrated lime can be very irritating if inhaled. Where dust concentrations are prevalent, approved respirators should be worn.
2) Approved eye protection is required for working with hydrated lime. Workers can wear either tight-fitting safety glasses with side shields or goggles.
3) Besides using eye protection and respirators, workers exposed to hydrated lime should be fully clothed. Workers should wear long-sleeved shirts with both the collar and sleeves buttoned. Trousers should be cuff less and have legs long enough to fit over the tops of shoes or boots (low shoes should not be worn). Clothing should not bind too tightly around the neck, wrists, or ankles. Approved protective gloves should also be worn.
4) The use of sweatbands is advisable to prevent perspiration that mixes with hydrated lime dust, from trickling into the eyes.
5) Workers should shower after handling hydrated lime. If clothes are permeated with dust or splattered with hydrated lime slurry, they should be removed and laundered. Clean clothes should be worn every shift.

Safety instructions from the manufacturer or suppliers of the chemicals, Material Safety Data Sheets and the O&M manuals for the chemical systems should be read by employees who will be working on the chemical systems Material Safety Data Sheets for the chemicals used in the plant are stored with the O&M manuals.

8.3.10 Fall Protection

This section presents general guidelines for basic fall protection when working in elevated areas. During elevated work, the precautions below must be taken.

- All fall hazards should be identified at work sites with the potential for elevated work. Once an elevated fall hazard has been recognized, an appropriate control measure must be selected. Priority should be given to elimination of the fall hazard over the use of fall protection equipment.
- Approved safety harnesses and lanyards shall be worn by employees whose work exposes them to falls of greater than 6 feet.
- All fall protection devices should be used only in accordance with manufacturer's recommendations.
- All fall protection devices shall be inspected daily before use.
- Any lifeline, harness, or lanyard actually subjected to in-service loading (a fall) should be immediately removed from service and not used again for employee fall protection.
- Employees who are required to wear fall protection should be trained in the use of the equipment, as well as in fall protection work practices.

- The system must limit maximum arresting force on an employee to 1,800 pounds when used with a body harness.
- The system must be rigged so that an employee cannot free fall more than 6 feet or come in contact with any lower level in the event of a fall.
- The system must bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet.
- The system must have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet or the free-fall distance permitted by the system, whichever is less.

8.3.11 Portable Ladder Safety

This section applies to portable ladders only. Fixed ladder systems shall be used when regular access is required such as for entering storage tanks and raised work platforms. Procedures to ensure portable ladder safety are listed below.

- Ladders should be maintained in good condition at all times. Damaged ladders shall be withdrawn from service immediately.
- Ladders should be inspected regularly and removed from service and repaired or discarded if defective.
- Rungs should have slip-resistant surfaces and be kept free of grease and oil.
- Tops and pail shelves of portable stepladders should not be used as steps.
- Rung and cleat ladders should be placed so that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder.
- Ladders should not be placed in front of doorways, drives, or passageways.
- Ladders should not be placed on boxes, barrels, or other unstable bases to add height.
- Employees should always face the ladder during ascent or descent.
- Metal ladders should not be used in areas with the potential for contact with electric circuits.
- Ladder side rails shall extend at least 3 feet above the upper landing surface to which the ladder is used to access.
- Ladder shall be used only on stable and level surfaces. Do not use ladders on slippery surfaces.

8.3.12 Cold Stress

This section describes situations where cold stress is likely to occur and discusses procedures for the prevention and treatment of cold-related injuries and illnesses. Cold conditions may present health risks to employees during field activities. The two primary factors that influence the risk potential for cold stress are temperature and wind velocity. Wetness can also contribute to cold stress. Other factors that increase susceptibility to cold stress, include age (very young or old), smoking, alcohol consumption,

fatigue, and wet clothing. Hypothermia can occur at temperatures above freezing if the individual has on wet or damp clothing or is immersed in cold water. The combined effect of temperature and wind can be evaluated using a wind chill index as shown in Table 3.

Table 3 Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	LITTLE DANGER in less than 1 hour with dry skin; maximum danger from false sense of security				INCREASING DANGER from freezing of exposed flesh within 1 minute			GREAT DANGER that flesh may freeze within 30 seconds				

Source: Modified from American Conference of Governmental Industrial Hygienists. 1997. "Threshold Limit Values for Chemical Substances and Physical Agents."

Bare flesh and body extremities that have high surface area-to-volume ratios such as fingers, toes and ears are most susceptible to wind chill or extremely low ambient temperatures. Because cold stress can create the potential for serious injury or death, employees must be familiar with the signs and symptoms and various treatments for each form of cold stress. Table 4 provides information on frostbite and hypothermia, the tow most common forms of cold-related injuries.

Table 4 Cold Stress Conditions

Condition	Causes	Signs and Symptoms	Treatment
Frostbite	Freezing of body tissue, usually the nose, ears, chin, cheeks, fingers, or toes	• Pain in affected area that later goes away • Area feels cold and numb • Incipient frostbite (frostnip) – skin is blanched or whitened and feels hard on the surface • Moderate frostbite – large blisters • Deep frostbite – tissues are cold, pale and hard	• Move affected worker to a warm area • Immerse affected body part in warm (100 to 105 °F) water – not hot! • Handle affected area gently; do not rub • After warming, bandage loosely and seek immediate medical treatment
Hypothermia	Exposure to freezing or rapidly dropping temperatures	• Shivering, dizziness, numbness, weakness, impaired judgment, and impaired vision • Apathy, listlessness, or sleepiness • Loss of consciousness • Decreased pulse and breathing rates • Death	• Immediately move affected person to warm area • Remove all wet clothing and redress with loose, dry clothes • Provide warm, sweet drinks or soup (only if conscious) • Seek immediate medical treatment

When working in cold environments, specific steps should be taken to lessen the chances of cold-related injuries. These include the following:

- Protecting of exposed skin surfaces with appropriate clothing (such as face masks, handwear, and footwear) that insulates, stays dry, and blocks wind.
- Shielding the work area with windbreaks to reduce the cooling effects of the wind.
- Providing equipment for keeping workers' hands warm by including warm air jets and radiant heaters in addition to insulated gloves.
- Using adequate insulating clothing to maintain a body core temperature of above 36 °C.
- Providing extra insulating clothing on site.
- Reducing the duration of exposure to cold.
- Changing wet or damp clothing as soon as possible.

8.3.13 Heat Stress

This section describes situations where heat stress is likely to occur and provides procedures for the prevention and treatment of heat-related injuries and illnesses. Wearing personal protective equipment (PPE), especially during warm weather, puts employees at considerable risk of developing heat-related illness. Health effects from heat stress may range from transient heat fatigue or rashes to serious illness or death.

May factors contribute to heat stress, including PPE, ambient temperature and humidity, workload, and the physical condition of the employee, as well as predisposing medical conditions. However, the primary factors are elevated ambient temperatures in combination with fluid loss. Because heat stress is one of the more common health concerns that may be encountered during field activities, employees must be familiar with the signs, symptoms, and various treatment methods of each form of heat stress. Heat stroke is the most serious heat-related illness – it is a threat to life and has a 20 percent mortality rate. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age directly affect the tendency to heat stroke. Table 5 lists the most serious heat conditions, their causes, signs and symptoms, and treatment.

Table 5 Heat Stress Conditions

Condition	Causes	Signs and Symptoms	Treatment
Heat cramps	Fluid loss and electrolyte imbalance from dehydration	• Painful muscle cramps, especially in legs and abdomen • Faintness • Profuse perspiration	• Move affected worker to a cool location • Provide sips of liquid such as Gatorade® • Stretch cramped muscles • Transport affected worker to hospital if condition worsens
Heat Exhaustion	Blood transport to skin to dissipate excessive body heat, resulting in blood pooling in the skin with inadequate return to the heart	• Weak pulse • Rapid and shallow breathing • General weakness • Pale, clammy skin • Profuse perspiration • Dizziness • Unconsciousness	• Move affected worker to cool area • Remove as much clothing as possible • Provide sips of liquid such as Gatorade® (only if conscious) • Fan the person but do not overcool or chill • Treat for shock • Transport to hospital if condition worsens
Heat Stroke	Life threatening condition from profound disturbance of body's heat-regulating mechanism	• Dry, hot and flushed skin • Constricted pupils • Early loss of consciousness • Rapid pulse • Deep breathing at first, and then shallow breathing • Muscle twitching leading to convulsions • Body temperature reaching 105 or 106 °F or higher	• Immediately transport victim to medical facility • Move victim to cool area • Remove as much clothing as possible • Reduce body heat promptly by dousing with water or wrapping in wet cloth • Place ice packs under arms, around neck, at ankles, and wherever blood vessels are close to skin surface • Protect patient during convulsions

When working in hot environments, specific steps should be taken to lessen the chances of heat-related illnesses. These include the following:

- Ensuring that all employees drunk plenty of fluids (Gatorade® or its equivalent)
- Ensuring that frequent breaks are scheduled so overheating does not occur
- Revising work schedules, when necessary, to take advantage of the cooler parts of the day

When PPE must be work (especially Levels A and B), suggested guidelines relating to ambient temperatures and maximum wearing time per excursion are as shown in Table 6.

Table 6 Suggested Guidelines when Wearing PPE

Ambient Temperature	Maximum PPE Wearing Time per Excursion
Above 90 °F	15 minutes
85 to 90 °F	30 minutes
80 to 85 °F	60 minutes
70 to 80 °F	90 minutes
60 to 70 °F	120 minutes
50 to 60 °F	180 minutes

Source: National Institute for Occupational Safety and Health (NIOSH). 1985. Memorandum Regarding Recommended Personal Protective Equipment Wearing Times at Different Temperatures. From Austin Henschel. To Sheldon Rabinovitz. June 20.

9.0 GENERAL REQUIREMENTS

9.1 Planned Changes

The operator shall include in the monthly progress reports a description of any physical alterations or additions to the WTP or other Facilities. The operator shall provide notice to, and gain approval from, EPA and the State prior to construction when the alteration or addition would significantly change the nature or increase the quantity of pollutants discharged from the WTP or other facilities. The operator shall furnish the EPA and State such plans and specifications reasonably necessary to evaluate the effect of the discharge on the receiving stream. The EPA and State may approve any such alterations or additions to the facilities by written notice to the operator.

9.2 Signatory Requirements

All reports or information submitted to the EPA or State shall be signed. The DMR shall be signed and certified.

1) All reports required by this plan shall be signed by the operator's Project Manager or by a duly authorized representative of that person. A person is a duly authorized representative only if:
    a. The authorization is made in writing by the operator's Project Manager and submitted to the EPA and State, and
    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).
2) Changes to authorization. If an authorization under paragraph 1) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph 1) must be submitted to the EPA and State prior to or together with any reports, information, or applications to be signed by an authorized representative.
3) Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete.

10.0 CONTINGENCY PLAN AND ROUTINE MONITORING PLAN

The Routine Monitoring Plan and Contingency Plan are generally discussed in this section and are attached to this plan as Appendix D and E, respectively. The Routine Monitoring Plan provides for the collection of long term monitoring information on the Yak Tunnel Hydrologic System to allow for evaluation of changes in the system and the potential need for response actions. The Contingency Plan provides the decision-making process for evaluating the monitoring data, and determining the need for expanded monitoring or response actions to address significant changes.

In many cases, procedures and protocols contained in this document also pertain to and will be followed for the RMP and CP. These procedures include Sections 5.6 Field Measurements and Sampling Procedures, 5.7 Quality Assurance/Quality Control, 5.8 Document Control and Reporting, and Appendix A - Standard Operating Procedures.

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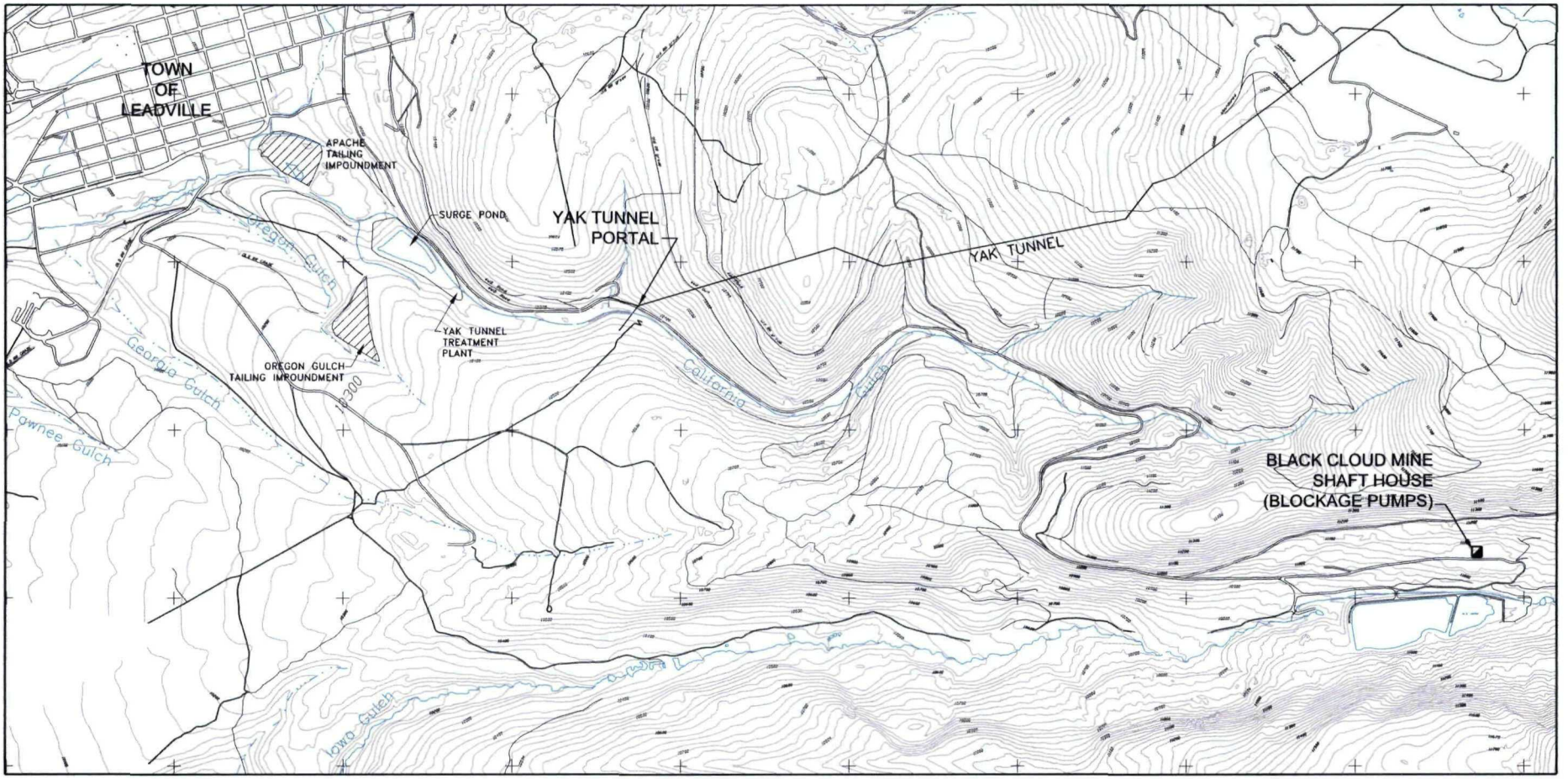

NORTH

SCALE IN FEET
0 1500

FIGURE 1
OVERVIEW OF OU1 REMEDIES

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Date:	MAY 2008
Project:	180885/37
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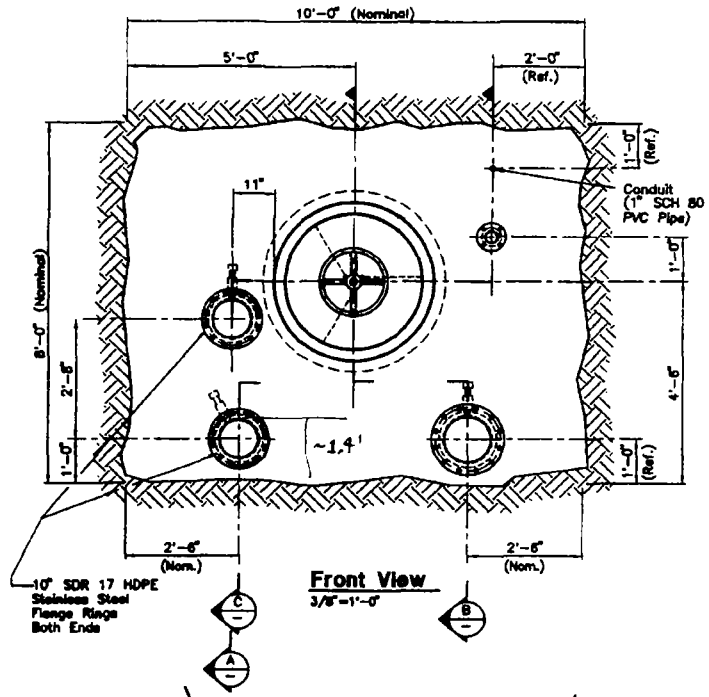
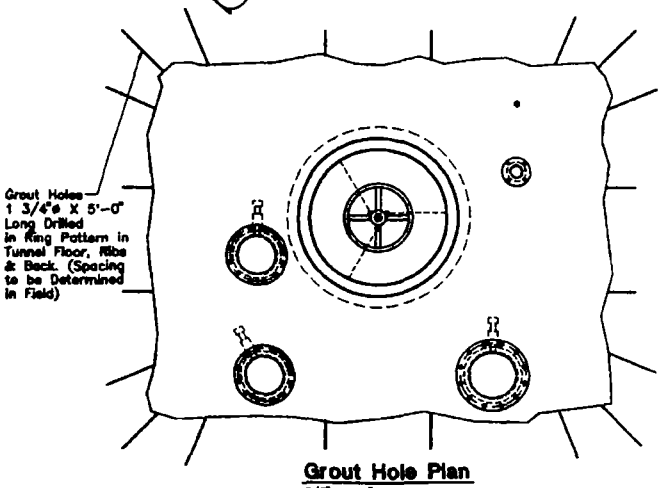
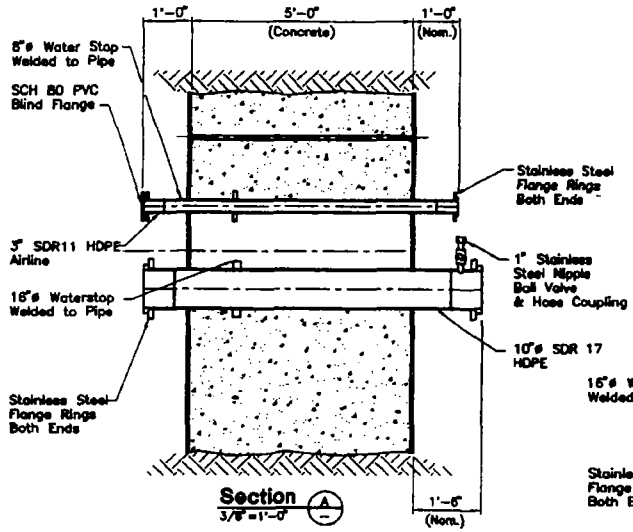


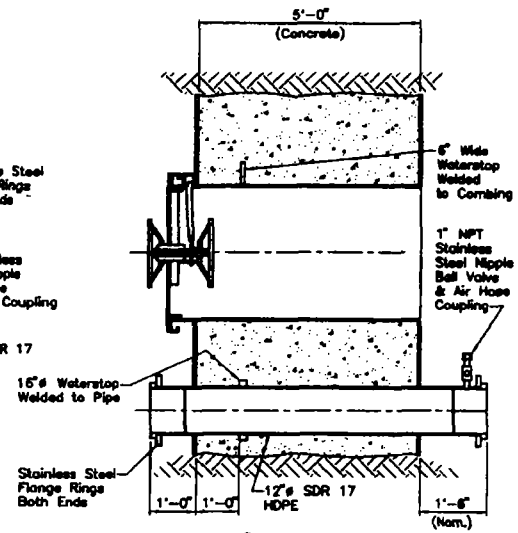
Front View
3/8"=1'-0"



Grout Hole Plan
3/8"=1'-0"



Section A
3/8"=1'-0"



Section B
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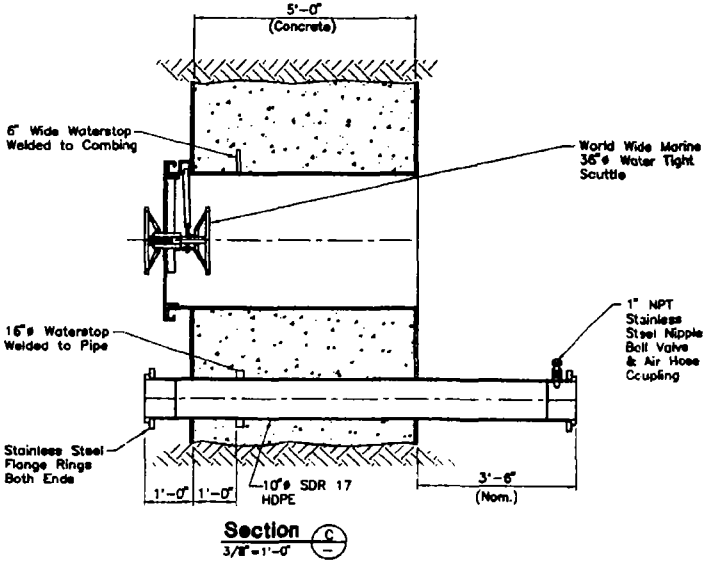

Section C
3/8"=1'-0"

FIGURE 2
BULKHEAD DESIGN

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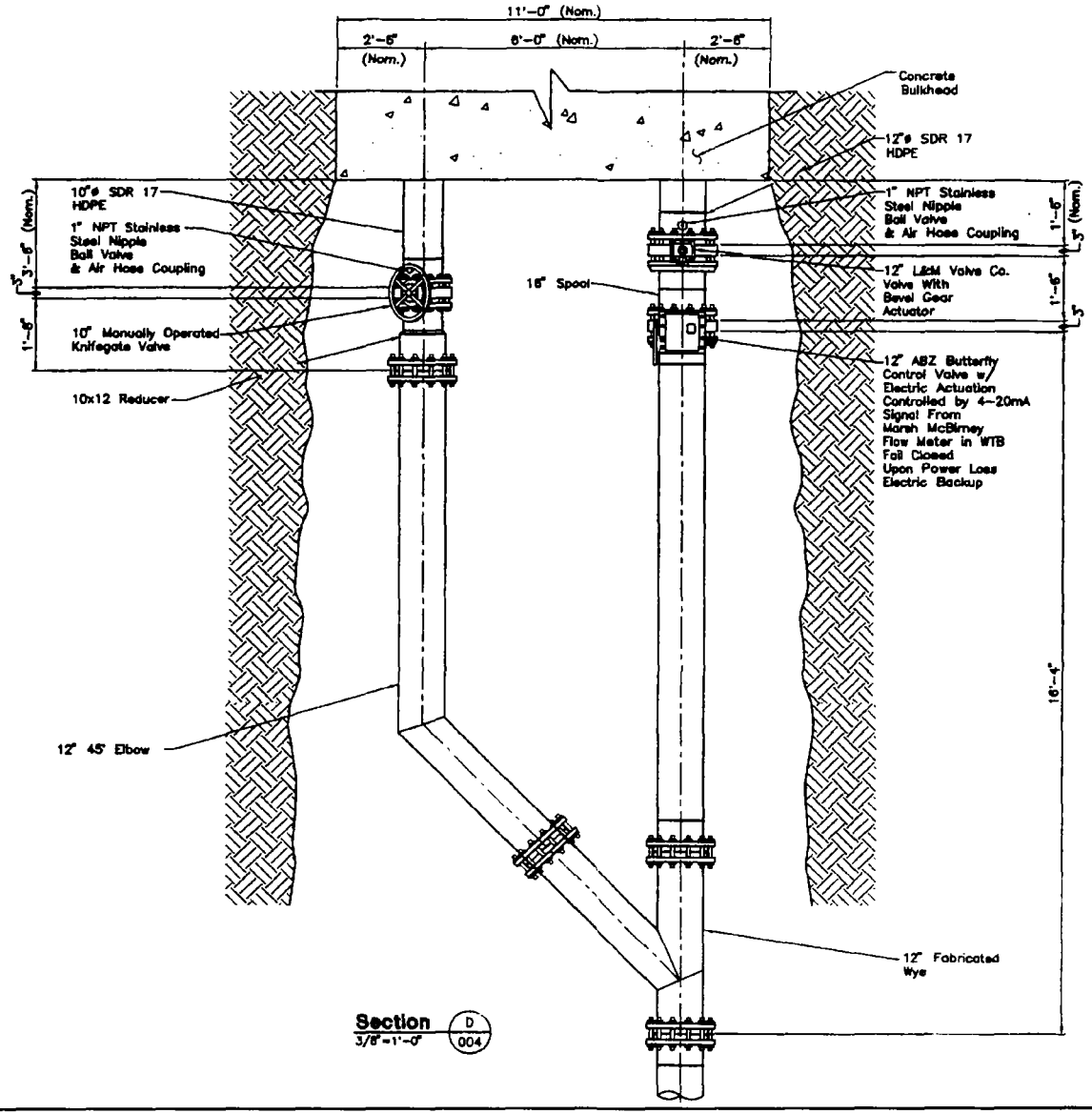

FIGURE 3
BULKHEAD FLOW
THROUGH PIPE DESIGN

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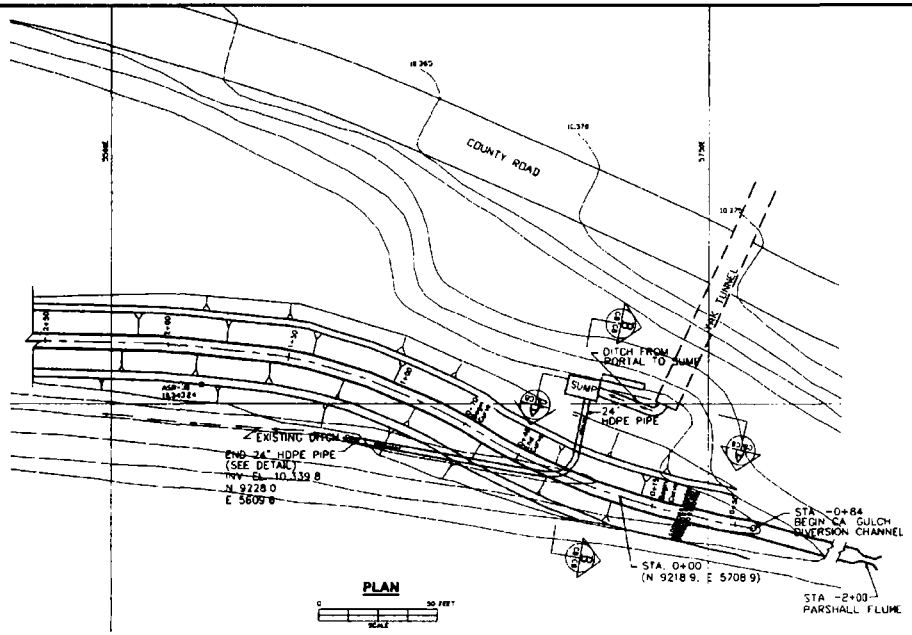
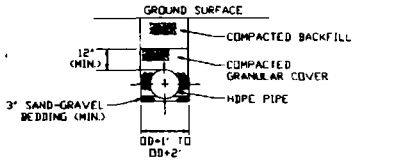
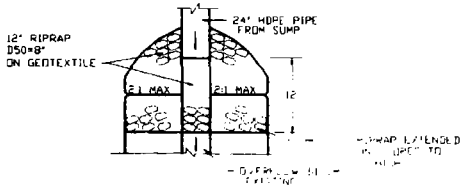


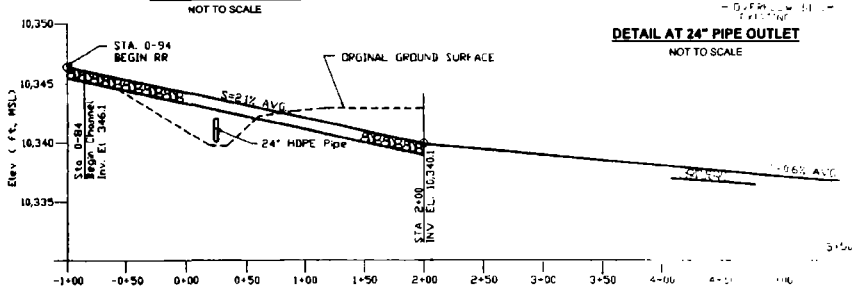
PLAN



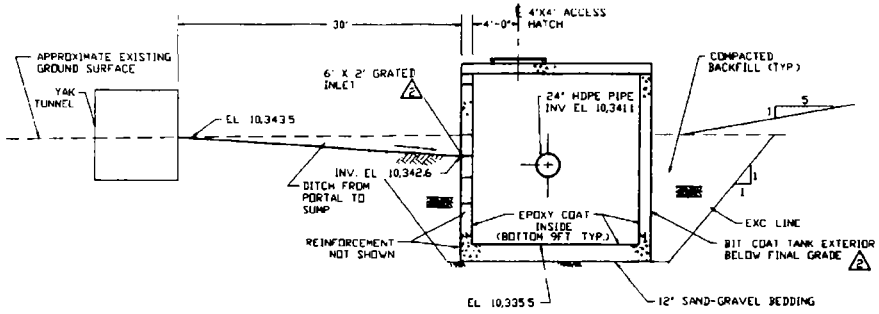
TYPICAL PIPE TRENCH
NOT TO SCALE



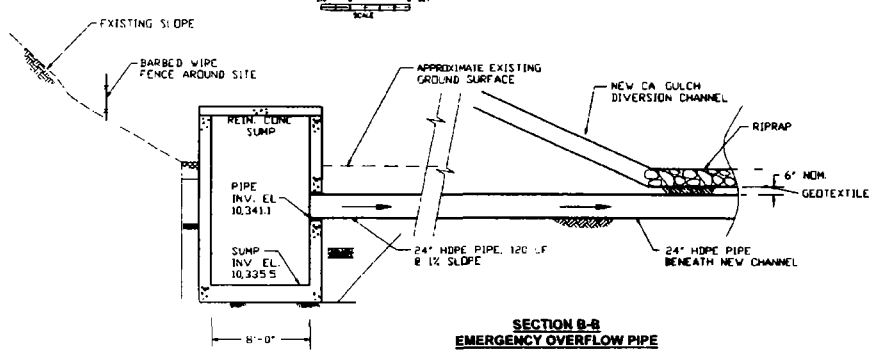
DETAIL AT 24" PIPE OUTLET
NOT TO SCALE



UPPER CALIFORNIA GULCH CHANNEL PROFILE



SECTION A-A
OUTLET DRAIN FROM YAK TUNNEL



SECTION B-B
EMERGENCY OVERFLOW PIPE

FIGURE 4
YAK TUNNEL
CONVEYANCE SYSTEM

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Project:	180885/37
File:	WTP-SCANS.dwg

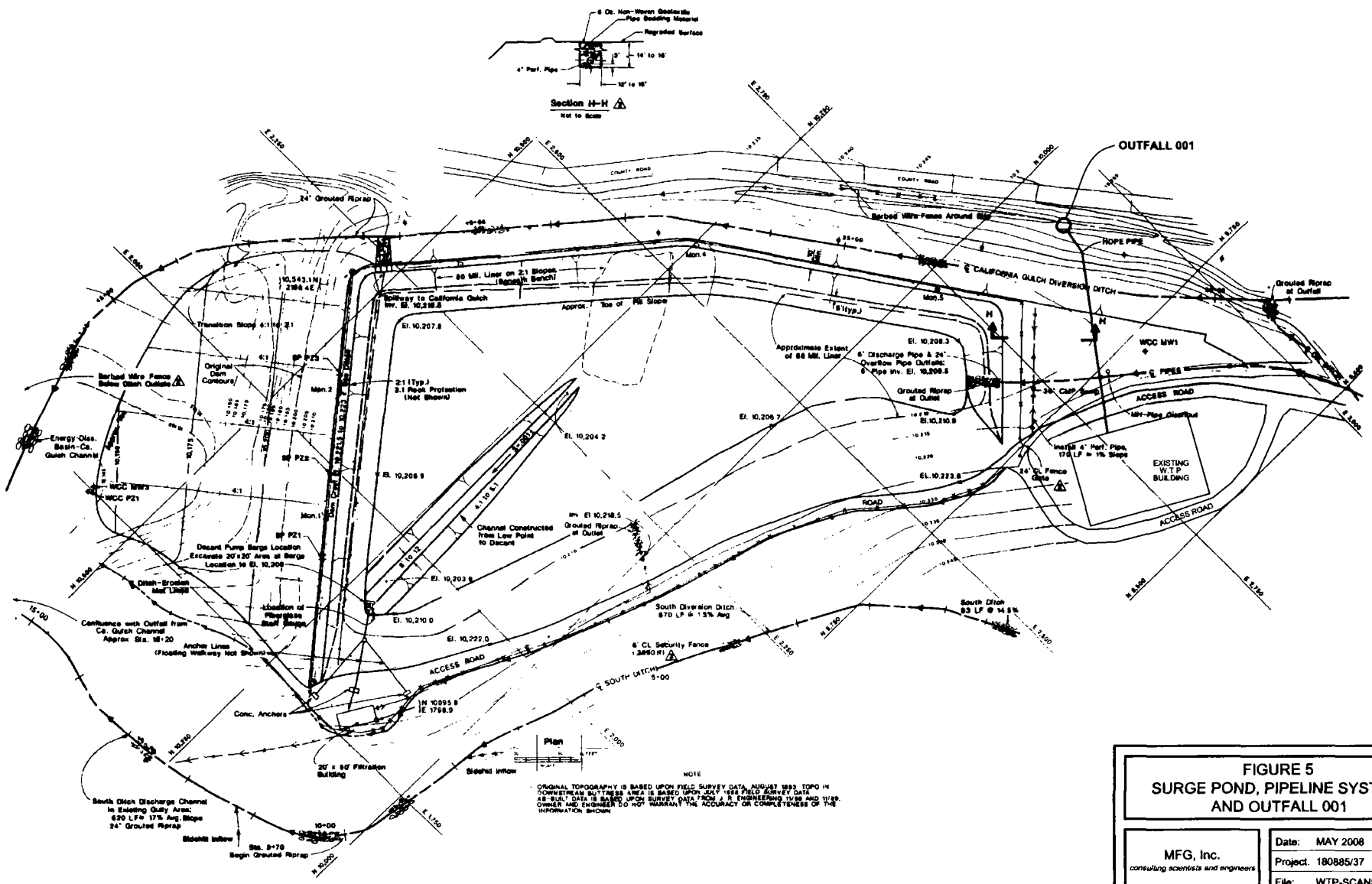

FIGURE 5
SURGE POND, PIPELINE SYSTEM, AND OUTFALL 001

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Project: 180885/37
File: WTP-SCANS.dwg

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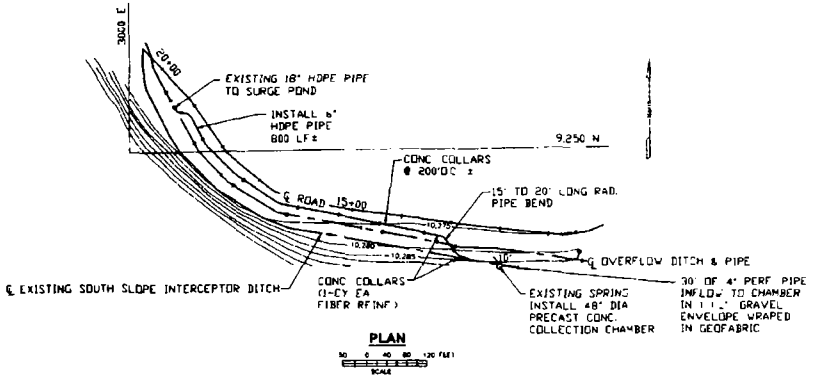
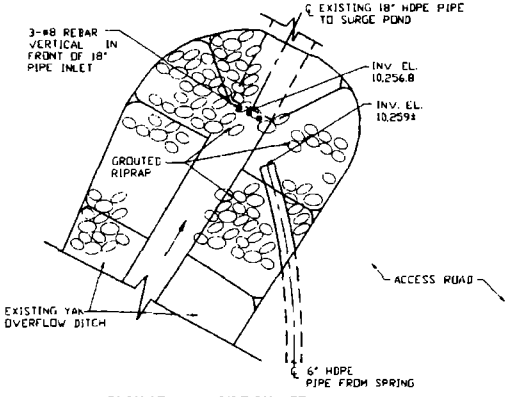
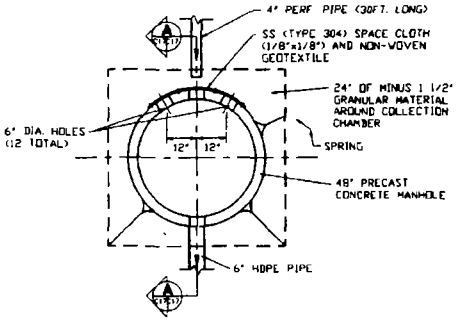


PLAN

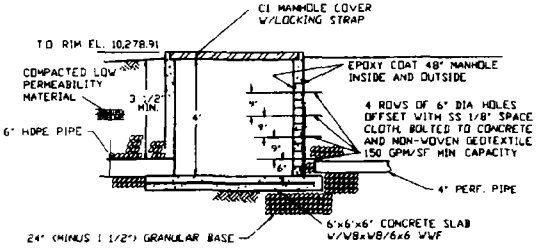


PLAN AT 6-INCH PIPE OUTLET

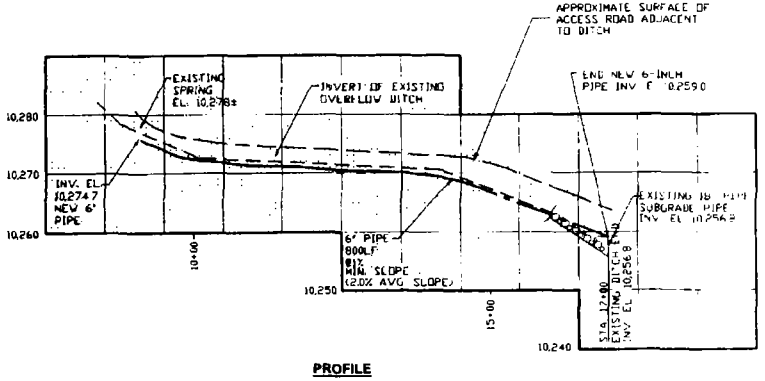
NOT TO SCALE



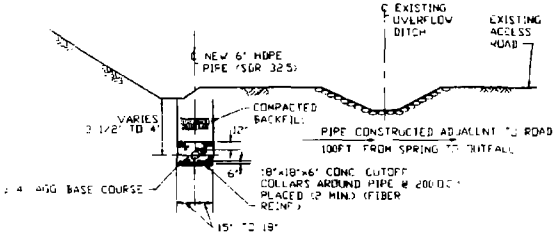
PLAN - SPRING COLLECTION



SECTION A-A'



PROFILE



TYPICAL PIPE TRENCH

NOT TO SCALE

FIGURE 6
HILLSIDE SPRING

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	Project: 180885/37
	File: WTP-SCANS.dwg

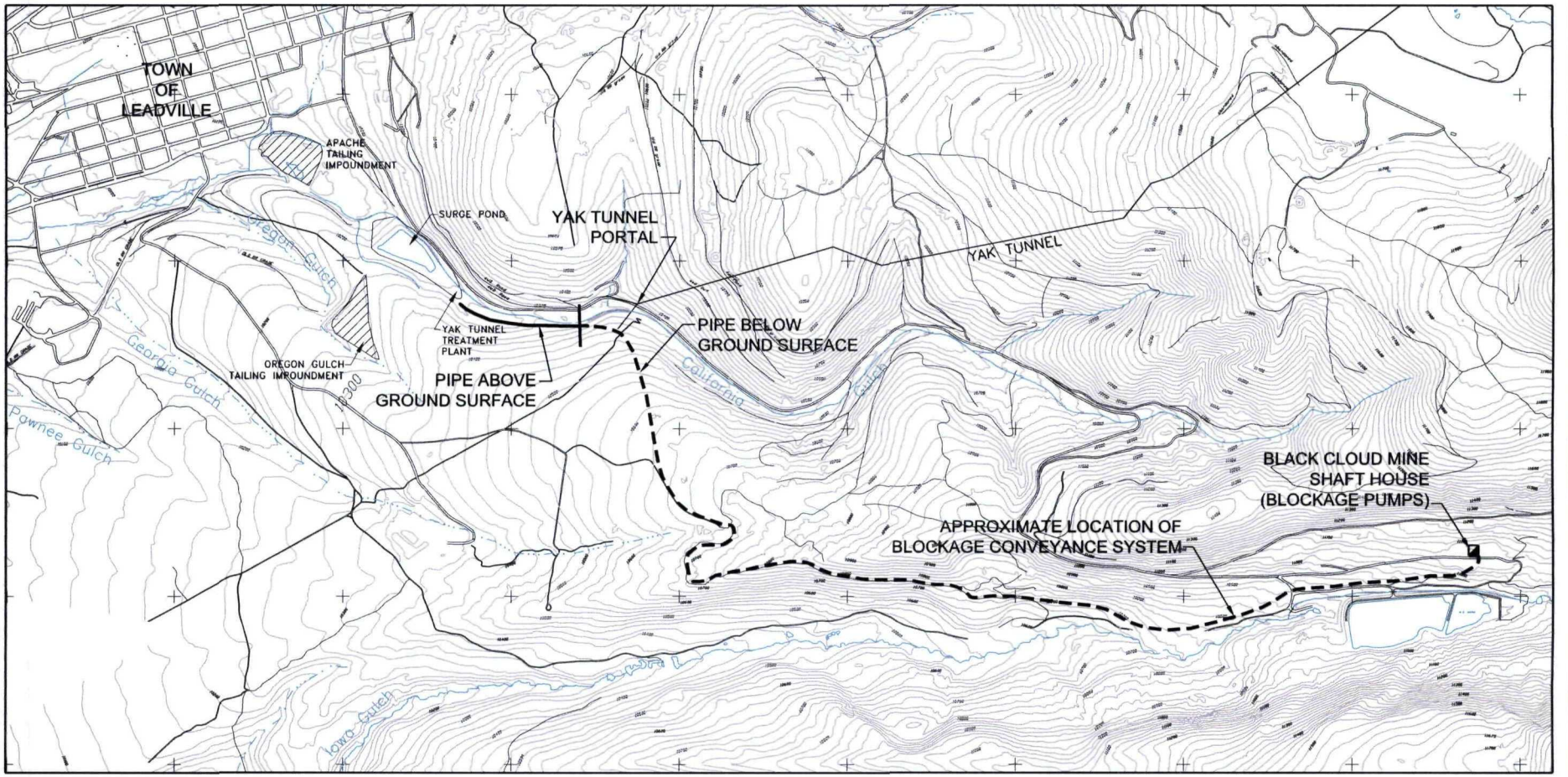

FIGURE 7
BLOCKAGE CONVEYANCE SYSTEM

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File: PLAN-001.DWG

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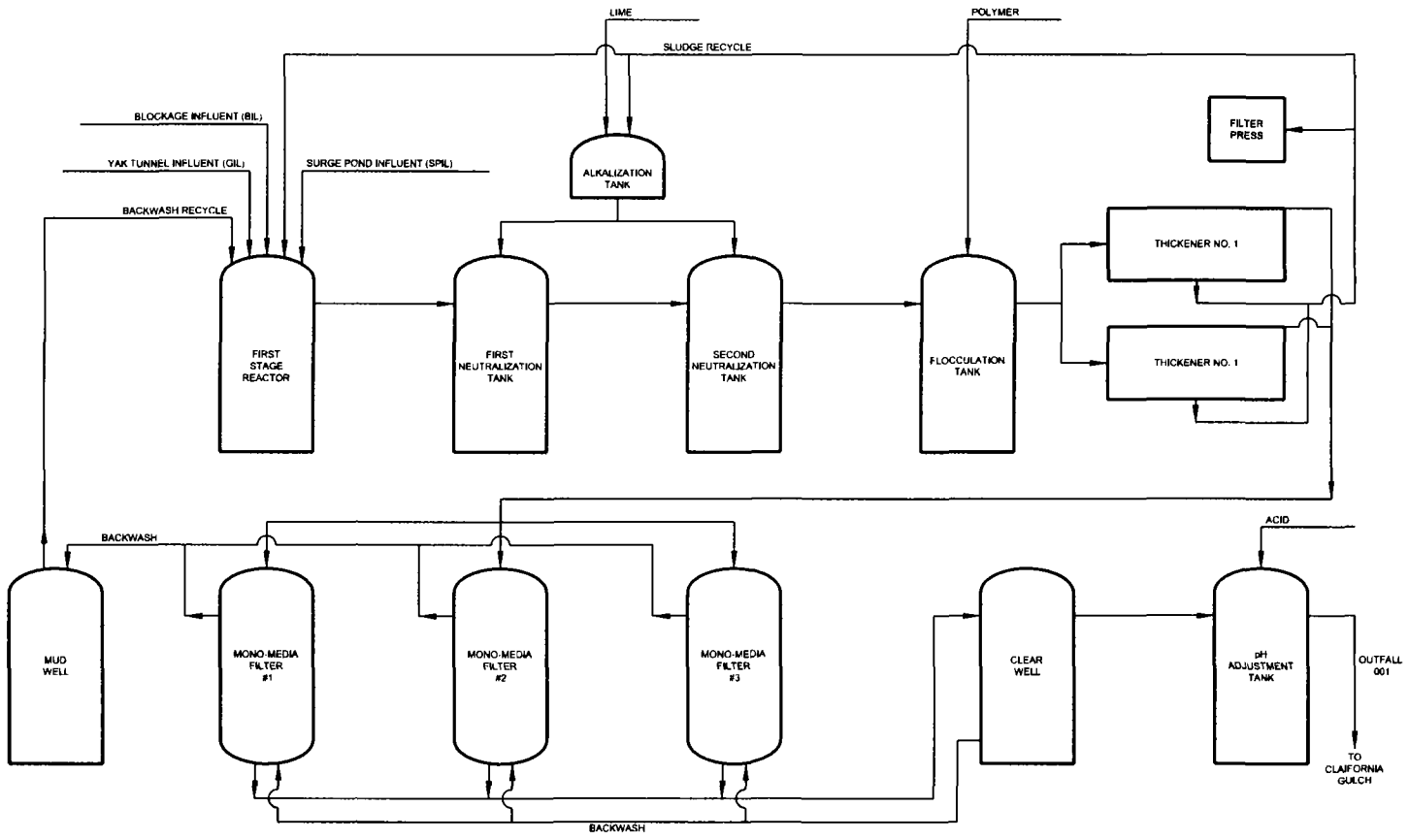

FIGURE 8
YAK WATER TREATMENT PLANT
TREATMENT PROCESSES

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Project: 180885/37
File: SCHEM-02.dwg

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APPENDIX A
TO OU1 WORK PLAN
STANDARD OPERATING PROCEDURES

SOP Number	Title
1	Decontamination
2	Well Water Level Measurement
3	Field Instrument Calibration and Operation
4	Ground Water Monitoring Well Sampling
5	Surface Water Flow Measurement
6	Surface Water Sample Collection
7	Sample Handling, Documentation, and Analysis
8	Water Treatment Plant Sampling
9	Surge Pond Staff Gauge
10	Field QA/QC Samples
11	Water Level Measurement Using Pressure Transducers

O&M SOP-1

SOP Date: May 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 and remediation efforts for the California Gulch CERCLA 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 personnel, sampling equipment (e.g., bailers, pumps, tubing, soil and sediment sampling equipment) and field support equipment (e.g., drill rigs, vehicles) is therefore required at all Operable Units of the California Gulch site. 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 sampling equipment that has been exposed to known or suspected hazardous materials (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 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 Pressure Tranducer

Pressure transducers will be rinsed with deionized or distilled water prior to installation. When the transducer/datalogger is removed it will be wiped down using a clean rag to remove excess moisture and obvious rust or dirt as the equipment is being recovered from the well. Each datalogger and pressure transducer assembly is dedicated to a specific piezometer; therefore, the equipment does not need to be thoroughly decontaminated except when it may have contacted a contaminated surface during removal from the well.

2.2.5 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.

2.2.6 Drilling and Heavy Equipment

Drilling and heavy equipment will be decontaminated at the decontamination area for large equipment near the Surge Pond. 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.

2.2.7 Equipment Leaving the Site

Vehicles used for nonintrusive activities shall be cleaned on an as needed basis. Cleaning will be required for very dirty vehicles which will be leaving the Leadville area. The cleaning shall take place at the decontamination area near the Surge Pond. On site construction equipment such as earth moving equipment, trucks, drilling rigs, backhoes, trailers, etc., will be pressure washed at the decontamination area near the Surge Pond before the equipment is removed from the site to limit off-site exposure to potential contaminants.

2.2.8 Wastewater

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

2.2.9 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

O&M SOP-2

SOP Date: May 2008

WELL WATER LEVEL MEASUREMENT

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for measuring water levels in wells for California Gulch CERCLA Site. This procedure describes equipment and field procedures necessary to collect water level measurements. This procedure is intended to be used together with other SOPs. SOP No. 1 describes decontamination procedures which are applicable to this SOP.

2.0 WATER LEVEL MEASUREMENT PROCEDURES

2.1 Equipment List

The equipment necessary to measure water levels includes:

- Electric water level indicator capable of producing measurements to a precision of 0.01 ft
- Field data sheets
- Field notebook
- Sprayer filled with deionized or distilled water
- Appropriate health and safety equipment

2.2 Measurement Procedures

This section gives the sequence of events to follow when measuring water levels.

- Appropriate health and safety equipment, as described in the Health and Safety Plan, should be worn during well opening, well measurement, and decontamination.
- Before any measurement is taken, the water level probe shall be decontaminated. Decontamination procedures are discussed in SOP #1 and Section 2.3 of this SOP.
- Test the water level probe to verify that it is working properly. Push the circuit test button to verify that the light/buzzer is working. This button tests only the light/buzzer. Dip the water level probe into water to verify that the water level probe is working properly. Note that deionized or distilled water, due to its low conductivity, will not trigger a response.
- Unlock and open the well. Follow all health and safety procedures and, if necessary, let the well vent any gases that may be present in the well casing.
- After opening the well cover, locate the measuring point for water level measurements. The measuring point for the water level is usually the top of the polyvinyl chloride (PVC) well casing or top of the PVC drop pipe, not the top of the protective casing. If not already marked and described, the measurement should be taken either from the point where the PVC casing elevation was measured or from

the north side of the PVC casing, if possible. The point should be marked and described for easy identification.

- To measure the static water level, lower the water level probe into the well until the buzzer/light indicates that the probe tip has contacted water. By raising and lowering the water level probe and adjusting the sensitivity to indicate when the probe is contacting the water, the depth to water shall be measured to the nearest 0.01 foot. Record the water level depth in the field logbook or field data sheet. Then recheck the measurement before removing the water level probe from the well. Compare the most recent measurement with past measurements and verify that the new measurement is reasonable before leaving the well. If the measurement does not seem reasonable, measure the water level again.
- If the well is dry, record the maximum depth measured (e.g., dry to 85 feet).
- When raising or lowering the water level probe from the well, exercise great care to avoid pulling the probe wire over the well casing or the protective casing. Even PVC pipe can damage the water level probe and connecting cable if they are not handled properly.
- Section 2.4 describes the documentation required. If measurements are taken over a several-day period, the date and time of each measurement should be clearly indicated in the field book or on the water sampling forms.

2.3 Decontamination

The water level indicator must be decontaminated before using, between wells, and at the conclusion of measurements. The probe will be decontaminated according to the procedure for decontamination of sampling equipment described in SOP #1. 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. Probe decontamination can be completed at the wells.

2.4 Documentation

Documentation necessary for performing water level monitoring shall be recorded in the field logbook or on field data sheets (as shown in SOP No. 3 and only used if the wells are also to be sampled) and shall include, as appropriate:

- Personnel who performed the measurement
- Date
- Time
- Well number
- Depth to water from the measurement point
- Description of the measurement point location for the well (if different from previous measurement point)
- Well probe serial/identification number
- All calculations performed.

The field logbook or field data sheets used during water level measurement activities shall include any other observations made while measuring water levels. The pages of the field book or the field data sheets shall be legible, signed, and dated.

3.0 CALIBRATION

The length of the water level measurement probe cord will be calibrated when there is reason to suspect that the cord may have been stretched or damaged. The calibration check consists of laying out 100 ft tape next to 100 ft of the probe cord. Note any measurement discrepancies between the two at 2-ft intervals.

The procedures followed during any calibration and verification of equipment shall be documented in the field notebook along with any calculations. If a correction is required, the probe will be tagged to indicate the correction.

O&M SOP-3

SOP Date: May 2008

FIELD INSTRUMENT CALIBRATION AND OPERATION

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for calibrating/checking pH, conductivity, and turbidity meters used to measure field parameters for the California Gulch CERCLA Site. This procedure is intended to be used together with other SOPs. SOP No. 1 describes decontamination procedures which are applicable to this SOP.

2.0 FIELD METER CALIBRATION AND MEASUREMENT

Generic operational procedures are presented in this SOP. Instrument specific manufacturer's operation manuals should be referred to for more detailed instructions for the operation of any instrument.

2.1 pH Meter

The pH meter shall be calibrated each day before use for sample collection. The pH meters used at the treatment plant (both inline and during routine monitoring) will be checked (calibration check) daily and calibrated as needed. Calibration and operation of the pH meter shall be performed according to the manufacturer's specific instructions. In general, calibration is done by adjusting the meter with standard buffers that bracket the expected pH of the field water. Although the procedures described in this section are generic, they were generally written for Hach Company SensION ph meters.

2.1.1 Required pH Measurement Equipment

Use the following apparatus and supplies for measuring pH in the field:

- Portable pH meter
- Spare pH probe
- pH electrode storage solution
- Extra batteries
- Beakers
- Buffer solutions of pH 4, 7, and 10
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent
- Calibration Data Sheet.

Determine the pH from a water sample as soon as possible after collecting it. Determine the pH by the electrometric method using standard buffer solutions for calibration. The electrometric method is the preferred method because of its greater accuracy and ease of measurement.

Either a glass electrode and a reference electrode, or a combination electrode, which combines the glass membrane electrode and the reference electrode, shall be used.

The pH meter shall automatically compensate for temperature and be capable of calibration with a three-point (using three buffers) slope adjustment method. The meter shall have a precision of at least 0.05 pH units.

2.1.2 pH Meter Calibration Procedures

Before collecting samples, calibrate the pH meter in accordance with the manufacturer's instructions using calibration solutions. The field sampling technician shall record all pH measurement data, including calibration dates and times, readings, the meter number, and sample temperatures on a Calibration Data Sheet.

The field sampling technician shall be familiar with the meter and shall follow the manufacturer's instructions for calibrating and using the meter. Check the pH calibration immediately after calibration and at the end of the day against an appropriate buffer. Thoroughly document all calibration checks, including the buffer readings and temperatures, on the Calibration Data Sheet. The field sampling technician shall do the following when calibrating the meter according to the manufacturer's procedures:

- Condition pH electrodes by soaking them for at least one hour in pH electrode storage solution. pH electrodes that have been properly stored in pH electrode storage solution do not need to be conditioned.
- Buffer solutions of 4, 7, and 10 will be used for calibration and an appropriate buffer solution for calibration checks. Use aliquots of the buffer solutions once and then discard the aliquots.
- Before immersing the probe(s) into the buffer or sample, rinse the probe with deionized or distilled water and blot it dry with clean Kimwipes® (or equivalent) and then rinse the probe with the buffer or sample. Protect the glass tip of the probe from abrasion and scratching.
- Calibrate the meter with three buffer solutions (three-point slope adjustment).
- Turn the instrument on and immerse the probe into the 7 pH buffer and allow to equilibrate until the display lock is enabled. Press the **CAL** button, **Standard** and 1 will be displayed and then press the **READ/ENTER** button. When the reading has stabilized, the standard number will change to **2**. Remove the probe from the 7 pH buffer and rinse with deionized water. Place the probe into the 10 pH buffer and press **READ/ENTER**. When the reading has stabilized the standard number will change to **3**. Remove the probe from the 10 pH buffer and rinse with deionized water. Place the probe into the 4 pH buffer and press **READ/ENTER**. When the reading has stabilized the **Store** and **?** will appear. To save the calibration and return to the reading mode, press **ENTER**. To review and document the calibration data on the Field Parameter Instrument Calibration Data Sheet press the **REVIEW** key. The display will show the standard number, standard pH, and temperature. Press the **UP** arrow once. The meter will continue to scroll through the standard information with each press of the up arrow key until the slope information is

displayed. Record the calibration data on the Calibration Data Sheet. Press **EXIT** to exit the Cal Review mode.

- Immediately after calibration perform a calibration check by measuring at least the 7 pH buffer or other appropriate buffer and recording the values on the Calibration Data Sheet. Other standard may need to be checked depending on the water to be measured. If the calibration check buffer varies by more than 0.2 pH units then the meter shall be recalibrated.
- If the calibrated slope of the pH meter deviates significantly from its theoretical value, test for a potentially defective electrode or contaminated buffer solution.
- Slow instrument response (long time to stabilize) may indicate that the pH probe should be replaced.
- Always use the same electrode for measurements that was used for calibration. Recalibrate the meter if the electrode is replaced or the batteries are changed.

2.1.3 pH Measurement

The sampler shall measure pH as follows:

1. If the pH is measured in a container, rinse the sample container with deionized water and then rinse it three times with the sample water prior to measurement. Rinse the pH probe with deionized water and, if possible, blot the probe dry with clean Kimwipes® or equivalent then rinse the pH probe with sample water. Be sure to protect the fragile glass bulb at the end of the probe from damage.
2. Immerse the electrode in the water, allow the pH reading to stabilize, and monitor the drift of the instrument. Do not immerse the electrode above the top of the pH probe. When the pH reading stabilizes (i.e., the meter beeps and the display lock is enabled), record the temperature to the nearest 0.1 °C and the pH reading to the nearest 0.01 unit.
3. Between measurements, store the electrode in Hach pH electrode storage solution or equivalent solution, if possible, or put a cotton swab soaked in electrode solution in the protective cap of the electrode.
4. Measure the pH of samples within a short period of time after sampling and on a separate aliquot of the sample.
5. Store the electrode on a short-term basis (between measurements/up to one week) in the Hach pH electrode storage solution or place a cotton swab that has been soaked in pH electrode storage solution in the pH probe protective cap. Do not store the electrode in deionized water, as this will shorten the electrode life.
6. Avoid prolonged exposure of the pH meter and probe to sunlight.

2.2 Conductivity Meter

The conductivity meter shall be calibrated each day before use for sample collection. The conductivity meters used at the treatment plant (both inline and during routine monitoring) will be checked (calibration check) daily and calibrated as needed. Calibration and operation of the conductivity meter shall be performed according to the manufacturer's specific instructions. In general, a single point calibration (near midrange of expected values) is performed and then the calibration is checked by checking with standards that bracket the expected value of the sample

water. Although the procedures described in this section are generic, they were generally written for Hach Company sensION conductivity meters.

Electrical conductivity, or specific conductance, is the ability of water to conduct an electric current and depends on the concentration of ions in solution. The relationship between conductivity and the concentration of dissolved solids is approximately linear for most natural waters. Changes in this relationship indicate changes in the proportions of different salts and, therefore, changes in the sources of dissolved substances that enter the water body.

For measuring conductivity in the field, the meter shall have an automatic temperature compensator and shall display conductivity directly in units of microsiemens per centimeter (µS/cm) or in millisiemens per centimeter (mS/cm) corrected to a temperature of 25 °C.

Electrical conductivity shall not be measured on a sample that was first used to measure pH. Potassium or silver chloride that diffuses from the pH probe can alter the conductivity of the sample.

2.2.1 Required Conductivity Measurement Equipment

Use the following apparatus and supplies for measuring conductivity in the field:

- Conductivity meter
- Extra batteries
- Calibration solutions (one near the midpoint and two which bracket expected sample values)
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent
- Beakers
- Calibration Data Sheet

2.2.2 Conductivity Meter Calibration

Before collecting samples, calibrate the conductivity meter using calibration solutions in accordance with the manufacturer's instructions. The sampler shall record all conductivity measurement data, including calibration dates, readings, the meter number, and sample temperatures on a Calibration Data Sheet.

Reagent-grade potassium chloride (KCl) or other equivalent solutions are universally used as reference solutions to calibrate conductivity equipment. The reference solutions are also used to check the accuracy of the meter. The conductivity of the reference solutions that are used to calibrate the meter should bracket the expected range of the conductivity of the water samples. Commercially prepared calibration standards are available from laboratory suppliers at many standard concentrations.

The sampler shall calibrate the meter as follows:

1. Calibrate the meter according to the manufacturer's instructions.
2. Verify that the automatic temperature compensation is on by looking for the thermometer icon. If **Off** is displayed next to the thermometer icon then the automatic temperature compensation is off. If **Off** is displayed then refer to the owner's manual to turn the automatic temperature compensation on.
3. Before immersing the probe(s) into the standard, rinse the probe with deionized or distilled water and blot it dry with clean Kimwipes® (or equivalent) and then rinse the probe with the standard.
4. Immerse the probe in the midpoint standard solution. Agitate the probe to dislodge bubbles in the cell. Avoid resting the probe on the bottom or side of the container.
5. Press **CAL**. The last calibration value will appear. Refer to the owner's manual to initially set the calibration value to the appropriate value then subsequent calibrations will display the value automatically. Press **ENTER** when the reading is stable the calibration is automatically stored and the instrument returns to the reading mode. Note the calibration data on the Calibration Data Sheet.
6. Check the calibration by measuring the end point standards and recording the check data on the Calibration Data Sheet. If the check values are not within 10 percent of the standard value then the instrument must be recalibrated.
7. An end of day calibration check shall be made by measuring the end point standards and recording the check data on the Calibration Data Sheet. If the check values are not within 10 percent of the standard value then it must be noted on the Ground Water Sampling Data Sheets for the samples collected that day.

2.2.3 Conductivity Measurement

Measure conductivity immediately after a sample is collected. Record conductivity readings to the nearest 1 µS/cm (for samples with conductivities less than 2,000 µS/cm) or 0.01 mS/cm (for samples with conductivities greater than 2.00 mS/cm), corrected to 25°C.

The sampler shall measure conductivity as follows:

1. Rinse the probe with deionized water and blot the probe dry with clean Kimwipes® or equivalent, without wiping the plating on the cell. Rinse the probe with sample water.
2. Insert the probe into the sample solution. Immerse the tip to or beyond the vent holes and agitate the probe vertically. Make sure that air bubbles are not trapped near the temperature sensor. Avoid resting the probe on the bottom or side of the container. Allow the reading to stabilize before recording measurements. Record the conductivity and temperature of the sample.
3. Verify that the correct units (µS/cm) or mS/cm) are indicated on the Ground Water Sampling Data Sheet.

4. During normal use, rinse the probe thoroughly with deionized water between measurements to minimize the buildup of interfering substances on the probe element.
5. Avoid prolonged exposure of the probe to sunlight.

2.2.4 Field Calibration Checks

In order to determine if the pH meter and conductivity meter measurements are accurate, the pH meter and conductivity meter calibrations shall be checked against a known standard immediately after calibration and at the end of the day. If the conductivity meter reading differs by more than 10 percent from the check standard, the conductivity meter shall be re-calibrated. If the pH reading differs by more than 0.2 pH units from the check standard, the pH meter shall be re-calibrated. All check standard readings and re-calibrations shall be recorded in the Calibration Data Sheet.

3.0 TURBIDITY METER CALIBRATION AND MEASUREMENT

One of the most sensitive and, therefore, the most representative field parameter measured during ground water sample collection is turbidity. Turbidity is measured in the field with the Hach Portable Turbidimeter Model 2100P. The procedure presented below is generic and the Hach Portable Turbidimeter Model 2100P Manual should be consulted for more detailed procedures.

3.1 Turbidity Measurement Equipment

Use the following apparatus and supplies for measuring turbidity in the field:

- Hach Portable Turbidimeter Model 2100P
- Measurement cells
- Extra battery
- Gelex standards (dedicated to the specific meter)
- Silicone oil and cloth
- Deionized water
- Wash bottle
- Liquinox solution
- Kimwipes
- Beakers.

3.2 Turbidity Meter Calibration and Measurements

Calibrate the turbidimeter in the laboratory as necessary before mobilizing to the field. Once in the field, check the calibration by measuring the Gelex standards. Gelex standards are used as a calibration check only and are not to be used for instrument calibration. The field sampling team shall record calibration checks, dates, and the SMI meter number on a Calibration Data Sheet or in the field book.

Note the following operational considerations:

- Avoid prolonged exposure to ultraviolet light and sunlight.
- Do not hold the instrument during measurements; place the instrument on a flat, steady surface.
- Measure samples immediately to prevent temperature changes and settling. Avoid sample dilution when possible. Particles suspended in the original sample may dissolve or otherwise change characteristics when the sample temperature changes or when the sample is diluted, resulting in a non-representative sample measurement.
- Handle measurement cells only by the top to minimize dirt, scratches, and fingerprints in the light path.
- Always cap the sample cell to prevent spillage of sample into the instrument.
- Always orient the sample cell and Gelex standards in the same direction, i.e., diamond shaped mark to the front of the instrument.
- Always close the sample compartment lid during measurement and storage.
- When oiling the sample cells, use only a thin coat of oil. Do not use excessive amounts of oil.

The sampler shall measure turbidity as follows:

1. Thoroughly check the meter, including the battery, in the laboratory before taking it to the field.
2. Measure and record on the Calibration Data Sheet the turbidity of the Gelex standards and compare it to its value.
3. Clean the sample cell.
4. Fill the sample cell with sample.
5. Clean and oil the sample cell.
6. Place the cell in the meter.
7. Select the range.
8. Signal average the sample (if necessary).
9. Read and record the turbidity to 0.01, 0.1, or 1.0 NTU, depending on the range of the sample.
10. Empty and clean the sample cell.

4.0 DOCUMENTATION

Record all calibration and calibration check data on the Calibration Data Sheet or in the field book.

APPENDIX A
CALIBRATION DATA SHEET

CALIBRATION DATA SHEEET

Date: _____ Time: _____ Personnel: _____

pH Meter Calibration *pH Meter Number:* _____

Buffer: 7 Measured Value: _____ Temperature _____ °C

Buffer: 4 Measured Value: _____ Temperature: _____ °C

Buffer: 10 Measured Value: Temperature: _____ °C

Slope: _____

pH Meter Calibration Check (Immediately After Calibration)

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

pH Meter Calibration Check (At End of Day) Time: : _____

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Conductivity Meter Calibration Conductivity Meter Number: _____

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Conductivity Meter Calibration Check (Immediately After Calibration)

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Conductivity Meter Calibration Check (At End of Day) Time: _____

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Turbidity Meter Check Turbidity Meter Number: _____

Gelex Standard Value: _____ Gelex Standard Reading: _____

Gelex Standard Value: _____ Gelex Standard Reading: _____

Comments:

_____

_____

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O&M SOP-4

SOP Date: May 2008

GROUNDWATER MONITORING 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 CERCLA 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 including:

- SOP 1 Decontamination
- SOP 2 Monitoring Well Water Level Measurement
- SOP 3 Field Instrument Calibration and Operation
- SOP 7 Sample Handling, Documentation, and Analysis
- SOP 10 Field QA/QC Samples

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 polypropolene 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 polypropolene 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 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. Specific instructions pH, conductivity, and turbidity instruments are given in SOP 3.

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.
- Following SOP 2 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.
- If a pressure transducer for water level measurements is installed in the well, download data from the data logger as per SOP 12 and make any corrections to the reference level using the recorded depth of static water level obtained previously Remove pressure transducer from well, winding the transducer cable on a steel or plastic reel. If a reel is not available, place a clean, plastic sheet on the ground and wind the cable on top of the sheet.

- 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 ±0.2 pH unit and conductivity and temperature readings within ±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:
  1. for low recovery wells (wells that can be pumped dry), place pump intake at bottom of screened interval.
  2. 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

a. 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.

b. 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.

c. a) 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.

d) 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.

e) Place samples on ice in a cooler.

5. Record time of sampling.
6. Replace and lock well cap.
7. Complete field documentation.

f) Replace the pressure transducer, if applicable, and check for normal operation, as per SOP12.

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® bag for disposal with the personal protective equipment.
- Any reusable filtering equipment will be decontaminated in accordance with SOP No. 1.

2.2.6 Field Quality Assurance/Quality Control Procedures and Samples

The well sampling order will be dependent on expected levels of contamination in each well, if known, and will be determined prior to sampling. Quality assurance/quality control (QA/QC) samples will be collected during groundwater sampling as specified in SOP 11.

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. The parameters for analysis are specified in the Quality Assurance Project Plan (QAPP).

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:

Evacuation Volume [gal] = (Total Depth [ft] - Water Level Depth [ft]) x 0.1632 gal/ft

	=	gallons/well casing volume

For 4-inch well:

Evacuation Volume [gal]	=	(Total Depth [ft] - Water Level Depth [ft]) x 0.6528 gal/ft
	=	gallons/well casing volume

For 6-inch well:

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.

APPENDIX A
GROUNDWATER DATA SHEET

GROUNDWATER DATA SHEET

IDENTIFICATION

Sample Location_____ Date _____ Time _____Page__of_____

Sample Control Number_____ Samplers: _____

WEATHER CONDITIONS

Ambient Air Temperature: ____ °C ☐ _____ °F ☐ Not Measured? ☐

Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

WELL MEASUREMENTS (Measurements made from top of PVC casing)

Depth to Static Water:_____feet Total Depth of Well:_____ feet Feet of water:_____

2-inch = 0.163 gal/ft 4-inch = 0.65 gal/ft 6-inch = 1.47 gal/ft

1 Casing Volume:_____ gallons 3 Casing Volumes:_____ gallons

Depth Pump Installed:_____ feet Volume water purged_____ Gallons

Well purged with: _____

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp.° °C ☐ °F ☐	Turbidity (visual estimate)	Comments

Final Sample Parameters

Sample Date	Sample Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐	Turbidity (NTU)

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)

Was a field blank collected? Yes ☐ No ☐ (sample control number_____)

Was a rinsate sample collected? Yes ☐ No ☐ (sample control number_____)

Notes: _____

_____

O&M SOP-5

SOP Date: May 2008

SURFACE WATER FLOW MEASUREMENT

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the Standard Operating Procedures (SOP) for measuring surface water discharge in streams and ditches at the California Gulch CERCLA Site (CGS) in Leadville, Colorado. Discharge is defined as the volume rate of flow of water, including any substances suspended or dissolved in the water. Discharge will be expressed in cubic feet per second (cfs) or gallons per minute (gpm). A complete discussion of all available flow measurement techniques and the theory behind them is beyond the scope of this text (see UGSG Water-Supply Paper 2175). This SOP outlines the three methods for measuring flow at CGS: (1) permanently installed or portable flumes, (2) the velocity-area method using Price AA, pygmy, or Marsh-McBirney meters, or (3) the volumetric method.

Because of the dynamic nature of surface water, flow measurement by the methods described in this document may, on occasion, be impossible at some sites. If unmeasurable flow conditions exist at any of the surface water sites, the field team will attempt to measure flow at a point upstream or downstream of the site and will note this point relative to the marked data collection point. Whether or not a measurement is made, the team will note the conditions that inhibited accurate flow measurement.

The discharge measurement method to be used at each site will be described in the field notes. Each of these methods will be presented in the following format:

- Method name
- Required measurement conditions
- Equipment
- Maintenance and calibration procedures
- Field procedures
- Discharge calculations

2.0 RESPONSIBILITIES AND QUALIFICATIONS

The project manager or task leader is responsible for assigning project staff to measure discharge at CGS. The project manager is also responsible for assuring that this and any other appropriate procedures are followed by all project personnel. The project staff assigned to measure discharge are responsible for completing their measurements according to this SOP.

Only qualified personnel will be allowed to perform these procedures. Qualifications are based on education, previous experience, and on-the-job training and supervision by another qualified person.

3.0 PROCEDURES

This section describes the three methods that will be used to measure discharge.

If none of these three methods can be used to measure discharge at a particular sample location, then other methods may be selected and added as addenda to this SOP; or, the measurement point will be evaluated in terms of whether it can either be relocated to a point which permits discharge measurement or whether the point should be eliminated. Discharge measurements should be recorded on Surface Water Data Sheet or on the Discharge Measurement Form, both provided in Appendix A.

3.1 Velocity-Area Method

Surface flow in stream channels and ditches that lack permanent flumes can be measured using a current meter or velocity-area method.

3.1.1 Marsh-McBirney Velocity Meter

The Marsh-McBirney velocity meter is preferred for measuring flow velocity at CGS.

Portable Marsh-McBirney meters are a type of current meter that may be used in the velocity-area flow measurement. Either Model 201D or Model 2000 will be acceptable for the required gauging. The Marsh-McBirney meters measure flow velocity using the Faraday principle which states that as a conductor moves through and cuts the lines of a magnetic flux, a voltage is produced. The magnitude of the generated voltage is directly proportional to the velocity at which the conductor moves through the magnetic field.

The selector switch of the Model 201D has five positions, these positions are OFF, CAL, FT/SEC, M/SEC and KNOTS. To check for electronics failure or discharged batteries, the selector is first switched to the CAL position and the time constant switch to 2. If this is not the case, change the batteries and check CAL again. The time constant switch is used to help stabilize the velocity readings. General procedures are to begin with the smallest time constant and increase if the readout velocity does not stabilize.

The sensor on the Marsh-McBirney meter can be connected to the universal sensor mount on the top-setting wading rod and used to determine flows using either the six-tenths depth method or the two-tenths and eight-tenths depths method. The minimum flow depth at which an average velocity can be measured with the Marsh-McBirney meter set at six-tenths of total depth is approximately 0.18 feet. Velocities can be estimated in flows as shallow as 0.1 feet. The meter is capable of measuring velocities ranging from 0 to 20 feet per second.

3.1.2 Vertical Axis Current Meter

The vertical axis current meter is acceptable when using the velocity-area method for the following reasons:

- This meter operates in lower velocities than the horizontal-axis meter
- Bearings are well-protected from silty water

- Rotor can be repaired in the field without adversely affecting the measurement
- Single rotor serves for the entire range of velocities

A common type of vertical axis current meter is the price current meter, type AA or Marsh-McBirney.

In addition to the type AA meters, the U.S. Geological Survey and others use a Price pygmy meter in shallow depths. The pygmy meter is scaled two-fifths as large as the standard meter and has neither a tailpiece nor a pentagear. The contact chamber is an integral part of the yoke of the meter. The pygmy meter makes one contact per revolution. The predominant flow conditions in channelized streams at CGS indicate that either the pygmy meter or the Price AA meter may be needed at particular sites, depending on the amount of runoff contributing to streamflow at the time.

Theoretical Considerations

The volume rate of flow of water, which is commonly called discharge (Q), is the product of multiplying the average velocity (V) times the total cross-sectional area (A):

$$Q = VA$$

where Q is the total discharge, V is the average velocity for the entire cross section, and A is the total cross-sectional area.

Any current meter measures velocity at a point. The velocity-area method of making discharge measurements at a cross section requires measurement of the mean velocity in multiple portions of the cross section at each of the selected verticals. These are taken at subsections of the cross section. A complete discussion of velocity observation methods is found in United States Geological Survey Water-Supply Paper 2175, Measurement and Computation of Streamflow: Volume 1 – Measurement of Stage and Discharge, Chapter 5. These methods have been found to accurately measure average velocities in the stream depths expected to be found at CGS surface water sites.

By dividing the stream width into subsections, total discharge becomes the total of discharges measured in each subsection. Individual point velocity (v) is measured at each subsection, and discharge becomes the sum of the products of each point velocity and cross-sectional area (a) of each subsection:

$$Q = \sum_{1}^{n} va$$

where Q is total discharge, v is point velocity, and a is the area of the subsection. A cross section is defined by depths at verticals 1, 2, 3, 4,...n. At each vertical, the average velocity is measured by a current meter.

The current meter measurements performed in channelized streams at CGS will be based on selecting subsections to contain approximately 10 percent or less of the total discharge. In

general, depending on average depth and velocity distribution, a stream less than 2 feet wide will require no more than 8 to 10 subsections. A stream up to 4 feet wide will require about 10 to 12 subsections. Streams wider than 4 feet will require more subsections. Further, subsections need not be of identical width. For example, because velocities near banks are generally lower than velocities near the center of streams, these subsections may be wider than subsections near the center. Subsections will also be more closely spaced if a stream has an unusually deep portion in the cross section, or if velocities are higher than usual for the cross section. Velocity will be observed by current meter at each point for a period that ranges from 40 to 70 seconds.

The following table is to be used to guide the selection of the approximate number of subsections to be used based on stream width:

Table 1 Number of Subsections Based on Stream Width

Approximate Width (ft)	Approximate Number of Subsections	Approximate Distance between Subsections (ft)
<2	8 – 10	0.2 - 0.3
2 – 4	10 -12	0.3 - 0.4
4 – 10	12 – 15	0.4 - 0.7
10 – 20	15 – 20	0.7 - 1.0
>20	20 – 25	1.0 - 2.0

The stage of a stream is the height of the water surface above an established datum plane. The water-surface elevation referred to is some arbitrary gage datum is called the "gage height." Stage or gage height is to be measured and recorded in feet and hundredths of a foot.

Required Measurement Conditions

In order to make a velocity-area discharge measurement, the following conditions are required:

1. The stream must be channelized; that is, observable banks must channel the stream flow.
2. Depth must be greater than 0.2 foot across most of the cross section being measured.
3. The stream must have measurable velocity of at least 0.2 feet per second (fps) in most of the cross section, although the pygmy meter is capable of measuring velocity as low as 0.07 fps.

Conditions No. 2 and 3 can often be met in streams of very low discharge by conservatively modifying the stream channel to produce a narrower and slightly deeper cross section in order to meet measurement requirements. These modifications will include removal of aquatic growth or ice, moving large stones which impact velocity upstream or downstream of the cross section, and narrowing or deepening of the cross section. By rearranging small amounts of native rock or sand, the technician will produce a measurable cross section. When such modifications are made, great care will be exercised to avoid unnecessary movement of sediments. After clearing the cross section, allow the flow to stabilize before measurement begins.

Current meter measurements are best made by wading, if conditions permit. Wading measurements have a distinct advantage over measurements made from cableways or bridges in that it is usually possible to select the best of several available cross sections for the measurement. The type AA, Pygmy meter, or Marsh-McBirney is used for wading measurements. Table 2 lists the type of meter and velocity method to be used for wading measurements at various depths. A discussion of Table 2 follows the table.

Some departure from Table 2 is permissible. For example, if a type AA meter is being used in a measurement section that has most of its depth greater than 1.5 feet, the pygmy meter should not be substituted for a few depths that are less than 1.5 feet, or vice versa. The type AA meter should not typically be used in depths less than 1.25 feet. The Marsh-McBirney meter is appropriate for all depths deeper than 0.15 feet.

Table 2 Current Meter and Velocity Method for Various Depths (ft)

Depth (feet)	Meter*	Velocity Method (% of Depth)
1.5-2.5	Type AA	0.6
0.3-1.5	Pygmy	0.6
<0.3	Pygmy	0.5

* The Marsh-McBirney meter is appropriate for all depths deeper than 0.15 ft.

In the 0.6-depth, an observation of velocity made in the vertical at 0.6 of the depth below the surface is used as the mean velocity in the vertical. The 0.5-depth method will be used in very shallow stream conditions, with depths of less than 0.3 feet. This method requires that the meter be set at one-half the depth of water at the point, or at the lowest setting on the rod. For streams deeper than 2.5 feet, the two point measurement method (i.e., velocity measurement at 20% and 80% of the total stream depth) is recommended.

Vertical axis current meters do not register velocities accurately when placed close to a vertical wall. A Price meter held close to a right-bank vertical wall will under-register flow because the slower velocity near the wall strikes the effective (concave) face of the cups. The converse is true at a left-bank vertical wall. (The terms "left bank" and "right bank" designate direction from the center of a stream for an observer facing downstream.) The Price meter also under-registers when positioned close to the water surface or close to the streambed.

Equipment

Current meters, timers, depth and width measuring devices, and a means of counting meter revolutions are needed for measurement of discharge. The equipment includes:

- Depth-measuring device, the wading rod
- Current meter
- Width-measuring devices, either engineer's tape or tagline
- Headset
- Stop watch

Depth-Measuring Device. The depth-measuring device that will be used is the top-setting 1/2-inch-diameter hexagonal wading rod. The current meter is attached to the wading rod. The top-setting wading rod consists of a 1/2-inch hexagonal main rod for measuring depth and a 3/8-inch diameter round rod for setting the position of the current meter.

Current Meter. A current meter is an instrument used to measure the velocity of flowing water. The principle of operation is based on the proportionality between the velocity of the water and the resulting angular velocity of the meter's rotor. By placing the current meter at a point in a stream and counting the number of revolutions of the rotor during a measured interval of time, the velocity of water at that point is determined.

The number of revolutions of the rotor is obtained by an electrical circuit through the contact chamber. Contact points in the chamber are designed to complete an electrical circuit at selected frequencies of revolution. The contact chambers selected for discharge measurements at CGS have contact points that will complete the circuit once per revolution. The electrical impulse produces an audible click in a headphone. The intervals during which meter revolutions are counted are timed with a stop watch.

Engineer's Tape or Tagline. Steel, metallic, or fiberglass tapes, or premarked taglines are used for width determinations during discharge measurements made by wading. Direct measurement of width using tapes or taglines can be accurate with proper precautions. Orientation normal to the flow pattern of the river and elimination of most of the sag, through support or tension, are recommended for improved accuracy.

Headset. A headset attaches to an electronic connection at the upper end of the wading rod. The hydrographer wears this headset to listen to audible clicking sounds which are produced when a rotating gear in the current meter makes contact with a thin wire ("cat's whisker") in the contact chamber. The rotating gear contacts the cat's whisker once each time the series of cups on the meter revolves one complete turn. The number of rotations are counted and timed. The first click is counted as zero. The relationship between rotations and time is the point velocity. Velocities as a function of time are listed on a velocity chart, which is kept in the current-meter carrying case.

Stop Watch. A stop watch is used to measure time during which velocity is measured at each point in the cross section. Velocity at each point is measured for a period greater than or equal to 40 seconds and less than or equal to 70 seconds.

Staff Gage. Each location where the velocity-area method will be consistently applied may be equipped with a standard U.S. Geological Survey (USGS) vertical staff gages. The staff gages will be used to measure gage height to the nearest 0.02 of a foot.

Maintenance and Calibration Procedures

Prior to use of the current meter and following use of the meter, spin tests will be conducted to ensure that the unit performs acceptable. The spin test will be performed in an enclosed area, such as in the cab of a truck or in the enclosed rear of a truck, to prevent wind interference. The test is to be performed prior to attaching the current meter to the wading rod. While holding the meter steady in an area sheltered from breezes, the technician will spin the rotor and then press the start button on the stop watch. The technician will observe the meter until the rotor ceases to spin.

The duration of the spin for the pygmy meter should be more than 40 seconds and for the Price AA meter should be more than 90 seconds. If the meter fails to meet the time-of-spin criteria, the meter will be cleaned and oiled before use. If the meter continues to spin well beyond these time limits, the record will indicate that the meter spun for 40+ seconds, in the case of the pygmy meter, or for 90+ seconds, in the case of the Price AA meter.

To ensure reliable observations of velocity, it is necessary that the current meter be kept in good condition. Before and after each discharge measurement, the meter cups or vanes, pivot and bearing, and shaft should be examined for damage, wear, or faulty alignment. During measurements, the meter will be observed periodically when it is out of the water to be sure that the rotor spins freely.

Meters will be cleaned and oiled daily when in use. If measurements are made in sediment-laden water, the meter will be cleaned immediately after each measurement. After oiling, the rotor will be spun to make sure that it operates freely. If the rotor stops abruptly, the cause of the trouble will be sought and corrected before using the meter.

In addition to meter maintenance, the entire unit, consisting of current meter, wading rod, digital counter, and headset, will be checked before departure to the field each day as follows:

- Attach the current meter and digital counter/headset to the wading rod.
- Test the headset by:
  - Spin the current meter to ensure that audible clicks occur.
  - If audible clicks do not occur, the following steps should correct the problem:
    - Check that electronic connections are tight.
    - Check that the cat's whisker lightly contacts the upper part of the shaft.
    - Spin again. If audible clicks still do not occur, check that the battery in the headset is properly aligned. Replace the battery, if necessary.

Field Procedures

Overview. Based on approximate depths, either the Price AA, Marsh-McBirney, or pygmy meter will be selected to perform a velocity-area measurement. Neither the Price AA nor pygmy meter should be used for measuring velocities slower than 0.1 fps unless absolutely necessary. If depths or velocities under natural conditions are too low for a dependable current meter measurement, the cross section will be modified, if practical, to provide acceptable conditions. A shovel will be used to remove aquatic vegetation, ice, or rocks which may interfere with meter operation or discharge measurement.

Before velocity-area measurements are taken, use the staff gage to measure and record the gage height to the nearest 0.02 of a foot.

At each measurement point (or station) across the stream cross section, depth is measured prior to measurement of velocity. Therefore, it is recommended that the wading rod be set with the current meter suspended out of the water and above the tagline, which is used to measure width and to identify stations across the cross-section. Placement of the rod about 0.5 feet downstream from the tagline prevents contact between the tagline and the current meter when the meter is lowered into measuring position.

The wading rod will be placed in the stream so the base plate rests on the streambed, and the depth of water will then be read from the graduated main rod. The main rod is graduated into 0.1-foot increments: these increments are indicated by a single score in the metal. Half-foot increments are marked by two scores in the metal, and each foot is marked by three scores in the metal. A vernier scale on the upper handle of the rod corresponds to 0.1-foot increments. The top-setting rod, to which the meter is attached, has single scored marks which are aligned with values on the vernier scale.

The hydrographer reads water depth directly from the main rod. In high velocity areas, it is recommended that depth be read as the value between the depth on the upstream side of the rod and the depth on the downstream side of the rod. Depth is measured to the nearest 0.02 foot. This depth is used to set the vertical location on the current meter.

Next, the top-setting rod is adjusted downward so that the scored mark which corresponds to the range of depth in feet (e.g., if depth = 0.46, range in feet = 0; or if depth = 1.72, range in feet = 1) is aligned with the stream depth value transposed to the vernier scale. This automatically positions the meter for use in the 0.6 method as the meter is then six-tenths of the total depth from the surface of the water. If depths are less than 0.30 foot, the 0.5-method may be used. The observed depth will then be 0.5 of the total depth.

The hydrographer will stand in a position that least affects the velocity of the water passing the current meter. That position is obtained by facing upstream while holding the wading rod vertically and close to the tagline or measuring tape. The hydrographer stands at about a 45-degree angle downstream from the wading rod and at least 1.5 feet from the wading rod. This angle is an imaginary angle between the extended arm holding the wading rod and the tagline or measuring tape. The hydrographer should avoid standing in the water if his or her feet and

legs occupy a significantly large percentage of a narrow cross section. For narrow streams, it is often possible to stand astride the stream.

The wading rod should be held in a vertical position with the meter parallel to the direction of flow while the velocity is being observed. When measuring streams that have shifting beds, the soundings or velocities can be affected by the scoured depressions left by the hydrographer's feet. For such streams, the meter should be placed ahead of and upstream from the hydrographer's feet.

Once the velocity-area measurements have all been taken, measure and record the gage height from the staff gage to the nearest 0.02 foot again.

Steps to be followed in Measuring Discharge. Water quality and bed material samples will be collected prior to making discharge measurements. The following steps are to be followed in discharge measurement:

- Use the staff gage to measure and record the gage height to the nearest 0.02 of a foot.
- Measurement notes should be recorded on the Discharge Measurement Form at each subsection of the cross section as the measurement is performed. If two people are performing the measurement, the hydrographer may state the stations, depths, counts, and number of seconds to a note keeper. The note keeper would then repeat each value stated by the hydrographer to ensure agreement between the value stated by the hydrographer and the value heard by the note keeper.
- Record on the Discharge Measurement Form the following: distance from initial point, width, depth, observation depth, revolutions, time in seconds, velocity, area, discharge.
- Note the distance in feet in terms of stream direction that this cross section lies from the prescribed location. For example, the note may read "25 feet downstream" or "15 feet upstream." This is recorded in a manner similar to that on the front of the Discharge Measurement Form.
- If the selected cross section contains aquatic growth, ice, boulders, or slack-water areas that can either interfere with operation of the current meter or otherwise impede accurate measurement, use a shovel to remove minor flow impediments.
- Several measurement locations are required from one side of the stream to the other. Select the approximate number of subsections at which to take measurements as listed on Table 1. Position a tape (for small streams) or the tagline (for large streams) about one foot above the surface of the water. Secure the tape so that it remains taut and perpendicular to the channel.
- Select a starting point at either the left bank (left edge of water, LEW) or the right bank (right edge of water, REW), which is determined by facing downstream.
- Measure the width of the stream in feet. After selecting the Marsh McBirney, the Price AA or pygmy meter (see Table 2), follow Table 1 to select the number of subsections in which to measure velocity. The goal in selection of measurement stations is to measure no more than ten percent of the total discharge in any given subsection. Subsections need not be identical in width. Use more observation

points in deep areas or portions of the channel having higher velocities. Frequently, fewer observation points are needed near the shore than near the center of the stream. Obvious breaks in streambed configuration are also proper locations at which to measure velocities.

- After determining the desired distance between stations, measurement can begin. Record the time and bank at which measurement starts on the discharge measurement note as "REW Start 0000", using REW or LEW, depending upon whether starting at the right or the left edge of the water. 24-hour clock time is used, and is recorded to the nearest five minutes.
- Note the distance to the beginning edge of water from the initial point. The initial point is an arbitrary point on the tape, preferably a whole number, which lies on the shoreside of the stream. All subsequent station locations are recorded as distances from the initial point.
- Proceed to the first station. Record the distance from the initial point on the discharge note.
- Stand downstream of the tagline or tape and face upstream. begin with the current meter on the wading rod well above the surface of the water.
- Measure stream depth at the measurement point on the wading rod. Individual lines on the wading rod indicate 0.10-foot increments; double lines indicate 0.50-foot increments, and triple lines indicate 1.00-foot increments. Record the stream depth to the nearest 0.02 feet: for example 0.32 feet or 1.54 feet.
- Lower the meter to the required depth and record the observation depth in the logbook. The observation depth as a fraction of total depth is usually 0.6, or 0.5 for subsections having depth of less than 0.3 feet.
- Stand downstream of the meter with the arm fully extended as you hold the wading rod. Position yourself so that the angle measured between the arm and the tagline is about 45 degrees. Stand as far away from the vertically held wading rod as possible.
- Start the stopwatch and begin counting clicks. The first click is counted as zero.
- After at least 40 but as much as 70 seconds have passed, stop the stopwatch. Record number of seconds and number of revolutions (clicks) on the same line of the note as the depth was recorded.
- Determine velocity as a function of elapsed time and number of revolutions from the velocity chart. Record velocity next to the other values for this station.
- Proceed to the next station. Record the distance from the initial point to the station. Repeat measurements of depth and velocity. Continue in this manner across the stream.
- After recording the distance measurement at the last station, record the time at which the ending edge of water is reached as "LEW (or REW) FINISH 1330."
- Note velocity and depth at the edge of water as zero.
- Following velocity-depth measurements, use the staff gage again to measure and record the gage height to the nearest 0.02 of a foot.
- Evaluate and record on the data collection note the following: Flow characteristics, weather, air temperature, water temperature, observer(s), type of meter, and remarks.

- For QA/QC purposes, each team should make repeat measurements at a station to document method precision. These measurements should be conducted at a minimum of one per every 20 flow measurements.

Discharge Calculations

A stream discharge is the summation of the products of the subsection areas of the stream cross section and their respective average velocities. The formula:

$$Q = \Sigma(av)$$

represents the computation, where Q is the total discharge, a is an individual subsection's area, and v is the corresponding mean velocity of flow normal to the subsection. The summation of the discharges for all the subsections is the total discharge for that stream cross section. The order for calculating discharge is:

- Use the distances from initial point to compute width for each section. The first width is computed by subtracting the first distance from the second distance, and dividing this quantity by two. The second width is the difference between the third distance and the first distance, divided by two. For each subsequent width, subtract the distance on the line above the line you are calculating from the distance on the line below the line you are calculating, and divide this quantity by two. This procedure is carried out for each line until you reach the final width calculation. This is calculated as the difference between the final and the second-to-last distance, divided by two.
- Subsequent calculations will be performed as follows:
  - Calculate each discharge for each subsection by multiplying the width of the subsection times the depth times the velocity.
  - Sum the discharges for each subsection to arrive at total discharge for the entire cross section.
  - If the two-point measurement method was employed, average velocities to obtain a "mean" velocity for the partial section.
- Check your math by summing the subsection widths. Their total should equal the value obtained by taking the difference between the LEW and the REW station distances from initial point.
- Initial at the line "Comp. by" to identify yourself as the person responsible for performing the discharge calculation.

3.2 Flumes

3.2.1 Theoretical Considerations

Flumes are specially shaped open-channel flow devices that constrict channel area and change the slope to force the flow through critical depth. Typical flumes consist of three sections:

- A converging section to accelerate the approaching flow
- A throat section, whose width is used to designate flume size

- A diverging section, designed to ensure that the level downstream is lower than the level in the converging section

The hydraulic theory behind flume is based on a calibrated constriction placed to change the level of the water in or near the constriction. By knowing the dimensions of the constriction, the discharge though the constriction will be a function of the water level. A simple depth determination near the constriction provides a discharge measurement. Flumes are constructed so that a restriction in the channel causes the water to accelerate, producing a corresponding change (drop) in the water level. The head can then be related to discharge.

3.2.2 Required Measurement Conditions

The flow rate through a flume is determined by measuring the gage (flow depth) at a single point upstream from the throat. Pressure transducers and data loggers maybe installed to continuously record gage depth. The gage height measurement determines the discharge only if critical flow is achieved in the throat of the flume. By definition, critical flow is when the ratio of force due to inertia to the force due to gravity (Froude number) is unity. Supercritical flow occurs when the Froude number exceeds unity. If the Froude number is less than one, subcritical flow occurs, commonly due to a condition referred to as submergence. If submergence exists, a second depth reading must be taken in the throat section to determine the flow rate. Additional information concerning the use of flumes under all flow conditions, including submergence, is found in USGS Water Supply Paper 2175, Volume 2, Chapter 10.

3.2.3 Equipment

For purposes of discharge measurements at CGS, existing flumes located at some of the surface water sites will be inspected and flow rates measured prior to sampling. Additional flumes may be permanently or temporarily installed at some sites.

Parshall Flume. The Parshall flume consists of a converging section with a level floor, a throat section with a downward sloping floor, and a diverging section with an upward sloping floor. The principal feature of the Parshall flume (developed by R. Parshall in 1922) is an approach reach having converging sidewalls and a level floor of which the downstream end is a critical-depth section. Critical flow is established at the throat due to a sharp downward break in the slope of the flume. The slope downstream from the level approach section is therefore supercritical. The primary gage height measurement is made in the approach reach at a standard distance upstream from the critical-depth cross section.

Portable Flume. A bed slope of less than one percent for a distance of four to six feet upstream of a portable cutthroat flume is necessary for proper operation for throat widths ranging from one to six inches. Also, a flow width equal to at least two times the front width of the flume is recommended upstream of the flume. The flume must be installed level, plumb and square. All of the flow must be diverted into the flume inlet. After the flow has equilibrated, the up and downstream staff gages provided in the flume should be read and flow depths recorded. The flume should be installed so free-flow occurs, that is the flow through the flume reaches critical depth in the vicinity of minimum width in the flume. If free-flow conditions exist, only the upstream gage needs to be read. For submerged flow conditions both the upstream gage (head) and downstream gage needs to be read to determine discharge.

3.2.4 Maintenance and Calibration Procedures

All flumes will be inspected prior to measurement of discharge to determine that the flume is discharging freely. Any problems observed during the inspection will be noted and reported to the site supervisor.

3.2.5 Field Procedures

Overview. If the site is equipped with a permanent flume, then discharge will be measured as described below.

Steps to be Followed in Measuring Discharge from a Permanent Flume

- Remove any material that may have accumulated in the flume.
- Note any deterioration of the flume; report these conditions to the project technical consultant at the conclusion of daily data collection activities.
- Measure and record the throat width to the nearest 0.01 of a foot.
- Record the time and date of the site visit.
- Use the staff gage to measure and record the gage height to the nearest 0.02 of a foot.
- Calculate discharge using tables or equations suitable for the width and type of flume located in Appendix B.
- Record the calculated discharge (Should any leakage occur around the flume, the amount of leakage is estimated as a percent of the total measured flow and added to the calculated flow value).

Steps to be followed Measuring Discharge from a Portable Flume

- Remove any material that hinders ability to form a flat surface for flume to be level, plumb, and square. Use a leveling device to ensure the flume is level and plumb.
- Follow the steps measuring discharge from a permanent flume.

3.3 Volumetric Method

The volumetric method consists of capturing flow in a container and measuring the time required to fill the container. This may be accomplished by building a small earthen dike to divert the flow through a pipe, temporarily placed in the channel, into a container with a known calibrated volume. The container is placed below the discharge pipe, and the time required to fill the known volume is recorded with a stopwatch. The measurement is repeated at least three times and the resulting values averaged. If the variance between the time measurements exceeds ten percent, the measurement procedure is repeated. Should any leakage occur through or around the dike, the amount of leakage is estimated as a percent of the total measured flow and added to the calculated flow value. Required Measurement Conditions

The volumetric method of measurements is best used for measurement of small flows that are immeasurable by other methods, and can be diverted through a pipe. The flow has to be fully controlled through the pipe with no leakage through or around constructed dike.

3.3.1 Equipment

Equipment necessary to measured discharge includes: smooth section pipe, graduated container or container of known volume, stop watch.

3.3.2 Maintenance and Calibration Procedures

The pipe and container will be inspected for damage prior to use. If any cracks or holes exist in the pipe or container, the pipe shall be replaced. Only a pipe with a smooth surface shall be used. The volume of the container will be determined and documented.

APPENDIX A
SURFACE WATER DATA SHEET AND DISCHARGE MEASUREMENT FORM

SURFACE WATER DATA SHEET

IDENTIFICATION

Sample Location_____ Date _____ Time _____ Page_ of
Sample Control Number_____ Samplers _____

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C ☐ °F ☐ Not Measured? ☐
Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

INSTRUMENT CALIBRATION

pH pH meter number:
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Conductivity Meter Calibration/Measurement Meter number:
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐

SAMPLE LOCATION DESCRIPTION

SAMPLE COLLECTION PROCEDURE

DISCHARGE MEASUREMENT

Method: Meter Type/Model/Serial No.:
Comments/Observations:

Discharge _____ Staff gauge

Final Sample Parameters

Sample Date	Sample Time	Discharge	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐	Turbidity (Visual Estimate)

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)
Was a field blank collected? Yes ☐ No ☐ (sample control number_____)
Was a rinsate sample collected? Yes ☐ No ☐ (sample control number_____)
Notes _____

DISCHARGE MEASUREMENT FORM

Sample Location: _____ Date:_____ Samplers:_____

Method: _____ Meter Type/Model/Serial No.:_____

Observations:_____

_____

_____

_____

DIST FROM INIT POINT	WIDTH (FT)	DEPTH (FT)	OBSER DEPTH	REVS	TIME (SEC)	VELOCITY (F/S) AT POINT	MEAN IN VERTICAL	AREA (FT)	DISCHARGE (CFS)
	LEW or REW (circle one) at time=_____								
	LEW or REW (circle one) at time=_____								

APPENDIX B
FLUME DISCHARGE CALCULATIONS

PARSHALL FLUME DISCHARGE CALCULATION

Flume Size (incl. discharge [cfs])

1	.5*(h(ft)^2)
2	1.02*(h(ft)^2)
4	2.08*(h(ft)^2)
8	4.22*(h(ft)^2)
6	2.060*(h(ft)^1.580)
9	3.070*(h(ft)^1.530)
12	4*(h(ft)^1.522)
18	6*(h(ft)^1.538)

h=staff gauge reading (ft)
cfs*440.83 = gpm

Collapsible Cutthroat Flume

For free discharge, downstream height ÷ by upstream height must be less than 0.5.

Upstream Gauge (ft)	gpm 1"	gpm 2"	gpm 4"	gpm 8"	cfs 1"	cfs 2"	cfs 4"	cfs 8"
0.10	2.25	4.58	9.32	19.0	0.005	0.010	0.021	0.042
0.11	2.72	5.54	11.3	23.0	0.006	0.012	0.025	0.051
0.12	3.24	6.60	13.4	27.4	0.007	0.015	0.030	0.061
0.13	3.80	7.74	15.8	32.1	0.008	0.017	0.035	0.072
0.14	4.41	8.98	18.3	37.2	0.010	0.020	0.041	0.083
0.15	5.06	10.3	21.0	42.8	0.011	0.023	0.047	0.095
0.16	5.76	11.7	23.9	48.6	0.013	0.026	0.053	0.108
0.17	6.50	13.2	26.9	54.9	0.014	0.029	0.060	0.122
0.18	7.29	14.8	30.2	61.6	0.016	0.033	0.067	0.137
0.19	8.12	16.5	33.6	68.6	0.018	0.037	0.075	0.153
0.20	9.00	18.3	37.3	76.0	0.020	0.041	0.083	0.169
0.21	9.92	20.2	41.1	83.8	0.022	0.045	0.092	0.187
0.22	10.9	22.2	45.1	92.0	0.024	0.049	0.101	0.205
0.23	11.9	24.2	49.3	101	0.027	0.054	0.110	0.224
0.24	13.0	26.4	53.7	109	0.029	0.059	0.120	0.244
0.25	14.1	28.6	58.3	119	0.031	0.064	0.130	0.265
0.26	15.2	31.0	63.0	128	0.034	0.069	0.140	0.286
0.27	16.4	33.4	67.9	139	0.037	0.074	0.151	0.309
0.28	17.6	35.9	73.1	149	0.039	0.080	0.163	0.332
0.29	18.9	38.5	78.4	160	0.042	0.086	0.175	0.356
0.30	20.3	41.2	83.9	171	0.045	0.092	0.187	0.381
0.31	21.6	44.0	89.6	183	0.048	0.098	0.200	0.407
0.32	23.0	46.9	95.4	195	0.051	0.104	0.213	0.434
0.33	24.5	49.9	101	207	0.055	0.111	0.226	0.461
0.34	26.0	52.9	108	220	0.058	0.118	0.240	0.489
0.35	27.6	56.1	114	233	0.061	0.125	0.254	0.519
0.36	29.2	59.4	121	246	0.065	0.132	0.269	0.549
0.37	30.8	62.7	128	260	0.069	0.140	0.284	0.580
0.38	32.5	66.1	135	274	0.072	0.147	0.300	0.611
0.39	34.2	69.7	142	289	0.076	0.155	0.316	0.644
0.40	36.0	73.3	149	304	0.080	0.163	0.332	0.677
0.41	37.8	77.0	157	319	0.084	0.172	0.349	0.712
0.42	39.7	80.8	164	335	0.088	0.180	0.366	0.747

Collapsible Cutthroat Flume

For free discharge, downstream height ÷ by upstream height must be less than 0.5.

Upstream Gauge (ft)	gpm 1"	gpm 2"	gpm 4"	gpm 8"	cfs 1"	cfs 2"	cfs 4"	cfs 8"
0.43	41.6	84.7	172	351	0.093	0.189	0.384	0.783
0.44	43.6	88.7	180	368	0.097	0.198	0.402	0.820
0.45	45.6	92.7	189	385	0.102	0.207	0.421	0.857
0.46	47.6	96.9	197	402	0.106	0.216	0.439	0.896
0.47	49.7	101	206	420	0.111	0.225	0.459	0.935
0.48	51.8	106	215	438	0.116	0.235	0.478	0.975
0.49	54.0	110	224	456	0.120	0.245	0.499	1.02
0.50	56.3	115	233	475	0.125	0.255	0.519	1.06
0.51	58.5	119	242	494	0.130	0.265	0.540	1.10
0.52	60.8	124	252	514	0.136	0.276	0.562	1.14
0.53	63.2	129	262	534	0.141	0.287	0.583	1.19
0.54	65.6	134	272	554	0.146	0.298	0.606	1.23
0.55	68.1	139	282	575	0.152	0.309	0.628	1.28
0.56	70.6	144	292	596	0.157	0.320	0.651	1.33
0.57	73.1	149	303	617	0.163	0.332	0.675	1.38
0.58	75.7	154	314	639	0.169	0.343	0.699	1.42
0.59	78.3	159	324	661	0.175	0.355	0.723	1.47
0.60	81.0	165	336	684	0.180	0.367	0.748	1.52
0.61	83.7	170	347	707	0.187	0.380	0.773	1.58
0.62	86.5	176	358	730	0.193	0.392	0.798	1.63
0.63	89.3	182	370	754	0.199	0.405	0.824	1.68
0.64	92.2	188	382	778	0.205	0.418	0.851	1.73
0.65	95.1	194	394	803	0.212	0.431	0.877	1.79
0.66	98.0	200	406	828	0.218	0.444	0.905	1.84
0.67	101	206	418	853	0.225	0.458	0.932	1.9
0.68	104	212	431	879	0.232	0.472	0.96	1.96
0.69	107	218	444	905	0.239	0.486	0.989	2.02
0.70	110	224	457	931	0.246	0.500	1.02	2.07
0.71	113	231	470	958	0.253	0.514	1.05	2.13
0.72	117	237	483	985	0.26	0.529	1.08	2.19
0.73	120	244	497	1013	0.267	0.544	1.11	2.26
0.74	123	251	510	1040	0.275	0.559	1.14	2.32
0.75	127	258	524	1067	0.282	0.574	1.17	2.38

O&M SOP-6

SOP Date: May 2008

SURFACE WATER SAMPLE COLLECTION

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for collection of surface water samples at the California Gulch CERCLA Site. This procedure gives descriptions of equipment, field procedures, and QA/QC procedures necessary to collect surface water samples from streams and surge pond areas. The sample locations and frequency of collection are specified in specific Operable Unit workplans/sampling and analysis plans.

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

- SOP 1 Decontamination
- SOP 3 Field Instrument Calibration and Operation
- SOP 5 Surface Water Flow Measurement
- SOP 7 Sample Handling, Documentation, and Analysis
- SOP 10 Field QA/QC Samples

2.0 SURFACE WATER SAMPLING

2.1 Sampling Methods

This section discusses the criteria for the selection of sampling methods and equipment. The selection of sampling methods and equipment is based on sample type, flow conditions, and data quality objectives stated in the sampling workplan. Selection of sampling methods and equipment based on flow conditions is as follows:

- If the stream is less than 3 ft wide, collect samples from the center of the flow.
  Use a dipper or a beaker to collect samples into the churn splitter and distribute the sample water from the churn splitter into the sample bottles. Alternately, pump directly from the stream into the sample bottles with a peristaltic pump and Tygon or silicon tubing, or immerse the bottles in the center of flow with the bottle mouth facing up stream. 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.
- If the stream is greater than 3 ft wide, use the horizontal areal composite method: Collect aliquots of sample from 3 stations spaced evenly across the stream. If the

stream is too deep to wade, collect a grab sample from the bank. Combine these in the churn splitter and fill sample bottles as described above.

2.2 Equipment List

Sample bottles with preservatives added (preservatives may be added in the field) will be obtained from the analytical laboratory. Several extra sample bottles will be obtained in case of breakage or other problems.

Equipment used during surface water sample collection is listed on the field equipment checklist (see Appendix A). This list will be checked before departing to the field.

2.2.1 USGS Churn Splitter

The churn splitter is a device which mixes (homogenizes) sample aliquots to form a sample composite and then splits the composite into discrete samples. Samples may be taken from the churn splitter for analysis of all dissolved and suspended inorganic constituents with the exception of total organic carbon (TOC), fecal coliform, volatile organic analyses (VOAs), and oil and grease (O&G). The churn splitter is used to mix the surface water sample while splitting the total volume into the various analyte samples.

Samples collected are composited and split in either an 8-liter or a 14-liter churn splitter. A total of 10 liters of the sample mixture can be withdrawn from the 14-liter churn; the remaining 4 liters should not be used directly because they will not be representative. Similarly, 5 liters can be withdrawn from the 8-liter churn. The sample mixture remaining in either churn can, however, be used for filtered samples. Unfiltered water samples should be withdrawn first and then filtered samples may be taken from the churn bucket with a peristaltic pump.

2.3 Sampling Procedures

This section gives the step-by-step procedures for collecting samples in the field. Observations made during sample collection should be recorded on the Surface Water Data Sheet (Appendix B).

Samples will be collected from the same cross section of the stream as that which is to be used for the discharge measurement, if discharge is measured. Always collect samples prior to making discharge measurements. Stand downstream of the water to be sampled.

2.3.1 Decontamination Equipment

Before any sampling begins, and between samples, all sample collection equipment shall be decontaminated. If dedicated equipment is used, it will be rinsed with deionized water. If nondedicated equipment is used, it will be washed with Alconox Soap (or equivalent), rinsed with potable water, then rinsed with deionized water, and placed in clean plastic bags. Mobile decontamination supplies will be provided so that equipment can be decontaminated in the field. A discussion of personnel decontamination is contained in the site Health and Safety Plan. See SOP No. 1 for additional information on decontamination procedures.

2.3.2 Instrument Calibration

Electronic equipment used during sampling may include a pH meter with temperature scale and a conductivity meter. Before going into the field, the sampler shall verify that all of these are operating properly. The pH and conductivity meters require calibration prior to use every day. Calibration times and appropriate readings will be recorded in the field notebook. Specific instructions for calibrating the pH meter and conductivity meter are given in SOP 3.

2.3.3 Filtering Samples

Total metals, conductivity, pH, and solids analyses are performed on unfiltered samples. Samples will be filtered in the field by using a disposable 0.45µm membrane filter apparatus and peristaltic or hand vacuum pump. Note: sample analysis may not include all parameters discussed in this section.

Filtered samples will be collected according to the following procedure:

- Assemble filter device according to manufacturer's instructions.
- Filter sample either by pouring sample in the top portion of filter unit or pumping it through Tygon® or silicone tubing and an in-line filter using a peristaltic pump. Composited sample remaining in the churn splitter may be used for filtered sample.
- Transfer filtered sample to appropriate sample bottles 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.
- Dispose of the used filter cartridge and tubing.

2.3.4 Field Quality Assurance/Quality Control Samples

Field QA/QC sample collection is discussed in SOP 10.

2.4 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.

2.5 Documentation

A Surface Water Data Sheet will be completed at each sample location. Items not applicable to the sampling will be labeled as not applicable (NA). The information on the data sheet will include the following:

- Sampling location
- Date and time of sampling
- Weather conditions
- Persons performing sampling
- Conductivity, temperature, and pH during sampling

- Color, odor, and cloudiness of the water
- Sample identification numbers
- Identification numbers of any QC samples from site
- Any irregularities or problems which may have a bearing on sampling quality

3.0 FLOW RATE MEASUREMENT

After collecting surface water samples, the surface water flow rate will be measured to ascertain the surface water flow conditions at the time of sample collection. Surface water flow rate procedures are described in SOP No. 5,

4.0 SURGE POND WATER VOLUME

After collecting surface water samples, the surge pond water volume will be measured to ascertain the surface water conditions at the time of sample collection. The volume of water contained in the surge pond should be measured using the staff gauge as described in SOP No. 9 — Surge Pond Staff Gauge.

APPENDIX A
FIELD EQUIPMENT CHECKLIST

FIELD EQUIPMENT CHECKLIST

Sampling Equipment

- Conductivity Meter
- pH meter w/temperature scale
- Conductivity standards
- pH Buffers
- Containers for field parameter measurement
- Samplers for all sampling conditions (i.e., dip sample)
- Churn splitter
- Sample bottles
- Sample labels
- Peristaltic pump
- Tygon or silicon tubing
- Disposable Filters
- Plastic storage bags for samples
- Coolers containing sample containers
- Blue ice
- Extra sample containers
- Chain-of-custody forms
- Gloves

Personal Equipment

- PPE, as discussed in the Health & Safety Plan
- Wrist or pocket watch
- Rain gear
- Duct tape
- Pocket knife
- First aid kit

Stream-Gaging Equipment

- Marsh-McBirney Current Velocity meter, or Velocity charts for Price AA meter and Pygmy meter
- Type AA current meters with spare parts (for high flow conditions only)
- 1 pygmy meter, with very small screwdriver
- 1 wading rod (complete)
- 1 head set (complete for wading measurements) and/or velocity meter
- 1 stop watch
- Calibrated volumetric containers (for pipe flow measurements only)
- Steel or fiberglass measuring tapes
- Meter oil
- Shovel
- Level
- Portable, adjustable width Cutthroat flume
- Waders or hip boots

Decontamination Equipment

- Alconox or a nonphosphate detergent, such as Liquinox
- Buckets with lids
- Brushes
- Distilled water
- Potable water
- Decon water containers
- Paper towels
- Clean plastic bags

Forms and Supplies

Chain-of-Custody Forms
Sample container labels
Applicable SOPs, HSP, equipment manuals, work plan and other required documentation
Chain-of-Custody Checklist
Surface Water Data Collection Sheet and Discharge Measurement Note
Logbook

APPENDIX B
SURFACE WATER DATA SHEETS

SURFACE WATER DATA SHEET

IDENTIFICATION

Sample Location_____ Date _____ Time _____ Page_ of
Sample Control Number_____ Samplers _____

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C ☐ °F ☐ Not Measured? ☐
Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

INSTRUMENT CALIBRATION

pH pH meter number:
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Conductivity Meter Calibration/Measurement Meter number:
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐

SAMPLE LOCATION DESCRIPTION

SAMPLE COLLECTION PROCEDURE

DISCHARGE MEASUREMENT

Method: Meter Type/Model/Serial No.:
Comments/Observations:

Discharge _____ Staff gauge

Final Sample Parameters

Sample Date	Sample Time	Discharge	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐	Turbidity (Visual Estimate)

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)
Was a field blank collected? Yes ☐ No ☐ (sample control number_____)
Was a rinsate sample collected? Yes ☐ No ☐ (sample control number_____)
Notes

DISCHARGE MEASUREMENT FORM

Sample Location: _____ Date: _____ Samplers: _____

Method: _____ Meter Type/Model/Serial No.: _____

Observations: _____

_____

_____

_____

DIST FROM INIT POINT	WIDTH (FT)	DEPTH (FT)	OBSER DEPTH	REVS	TIME (SEC)	VELOCITY (F/S) AT POINT	MEAN IN VERTICAL	AREA (FT)	DISCHARGE (CFS)
	LEW or REW (circle one) at time=								
	LEW or REW (circle one) at time=								

O&M SOP-7

SOP Date: May 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 California Gulch CERCLA 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:

R-CGMW1-01-900423

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., CGMW1 indicates California Gulch Monitoring 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 to allow data in the analytical database to be easily sorted. For example, the sample identified above was collected on April 23, 1990. Table 1 provides a list of the possible code entries for each of the data fields for routine monitoring samples.

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 2Sample 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 2.

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 2. 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.

The chemical constituents for which samples from all current sampling programs will be analyzed are summarized in the project QAPP.

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 Identification Codes

Example Sample I.D.	R-MWBB1-W-01-911217	
	R =	Sampling company (i.e., Resurrection)
	BBW1 =	Sampling location and matrix (i.e., MWBB1 indicates Monitoring BB-1, second W indicates a water Well matrix)
	01 =	Type of sample (i.e., primary sample)
	911217 =	Date of sample collection (Year Month Day) (i.e., December 17, 1991)

First field will be: "R" for Resurrection, "RA" for Res-ASARCO Joint Venture or other letters to identify subcontractor collecting samples

OU1 Second field will be: "YFW" for Yak Portal Discharge Water, or
"BBWI" for Monitoring Well BBW-1, or
"SEW" for Surface Water, or
"SPW" for Surge Pond Water, or
"SSW" for Seep or Spring Water, or
"SPS" for Surge Pond Sediment, or
"WPE" for Water Treatment Plant, or
"GIL" for Gravity Influent Line, or
"SPIL" for Surge Pond Influent Line, or
"WE5" for EPA well MW5, or
"W5A" for EPA well MW5A, or
"W5B" for EPA well MW5B, or
"BTL" for Blockage Water

Third field will be:
"01" for primary sample or grab sample
"02" for field duplicate sample
"03" for field blank
"04" for equipment rinsate

Fourth field will be:
YEAR MONTH DAY
Date sample collected

Table 2 Sample Containers, Preservation Methods, and Holding Times

Analyte	Container[1]	Filtration[2]	Preservation	Holding Time[3]
pH	P,G	No	Cool, 4°C	7 days[4]
Specific conductance	P,G	No	Cool, 4°C	28 days
Total alkalinity (as $CaCO_3$)	P,G	Yes	Cool, 4°C	7 days[4]
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
Cyanide (total)	P,G	No	Cool, 4°C, NaOH to pH >12	12 days
Mercury	P,G	Yes	HNO_3 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_2SO_4 to pH <2	28 days
Total Phosphorus	P,G	Yes	Cool, 4°C, H_2SO_4 to pH <2	28 days
Orthophosphate	P	Yes	Cool, 4°C	48 hours
Radionuclides (total)	P,G	No	HNO_3 to pH <2	6 months
Radionuclides (dissolved)	P,G	Yes	HNO_3 to pH <2	6 months
Silica	P	Yes	Cool, 4°C	28 days
Sulfate	P,G	Yes	Cool, 4°C	28 days
Dissolved metals[5]	P,G	Yes	Cool, 4°C, HNO_3 to pH <2	6 months
Total metals[5]	P,G	No	Cool, 4°C, HNO_3 to pH <2	6 months
Total recoverable metals	P,G	No	Cool, 4°C, HNO_3 to pH <2	6 months
Turbidity	P,G	No	Cool, 4°C	2 days

(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.
(5) Metals in this category are listed the O&M Plan or Routine Monitoring Plan.

O&M SOP-8

SOP Date: May 2008

WATER TREATMENT PLANT SAMPLING

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard protocols for Water Treatment Plant sample collection for California Gulch CERCLA Site. This procedure is intended to be used together with other SOPs including:

- SOP 3 Field Instrument Calibration and Operation
- SOP 7 Sample Handling, Documentation, and Analysis

2.0 WATER TREATMENT PLANT SAMPLING

Water Treatment Plant sampling will collect samples from the following sample streams:

- Effluent
- Yak Tunnel
- Surge Pond
- Blockage

The effluent sample will be collected from the sample port on the pipe leading to outfall 001. The Yak Tunnel, Surge Pond, and blockage samples will be collected at the sample ports at the 1st stage tank.

These samples will be flow proportional composite samples. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;
b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;
c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,
d. Continuous collection of sample, with sample collection rate proportional to flow rate.

Sample streams will be pumping a minimum of six hours before sampling. Sample ports will be flushed approximately one minute before sample collection. The sample container will be triple rinsed only before the collection of the first aliquot. Subsequent aliquots will be placed in the

sample container without rinsing. Samples will not be filtered. Sample handling, documentation, and labeling procedures are discussed in SOP 7.

Field parameters will be measured before the collection of the first aliquot only. Instrument calibration/check procedures are presented in SOP 3.

Field QA/QC samples will not be collected.

All sampling equipment is dedicated and decontamination will not be required.

O&M SOP-9

SOP Date: May 2008

SURGE POND STAFF GAUGE

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for measuring water and sediment levels in the Surge Pond of the California Gulch CERCLA Site. This procedure gives descriptions of equipment and field procedures necessary to collect water level measurements.

2.0 WATER AND SEDIMENT LEVEL MEASUREMENT PROCEDURES

2.1 Equipment List

The equipment necessary to measure surge pond water levels includes:

- Field notebook
- Waterproof pen
- Rag for cleaning staff gradations
- Appropriate Health and Safety equipment

2.2 Procedures

The surge pond staff gauge is permanently installed on the walkway adjacent to the pump barge in the Surge Pond. The staff gauge has a white porcelain finish with readily visible black numeric gradations. The staff gauge is clearly visible from the pump barge.

The pond water level is read directly from the gauge. If the gradations on the gauge are difficult to read, use a rag to wipe off the gauge.

2.3 Documentation

Surge pond water levels observed on the staff gauge will be recorded in the field notebook. Volumes of pond water can be determined from Table 1. The pond water volumes will be recorded in the field notebook. Additional notes and observations are also recorded in the field notebook or on the daily Yak Water Treatment Plant form and shall include the time and date of readings and any unusual conditions observed.

Table 1 Staff Gauge Volume vs. Pond Volume

Staff Gauge Reading	Pond Volume	Staff Gauge Reading	Pond Volume	Staff Gauge Reading	Pond Volume	Staff Gauge Reading	Pond Volume	Staff Gauge Reading	Pond Volume
1.6	4,065,442	3.46	6,695,236	5.35	9,839,377	7.15	13,477,414	9.2	17,232,328
1.65	4,120,603	3.5	6,764,500	5.4	9,927,911	7.2	13,568,998	9.25	17,323,911
1.7	4,175,764	3.55	6,851,080	5.42	9,963,340	7.25	13,660,581	9.3	17,415,494
1.75	4,230,925	3.6	6,937,660	5.45	10,012,135	7.3	13,752,164	9.35	17,507,077
1.8	4,286,086	3.65	7,024,240	5.5	10,093,461	7.35	13,843,747	9.4	17,598,661
1.85	4,341,247	3.7	7,110,820	5.55	10,174,786	7.4	13,935,331	9.45	17,690,244
1.9	4,396,408	3.72	7,145,452	5.6	10,256,111	7.45	14,026,914	9.5	17,781,827
1.95	4,458,958	3.75	7,188,742	5.65	10,337,437	7.5	14,118,497	9.55	17,873,410
2	4,521,508	3.8	7,260,892	5.68	10,386,232	7.55	14,210,080	9.6	17,964,994
2.05	4,584,058	3.85	7,333,042	5.7	10,446,941	7.6	14,301,664	9.65	18,056,577
2.1	4,646,608	3.9	7,405,192	5.75	10,598,713	7.65	14,393,247	9.7	18,148,160
2.15	4,709,158	3.95	7,477,342	5.8	10,750,486	7.7	14,484,830	9.75	18,239,743
2.2	4,771,708	4	7,549,492	5.81	10,780,840	7.75	14,576,413	9.8	18,331,327
2.22	4,796,728	4.02	7,578,352	5.85	10,872,540	7.8	14,667,997	9.85	18,422,910
2.25	4,837,537	4.05	7,638,858	5.9	10,987,165	7.85	14,759,580	9.9	18,514,493
2.3	4,905,551	4.1	7,739,702	5.95	11,101,791	7.9	14,851,163	9.95	18,606,076
2.35	4,973,565	4.15	7,840,545	6	11,216,416	7.95	14,942,746	10	18,697,660
2.4	5,041,579	4.2	7,941,389	6.05	11,289,754	8	15,034,330	10.05	18,789,243
2.45	5,109,594	4.22	7,981,726	6.1	11,363,091	8.05	15,125,913	10.1	18,880,826
2.5	5,177,608	4.25	8,023,170	6.15	11,436,429	8.1	15,217,496	10.15	18,972,409
2.55	5,245,622	4.3	8,092,244	6.2	11,509,766	8.15	15,309,079	10.2	19,063,993
2.6	5,313,637	4.35	8,161,317	6.25	11,699,186	8.2	15,400,662	10.25	19,155,576
2.65	5,381,651	4.4	8,230,391	6.28	11,764,838	8.25	15,492,246	10.3	19,247,159
2.7	5,449,665	4.45	8,299,465	6.3	11,816,535	8.3	15,583,829	10.35	19,338,742
2.75	5,517,679	4.5	8,368,538	6.35	11,945,779	8.35	15,675,412	10.4	19,430,326
2.78	5,558,488	4.55	8,437,612	6.36	11,971,628	8.4	15,766,996	10.45	19,521,909
2.8	5,593,901	4.6	8,530,897	6.4	12,061,686	8.45	15,858,579	10.5	19,613,492
2.85	5,682,435	4.65	8,624,182	6.45	12,174,259	8.5	15,950,162	10.55	19,705,075
2.9	5,770,968	4.7	8,717,467	6.5	12,286,832	8.55	16,041,745	10.6	19,796,659
2.95	5,859,501	4.75	8,810,752	6.55	12,378,415	8.6	16,133,329	10.65	19,888,242
3	5,948,035	4.8	8,893,672	6.6	12,469,999	8.65	16,224,912	10.7	19,979,825
3.05	6,036,568	4.85	8,976,592	6.65	12,561,582	8.7	16,316,495	10.75	20,071,408

Table 1 Staff Gauge Volume vs. Pond Volume (continued)

3.1	6,125,043	4.9	9,059,512	6.7	12,653,165	8.75	16,408,078	10.8	20,162,992
3.15	6,213,519	4.95	9,142,432	6.75	12,744,748	8.8	16,499,662	10.85	20,254,575
3.2	6,301,994	5	9,225,352	6.8	12,836,332	8.85	16,591,245	10.9	20,346,158
3.22	6,337,384	5.05	9,312,418	6.85	12,927,915	8.9	16,682,828		
3.25	6,382,116	5.1	9,399,484	6.9	13,019,498	8.95	16,774,411		
3.3	6,456,668	5.15	9,486,550	6.95	13,111,081	9	16,865,995		
3.35	6,531,221	5.2	9,573,616	7	13,202,665	9.05	16,957,578		
3.4	6,605,773	5.25	9,662,190	7.05	13,294,248	9.1	17,049,161		
3.45	6,680,326	5.3	9,750,763	7.1	13,385,831	9.15	17,140,744		

O&M SOP-10

SOP Date: May 2008

FIELD QA/QC SAMPLES

1.0 PURPOSE AND SCOPE

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

All QA/QC samples will be collected following procedures presented in SOP 4 Ground Water Monitoring Well Sampling and SOP 6 Surface Water Sample Collection. This SOP applies to samples collected under the Routine Monitoring Plan and does not apply to samples collected monthly at the Yak Water Treatment Plant.

2.0 GROUNDWATER SAMPLING FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND SAMPLES

The well sampling order will be dependent on expected levels of contamination in each well, if known, and will be determined prior to sampling. Quality assurance/quality control (QA/QC) samples will be collected during groundwater sampling.

QA/QC samples are designed to help identify potential sources of sample contamination and evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

Field QA/QC samples consist of duplicates, rinsate blanks, and field blanks. The water quality sampling investigation will include collecting QA/QC samples at a minimum rate of 1 duplicate, 1 rinsate blank, and 1 field blank collected per sample event.

2.1 Rinsate Samples

An equipment rinsate sample of the sampling equipment is intended to check if decontamination procedures have been effective. For the well sampling operation, a rinsate sample will be collected from the decontaminated sampling equipment (bailer or pump) or filter equipment before it is used to obtain the sample. Deionized water will be rinsed over the decontaminated sampling apparatus and transferred to the sample bottles. The same parameters that are being analyzed in the groundwater samples will be analyzed in the rinsate samples. The rinsate sample is assigned a QA/QC sample identification number (SOP 7 Sample Handling, Documentation, and Analysis), stored in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within the holding times. Rinsate sample(s) will be collected at a minimum rate of 1 per every sample event.

2.2 Duplicate Samples

Duplicate samples are samples collected side-by-side to check for the natural sample variance and the consistency of field techniques and laboratory analysis. For groundwater sampling, a duplicate sample will be collected at the same time as the initial sample. The initial sample bottles for total metals and cyanide analyses will be filled first, then the duplicate sample bottles for total metals and cyanide and so on until all the necessary sample bottles for both the initial sample and the duplicate sample have been filled. The duplicate groundwater sample will be handled in the same manner as the primary sample. The duplicate sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within holding times. Duplicate samples will be collected at a minimum rate of 1 per every sample event.

2.3 Field Blanks

Field blanks check for contamination of samples due to factors at the well site. For a field blank, deionized water will be poured into the sample containers at the sample site at the same time the water sample is collected. The sample will be analyzed for the same parameters as the samples being collected with that blank. The sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped to the laboratory with the other samples. Field blank samples will be collected at a minimum rate of 1 per every sample event.

3.0 SURFACE WATER SAMPLING FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND SAMPLES

Quality assurance/quality control (QA/QC) samples will be collected during surface water sampling. QA/QC samples are designed to help identify potential sources of sample contamination and evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

Field quality assurance/quality control (QA/QC) samples consist of duplicates, rinsate blanks and field blanks. The water quality sampling investigation will include collection of the QA/QC samples at a minimum rate of one duplicate, one rinsate blank and one field blank collected per day or for every 20 samples per medium such that at least a rate of 5% of primary samples collected is achieved. For example, if from 1 to 20 primary samples are collected during a sampling episode, one each of a duplicate field blank and rinsate blank sample will be collected; if from 21 to 40 samples are collected during a sampling episode then two each of the QA/QC samples will be collected and so forth.

The 5% should be collected in such a method that they are representative of field condition variability, schedule/time of collection for the sampling event and sample teams. For example, if ambient conditions are altered that could impact sample quality, the frequency may be increased; QA/QC sampling should be conducted throughout the sampling event not just at the end.

3.1 Rinsate Samples

A decontamination rinsate sample of sampling equipment is intended to check is decontamination procedures have been effective. For the surface water sampling operation, a rinsate sample will be collected from the decontaminated sampling or filter equipment before it is used to obtain the sample. Deionized or distilled metal analyte-free water will be rinsed over a decontaminated sampling apparatus and transferred to the sample bottles. The same parameters that are being analyzed in the water samples will be analyzed in the rinsate samples. The rinsate sample is assigned a QA/QC sample identification number, stored in an iced cooler, and shipped to the laboratory. One rinsate sample will be collected at a minimum rate of one per day or one for every 20 water samples such that at least a rate of 5% of primary samples collected is achieved.

3.2 Field Duplicate Samples

Duplicate samples are samples collected side-by-side to check for the natural sample variance and the consistency of field techniques and laboratory analysis. For the surface water sampling a duplicate sample will be collected at the same time of the initial sample. One field duplicate will be collected at a minimum rate of per day or one for every twenty samples collected. The initial sample bottles for total metals analyses will be filled first, then the field duplicate sample bottles for total metals analyses, and so on until all necessary sample bottles for both the initial sample and the field duplicate sample have been filled. The field duplicate samples will be handled in the same manner as the primary sample. The field duplicate surface water samples will be assigned QA/QC identification numbers as described in SOP 10, subsection 2.1, Sample Identification, stored in a cooler containing either ice or blue ice, and shipped to the laboratory within a time frame allowing laboratory analysis within sample holding times.

3.3 Field Blanks

Field blanks check for contamination of samples due to factors at the sampling site or from the containers. For a field blank, a metals sample bottle is taken empty to the field and filled at the sampling site with organic-free deionized or distilled analyte-free water at the time the surface water is collected. The sample will be assigned a QA/QC identification number, stored in an iced or blue ice cooler, and shipped to the laboratory with the other samples. One field blank will be collected at a minimum rate of one per day or one for every 20 water samples such that at least a rate of 5% of primary samples collected is achieved.

O&M SOP-11

SOP Date: May 2008

WATER LEVEL MEASUREMENT USING PRESSURE TRANSDUCERS

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure applicable to the use of pressure transducer and datalogger equipment for measuring water levels at the California Gulch CERCLA Site. This SOP describes the equipment and field procedures that are required for collection of water level measurements. This SOP is intended to be used together with manufacturer's manuals and other SOPs. SOP No. 1 describes decontamination procedures that are applicable to this SOP. SOP 2 describes manual water level measurement procedures. This SOP does not apply to the pressure transducer installed in the Yak Tunnel Bulkhead, see the O&M Plan for the Yak Tunnel Bulkhead for specific procedures for that transducer.

2.0 WATER LEVEL MEASUREMENT PROCEDURES

This SOP was prepared for use with In-Situ pressure transducer/data loggers. These In-Situ instruments are the MiniTROLL, TROLL 4000, and the Level TROLL 500. Each instrument requires a different version of software to download data and its own communications cable. The MiniTROLL requires Win-Situ 4, the TROLL 4000 requires Win-Situ 2000 and the Level TROLL 500 requires Win-Situ 5. In-Situ operation manuals for the transducers and software should be referred to for operational procedures and can be found at http://www.in-situ.com/.

Transducers should be programmed to read in feet, top of casing mode (positive down), and be referenced to the water level such that a decrease in water level results in an increase in depth to water from the reference point.

2.1 Equipment List

The equipment necessary to install, download, or remove the pressure transducer, data cable, and datalogger includes:

- Pressure transducer/data logger and vented data cable with cable hanger (Kellems Grip)
- Appropriate wrenches and tools
- RS-232 data transfer cable for the specific tranducer/datalogger
- Transducer/Datalogger and software manual
- Field microcomputer with serial port
- Microcomputer compatible magnetic data storage diskettes
- Electric water level indicator capable of producing measurements to a precision of 0.01 ft
- Field data sheets for manual water level measurement
- Field notebook

- Garden-type sprayer filled with deionized or distilled water
- Paper or cloth towels
- Appropriate health and safety equipment

2.2 Installation and Removal of Equipment

This section gives the sequence of events that should be followed when measuring water levels.

Appropriate health and safety equipment, as described in the Site Health and Safety Plan, should be worn during well opening, well measurement, and decontamination.

2.2.1 Equipment Installation

The following procedure describes the steps that need to be followed to assure that the datalogger/pressure transducer equipment is correctly installed in the piezometer:

1. The locking steel protective cap and vented well cap are removed.
2. The plastic cover of the data cable reel is removed and the pressure transducer and cable are inspected for damage or contamination.
3. The transducer end of the cable is placed in the well and the cable is unreeled into the well to the full length of the cable.
4. The RS-232 cable is attached to link the computer to the top of the logger. Communication is established with the transducer/data logger using In-Situ software.
5. The logger status is checked using the logger communications software. The readings are evaluated to ensure that the equipment is operating correctly.
6. With the data cable and pressure transducer in the well, a manual water level measurement is made following SOP No. 2 and the reading is recorded in the field notebook and on a water level measurement data sheet.
7. The locking protective cap is put in place and locked. Any necessary documentation is completed.

2.2.2 Equipment Removal

The following procedure describes the steps required for proper removal of the datalogger/pressure transducer equipment from the piezometer.

1. The locking cap is removed. The support cap, support cable and transducer/datalogger are withdrawn from the well casing and secured.
2. The transducer/datalogger is attached to the field computer by the RS-232 cable and the data are downloaded to a designated computer file following procedures described in the datalogger manual.
3. The data are examined using the computer to determine if the equipment has been operating properly. If no operational problems are identified the data file is backed up on a magnetic computer disk, the logger is stopped, and communications ended.

2.3 Downloading Data

Data collected by the datalogger during stand-alone operation can be transferred to a computer file in the field The In-Situ Instruction Manual describes the downloading process and other communication procedures in detail.

2.4 Decontamination

The datalogger and pressure transducer equipment must be decontaminated before installation, and after removal from the piezometer.

The datalogger, pressure transducer, and data cable will be decontaminated following the sensitive equipment procedure described in SOP No. 1. The equipment will be rinsed with deionized or distilled water prior to installation. When the transducer/datalogger is removed it will be wiped down using a clean rag to remove excess moisture and obvious rust or dirt as the equipment is being recovered from the well. Each datalogger and pressure transducer assembly is dedicated to a specific piezometer; therefore, the equipment does not need to be thoroughly decontaminated in accordance with SOP No. 1 except when it may have contacted a contaminated surface during removal from the well. The equipment will be stored in clean plastic bags whenever it is not in the well.

2.5 Documentation

This section describes the documentation necessary for water level measurement using pressure transducers.

In general, the documentation requirements for water level measurements collected using pressure transducers are the same as those that apply to water level measurements collected manually. These requirements, described in SOP No. 2, include the completion of a field data sheet during each measuring event. The field data sheet will include date, time, well number, water level, and static water elevation data. A field notebook will also be used for recording both manual and pressure transducer datalogger water level measurement activities, for describing decontamination, calibration, and monitoring procedures, and for recording other observations. Both the data sheets and notebook should be neat and legible, and will be signed and dated by the person completing each page.

The following information will be recorded in the field notebook to document datalogger field operations:

- Arrival time at well
- Data and time of manual water level measurement
- Results of examination of equipment
- The record number of the most recent transducer reading
- The head value of that record and the temperature reading
- The computer file name
- Any repairs made to the equipment
- Transducer battery voltage
- Observations of the weather and condition of the well

- Notes about the quality of the data or any problems that have been identified
- Whether the memory of the instrument or any recording parameters have been reset
- Time of replacing the equipment in the well.

3.0 DATA CORRECTIONS

Each time the datalogger is installed, removed or downloaded, field personnel must compare the depth to water measured manually with the reading recorded by the datalogger. This is necessary because the pressure transducer readings are subject to drift over time and the data cable may tend to stretch with time. The comparison of the manual and transducer readings provides a means of correcting for the combined "drift" of the logger data. Return transducer to manufacturer for recalibration if unusual data is noted.

APPENDIX B

TO OU1 WORK PLAN

MONTHLY PROGRESS REPORT FORMAT

Date

Name
Title
Entity
Address
Address

Subject: OU1 Work Plan Monthly Report, Yak Tunnel Operable Unit, California Gulch Site

Dear Name:

This letter presents the DATE___ Monthly Report regarding the Yak Tunnel Operable Unit Remedial Design/Remedial Action for the above referenced OU1 Work Plan. This report is submitted as required by Section 5.8 of the OU1 Work Plan.

1. **Description of the actions taken pursuant to the OU1 Work Plan:**
   - -Cumulative volume of water pumped from blockage
   - -Water levels behind blockage
   - -Water levels behind bulkhead

2. **Describe work completed at the Water Treatment Plant:**

   Water Treatment Plant Operations including:
   - -Chemicals used
   - -Monthly daily maximum and minimum flow rates of influent by source
   - -Total gallons of influent and effluent

   Water Treatment Plant Effluent Quality:

   Water Treatment Plant Sludge,
   - -Amount of hazardous and non-hazardous sludge shipped offsite and amount stored onsite:

   Maintenance:

3. **Activities that deviated from the OU1 Work Plan:**

4. **Summaries of all changes made in the OU1 facilities during the month:**

5. **Unresolved problems or potential problems encountered during the month that may cause a performance delay:**

6. **Changes in personnel during the reporting period:**

7. **Projected work for next reporting period includes:**

8. **Results of sampling, tests and other data received or produced:**

9. **Is tri-annual electronic transmittal of RMP data attached:**
___Yes or ___No

10. **If the tri-annual data transmittal was attached, was there any determination under the CP during the prior month that enhanced monitoring or additional investigations are required, or that an adverse water condition or hydraulic gradient reversal has occurred:**

Yak Tunnel Water Treatment Plant

Water Analysis Summary

DATE

LABORATORY PARAMETER	INFLUENT ANALYSIS															
	GIL				SPIL				BIL				Mixed Influent			
	Result (mg/l)	Qualifier	PQL/RL (mg/l)	Adjusted Result (mg/l)	Result (mg/l)	Qualifier	PQL/RL (mg/L)	Adjusted Result (mg/L)	Result (mg/l)	Qualifier	PQL/RL (mg/L)	Adjusted Result (mg/L)	Weighted Avg Flow Conc (mg/L)	Weighted Max Flow Conc (mg/L)	Avg (lbs/Day)	Max (lbs/Day)
Aluminum (AS)																
Arsenic (TR)																
Cadmium (TR)																
Chromium (TR)																
Copper (TR)																
Iron (TR)																
Lead (TR)																
Manganese (TR)																
Mercury (TR)																
Selenium (TR)																
Silver (TR)																
Zinc (TR)																
Solids (TSS)																
Calcium																
Magnesium																
Hardness (calc)																

FIELD PARAMETERS	GIL				SPIL				BIL			
	Min	Max	Avg	Total Million Gal	Min	Max	Avg	Total Million Gal	Min	Max	Avg	Total Million Gal
Cond. - uS/cm												
pH (su)												
Flow (MGD)												

0

Yak Tunnel Water Treatment Plant

Water Analysis Summary

DATE

LABORATORY PARAMETER	EFFLUENT ANALYSIS									
	Result (mg L)	Qualifier	PQL RL (mg L)	Adjusted Result (mg L)	Avg Discharge Limit (mg L)	Max Discharge Limit (mg L)	Avg (lbs Day)	Avg Discharge Limit (lbs Day)	Max (lbs Day)	Max Discharge Limit (lbs Day)
Aluminum (AS)										
Arsenic (TR)										
Cadmium (TR)					0.050	0.100				
Chromium (TR)										
Copper (TR)					0.150	0.300				
Iron (TR)										
Lead (TR)					0.300	0.500				
Manganese (TR)										
Mercury (TR)					0.001	0.002				
Selenium (TR)										
Silver (TR)										
Zinc (TR)					0.750	1.500				
Solids (TSS)					20	30		240		360
Calcium										
Magnesium										
Hardness (calc)										

FIELD PARAMETERS	EFFLUENT					
	Min	Min Discharge Limit	Max	Max Discharge Limit	Avg	Total Million Gal
Cond. - uS/cm						
pH (su)						
Flow (MGD)						

CHEMICAL USAGE	Start of Month (lbs)	Received (lbs)	End of Month (lbs)	Used (lbs)	Approx. Dosage (mg L)
Hydrated Lime					
Sulfuric Acid					
Polymer					

Yak Tunnel Water Treatment Plant

Daily Flow Data

DATE

Date	Start Time	End Time	Hours of Operation	Discharge for Day
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
Month/Day/Year				
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Month/Day/Year				
Month/Day/Year				
Month/Day/Year				

Total for Month 0

APPENDIX C

TO OU1 WORK PLAN

DISCHARGE MONITORING REPORT (DMR) FORMAT

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

PERMITTEE NAME/ADDRESS
NAME RES-ASARCO
ADDRESS CALIFORNIA GULCH-YAK TUNNEL
PO BOX 1210
LEADVILLE CO 80461

FACILITY
LOCATION

COU000099	001' A
PERMIT NUMBER	DISCH NUMBER

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
FLOW	SAMPLE MEASUREMENT			MGD	*****	*****	*****		0	DAILY	CONT
'74078 100 EFFLUENT	PERMIT REQUIREMENT	REPORT	REPORT		*****	*****	*****			DAILY	CONT
pH	SAMPLE MEASUREMENT	*****	*****			*****		SU	0	DAILY	CONT
'00400 100 EFFLUENT	PERMIT REQUIREMENT	*****	*****		6.00	*****	9.00			DAILY	CONT
SOLIDS, SUSPENDED TOTAL	SAMPLE MEASUREMENT			LBS	*****			mg/l	0	1	COMP
'00530 100 EFFLUENT	PERMIT REQUIREMENT	240	360	PER DAY	*****	20	30			1 X MONTH	COMP
ALUMINUM ACID SOL.	SAMPLE MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'85824 100 EFFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP
ARSENIC TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'00978 100 EFFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP
CADMIUM TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'01113 100 EFFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	50	100			1 X MONTH	COMP
CHROMIUM TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'01033 100 EFFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP

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LEADVILLE CO 80461

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LOCATION

COU000099 (PERMIT NUMBER) | 001' A (DISCH NUMBER)

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
COPPER	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'01119 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	150	300			MONTH	COMP
IRON	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'00980 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	REPORT	REPORT			MONTH	COMP
LEAD	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'01114 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	300	500			MONTH	COMP
MANGANESE	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'11123 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	REPORT	REPORT			MONTH	COMP
MERCURY	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	
'71901 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	1	2			MONTH	COMP
SELENIUM	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'00981 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	REPORT	REPORT			MONTH	COMP
SILVER	SAMPLE										
TOTAL REC	MEASUREMENT			LBS	*****			ug/l	0	1	COMP
'01079 100	PERMIT			PER						1 X	
EFFLUENT	REQUIREMENT	REPORT	REPORT	DAY	*****	REPORT	REPORT			MONTH	COMP

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LOCATION

COU000099	001' A
PERMIT NUMBER	DISCH NUMBER

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
ZINC TOTAL REC '01094 100 EFFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	*****			ug/l	0	1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		*****	750	1500			1 X MONTH	COMP
CALCIUM TOTAL '00916 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l	0	1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	COMP
MAGNESIUM TOTAL '00927 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l	0	1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	COMP
HARDNESS TOTAL '00900 100 EFFLUENT	SAMPLE MEASUREMENT				*****			mg/l	0	1	CALC
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	CALC
OIL & GREASE Visual '84066 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			Report	0	DAILY	VIS
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT	Report		DAILY	VIS
OIL & GREASE Contingent '84066 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l	0	CNTGT	GRAB
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			CNTGT	GRAB
	SAMPLE MEASUREMENT	*****	*****		*****			mg/l			
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT				

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FACILITY
LOCATION

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001' A (DISCH NUMBER)

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
48 HOUR ACUTE CERIODAPHANIA TGM3B 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			PASS=0	0	1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT	FAIL=1		SEMI-ANNUAL	COMP
96 HOUR ACUTE FATHEAD MINNOWS TGN6C 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			PASS=0	0	1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT	FAIL=1		SEMI-ANNUAL	COMP
	SAMPLE MEASUREMENT	*****	*****		*****	*****	*****				
	PERMIT REQUIREMENT	*****	*****		*****	*****	*****				
	SAMPLE MEASUREMENT	*****	*****		*****	*****	*****				
	PERMIT REQUIREMENT	*****	*****		*****	*****	*****				
	SAMPLE MEASUREMENT	*****	*****		*****	*****	*****				
	PERMIT REQUIREMENT	*****	*****		*****	*****	*****				
	SAMPLE MEASUREMENT	*****	*****		*****	*****	*****				
	PERMIT REQUIREMENT	*****	*****		*****	*****	*****				
	SAMPLE MEASUREMENT	*****	*****		*****	*****	*****				

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FACILITY
LOCATION

COU000099 (PERMIT NUMBER) | 001' A (DISCH NUMBER)

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO m m/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
FLOW	SAMPLE MEASUREMENT			MGD	*****	*****	*****			DAILY	CONT
'74076 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT		*****	*****	*****			DAILY	CONT
pH	SAMPLE MEASUREMENT	*****	*****			*****		SU		DAILY	CONT
'00400 G00 INFLUENT	PERMIT REQUIREMENT	*****	*****		REPORT	*****	REPORT			DAILY	CONT
SOLIDS, SUSPENDED TOTAL	SAMPLE MEASUREMENT			LBS	*****			mg/l		1	COMP
'00530 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP
ALUMINUM ACID SOL.	SAMPLE MEASUREMENT			LBS	*****			ug/l		1	COMP
'85824 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP
ARSENIC TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l		1	COMP
'00978 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP
CADMIUM TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l		1	COMP
'01113 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1X MONTH	COMP
CHROMIUM TOTAL REC	SAMPLE MEASUREMENT			LBS	*****			ug/l		1	COMP
'01033 G00 INFLUENT	PERMIT REQUIREMENT	REPORT	REPORT	PER DAY	*****	REPORT	REPORT			1 X MONTH	COMP

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FACILITY
LOCATION

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PERMIT NUMBER	DISCH NUMBER

MAJOR
M - INTERIM
DISCHARGE - Yak Tunnel WTP

MONITORING PERIOD
FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
COPPER TOTAL REC '01119 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
IRON TOTAL REC '00980 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
LEAD TOTAL REC '01114 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
MANGANESE TOTAL REC '11123 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
MERCURY TOTAL REC '71901 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
SELENIUM TOTAL REC '00981 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP
SILVER TOTAL REC '01079 G00 INFLUENT	SAMPLE MEASUREMENT	0	0	LBS PER DAY	* * * * *			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		* * * * *	REPORT	REPORT			1 X MONTH	COMP

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LEADVILLE CO 80461

COU000099 (PERMIT NUMBER) | 001' A (DISCH NUMBER) | MAJOR | M - INTERIM | DISCHARGE - Yak Tunnel WTP

FACILITY
LOCATION

MONITORING PERIOD FROM mm/dd/yy TO mm/dd/yy

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
ZINC TOTAL REC '01094 G00 INFLUENT	SAMPLE MEASUREMENT			LBS PER DAY	*****			ug/l		1	COMP
	PERMIT REQUIREMENT	REPORT	REPORT		*****	REPORT	REPORT			1 X MONTH	COMP
CALCIUM TOTAL '00916 G00 INFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l		1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	COMP
MAGNESIUM TOTAL '00927 G00 INFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l		1	COMP
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	COMP
HARDNESS TOTAL '00900 G00 INFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l		1	CALC
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			1X MONTH	CALC
OIL & GREASE Visual '00556 G00 INFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			[illegible]		DAILY	VIS
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT	[illegible]		DAILY	VIS
OIL & GREASE Contingent '84066 100 EFFLUENT	SAMPLE MEASUREMENT	*****	*****		*****			mg/l		CNTGT	GRAB
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT			CNTGT	GRAB
	SAMPLE MEASUREMENT	*****	*****		*****						
	PERMIT REQUIREMENT	*****	*****		*****	REPORT	REPORT				

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APPENDIX D
TO OU1 WORK PLAN
ROUTINE MONITORING PLAN

APPENDIX D
TO OU1 WORK PLAN

2008 ROUTINE MONITORING PLAN
YAK TUNNEL OPERABLE UNIT
CALIFORNIA GULCH SUPERFUND SITE
LEADVILLE, COLORADO
MAY 2008

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Objectives 1
1.2 Routine Monitoring Plan Organization 2
2.0 ROUTINE MONITORING REQUIREMENTS 3
2.1 Monitoring Locations 3
2.2 Parameters 3
2.3 Details of Routine Monitoring Program at the Various Locations 4
2.3.1 Yak Tunnel Bulkhead and Flow Rates 4
2.3.2 Yak Tunnel Blockage Pumping Rate, Water Levels and Water Quality 5
2.3.3 Bedrock Groundwater Monitoring 5
2.3.3.1 Description of the Monitoring Network 5
2.3.3.2 Groundwater Level Monitoring 6
2.3.3.3 Groundwater Quality Monitoring 7
2.3.3.4 Springs/Seeps 8
3.0 SAMPLING, MONITORING AND ANALYTICAL PROCEDURES AND METHODS 10
3.1 Sampling and Monitoring Methods 10
3.1.1 Sample Collection 10
3.1.2 Groundwater Level Measurement 11
3.2 Equipment Calibration, Maintenance, and Decontamination 11
3.3 Analytical Methods 11
3.4 Quality Assurance/Quality Control (QA/QC) 12
3.4.1 Quality Assurance/Quality Control Samples 12
3.5 Data Quality Assessment and Validation 13
3.5.1 Data Quality Assessment 13
3.5.2 Field QA/QC Samples Evaluation 13
3.5.3 Laboratory Data 14
3.6 Data Handling Procedures 14
3.7 Data Management 15
4.0 DATA EVALUATION 16
4.1 Yak Tunnel Bulkhead 16
4.2 Groundwater 16
4.3 Springs/Seeps 17
5.0 SYSTEMATIC REVIEW AND REVISION OF MONITORING PLAN 18
5.1 Need For Periodic Review And Revision of Monitoring Plan 18
5.2 Procedure for Modification of Plan 18
6.0 ROUTINE REPORTING 20
7.0 REFERENCES 22

LIST OF TABLES

Table 1	Sampling Locations, Parameters and Monitoring Frequencies, Yak Tunnel – Operable Unit 1
Table 2	Summary of Monitoring Well/Piezometer Construction Details-Yak Tunnel OU1
Table 3	Analytical Methods and Detection Limits for Groundwater and Seep Samples – Operable Unit 1

LIST OF FIGURES

Figure 1	Contingency Plan Flow Chart
Figure 2	Yak Tunnel Monitoring Network

1.0 INTRODUCTION

This Routine Monitoring Plan (RMP), Contingency Plan (CP) (MFG, 2008a) and the OU1 Work Plan (Work Plan) (MFG, 2008b) govern the long-term implementation of the selected remedy for the Yak Tunnel Operable Unit (OU1), California Gulch Superfund Site, Leadville, Colorado, in accordance with the terms of the Consent Decree by and among the United States, State of Colorado, Newmont USA Limited and Resurrection Mining Company, to which the OU1 Work Plan and this RMP are appended. The purpose of the RMP is to collect the appropriate type, amount, and quality of data needed to support the decision-making in the CP. These decision-making steps are illustrated in Figure 1 and discussed in detail in the CP. The RMP describes the objectives of the monitoring program, monitoring points and parameters, sampling and laboratory methods, quality assurance procedures, data evaluation methods, and reporting requirements to be implemented during the routine monitoring mode of operation of the CP. This Plan is incorporated into the Work Plan by reference.

1.1 Objectives

The general objectives of the RMP are to:

- Provide information on current conditions of the Yak Tunnel Hydrologic System, and compare current conditions to all previously recorded conditions
- Provide information on changes that may occur in the Yak Tunnel Hydrologic System
- Provide information to support decisions regarding the need for enhanced monitoring activities, additional investigations, and the need for response actions, and
- Document the effectiveness of response actions that have been implemented.

These objectives assure that the six decision steps described in the CP can be made effectively and defensibly. In particular, routine monitoring consists of the recording of conditions of the Yak Tunnel Hydrologic System over time, to allow assessment of any significant changes of conditions. As described in detail in the CP, the major decisions related to data evaluation are: (a) whether hydraulic gradient reversal away from the Yak Tunnel has occurred, and (b) whether adverse water quality conditions exist. (See Table 1 of the CP).

This RMP includes monitoring revisions that have been implemented since the issuance of the Routine Monitoring Plan Revision 1 (MFG, 1999). Those revisions reflect changes that have

occurred between 1991, when the initial phase of routine monitoring began, and 1999. It also reflects current conditions within the Yak Tunnel Hydrologic System. Changes to and current conditions of the Yak Tunnel include:

- Construction of the Yak Tunnel bulkhead in 1994
- Cessation of mining activities and dewatering of the Black Cloud Mine in 1999

- Formation of a blockage in the Yak Tunnel in approximately 2002
- Beginning of remedial pumping of blockage water beginning in 2006

1.2 Routine Monitoring Plan Organization

Section 1 presents the overall purpose and objectives of the RMP. Section 2 presents monitoring and evaluation requirements to ensure that the relevant hydrologic conditions within OU1 are adequately documented, and the information necessary for the CP decision-making processes is generated. Section 3 contains the sampling and analytical methods which will be employed during monitoring activities. The data quality review, data evaluation, and data management procedures are discussed in Section 4. Procedures for systematically reviewing additional data and revising the monitoring plan are discussed in Section 5. Section 6 discusses the reporting requirements for the routine monitoring program. References are presented in Section 7. The terms used in this Routine Monitoring Plan shall have the same definition as that provided in the Work Plan and Contingency Plan.

2.0 ROUTINE MONITORING REQUIREMENTS

The routine monitoring program is designed to collect adequate data regarding the conditions of the Yak Tunnel Hydrologic System to support decision-making in the CP. Data collected during routine monitoring is evaluated along with all previously recorded data to determine the current state of the Yak Tunnel Hydrologic System and what, if any, changes to the Yak Tunnel Hydrologic System have occurred. Following is a discussion of the monitoring locations, parameters, and frequencies which will be incorporated into the routine monitoring program. The monitoring requirements discussed in this section are summarized in Table 1. Sampling, monitoring, and analytical methods will be discussed in Section 3.

2.1 Monitoring Locations

Monitoring locations were established during previous investigations, including the Draft RMP (Baker, 1993), Routine Monitoring Plan Revision 1 (MFG, 1999), and Additional Investigation Work Plan (MFG, 2004). Parameters monitored have been revised from those established in the Routine Monitoring Plan Revision 1 (MFG, 1999). Monitoring locations that comprise the routine monitoring program remain unchanged from those previously monitored with the exception of the exclusion of the 1330 Lateral as a monitoring point. Locations and monitoring activities to evaluate the Yak Tunnel Hydrologic System are discussed below and include the Yak Tunnel Bulkhead/Treatment Plant, Yak Tunnel blockage pumping system, piezometers and monitoring wells, and springs/seeps. Monitoring locations are summarized in Table 1 and shown on Figure 2.

2.2 Parameters

Parameters that will be monitored under the routine monitoring program are listed on Table 1. These parameters will be used for: (1) ongoing characterization of potential short- and long-term natural variability; and (2) interpretation of significant departures from previously recorded conditions, should they occur. The parameters are used to assess conditions in the Yak Tunnel Hydrologic System to support the decision making process of the CP. Data collected pursuant to the RMP will allow for ongoing evaluation during the Routine Monitoring Mode of Operation (RMM) of whether a hydraulic gradient reversal has occurred, or adverse water conditions

resulting from changes within the tunnel system exist. To provide that information, the parameters routinely monitored include:

- Water level elevation behind the Yak Tunnel bulkhead
- Yak Tunnel flow rates and select field water quality parameters
- Yak Tunnel blockage pumping rates
- Water level elevations in monitoring wells
- Water level elevations in mine shafts
- Piezometer and monitoring well field parameter and water quality measurements
- The occurrence, surface elevation, flow rate, and water quality of any newly-observed seeps and springs

2.3 Details of Routine Monitoring Program at the Various Locations

This section details the routine monitoring program at various locations and the rational for the use of these monitoring locations and parameters. A summary of the routine monitoring program, including monitoring locations, general parameters, and sampling frequency, is provided in Table 1.

2.3.1 Yak Tunnel Bulkhead and Flow Rates

The Yak Tunnel water data that will be monitored include bulkhead water levels, flow rates through the bulkhead, and water quality of the Yak Tunnel discharge. A description of these monitoring details is provided in Section 5.3 of the Work Plan. The water level behind the bulkhead will be compared to water levels in Yak Tunnel Hydrologic System monitoring wells to assess the potential of a gradient reversal and to determine whether an adverse water condition exists. The Yak Tunnel flow rate is measured daily at the Gravity Influent Line (GIL). Under current conditions, the Yak Tunnel flow rate at the bulkhead does not represent free-flowing conditions since water is impounded behind the bulkhead and the blockage. However, bulkhead water level elevations can be compared to groundwater elevations. The quality of the Yak Tunnel water is a product of numerous physical and chemical processes which vary seasonally and with the water level behind the bulkhead. It is important to characterize the Yak Tunnel water quality to determine baseline conditions and for comparison to the water quality at the other monitoring locations. However, other monitoring locations and parameters would be more responsive to tunnel blockage or changes in the Yak Tunnel Hydrologic System; therefore, the

Yak Tunnel flow rate and field and water quality parameters will not be considered parameters in the CP decision-making process.

The water level behind the bulkhead is monitored by either a pressure transducer or a sonic level device, and recorded daily. The Yak Tunnel flow rate is recorded once daily during treatment plant operation. Field parameters are measured daily according to the Work Plan.

2.3.2 Yak Tunnel Blockage Pumping Rate, Water Levels and Water Quality

As described in Section 5.4 of the Work Plan, the water flowing to the Yak Tunnel WTP will be continuously monitored at the Blockage Influent Line (BIL) when water is being pumped from the Yak Tunnel blockage. The pumping rate will be recorded once daily. Groundwater levels in the Black Cloud, Irene, and Helena shafts will be measured daily using pressure transducers and recorded by data loggers, as described below in Section 2.3.3.2. Water quality sampling will occur semi-annually (twice a year) within the Yak Tunnel blockage mine water, as described below in Section 2.3.3.3.

2.3.3 Bedrock Groundwater Monitoring

2.3.3.1 Description of the Monitoring Network

The OU1 monitoring network includes monitoring wells BBW-1, BBW-2, BBW-3, BBW-4, BBW-5 and BBW-10, and piezometers BBW-7 and BBW-8. The locations of the BBW wells and piezometers are shown on Figure 2, and the well/piezometer construction details are provided in Table 2. Monitoring wells BBW-1, BBW-2, BBW-3, BBW-4 and BBW-10 are located along faults known or thought to communicate hydraulically with the Yak Tunnel. Wells BBW-1 and BBW-2 are located on either side of the Yak Tunnel in the Pilot Fault, and are screened in gray porphyry. Wells BBW-3 and BBW-4 are located on either side of the Yak Tunnel in the Weston Fault. Well BBW-3 is screened in quartzite and gray porphyry, and well BBW-4 is screened in gray porphyry. Well BBW-10 is located in upper Evans Gulch along an assumed extension of the Silent Friend Fault, and is screened in quartzite. Monitoring well BBW-5 and piezometer BBW-8 are completed in extensively mined areas near the Yak Tunnel. BBW-5 is screened in quartzite and is located approximately 16,200 feet from the Yak Tunnel portal. BBW-8 is completed in backfilled or collapsed mine workings near the Yak Tunnel approximately 5,630 feet from the portal. Piezometer BBW-7 is located west of the

Iron/Mikado/Emmett Fault complex, between the Yak Tunnel portal and the bulkhead. BBW-7 is completed in the Pando porphyry.

Water level measurements from BBW-1, BBW-2, BBW-3, BBW-4, BBW-7, and BBW-10 have been used primarily to document the seasonal groundwater elevation variations in the local groundwater system near the Yak Tunnel. Water level data from BBW-5 and BBW-8 are primarily used to document hydraulic conditions within the Yak Tunnel. The hydraulic gradient in bedrock groundwater in the vicinity of the Yak Tunnel is evaluated by comparing water levels in wells BBW-1, BBW-2, BBW-3, BBW-4 and BBW-10 to water levels in piezometers BBW-5 and BBW-8.

In addition, groundwater monitoring also occurs at the Irene Shaft (the replacement monitoring location for the 1330 Lateral), the Black Cloud Shaft, and the Helena Shaft. These data provide information regarding groundwater conditions behind the Yak Tunnel blockage. This water is hydraulically connected to the Yak Tunnel via the 1330 Lateral.

2.3.3.2 Groundwater Level Monitoring

Groundwater elevations serve to assess groundwater gradients and other conditions within the Yak Tunnel Hydrologic System. Indication of a reversal of hydraulic gradient away from the Yak Tunnel or significant changes in groundwater elevations may result in a YES response to Decision 3 of the CP and thereby trigger additional response actions or a revision to the routine monitoring program. As groundwater elevation data is collected, the data will be compared to all previously recorded data to assess natural variability of the hydraulic system and to determine if significant changes have occurred.

The water levels in BBW-5, BBW-8, Black Cloud Shaft and Irene Shaft provide a direct indication of water level elevations in the Yak Tunnel and Yak Tunnel blockage pool. Storage of water behind the bulkhead or blockage within the tunnel between the bulkhead and BBW-8 should be observed in piezometer BBW-8 due to the hydraulic connection between this piezometer and the tunnel. A blockage upgradient of BBW-8 area should be observed by an increase in the water level in BBW-5 and the Black Cloud and Irene shafts. The effects of a blockage on water levels will depend upon the magnitude of the blockage and the distance between the blockage and the groundwater monitoring point. Due to the extensive mine

workings, blockages within other areas of the Yak Tunnel may not be obvious since the groundwater may be re-routed though the mine workings into the tunnel. Water level changes may be observed in the other wells and piezometers; however, it is expected that the water levels in BBW-5, BBW-8 or at the Black Cloud or Irene mine shafts would respond more quickly to tunnel blockage. Nonetheless, water levels in wells BBW-1, BBW-2, BBW-3, BBW-4 and BBW-10 will be monitored because of their use in evaluating a potential gradient reversal. Water levels in BBW-7 are also considered because they provide information regarding the extent to which the Iron/Mikado/Emmett fault complex inhibits westward groundwater flow at the Yak Tunnel. However, these data are not considered suitable for calculating hydraulic gradients for purposes of determining a hydraulic gradient reversal because water levels in BBW-7 are naturally lower than water levels in the Yak Tunnel Hydrologic System.

Groundwater levels in all BBW wells and piezometers, and the Irene and Helena shafts, will be measured weekly using pressure transducers and recorded by data loggers, with the exception of BBW-1 and BBW-2, which do not have pressure transducers installed and will be manually measured at least quarterly during spring, summer, and fall with an electric water level indicator. Groundwater levels in the Black Cloud shaft will be measured daily using pressure transducers and recorded by data loggers. Downloading of data loggers and manual water level measurements will occur tri-annually at all wells, piezometers, and mine shafts during the spring, summer, and fall seasons.

2.3.3.3 Groundwater Quality Monitoring

Groundwater quality data will be used to assess groundwater conditions in the Yak Tunnel Hydrologic System, and whether adverse water conditions exist. As with the hydraulic gradient reversal discussed above, a finding of adverse water conditions will result in a YES response to Decision 3 of the CP. The primary parameters to assess water quality changes within the Yak Tunnel Hydrologic System are pH and specific conductance. A gradient reversal away from the Yak Tunnel may result in significant changes in pH or higher specific conductance in the groundwater entering the wells. The pH and specific conductance change would depend upon the magnitude of the gradient reversal, residence time of the water prior to reaching the wells, and the nature of geochemical interactions between groundwater and geologic materials. Other water quality parameters, including dissolved metals, major cations, general chemical

constituents, and total and dissolved solids, will also be monitored. As with pH and specific conductance, data for these parameters will be compared with all previously collected data to evaluate natural variability of the hydrologic system, and to determine whether any significant changes have occurred. As indicated in Table 3, parameters that will be used for characterization of water quality include general chemical constituents (total alkalinity and total dissolved solids), major inorganic constituents (calcium, chloride, magnesium, potassium, sodium, silica, and sulfate) and dissolved metals (aluminum, arsenic, cadmium, copper, iron, lead, manganese, nickel and zinc).

Water quality sampling will occur semi-annually (twice a year) at monitoring wells BBW-5 and BBW-10, and within the Yak Tunnel blockage mine water. The blockage mine water can be sampled directly from either the Black Cloud or Irene mine shafts, or while pumping of blockage water is occurring, from the sampling port on the BIL at the Yak Tunnel WTP. Water quality sampling of monitoring wells BBW-1, BBW-2, BBW-3, and BBW-4 will occur once every five years beginning in 2010. Previous sampling events occurred in 1995, 2000, and 2005. Water quality sampling of the GIL will be performed according to the Work Plan.

2.3.3.4 Springs/Seeps

The emergence of new springs or seeps on the south side of Iron Hill or other areas may indicate that Yak Tunnel water level has risen to an elevation leading to surface discharge along faults, fractures, or mine workings. Spring and seep surveys have been conducted as part of remedial investigations to establish baseline conditions for the California Gulch Superfund Site.

Observations of the emergence of new seeps or springs will occur during the course of other routine monitoring activities related to the Yak Tunnel. The flow measurements, field parameters, and water quality parameters of any new springs/seeps observed will be used to assess whether the new spring/seep represents an adverse water condition. The elevation, flow measurements, field parameters, and water quality parameters of the new springs/seeps may be used to assess the source of the new spring/seep.

The need to conduct systematic reconnaissance surveys of springs and seeps will be evaluated if a substantial water level rise is observed in piezometer BBW-8 (unrelated to bulkhead operation) or if any new seeps or springs are observed during routine monitoring activities discussed above.

As in the past, reconnaissance surveys of seeps and springs will focus on the south side of Iron Hill where surface discharge of Yak Tunnel water is most likely to occur. Upon the first observation of a new spring or seep, flow measurements, elevation, field parameters and water quality parameters will be collected at the new and any existing springs or seeps in the vicinity of the new spring or seep.

3.0 SAMPLING, MONITORING AND ANALYTICAL PROCEDURES AND METHODS

This Chapter addresses requirements for sampling, monitoring, sample analysis, quality assurance, data validation, recordkeeping and reporting. Yak Tunnel flow rates, groundwater and surface water samples will be collected and analyzed in accordance with the following procedures to ensure the information needed to support the CP decision process is obtained. Sampling and monitoring procedures are described in detail in Standard Operating Procedures (SOPs) included in Appendix A of the Work Plan (MFG, 2008b). SOPs required for the RMP include:

SOP Number	Title
1	Decontamination
2	Well Water Level Measurement
3	Field Instrument Calibration and Operation
4	Ground Water Monitoring Well Sampling
5	Surface Water Flow Measurement
6	Surface Water Sample Collection
7	Sample Handling, Documentation, and Analysis
8	Water Treatment Plant Sampling
10	Field QA/QC Samples
11	Water Level Measurement Using Pressure Transducers

Specific procedures to perform routine monitoring are provided below.

3.1 Sampling and Monitoring Methods

3.1.1 Sample Collection

Groundwater samples from the BBW wells and piezometers and direct sampling from mine shafts will be collected according to the methods described in SOP No. 4-Ground Water Monitoring Well Sampling. Spring and seep samples will be collected according to the methods described in SOP No. 6-Surface Water Sample Collection. Yak Tunnel blockage water samples collected at the BIL sampling port at the Yak Tunnel WTP will be collected according to the methods described in SOP No. 8-Water Treatment Plant Sampling.

Non-disposable sampling equipment will be decontaminated prior to collection of every 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.

3.1.2 Groundwater Level Measurement

Manual groundwater level measurements from the BBW wells/piezometers and mine shafts will be performed according to the methods described in SOP No. 2-Well Water Level Measurement. Groundwater level measurements and data collection using pressure transducers will be performed according to the methods described in SOP No. 11-Water Level Measurement Using Pressure Transducers. Water level monitoring equipment will be decontaminated prior to use according to the methods described in SOP No. 1 - Decontamination.

3.2 Equipment Calibration, Maintenance, and Decontamination

Equipment used for the collection of samples and measurement of field parameters will be calibrated, maintained and operated properly to ensure that representative samples and measurements are obtained. Field parameter instruments will be calibrated according to the methods described in SOP No. 3- Field Instrument Calibration and Operation. Water level measurement equipment will be calibrated according to the methods described in SOP No. 2-Well Water Level Measurement and SOP No. 11-Water Level Measurement Using Pressure Transducers. Non-disposable equipment used for the collection of samples, measurement of field parameters, and measurement of water levels will be decontaminated prior to use and between sampling locations. Decontamination will be performed in accordance with SOP No. 1-Decontamination.

3.3 Analytical Methods

Samples will be analyzed according to the methods listed in Table 3. The specified methods provide data of appropriate quality for performing routine monitoring of the Yak Tunnel Operable Unit. Table 3 also includes the method detection limits (MDLs). Sample container, preservation, and holding times are provided in SOP No. 7-Sample Handling, Documentation, and Analysis.

One or more laboratories will be used to perform analyses of samples collected. 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. Designated laboratory personnel will be required to ensure that QA/QC procedures are achieved. The laboratory utilized will be required to allow access by employees of the EPA and the State of Colorado. The laboratories contracted for constituent analysis must be accredited by the Colorado Certification Program.

3.4 Quality Assurance/Quality Control (QA/QC)

The Work Plan (MFG, 2008b) serves as the QAPP for the RMP, with the modifications presented below. These QA/QC protocols serve to assure that the data collected pursuant to this plan meet specified standards of precision, accuracy, representativeness, comparability, and completeness.

3.4.1 Quality Assurance/Quality Control Samples

Field quality control (QC) samples to be collected include field duplicates, equipment rinsates, and field blanks. Quality control samples will be collected in accordance with SOP No. 10-Field QA/QC Samples. Field duplicates, equipment rinsates, and field blanks will be collected during groundwater and spring/seep sampling. These field QC samples will be collected at a rate of one per batch of 20 samples or one per day, whichever is more frequent. For purposes of groundwater quality sampling, one batch of QC samples will be obtained from the monitoring network during each sampling event.

Laboratory quality assurance checks will include the use of blank, spiked, split, and duplicate samples, calibration checks, and internal standards. The laboratory will analyze one matrix spike and one duplicate sample per sample delivery group. The sample delivery group is defined as a group of up to 20 samples received within a 14-day period. At a minimum, laboratories selected to perform the sample analyses will be required to report the QC results that are necessary to perform the data quality evaluation (Section 3.5). In addition, copies of the chain-of-custodies, sample log-in forms, and a report narrative will be included with each data package. The data will be reported in both electronic and hard copies unless otherwise agreed.

3.5 Data Quality Assessment and Validation

3.5.1 Data Quality Assessment

The quality of data obtained for RMP purposes will initially be assessed by comparing the data against historic data and looking for significant deviations. The data will be reviewed in an attempt to identify any transcriptional or computational errors. Presence of anomalous data will initiate a review of sampling, handling, analytical, and data management procedures, and in the event that data of questionable quality are identified, water levels and field parameters may be re-measured and water samples will either be reanalyzed or resampling may be recommended. The QC and other data will be evaluated to reach decisions regarding the usability of the original data. Data errors, corrections, or deletions will be discussed in the Annual Monitoring Report.

3.5.2 Field QA/QC Samples Evaluation

Field QC samples will be evaluated to determine QC of sampling procedures. Field QC will be evaluated as follows:

- Comparison of Dissolved and Total Concentrations.

  Samples in which both total and dissolved analyses were requested are reviewed to determine if dissolved concentrations exceed total concentrations. Typically, dissolved metal concentrations are less than total metal concentrations; however, dissolved metals concentrations may slightly exceed the total metals concentrations. If dissolved concentrations exceed total concentrations, the laboratory may be requested to re-analyze the digestates and dissolved samples. The relative percent difference (RPD) is calculated if dissolved concentrations exceed total concentrations.

$$RPD = ((T-D) \times 100)/((T+D)/2)$$

  where: T = total concentration (mg/L
  D = dissolved concentration (mg/L).

If the RPD is greater than 20 percent, both results are qualified as estimated.

- Field Duplicate Analysis

  Field duplicates are collected and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than lab duplicates which measure only lab performance. A comparison of primary and duplicate samples is conducted to determine the variance or relative percent difference (RPD) between the concentrations of each analyte. A target control limit of ± 20 percent for the RPD will be used for primary and duplicate

samples greater than or equal to five times the detection level. A target control limit of ± the detection level will be used when either or both the primary and duplicate samples are less than five times the detection level.

If the target control limit is exceeded, it will be noted in narrative comments accompanying the data validation report. As a possible indication of the source of the variance, the RPDs of associated laboratory duplicate analysis will be checked. If it appears that the source of the variance was not due to the laboratory analysis, then field procedures will be reviewed. If field procedures were a potential source of variance it will be noted in the narrative report.

- Evaluation of Field and Equipment Blank Analyses

  If any analyte is detected in the equipment rinsate or field blank, field sample results within a factor of five times the concentration found in an associated blank are qualified as U/non-detect.

3.5.3 Laboratory Data

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.

Following receipt of the data from the laboratory, the data quality will be evaluated. The purpose of data validation is to assess the data quality, using information such as sample holding times, and laboratory and field quality assurance. Laboratory data will be reviewed and validated in accordance with the Work Plan (MFG, 2008b).

3.6 Data Handling Procedures

For the evaluation of data, the following data handling procedures will be used:

- When parameter concentrations are reported by the analytical laboratory as non-detect, the detection limit value will be used in graphical presentations and, where necessary, to perform statistical analyses.
- For data which are detected by the laboratory but "U" flagged by the data validator (indicating that the results should be considered non-detect), those results will be considered non-detect for all non-statistical purposes. However, a judgment will be made as to whether the data will be usable for statistical purposes at the concentration detected by the laboratory. If the U-flagged result is consistent with previously observed results and the data user feels that the result is representative of the sample

collected, then the concentration reported by the laboratory may be used for statistical purposes only. The use of the reported concentration of a U-flagged data point should be noted on all tables, graphs, or other products to which it applies.

- Plots of logarithmic data, such as pH and log-transformed data, may be shown on semi-log plots to facilitate linear trend analysis.
- Parameter values for duplicate samples will not be averaged for statistical analyses; the original value will be used, unless rejected by the data validator.

3.7 Data Management

The RMP database will consist of data collected under the routine monitoring program from the beginning of monitoring, which is defined as October 1989, in the case of the Yak Tunnel, throughout the routine monitoring period. The RMP database will consist of two databases: one which includes data associated with the Yak Tunnel flow rates and one that includes relevant data obtained from other site activities, including groundwater, spring/seep and supplemental monitoring. The Yak Tunnel flow rate database will be maintained at the treatment plant in accordance with the Work Plan. The database for the groundwater, spring/seep and supplemental monitoring will be maintained by the project consultant. Data included in the databases will meet the following two criteria:

- An evaluation indicates that the data represent natural fluctuations in conditions within the Yak Tunnel Hydrologic System.
- An evaluation of the QC data indicates that no significant QC deviations occurred. Data which is rejected by the data validator will not be included in the database, however an indication that the sample was collected, analyzed and rejected will be made in the database.

4.0 DATA EVALUATION

During routine monitoring, field measurements and analytical data will be obtained from the monitoring of the Yak Tunnel Hydrologic System as described in Sections 2 and 3 above. Following the data quality review (Section 3), the monitored data will be evaluated as soon as practicable to provide the information necessary to support CP decision-making. The parameters listed on Table 1 were selected to support the decision-making process described in the CP. Data and information collected under this RMP will be evaluated using standard data reduction and analysis methods.

4.1 Yak Tunnel Bulkhead

Monitoring data that will be collected relative to the Yak Tunnel include water level measurements at the bulkhead, flow rates, and field parameters and water quality parameters. In addition, visual inspections will be performed as part of operations and maintenance. Data obtained from monitoring of the Yak Tunnel Hydrologic System will be evaluated as follows:

- Water levels measured behind the bulkhead will be graphed versus time. Precipitation and snow melt data, to the extent such data is available form other sources, will also be included on the graphs to aid in the interpretation of water level changes.
- Total monthly flow rate measurements at the GIL will be graphed versus time. Precipitation and snow melt data, to the extent such data is available form other sources, will also be included on the graphs to aid in the interpretation of flow rates.
- Field parameters (pH and specific conductance) will be graphed versus time and water levels behind the bulkhead.
- Other water quality parameters will be reviewed for data which appear anomalous. If anomalous data are present, the data for that parameter will be graphed versus time or other parameters (such as pH or water levels) in an attempt to discover a correlation or explanation for the anomalous data. Ion balances may be calculated.

Correlations with previous seasonal or annual trends will be evaluated for the water levels, flow rates, and field parameters.

4.2 Groundwater

Groundwater monitoring data will include water level measurements and field and water quality parameters from the BBW wells and piezometers, the Black Cloud, Irene, and Helena mine

shafts, and the water behind the Yak Tunnel blockage. Data obtained from groundwater monitoring will be evaluated as follows:

- Water levels at each location will be graphed versus time (hydrographs). The hydrographs will be compared to the hydrograph produced for the Yak Tunnel bulkhead. Precipitation and snow melt data, to the extent such data is available form other sources, will also be included on the graphs to aid in the interpretation of water level changes.
- Field parameters (pH and specific conductance) will be graphed versus time and the water level for each location.
- Other water quality parameters will be reviewed for data which appear anomalous. If anomalous data are present, the data for that parameter will be graphed versus time or other parameters (such as pH or water levels) in an attempt to discover a correlation or explanation for the anomalous data. Ion balances may be calculated.

Correlations with previous seasonal or annual trends will be evaluated for the water levels and field parameters. Stiff diagrams or piper diagrams may be plotted for further evaluation of the groundwater chemistry.

4.3 Springs/Seeps

Information collected during spring/seep reconnaissance surveys will include visual observations of the spring/seep occurrence, spring/seep flow measurements, elevations, and field and water quality parameter measurements. This information will be documented in photographs, field notes, GIS or using other reliable methods. The spring/seep reconnaissance survey data will be evaluated as follows:

- New springs/seeps will be plotted on a map for comparison to other springs/seeps, geologic features, and man-made features such as mine shafts, tunnels, drifts, excavations, waste rock piles and tailing piles.
- The elevation of the new seep/spring will be compared to the groundwater elevations in the Yak Tunnel and surrounding monitoring wells and piezometers.
- Spring/seep duration and flow measurements will be compared to precipitation and snow-melt trends.
- Spring/seep parameters will be compared to the field parameters for the Yak Tunnel and surrounding monitoring locations to evaluate correlations.

5.0 SYSTEMATIC REVIEW AND REVISION OF MONITORING PLAN

5.1 Need For Periodic Review And Revision of Monitoring Plan

Systematic review and revision of the RMP will take place under Decision 6 and Task F of the CP. As the routine monitoring program progresses, it is expected that modifications of the RMP will be required.

In general, routine monitoring requirements will be modified whenever a better understanding of the Yak Tunnel Hydrologic System suggests that monitoring elements should be updated, or when the specific objectives of the monitoring program change. These objectives may change if, as a result of Tasks A and B in the CP, the decision is made that additional investigations or enhanced monitoring are needed. In such a case, the objectives and requirements of the additional investigations or enhanced monitoring will be incorporated into the RMP as required by EPA after consultation with the State. Additional monitoring or data analysis may also be required to provide sufficient evidence to support Decisions 3, 4A and 4B of the CP; that is, to determine whether a gradient reversal has occurred or adverse water conditions exist, and whether response action is required. Finally, additional monitoring requirements may be added to the RMP as a component of one or more response actions selected under Task E of the CP.

The types of changes that may be made to the RMP as a result of systematic review and revision of the monitoring program may include:

- Addition or deletion of monitoring points
- Change in the frequency or location(s) of monitoring
- Addition or deletion of flow, field and water quality parameters
- Modification of the methods used to perform field measurements or laboratory procedures
- Changes in the methods of analysis applied during data evaluation

5.2 Procedure for Modification of Plan

The basic procedure for modification of the RMP consists of the periodic review of the contents of the RMP, confirmation of conformance with the objectives of the program and the effectiveness of the program in supporting decision-making pursuant to the CP. If it is determined that the RMP is not meeting these objectives, recommended improvements will be

presented to EPA and the State for approval. The review will include all aspects of routine monitoring as well as specific evaluations and analyses. At a minimum, the RMP will be reviewed annually at the time the Annual Monitoring Report is being prepared.

As more information is gained about the Yak Tunnel Hydrologic System, and as data collection procedures, laboratory analysis methods, methods used for data evaluation and technology changes, and as the usefulness of the collected data is reevaluated, modifications may be appropriate to improve the efficiency and cost-effectiveness of routine monitoring. In such events, this RMP may likewise be modified with the approval of EPA after consultation with the State.

At the conclusion of the RMP review under Decision 6 of the CP, recommendations may be made for modification of the RMP. Decision 6 of the CP considers whether or not the RMP requires revision. These recommendations will be presented and justified in the Annual Monitoring Report. In addition, EPA, after consulting with the State, may require modifications to the RMP. The revised RMP will be implemented immediately after receipt of EPA approval of the revised document. If the revision requires a phased implementation of the recommended changes, the schedule for implementation will be provided in the revised RMP.

6.0 ROUTINE REPORTING

An Annual Monitoring Report will be prepared as part of the routine monitoring program, as provided in Section 5.8.3.2 of the Work Plan. This document constitutes the reporting component of Task A of the CP, and will summarize the results of the routine monitoring program and evaluations made during consideration of Decisions 3 and 6 of the CP. The content of a typical report is described below.

The Annual Monitoring Report will document and summarize monitoring program and investigation activities that have taken place during the entire year. The report will provide a summary of routine or enhanced monitoring data collected during the year, along with the results of any investigations initiated pursuant to Decision 6. It will also include updated databases in a form approved by EPA and the State. A duplicate copy of the databases will be maintained in accordance with the data management procedures described in the Work Plan. A current description of hydrologic conditions within the Yak Tunnel Hydrologic System will be provided, and any unusual events observed throughout the year will be noted.

The report will include the following information:

- Summary of routine and enhanced monitoring activities
- Summary and evaluation of Yak Tunnel bulkhead data including water levels, flows, and water quality data
- Summary and evaluation of groundwater levels and quality
- Summary and evaluation of Yak Tunnel blockage pumping data
- Conclusions and recommendations

A data evaluation summary will be presented in the Annual Monitoring Report. This will contain the results of data evaluation procedures such as statistical analyses; interpretations of data correlations; and evaluations of data completeness, representativeness, comparability, precision, and accuracy.

Finally, the Annual Monitoring Report will review the current status of the RMP, summarize revisions that have been considered or adopted during the year, and if necessary, recommend changes or improvements to routine monitoring that might be justified for the upcoming year. Topics that will be discussed in this part of the report include existing or proposed modifications

to the monitoring program, if any, and objectives and results of any enhanced monitoring or additional investigations that were undertaken during the previous year.

The Annual Monitoring Report will be due 90 days after the end of the calendar year.

Monthly reports will be prepared as part of the routine monitoring program, as provided in Section of 5.8.3.1 of the Work Plan. As discussed above, downloading of data loggers and manual water level measurements will occur tri-annually at all wells, piezometers, and mine shafts during the spring, summer, and fall seasons. These data will be provided to EPA and the State with the first Yak Tunnel monthly progress report following each tri-annual data download. Also, the Yak Tunnel monthly progress reports providing the tri-annual data will state whether there was any determination under the CP that enhanced monitoring or additional investigations are required, or that an adverse water condition or hydraulic gradient reversal has occurred. After receipt of the monthly reports providing the tri-annual data, the EPA and the State may contact the operator to discuss any trends or anomalies in the reported data.

7.0 REFERENCES

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MFG, Inc. (MFG), 2008d. *DRAFT Work SOP-6, Surface Water Sample Collection.* January.

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MFG, Inc. (MFG), 2008f. *DRAFT Work SOP-1, Decontamination.* January.

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MFG, Inc. (MFG), 2008h. *DRAFT Work SOP-2, Well Water Level Measurement.* January.

MFG, Inc. (MFG), 2008i. *DRAFT Work SOP-11, Water Level Measurement Using Pressure Transducers.* January.

MFG, Inc. (MFG), 2008j. *DRAFT Work SOP-3, Field Instrument Calibration and Operation.* January.

MFG, Inc. (MFG), 2008k. *DRAFT Work SOP-10, Field QA/QC Samples.* January.

Table 1 Sampling Locations, Parameters and Monitoring Frequencies, Yak Tunnel – Operable Unit 1

Location	Parameter [1], [2]	Method	Data Collection Frequency
Yak Tunnel Bulkhead	Water Level	Transducer	Recorded Manually Daily
	Flow Rate (at the Gravity Influent Line)	Flow Meter	Daily (during water treatment plant operation)
	Field Parameters (GIL sampling port)		Daily (during water treatment plant operation)
Groundwater Elevation and Blockage Monitoring Points	Water level in BBW-1 and BBW-2	Manual	Spring, Summer, Fall
	Water level in BBW-3, BBW-4, BBW-7, BBW-8, and Helena Shaft	Manual	Spring, Summer, Fall
		Transducer[4]	Weekly
	Water level in BBW-5, BBW-10, and Irene Shaft	Manual	Spring, Summer, Fall
		Transducer[4]	Daily
	Water level in Black Cloud Shaft	Manual	Spring, Summer, Fall
		Transducer[4]	Daily
	Flow rate at BIL	Flow Meter	Daily
Groundwater Quality Monitoring Points	Field and Water Quality Parameters in BBW-1, BBW-2, BBW-3, and BBW-4		Every 5 years
	Field and Water Quality Parameters BBW-5, BBW-10, and Yak Tunnel blockage [3]		Semi-annually
Springs/Seeps	Occurrence/Elevation		As required (on first observation)
	Stream Flow		As required (on first observation)
	Field and Water Quality Parameters		As required (on first observation)

Notes: (1) Field parameters include pH, specific conductance, temperature, and turbidity.
(2) Water quality parameters presented in Table 3.
(3) Water quality sample from Yak Tunnel blockage taken from Black Cloud Shaft, Irene Shaft, or BIL sampling port.
(4) Transducer data downloaded tri-annually in Spring, Summer, and Fall during manual measurement event.

Table 2 Summary of Monitoring Well/Piezometer Construction Details-Yak Tunnel OU1

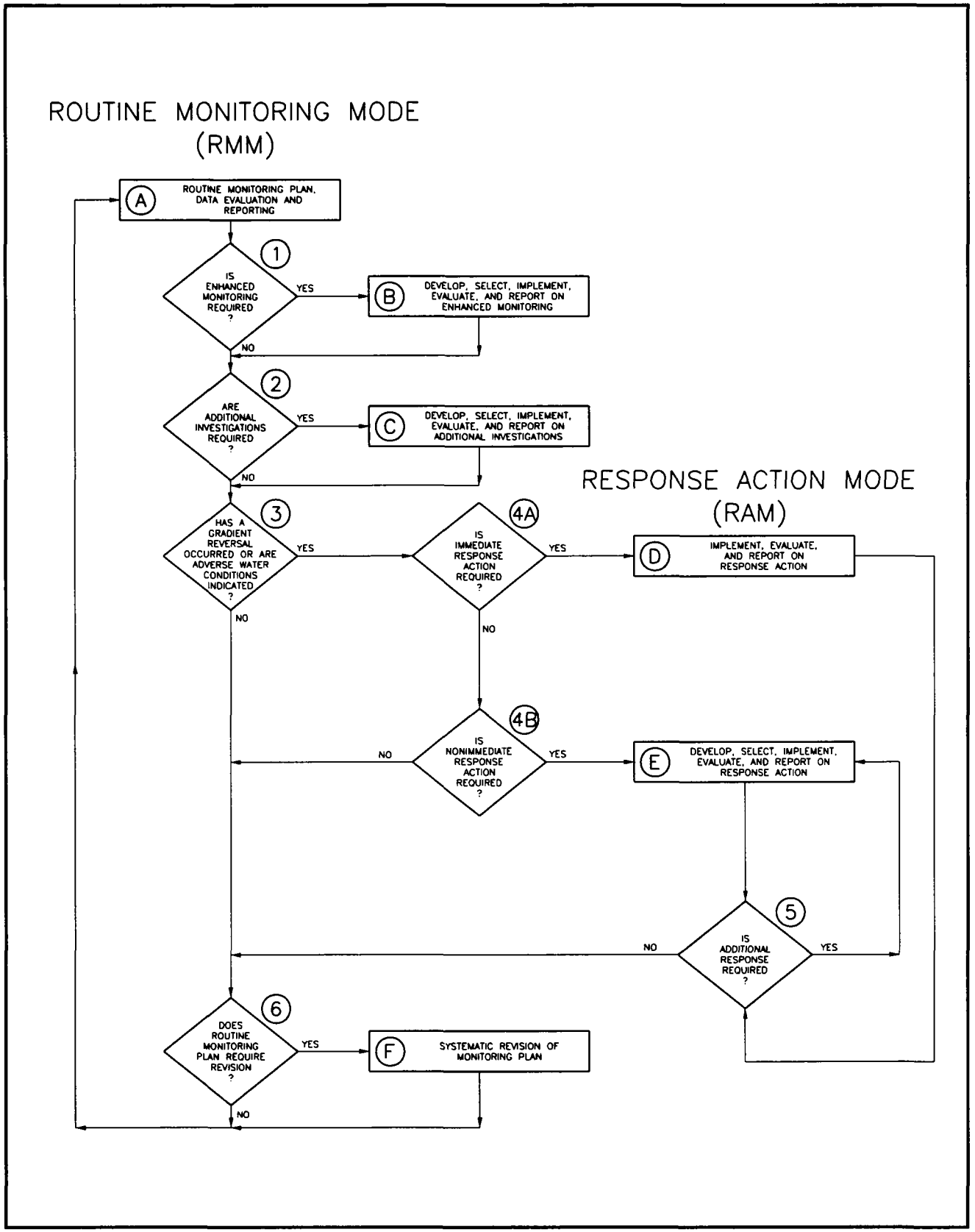
Location Identification	Date of Installation	Elevation (ft amsl)		Casing Diameter (in.)	Screen Type[2]	Well Screen Interval					Total Depth of Well (ft BTOC)	Total Depth of Boring (ft BGS)	Elevation of Bottom of Boring (ft amsl)
		Top of PVC Casing	Approx. Ground Surface			Length (ft)	Approx. Depth bottom of screen (ft BTOC)	Approx. Elevation bottom of screen (ft amsl)	Hydrogeologic Unit- Fault Monitored	Est. Tunnel Elevation (ft amsl)			
BBW-1	9/13/91	11,220.43	11,220.2	2	S.S	40	901.0	10319.4	Bedrock-Pilot	10,350	901	914	10,306.20
BBW-2	10/19/91	10,796.26	10,794.5	2	S.S	38	460.2	10336.1	Bedrock-Pilot	10,347	462	475	10,319.50
BBW-3	10/5/91	11,236.11	11,235.2	2	S.S	39.9	779.5	10456.6	Bedrock-Weston	10,369	781	797	10,438.20
BBW-4	9/26/91	11,555.91	11,543.9	2	S.S	40.2	1199.5	10345.4	Bedrock-Weston	10,356	1200	1227	10,316.90
BBW-5	10/15/91	11,190.53	11,189.2	2	S.S	40	860.7	10329.8	Bedrock-Silent Friend (YakT.)	10,386	861	900	10,289.20
BBW-7	9/7/91	10,445.06	10,443.8	2	S.S	40	292.0	10153.1	Bedrock-Iron/Mikado/ Emmet	10,333	292	291	10,152.80
BBW-8	10/29/91	10,920.30	10,916.0	2	S.S	40	636	10284.3	Bedrock-Adalaide (Yak T.)	10,344	638	665	10,251.00
BBW-10	11/24/91	11,059.70	11,056.0	2	S.S	40	753	10306.7	Bedrock-Silent Friend (?)	10,382	750	825	10,231.00

S.S = stainless steel
amsl =above mean sea level
BTOC = below top of casing
BGS = below ground surface

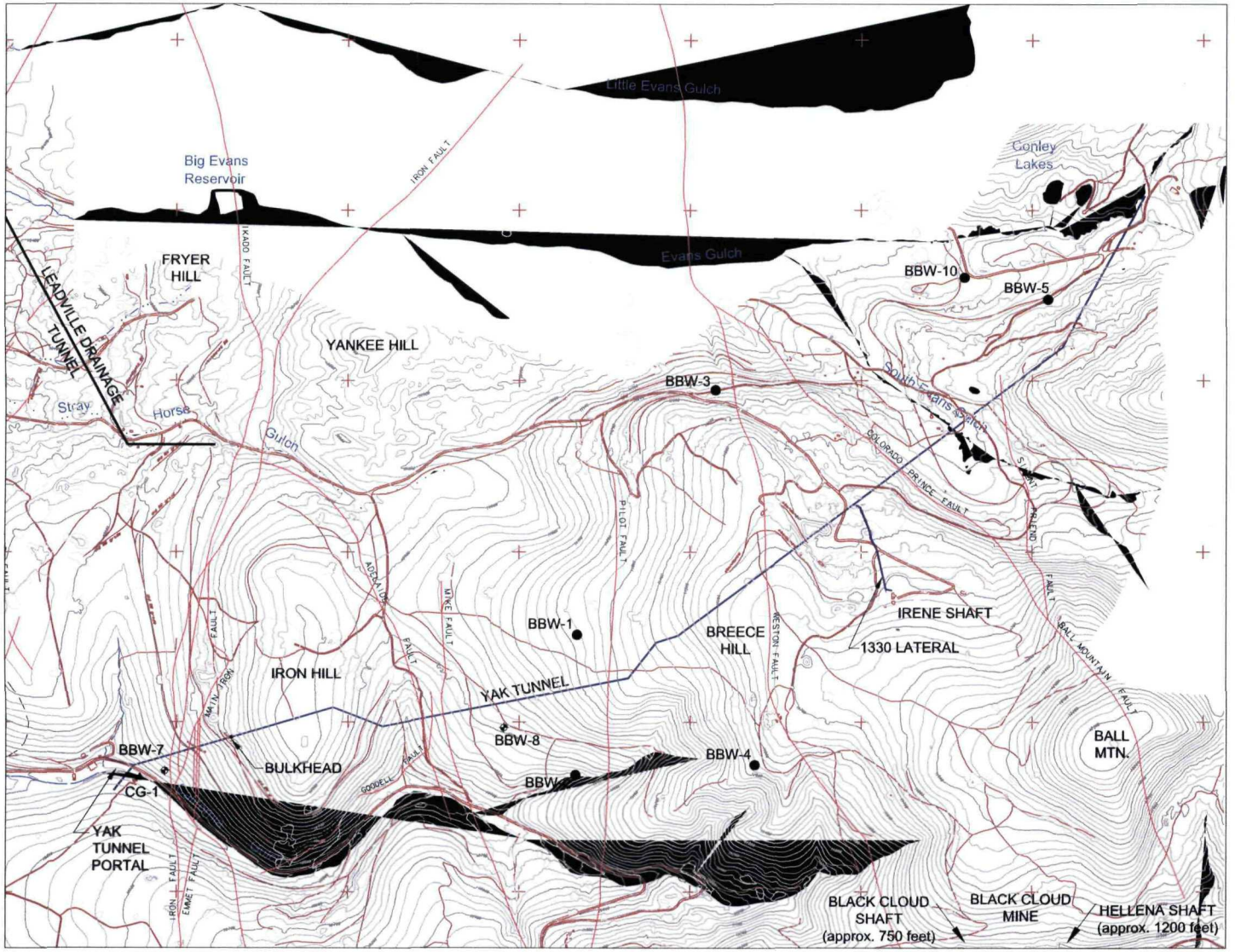
Table 3 Analytical Methods and Detection Limits for Groundwater and Seep Samples –Operable Unit 1

Parameter	Analytical Method	Reference	Detection Limit	Units
Field				
Flow rate	Parshall flume reading	SOP NO. 5	0.1	cfs
Water level	Manual/data logger reading	SOP NO. 2	0.01	foot
pH	Meter	EPA 150.1/SOP NOS. 4, 6	0.1	std pH unit
Specific conductance	Meter	EPA 120.1/SOP NOS. 4, 6	1	µS
Temperature	Thermometric	EPA 170.1/SOP NOS. 4, 6	0.1	°C
Turbidity	Nephelometric	EPA 180.1	N/A	NTU
Laboratory				
General Chemical Constituents:				
Total alkalinity	Titrimetric	EPA 310.1	2	mg/L
pH	Meter	EPA 150.1	0.1	std. pH unit
Specific conductance	Meter	EPA 120.1	1	µS
Total dissolved solids	Gravimetric	EPA 160.1	2	mg/L
Major Inorganic Constituents				
Calcium	ICP	EPA 200.7	1	mg/L
Chloride	IC	EPA 300.0	1	mg/L
Magnesium	ICP	EPA 200.7	1	mg/L
Potassium	ICP	EPA 200.7	1	mg/L
Sodium	ICP	EPA 200.7	1	mg/L
Silica	ICP	EPA 200.7	1	mg/L
Sulfate	Gravimetric	EPA 375.3	4	mg/L
Dissolved Metals				
Aluminum	ICP or ICP/MS	EPA 200.7/200.8	50	µg/L
Arsenic	ICP or ICP/MS	EPA 200.7/200.8	1	µg/L
Cadmium	ICP or ICP/MS	EPA 200.7/200.8	5	µg/L
Copper	ICP or ICP/MS	EPA 200.7/200.8	10	µg/L
Iron	ICP	EPA 200.7	20	µg/L
Lead	ICP or ICP/MS	EPA 200.7/200.8	1	µg/L
Manganese	ICP or ICP/MS	EPA 200.7/200.8	10	µg/L
Nickel	ICP or ICP/MS	EPA 200.7/200.8	20	µg/L
Zinc	ICP or ICP/MS	EPA 200.7/200.8	10	µg/L

IC = ion chromatography
ICP = inductively coupled plasma - atomic emission spectroscopy
ICP/MS = inductively coupled plasma/mass spectrometry
EPA 6010/6020 may be used in place of EPA 200.7/200.8



MFG, Inc. *consulting scientists and engineers*	FIGURE 1 CONTINGENCY PLAN FLOW CHART	Date: MAY 2008 Project: 180885/37 File: Figure-01.dwg



LEGEND

- FAULT
- MINE DRAINAGE TUNNEL
- PIEZOMETER
- MONITORING WELL
- SURFACE WATER MONITORING LOCATION

N

SCALE

1500 0 1500 FEET

FIGURE 2
YAK TUNNEL MONITORING NETWORK

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APPENDIX E
TO OU1 WORK PLAN
CONTINGENCY PLAN

APPENDIX E
TO OU1 WORK PLAN

2008 CONTINGENCY PLAN
YAK TUNNEL OPERABLE UNIT 1
CALIFORNIA GULCH SUPERFUND SITE
LEADVILLE, COLORADO
MAY 2008

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Summary of Current Conditions 1
1.2 Contingency Plan Objectives 2
1.3 Contingency Plan Overview 3
1.4 Contingency Plan Organization 5
2.0 ROUTINE MONITORING MODE OF OPERATION 6
2.1 Task A: Routine Monitoring Plan, Data Evaluation, and Reporting 6
2.1.1 Objectives of the Routine Monitoring Plan 6
2.1.2 Monitoring Elements 6
2.1.3 Methods of Data Evaluation During Routine Monitoring 7
2.2 Decision-Making Process in RMM 7
2.2.1 Decision 1: Is Enhanced Monitoring Required? 7
2.2.2 Task B: Develop, Select, Implement, Evaluate and Report on Enhanced Monitoring 9
2.2.3 Decision 2: Are Additional Investigations Required? 9
2.2.4 Task C: Develop, Select, Implement, Evaluate, and Report on Additional Investigations 10
2.2.5 Decision 3: Has a Hydraulic Gradient Reversal Occurred or Does a Adverse Water Condition Exist in the Yak Tunnel System 11
2.2.6 Decision 4A: Is Response Action Required? 12
2.2.7 Decision 4B: Is Non-Immediate Response Action Required? 13
2.2.8 Decision 6: Does Routine Monitoring Plan Require Revision? 13
2.2.9 Task F: Systematic Revision of Routine Monitoring Plan 14
3.0 RESPONSE ACTION MODE OF OPERATION 15
3.1 Task D: Implement, Evaluate, and Report on Immediate Response Actions 15
3.1.1 Conditions That Warrant Immediate Response Action 15
3.1.1.1 Response Action for Occurrence of Condition 5 15
3.1.1.2 Response Action for Occurrence of Condition 8 17
3.1.1.3 Response Action for Occurrence of Conditions 1 and 9 18
3.2 Task E: Develop, Select, Implement, Evaluate, and Report on Non-Immediate Response Actions 21
3.2.1 Development of Response Actions for Non-Immediate Situations 21
3.2.2 Discussion of Potential Long-Term Response Actions 23
3.3 Decision 5: Is Additional Response Required? 24
3.4 Reporting Requirements 24
4.0 REFERENCES 25

LIST OF TABLES

Table 1 Conditions That Constitute Gradient Reversal and Adverse Water Conditions-Yak Tunnel Operable Unit

LIST OF FIGURES

Figure 1 Contingency Plan Flow Chart

APPENDIX

Appendix A Glossary

1.0 INTRODUCTION

This 2008 Contingency Plan (CP), the 2008 Routine Monitoring Plan (RMP) (MFG, 2008a), and the Work Plan for OU1 (Work Plan) (MFG, 2008b) govern implementation of the selected remedy for the Yak Tunnel Operable Unit (OUl), California Gulch Superfund Site, Leadville, Colorado, pursuant to the Consent Decree by and among the United States, State of Colorado, Newmont USA Limited and Resurrection Mining Company, to which the OU1 Work Plan and this CP are appended. The CP describes the decision-making process for identifying gradient reversals and adverse water conditions related to the Yak Tunnel Hydrologic System, and for designing and implementing appropriate actions to respond to such conditions. Conditions constituting gradient reversal and adverse water conditions are enumerated in Table 1 of this Plan.

The RMP describes the objectives, monitoring points, data criteria for implementation of the CP decision- making process, sampling and laboratory methods, quality assurance procedures, data evaluation methods, and reporting requirements that will be implemented during the routine monitoring mode of operation of the CP.

The CP incorporates revisions and updates to the prior contingency plan to reflect current conditions associated with the Yak Tunnel Hydrologic System, including the cessation of mining activities at the Black Cloud Mine in 1999 and the formation of a blockage in the Yak Tunnel in approximately 2002.

1.1 Summary of Current Conditions

Beginning in May 2002, increasing water levels were observed at piezometer BBW-5 and well BBW-10. The rise in groundwater elevations occurred coincident with the recovery of groundwater levels in the Black Cloud Mine workings above the level of the 1330 Lateral, and indicated that a blockage existed in the upper region of the Yak Tunnel downgradient of the 1330 Lateral.

Pursuant to the former Contingency Plan (MFG, 1999), it was determined that enhanced monitoring was required. An enhanced monitoring program was submitted to the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and

Environment (CDPHE) in a letter dated December 19, 2002 (Asarco, 2002). As prescribed by the enhanced monitoring program (Asarco, 2002), water levels in BBW-3, BBW-5, BBW-10, and the Black Cloud/Irene shafts have been measured at an increased frequency since December 2002 to assess groundwater conditions in the upper portion of the Yak Tunnel and the Black Cloud Mine. In 2004, the Additional Investigation Work Plan (MFG, 2004) was implemented to provide information to supplement the routine and enhanced monitoring programs and to develop a better understanding of the current conditions within the Yak Tunnel Hydrologic System and the potential implications or consequences if water levels were allowed to continue to rise.

The Additional Investigation Work Plan described pumping of groundwater from behind the blockage and conveyance of this water to the Yak Tunnel Water Treatment Plant for treatment and discharge. Pumping of the Yak Tunnel blockage water from the Black Cloud Shaft began on March 21, 2006. Historic high groundwater elevation within the Yak Tunnel mine pool of 10,684 feet above mean sea level (ft. amsl) was reached at the Black Cloud Shaft prior to the initiation of pumping on March 21, 2006. Pumping has continued since the March 21, 2006 start-up (with periodic shutdowns for maintenance), and water levels in the Yak Tunnel mine pool have dropped as a result. At the historic high groundwater elevation, the groundwater elevation data continued to indicate a hydraulic gradient towards the Yak Tunnel. Therefore, no reversal of the hydraulic gradient away from the Yak Tunnel or adverse groundwater quality conditions are expected away from the Yak Tunnel as long as pumping continues and the groundwater elevation remains below the historic high groundwater elevation. Continued pumping from the Black Cloud Shaft is anticipated to reduce and maintain water levels behind the blockage and is included in the Work Plan. This CP reflects current conditions within the Yak Tunnel Hydrologic System including such pumping. Should changing conditions warrant, additional response actions may be required pursuant to this CP, which may include pumping from other areas of the System in addition to, or instead of, the Black Cloud Shaft.

1.2 Contingency Plan Objectives

The development of a contingency plan that addresses any potential adverse hydrologic change occurring in the Yak Tunnel Hydrologic System is one of the elements of the selected remedy for OU1. The CP was prepared to satisfy that requirement and to meet the following objectives:

- Define the decision-making process by which the operational status of OU1 will be evaluated to determine whether hydraulic gradient reversal has occurred or adverse water conditions exist and whether those conditions warrant response action.

- Present the basis for the CP decision-making process, including the information needed to make each decision, the protocol that will be followed while each decision is being made, and the person(s) or decision-making body designated to make each decision.

- Describe the actions that will be taken to develop, select, implement, evaluate, and report on the outcome of the CP decisions and associated activities.

- Define the reporting, notification, and review requirements associated with the decisions and tasks identified in the CP.

- Define the degree of involvement and interactions among the parties charged with the implementation and operation of the CP.

In addition to the general objectives listed above, quality assurance and quality control (QA/QC) protocols serve to assure that the data collected as a part of the RMP meet specified standards of precision, accuracy, representativeness, comparability, and completeness. QA/QC protocols are presented in the Work Plan and RMP.

1.3 Contingency Plan Overview

The decision-making process that will be followed during evaluation of monitoring data and implementation of contingency measures, as necessary, is described below and shown in Figure 1. The CP decision-making process illustrates the relationship between the routine monitoring and response action components of the CP. Rectangular elements shown in the CP Flow Chart (Figure 1) represent contingency planning or activity tasks and diamond-shaped elements represent contingency planning decisions. The normal mode of operation of the CP, called the Routine Monitoring Mode of Operation (RMM), consists of all routine monitoring, data evaluation, and reporting activities associated with the execution of Tasks A, B, C and F and the evaluation of Decisions 1, 2, 3, 4A, 4B, and 6 of the CP. These activities are summarized in Section 2 of this document, and a detailed description of the associated monitoring activities is provided in the RMP. Activities associated with implementation of Tasks D and E and Decision 5 constitute the Response Action Mode of Operation (RAM) of the CP. The RAM is initiated when adverse hydrologic conditions have been demonstrated, and the need for response action is warranted.

Implementation of the routine monitoring program for the Yak Tunnel Hydrologic System occurs in Task A. Monitoring was implemented with the Draft Routine Monitoring Plan (Baker, 1993) and has provided an understanding of the range of fluctuations within the hydrologic system, allowing for the evaluation of existing conditions and overall system performance. Routine monitoring of various parameters provides information to continually update the monitoring database that documents the hydrologic conditions within the Yak Tunnel Hydrologic System, and to determine whether a significant change as compared to previously recorded data has occurred. A summary of the monitoring and data evaluation requirements for Task A is presented in Section 2.1.

During the RMM, modifications to the monitoring program have been and will continue to be implemented during execution of Task F, as required by EPA in consultation with the State. As part of this task, the monitoring program will be reevaluated on a routine basis and revised if necessary as specified in the RMP. Revisions not initially requested by the regulatory agencies will first be presented to EPA and the State for review and approval. The types of revisions that may be made to the RMP include initiation or curtailment of enhanced monitoring or implementation of additional investigations. Once approved, the revised RMP will remain in effect until additional modifications become necessary.

The major decision that affects routine monitoring is Decision 3. Consideration of Decision 3 involves a determination of whether a hydraulic gradient reversal away from the Yak Tunnel has occurred, or if an adverse water condition, is observed in the Yak Tunnel Hydrologic System. The term adverse water condition is defined in Table 1. If there is a gradient reversal or creation of adverse water condition (Answer to Decision 3 is YES), then Decision 4A will determine whether or not an immediate response action is required. If an immediate response action is found to be necessary (Answer to Decision 4A is YES), then the CP will enter the RAM. In this mode of operation, alternatives will be implemented, and evaluated during Task D. If consideration of Decision 4A results in a negative response (Answer to Decision 4A is NO), then Decision 4B will determine whether or not a non-immediate response action is required. If a non-immediate response action is found to be necessary (Answer to Decision 4B is YES), then the CP will enter the RAM. In this mode of operation, alternatives will be developed, selected, implemented, and evaluated during Task E. If consideration of either Decision 3 or Decision 4B

results in a negative response (Answer to Decision 3 or 4B is NO), the process will continue with reevaluation of the monitoring plan, revision of the plan if necessary, and a return to routine monitoring.

After a given response action has been implemented, either immediate or non-immediate, the need for additional response will be evaluated in Decision 5. If further response is required, additional alternatives will be developed, selected, implemented, and evaluated in Task E. If no additional action is required (Answer to Decision 5 is NO), the results of the response action will be reported to EPA and the State, and the RMP will be reevaluated and revised as necessary in Decision 6 and Task F. Routine monitoring will then continue.

1.4 Contingency Plan Organization

The CP is organized around the Decisions and Tasks that form the basic elements of the two modes of operation. Section 1.0 describes the overall objectives, presents an overview of the CP -making process, and describes the organization of the CP. The Decisions and Tasks associated with the RMM are described in Section 2.0. The RAM, which includes Task D, Task E and Decision 5, and response action alternatives, is discussed in Section 3.0. References are presented in Section 4.0. Finally, a glossary of technical terms is provided in Appendix A.

2.0 ROUTINE MONITORING MODE OF OPERATION

2.1 Task A: Routine Monitoring Plan, Data Evaluation, and Reporting

2.1.1 Objectives of the Routine Monitoring Plan

The overall goal of the routine monitoring program is to obtain information about the Yak Tunnel Hydrologic System to support decision-making processes in the CP. This goal is embodied in the general objectives of the RMP, which are to:

- Provide information on current conditions of the Yak Tunnel Hydrologic System, and compare current conditions to all previously recorded conditions
- Provide information on changes that may occur in the Yak Tunnel Hydrologic System
- Provide information to support decisions regarding the need for enhanced monitoring activities, additional investigations, and the need for response actions, and
- Document the effectiveness of response actions that have been implemented.

2.1.2 Monitoring Elements

A detailed discussion of the elements that comprise the routine monitoring program is provided in the RMP. Section 2 of the RMP identifies monitoring parameters that are useful for ongoing characterization of changes or fluctuations in the Yak Tunnel Hydrologic System, and evaluation of conditions to identify potential undesirable changes within the Yak Tunnel Hydrologic System. Section 3 of the RMP describes the sampling and analytical methods of the sampling plan. Section 4 of the RMP presents procedures for qualitatively and quantitatively evaluating data to provide the information necessary to support the CP decision-making process.

Data collected during routine monitoring will be evaluated with previously reported data to determine what, if any, changes of conditions have occurred. Routine collection and evaluation of these data will provide an increased understanding of the hydrologic system, and allow the recognition of significant changed conditions, should they occur. The parameters and conditions which will be routinely monitored and evaluated include:

- Groundwater elevation
- Yak Tunnel Bulkhead water level

- Yak Tunnel Blockage water level
- Hydraulic gradient between the Yak Tunnel and outlying monitoring locations
- Yak Tunnel flow rates
- Piezometer and monitoring well field parameter and water quality parameters
- Mine shaft field parameter and water quality parameters
- Field parameters and water quality parameters at the Yak Tunnel bulkhead
- The occurrence, surface elevation, flow rate, and water quality of newly-observed seeps and springs.

The rationale for selection of monitored parameters and conditions, and monitoring location is provided in Section 2 of the RMP. Sampling locations that comprise the monitoring network are illustrated in Figure 2 of the RMP and the content of the monitoring program is summarized in Table 1 of the RMP.

2.1.3 Methods of Data Evaluation During Routine Monitoring

Data and information collected during routine monitoring will be evaluated using standard data reduction, graphical, and statistical analysis methods. These methods are described in Section 4 of the RMP. As with the rest of the RMP, methods used for data evaluation will be reviewed periodically and updated, deleted, or replaced as appropriate during the course of the monitoring program.

2.2 Decision-Making Process in RMM

2.2.1 Decision 1: Is Enhanced Monitoring Required?

As indicated in Figure 1, Decision 1 evaluates whether an enhanced monitoring effort is needed to confirm existing monitoring data or to provide supplemental information for the routine monitoring program. Enhanced monitoring could include increased frequency of monitoring or additional monitoring of parameters at existing sampling locations and monitoring points to provide specific information to address a suspected hydrologic condition. Enhanced monitoring could also include monitoring other existing sampling locations and monitoring points which are not part of the RMP. Possible elements of enhanced monitoring activities are developed in Task B, as described in Section 2.2.2.

In Decision 1, the need for enhanced monitoring is evaluated. If needed (Answer to Decision 1 is YES), the enhancements to the monitoring program will be developed, selected, implemented, evaluated, and reported under Task B. If unnecessary (Answer to Decision 1 is NO), then Decision 2 will be considered.

Although it is difficult to foresee all possible conditions where enhanced monitoring could be considered and selected, the following situations provide examples:

- A sudden change in head behind the Yak Tunnel Bulkhead could lead to an additional spring and seep survey in the vicinity of Iron Hill, or other additional monitoring activities.

- A sudden, unanticipated reduction in the Yak Tunnel flow rate or increase in head behind the bulkhead could lead to changes in the frequency of monitoring water levels behind the bulkhead, flows from the bulkhead, and measurements of water levels in one or more of the piezometers within the monitoring network. This situation could also initiate additional seep/spring surveys, sampling and analysis of Yak Tunnel water quality, and the performance of bulkhead O&M activities.

- A sudden, unexplained change in water quality from the Yak Tunnel bulkhead could warrant sampling of piezometers and/or wells.

- An anomalously rapid rise/fall of groundwater elevations in the Yak Tunnel Hydrologic System could prompt more frequent monitoring of water levels in the affected monitoring locations, as necessary.

- A significant, unanticipated water level rise in piezometer BBW-8 could lead to an additional seep and spring survey in the vicinity of Iron Hill.

- A significant, unanticipated water level rise in one or more wells/piezometers other than BBW-8 could lead to a seep/spring survey in areas adjacent to the affected piezometers or other locations, as appropriate, that may be connected by mine workings or other hydraulic connections.

- If a newly-occurring seep or spring were discovered during a seep/spring reconnaissance survey, or at any other time during the dry season, seep water quality would be evaluated.

Decision 1 will be made each time the routine monitoring results are evaluated. If the outcome of this decision suggests that enhanced monitoring is needed, this conclusion will be communicated in writing to EPA and the State within ten working days after the decision has been made.

2.2.2 Task B: Develop, Select, Implement, Evaluate and Report on Enhanced Monitoring

If consideration of Decision 1 indicates that enhanced monitoring is necessary, an enhanced monitoring program will be developed under Task B of the contingency planning process and provided to EPA and the State. The program will be designed to meet the specific needs of the situation depending on the type of conditions encountered. The enhancements will be implemented as soon as practicable after the EPA and the State have approved of the proposed enhanced monitoring program. Enhanced monitoring results will be evaluated and reported in accordance with the requirements established and set forth in the enhanced program. Each enhanced monitoring program will contain the following elements:

- Summary of the conditions that led to enhanced monitoring
- The objectives of the enhanced monitoring program
- A description of the enhancements that will be made to monitoring
- The data analysis and evaluation procedures that are anticipated to be performed on the resulting data
- The duration of the program
- Reporting requirements

When enhanced monitoring activities have been completed, the monitoring program will return to routine monitoring. If continuation of enhanced monitoring is determined necessary, the changes will be incorporated into the routine monitoring program under Task F as described in Section 5 of the RMP.

2.2.3 Decision 2: Are Additional Investigations Required?

Decision 2 evaluates the need to carry out additional investigations that may be needed to clarify or supplement data obtained from routine or enhanced monitoring. If the answer to Decision 2 is YES, an additional investigation will be developed, selected, implemented, and evaluated under Task C. If a NO decision is reached, Decision 3 will be considered.

Additional investigations may become necessary whenever information is needed to clarify Decisions 3, 4A, 4B, and 5, and such information cannot be obtained from the routine monitoring program network, enhanced monitoring, or from other existing monitoring locations.

In general, the objectives of an additional investigation will be more specific than those of an enhanced monitoring program, and may range from the installation of one or more piezometers or wells to the application of a new data evaluation technique. Circumstances that might lead to the initiation of an additional investigation include the following:

- The occurrence of a new seep/spring of adverse water quality that is discharging to a stream or surface water body
- The occurrence of a persistent, unexplained rise in groundwater elevations over a large area that is associated with the Yak Tunnel Hydrologic System
- A reversal of hydraulic gradient away from the Yak Tunnel, accompanied by a change in water quality in one of the outer monitoring wells
- The need to collect information to support the design or evaluation of a response action considered or selected in Tasks D or E

Decision 2 will be made each time routine monitoring results are evaluated. The decision to conduct an additional investigation will depend on the specific conditions that exist at the time the decision is considered. If the decision is made to conduct an additional investigation, EPA and the State will be notified of the decision in writing within ten working days and further planning/scoping of the investigation will begin.

2.2.4 Task C: Develop, Select, Implement, Evaluate, and Report on Additional Investigations

If the result of Decision 2 is to conduct an additional investigation, a Draft Additional Investigation Work Plan will be developed to respond to the specific conditions and questions that led to the decision. The Draft Additional Investigation Work Plan will contain the following elements:

- A summary of the conditions that led to the investigation
- The specific objectives of the investigation
- Details of the work to be conducted including a description of the location of any new wells/piezometers or other monitoring points that will be installed, sampling activities and field and laboratory analyses that will be performed, and other data collection activities
- Methods anticipated for data analysis and evaluation

- A summary of applicable waste management, health and safety, and quality assurance/quality control (QA/QC) procedures that will be followed
- An estimated schedule for completion of the investigation
- Reporting requirements
- Any permits or regulatory requirements necessary for completion of fieldwork

The Draft Work Plan will be provided to the EPA and the State for approval.

The additional investigation will be initiated and implemented in conjunction with the routine or enhanced monitoring activities required under the RMP. If, as a result of the investigation, modifications to the routine monitoring program are made under Decision 6 of the CP, those modifications will be incorporated into the routine monitoring program as discussed in Section 5 of the RMP.

2.2.5 Decision 3: Has a Hydraulic Gradient Reversal Occurred or Does a Adverse Water Condition Exist in the Yak Tunnel System

Decision 3 evaluates whether a reversal of hydraulic gradient away from the Yak Tunnel has occurred, or an adverse water condition exists, and whether the reversal or adverse condition is caused by conditions within the Yak Tunnel Hydrologic System, or is caused by unrelated natural conditions (e.g., anomalous regional water levels associated with unusually high or low annual precipitation). A reversal in hydraulic gradient can be identified by a change in the direction of the hydraulic gradient between a piezometer (BBW-5 and BBW-8) and the nearest outlying monitoring well (BBW-1, BBW-2, BBW-3, BBW-4 and BBW-10). Note that water levels in BBW-7 provide information regarding the extent to which the Iron/Mikado/Emmett fault complex inhibits westward groundwater flow at the Yak Tunnel. However, these data are not considered suitable for determining a hydraulic gradient reversal because water levels in BBW-7 are naturally lower than water levels in the Yak Tunnel Hydrologic System. The term adverse water condition means those hydrologic, flow and water quality conditions associated with the Yak Tunnel Hydrologic System identified in Table 1. The presence of one or more of these conditions indicates that the response to Decision 3 is YES and the need for response action should be considered in Decisions 4A or 4B. If none of the conditions listed in Table 1 exist, the program returns to routine monitoring and Decisions 1, 2, and 6 are considered.

Decision 3 will be made in conjunction with the EPA and the State after sufficient information has been collected to perform an analysis of site conditions for adequate evaluation of the decision. If the operator determines that the answer to Decision 3 is YES, EPA and the State will be notified of the decision in writing within ten working days. If there is insufficient information available to determine whether a gradient reversal or adverse water condition has occurred, then a NO response will normally be made to Decision 3.

2.2.6 Decision 4A: Is Immediate Response Action Required?

Decision 4A evaluates whether an immediate response action is required to address a reversal of hydraulic gradient away from the Yak Tunnel or an adverse water condition, due to Conditions 1 and 9 (concurrently), 5 or 8 as identified in Table 1. These conditions represent a potential adverse impact that would require immediate response action. Immediate response actions could result in either short-term or long-term response measures.

The following conditions or combinations of conditions represent circumstances that would require immediate response action. Immediate response actions are discussed further in Section 3.

Conditions Requiring Immediate Response Action

- Condition 5: Indicates possible discharge of Yak Tunnel water through a new seep or spring that discharges into a stream or surface water body.
- Condition 8: Indicates that bulkhead intakes are buried or a flow-through pipe in the bulkhead is plugged and normal O&M clearing procedures have proved to be ineffective.
- Conditions 1 and 9: Indicate a gradient reversal, the migration of Yak Tunnel water away from the tunnel, and a potential threat to a public water supply or the environment.

Decision 4A will be made in conjunction with EPA and the State based on all information available at that time. A YES response to Decision 4A initiates Task D activities during which an appropriate response action is implemented.

2.2.7 Decision 4B: Is Non-Immediate Response Action Required?

Decision 4B evaluates whether a non-immediate response action is required to address a reversal of hydraulic gradient away from the Yak Tunnel or an adverse water condition, as identified in Table 1. Non-immediate response actions could result in either short-term or long-term response measures.

The following conditions or combinations of conditions represent circumstances that would require non-immediate response action. Non-immediate response actions are discussed further in Section 3.

Conditions Requiring Non-Immediate Response Action

- Conditions 1, 3, 4, or 7: Indicate a gradient reversal and possible migration of Yak Tunnel water away from the tunnel.
- Conditions 2, 3, or 6: Indicate an unexpected build up of water within the Yak Tunnel Hydrologic System.

Decision 4B will be made in conjunction with the EPA and the State based on all information available at that time. A YES response to Decision 4B initiates Task E activities during which an appropriate response action is developed and implemented. If there is insufficient information available to determine whether gradient reversal or adverse water conditions require a response action, then a NO response will normally be made to Decision 4B. Routine monitoring will continue and the data will be evaluated to determine if enhanced monitoring, additional investigations, or revision of the routine monitoring plan is required.

2.2.8 Decision 6: Does Routine Monitoring Plan Require Revision?

Decision 6 considers whether or not the RMP requires revision. As knowledge of the Yak Tunnel Hydrologic System improves during the course of routine monitoring, it is expected that various elements of the RMP will need to be modified or updated. Modifications to the RMP may include changes in the locations being monitored, the parameters being analyzed, the frequency or location of monitoring, or the methods of analysis applied during data evaluation.

If a decision is made to modify the RMP (Answer to Decision 6 is YES), then appropriate revisions and modifications will be made under Task F. These revisions will be submitted to the

agencies for approval prior to being implemented. If no revisions of the RMP are required (Answer to Decision 6 is NO), then routine monitoring will continue with Task A.

2.2.9 Task F: Systematic Revision of Routine Monitoring Plan

In order to ensure that routine monitoring activities or response actions are consistent with the objectives of the CP, a mechanism for systematic revision of the monitoring program has been incorporated into Section 5of the RMP. Revisions will be implemented in response to the routine evaluation of monitoring data or as a result of the implementation of enhanced monitoring, additional investigations, or response actions, where appropriate. Revisions to the RMP will be made with the approval of EPA and the State, and approved modifications will be documented in the Annual Monitoring Report, as provided by Section 6.0 of the RMP, or other documents, as appropriate. Modifications to the RMP may include:

- Incorporation of enhanced monitoring elements (e.g., increased monitoring frequency or expanded target analyte list for water quality analysis)
- Incorporation of additional investigations (e.g., installation of new monitoring wells or piezometers)
- Reduction of monitoring frequency (e.g., less frequent collection of monitoring data or deletion of analytes required for water quality analysis)
- Elimination of ineffective monitoring points

3.0 RESPONSE ACTION MODE OF OPERATION

3.1 Task D: Implement, Evaluate, and Report on Immediate Response Actions

The work performed under Task D consists of two types of activities: (1) implementation and evaluation of response actions applicable in situations where an immediate response action is needed; and (2) evaluation and reporting of the outcome of response actions that have been completed.

3.1.1 Conditions That Warrant Immediate Response Action

The following three conditions warrant immediate response action.:

- Conditions 5 - Occurrence of a new seep or spring discharging to a stream or surface water body resulting from a change in the Yak Tunnel Hydrologic System with water quality that exceeds the Yak Tunnel WTP effluent limitations defined in the Work Plan
- Condition 8 - Catastrophic plugging of the bulkhead intakes or pipes in which repeated O&M clearing procedures fail to restore flow
- Conditions 1 and 9 - Simultaneous reversal of hydraulic gradient and presence of Yak Tunnel water in the vicinity of a public water supply or discharge of untreated Yak Tunnel water to a surface water body or stream

The immediate response actions that may be required in each of these situations are described below. These actions will only be undertaken if the response to Decision 4A as discussed in Section 2.2.6 is a YES.

3.1.1.1 Response Action for Occurrence of Condition 5

The immediate response action to Condition 5 will be to contain and prevent the discharge of a new seep or spring water to a surface water body or stream. The factors that will be taken into account for designing the components of this response action are seep/spring location, flow rate, and the time of year that response is required. If the new seep or spring occurs in a remote location during the summer, it may be readily accessible for implementation of water containment and collection measures even if a new roadway is needed to provide access to that location. In addition, construction of water containment or collection structures could proceed relatively quickly during warm weather.

Logistical difficulties associated with the cold weather might make it impossible to implement response measures at the seep/spring location until the spring melt occurs. In the event that immediate response action is necessary despite adverse winter weather conditions, containment of seep/spring water may have to be restricted to the point of discharge in an adjacent stream that is accessible. The containment would then be moved to the source of the seep or spring when weather conditions permit.

When Condition 5 is encountered the following actions will occur:

- The EPA and the State will be notified, both verbally and in writing, of a YES response to Decision 4A based on the occurrence of Condition 5, and that response action is being undertaken. Resources necessary to carry out response actions will be mobilized.

- After notification and approval of EPA and the State, immediate response actions will be implemented to contain and prevent the discharge of contaminated seep or spring water to a surface water body or stream. The response action would be dependent on site-specific conditions (location, flow rate, time of year, etc.). Examples of immediate response actions could include the following types of activities:

    - Construction of an earthen containment berm

    - Placement of storage tank, construction of holding pond, or enlargement of capacity of bermed area

    - Use of tanker truck or pipeline, to transfer or convey discharge water from storage devices to the treatment plant.

- Preparation of a Draft Additional Investigation Work Plan under Task C of the CP. The purpose of the additional investigation will be to determine the cause of the seep or spring, whether it is permanent or ephemeral, and to evaluate whether long-term actions are necessary and should be taken to eliminate the occurrence of the seep/spring or to design a permanent control/treatment system for its discharge.

- EPA and the State will review and comment on the Draft Additional Investigation Work Plan.

- Preparation of a Final Additional Investigation Work Plan incorporating EPA and the State's comments and submittal to the EPA and the State for approval.

- Upon approval of the Final Additional Investigation Work Plan, the additional investigation will proceed according to the schedule presented in the Final Additional Investigation Work Plan.

- Evaluation of the likely causes for the occurrence of the seep/spring and develop recommendations for additional action, if necessary, upon completion of the Final Additional Investigation Work Plan.

- The EPA will evaluate these recommendations and decide on the appropriate action. If additional action is required, a Response Action Plan (RAP) (see Section 3.1.2) describing the action to be taken and defining the schedule for its implementation will be prepared.

- When the EPA has determined that the response action for the seep or spring has been completed, appropriate changes will be made to the RMP and Work Plan to incorporate additional monitoring or O&M specifications required by the action.

- Upon EPA approval of these revisions, the current response action will be closed out and routine monitoring will resume.

3.1.1.2 Response Action for Occurrence of Condition 8

Condition 8 occurs when normal operation of the Yak Tunnel bulkhead is prevented due to catastrophic blockage of the bulkhead or tunnel immediately behind the bulkhead and application of normal O&M clearing methods fail to remove the blockage. The primary causes for this condition are likely to be: (1) inundation of the bulkhead intakes by rubble transported during a sudden water surge; or (2) plugging of the bulkhead by rockfall from collapse of the tunnel above the intake structure. In this case, the Decision 4A result will be a YES. Prior to the initiation of response action, it is assumed that O&M procedures appropriate for clearance of the bulkhead have been carried out with no success, indicating that other measures are required to restore flow through the bulkhead. If this is the case, access to the upstream side of the bulkhead via the manway is likely to be restricted, and efforts to reestablish flow must be made either from the downstream face or the ground surface.

When Condition 8 is encountered, the following actions will occur:

- The EPA and the State will be notified in writing that Condition 8 exists, appropriate O&M measures have been unsuccessful in reestablishing flow through the bulkhead, that Decision 4A results in a YES decision, and that a response action is being undertaken. Resources necessary to carry out response actions will be initiated.

- After notification and approval of EPA and the State, response actions will occur to relieve the buildup of water behind the bulkhead and to clear blockage on the upstream side of the bulkhead. The response action would be based on site-specific conditions. Examples of these response actions could include the following types of activities:

- Blow out debris with air or water through pipes.
- Drill through existing pipes and inlet screens to open intake pathway.
- Install a well at a suitable location and pump Yak Tunnel water to relieve pressure and prevent backup behind the blockage. Convey pumped water to treatment plant.
- Construct a horizontal drain at a suitable location to allow gravity drainage of Yak Tunnel water from behind the blockage to the treatment plant.

- When the bulkhead has been restored to normal operations, as determined by the EPA in Decision 5, the RMP and Work Plan for OU1 will be revised to incorporate additions or changes caused by the response action.
- Upon EPA approval of the revisions, the revised RMP and OU1 Work Plan will be implemented and the response action will be closed out.

3.1.1.3 Response Action for Occurrence of Conditions 1 and 9

When Conditions 1 and 9 occur concurrently, there is reason to suspect that Yak Tunnel water may threaten a public water supply or the environment. The response action presented below is only appropriate if: (1) a YES decision has been reached for Decision 4A; (2) it has been demonstrated that degradation of surface and ground water quality is due to mine drainage away from the Yak Tunnel; and (3) the observed water quality presents an immediate threat to the water supply or the environment.

Response Action Specifications

The response action presented below is directed toward protection of a public water supply that has been threatened or impacted by migration of Yak Tunnel waters. An alternative water supply on a temporary basis may be required while investigation, design and construction activities are being conducted. When Condition 1 and 9 occur concurrently and the observed water quality impacts present an immediate threat to a public water supply, the following actions, based on site-specific conditions, will occur:

- After it has been determined that the response to Decision 4A is YES, the EPA and the State and parties responsible for management of the affected public water supply will be notified that the response action is being undertaken. If the management of the public water supply disagrees with the proposed action, the matter will be resolved by the EPA.

- If it is deemed necessary, an alternative supply of raw water to the public water treatment system or alternate supply of drinking water will be provided to the affected population.

- If needed to determine appropriate response actions to address the hydraulic gradient reversal, a Draft Additional Investigation Work Plan under Task C will be prepared describing any additional work that may be required to evaluate hydrogeologic conditions, risks to human health, and other information associated with the design and construction of a long-term remedy to the situation. The alternative drinking water supply will be provided until it is no longer needed.

- The EPA and the State will review and comment on the Draft Additional Investigation Work Plan.

- The Final Additional Investigation Work Plan will be prepared and submitted to the EPA and the State after receipt of comments on the Draft Work Plan.

- Upon EPA and State approval, the Final Work Plan will be implemented according to the approved schedule provided in the document.

- If the results of the Additional Investigation indicate that a response action is appropriate, a Draft RAP (see Section 3.1.2) will be developed and submitted to EPA and the State for review. The EPA and the State will review and comment on the Draft RAP, and a Final RAP incorporating EPA comments on the Draft RAP will be prepared.

- Upon EPA approval of the Final RAP, the RAP will be implemented according to the approved schedule.

- When the response action has been completed as determined by the EPA and the State, the RMP and Work Plan for OUI will be revised to incorporate additional monitoring and O&M specifications required as a result of the response action.

- Upon receipt of EPA and State approval, the revised RMP and Work Plan will be implemented and the response action will be closed out.

When Conditions 1 and 9 occur concurrently, and the discharge of untreated seep or spring water from the Yak Tunnel to a surface water body or stream presents an immediate threat to the environment the following actions will be undertaken.

- The EPA and the State will be notified, both verbally and in writing, of a YES response to Decision 4A based on the occurrence of Conditions 1 and 9, and that response action is being undertaken. Resources necessary to carry out response actions will be mobilized.

- After notification and approval of EPA and the State, immediate response actions will be implemented to contain and prevent the discharge of contaminated water to a surface water body or stream. The response action would be dependent on site-specific

conditions (location, flow rate, time of year, etc.). Examples of immediate response actions could include the following types of activities:

- Construction of an earthen containment berm
- Placement of storage tank, construction of holding pond, or enlargement of capacity of bermed area
- Use of tanker truck or pipeline, to transfer or convey discharge water from storage devices to the treatment plant.

The factors that will be taken into account for designing the components of this response action are discharge location, flow rate, and the time of year that response is required. If the new discharge occurs in a remote location during the summer, it may be readily accessible for implementation of water containment and collection measures even if a new roadway is needed to provide access to that location. In addition, construction of water containment or collection structures could proceed relatively quickly during warm weather.

Logistical difficulties associated with the cold weather might make it impossible to implement response measures at the discharge location until the spring melt occurs. In the event that immediate response action is necessary despite adverse winter weather conditions, containment of discharge water may have to be restricted to the point of discharge in an adjacent stream that is accessible. The containment would then be moved to the source of the discharge when weather conditions permit.

- Preparation of a Draft Additional Investigation Work Plan under Task C of the CP. The purpose of the additional investigation will be to determine the cause of the discharge, whether it is permanent or ephemeral, and to evaluate whether long-term actions are necessary and should be taken to eliminate the occurrence of the discharge or to design a permanent control/treatment system for its discharge.

- EPA and the State will review and comment on the Draft Additional Investigation Work Plan.

- Preparation of a Final Additional Investigation Work Plan incorporating EPA and the State's comments and submittal to the EPA and the State for approval.

- Upon approval of the Final Additional Investigation Work Plan, the additional investigation will proceed according to the schedule presented in the Final Additional Investigation Work Plan.

- Evaluation of the likely causes for the occurrence of the discharge and develop recommendations for additional action, if necessary, upon completion of the Final Additional Investigation Work Plan.

- The EPA will evaluate these recommendations and decide on the appropriate action. If additional action is required, a Response Action Plan (RAP) (see Section 3.1.2)

describing the action to be taken and defining the schedule for its implementation will be prepared.

- When the EPA has determined that the response action for the discharge has been completed, appropriate changes will be made to the RMP and Work Plan to incorporate additional monitoring or O&M specifications required by the action.

- Upon EPA approval of these revisions, the current response action will be closed out and routine monitoring will resume.

3.2 Task E: Develop, Select, Implement, Evaluate, and Report on Non-Immediate Response Actions

In Task E of the CP, response action alternatives will be developed, selected, or modified to mitigate specific conditions that may be the cause of gradient reversal or adverse water conditions resulting from a change in the Yak Tunnel Hydrologic System, as presented in Table 1. In order to select the most appropriate response action, it may be necessary to evaluate all changes that have affected the Yak Tunnel Hydrologic System since the adverse impacts were noticed.

The work performed under Task E consists of two types of activities: (1) development or modification of response actions to address conditions that do not require an immediate response action; and (2) evaluation and reporting of the outcome of response actions that have been completed.

3.2.1 Development of Response Actions for Non-Immediate Situations

In Section 2.2.7 of this document, circumstances that may require some form of non-immediate response action were presented with reference to the conditions listed in Table 1. When conditions that do not require immediate action are encountered, or when immediate situations have been mitigated, additional investigations may be needed to clarify or supplement existing monitoring data. After these have been conducted and the results from the investigations confirm that response is required, a RAP will be prepared to develop, select, and implement the appropriate response action.

Development of an Additional Investigation Work Plan

In general, an Additional Investigation Work Plan will be prepared under Task C of the contingency planning process if: (1) additional monitoring data are required to better understand the behavior of the Yak Tunnel Hydrologic System; (2) more information is needed to better define or identify the cause of one of the Table 1 conditions; or (3) additional engineering data are needed to support the development and design of a response action. The additional investigation will be developed, selected, implemented, evaluated and reported through Task C of the CP (Section 2.2.4). The contents of a typical Additional Investigation Work Plan are summarized in Section 2.2.4. The work plan for each additional investigation will be developed to meet the specific objectives of that particular investigation.

Development of a Response Action Plan

Once the nature of the situation to be corrected is understood, a RAP will be developed to select, design and implement a suitable remedy. The RAP will present all pertinent information necessary for development and implementation of the selected remedy. Supporting documents such as the RMP or Work Plan for OU1 may have to be modified or amended to ensure that the RAP can be successfully implemented.

The RAP will contain a concise summary of the relevant background data; the nature of the problem to be resolved; a summary of risk considerations or results from a risk assessment (if one has been performed); a discussion of alternative approaches that can be applied; selection and justification of the selected response action; design and cost of the selected remedy; and a schedule for implementation of the response action. The RAP will also define the criteria that will be used to determine whether the response action is successful. In more complex cases, a separate set of design plans may be required to describe the components of the selected remedy.

The Draft RAP will be prepared and submitted to EPA and the State for review and comment in compliance with the schedule proposed in the RAP or one specified by the EPA. EPA and the State will review and comment, and a Final RAP that incorporates Agency comments on the Draft RAP will be prepared for EPA and the State's approval.

Implementation and Schedule of Response Action

The Final RAP will be implemented as soon as Agency approval has been obtained. Work will proceed according to the approved schedule and progress reports will be prepared as specified in the RAP.

After the remedy has been completed, its effectiveness and performance will be evaluated according to testing measures and criteria specified in the RAP. The results of this evaluation will serve as the primary basis for the determination of whether or not additional response is required in Decision 5 (Section 3.2).

3.2.2 Discussion of Potential Long-Term Response Actions

As described in Section 1.1, pumping of Yak Tunnel blockage water from the Black Cloud Shaft constitutes current conditions for maintaining water levels behind the blockage. In the event a future condition precludes the ability to maintain blockage water levels as defined in the Work Plan by pumping from the Black Cloud Shaft or a future blockage occurs that impedes the gravity flow of water in the Yak Tunnel, evaluation and implementation of future response actions may be required. The response action would be dependent on site-specific conditions (e.g. location of blockage). Examples of response actions that would be evaluated include:

- Pumping of blockage water from another accessible shaft (e.g, Irene Shaft) and conveying the pumped water to the treatment plant. Activities required to begin pumping from the Irene Shaft, or other accessible shaft, include development of electrical infrastructure, installation of new pump or relocation of the existing pump from the Black Cloud, and pipeline installation to convey pumped water to the Yak Tunnel Treatment Plant. The time required to complete these activities and begin pumping is estimated to be less than six months.

- Installation of well(s) behind the blockage and pumping of water from the wells to the treatment plant.

- Construction of a horizontal drain at a suitable location to allow gravity drainage of Yak Tunnel water from behind the blockage to the treatment plant.

- Engineered improvement of the blockage by subsurface grouting through borings or other techniques.

- Installation of a plug(s) or an additional bulkhead.

3.3 Decision 5: Is Additional Response Required?

Decision 5 evaluates whether a response action selected under either Task E or D is effective and whether additional response is required. If it is found that no additional response is needed based on performance standards established for the action in either Task E or D (Answer to Decision 5 is NO), then the contingency planning process will return to the RMM. Performance standards developed under either Task E or D will be considered part of the OU1 Work Plan. If the response action is ineffective and additional response is required (Answer to Decision 5 is YES), the response will be reviewed and additional response actions will be developed, selected, and implemented as necessary. This process will continue until the results are satisfactory. Routine monitoring of unaffected portions of the Yak Tunnel Hydrologic System will continue while response actions are being implemented. Decision 5 is considered to be an iterative step that recycles through Task E until a given set of undesirable conditions is remediated. The contingency planning program returns to routine monitoring at Decision 6 following satisfactory completion of one or more response actions.

3.4 Reporting Requirements

Reports will be submitted to the EPA and State, as prescribed in Section 6.0 of the RMP. Section 6.0 of the RMP outlines the contents and frequency of reports that will be submitted to the agencies as documentation of routine monitoring.

The results of all decisions made during the contingency planning process will be reported to EPA and the State in writing. If the response to these decisions is NO, this fact will be reported to the EPA and the State in the monthly reports that accompany the tri-annual data transmittals and the Annual RMP Summary Report. If the response to Decisions 1, 2 or 3 is YES, the EPA and the State will be notified in writing within ten working days after the decision is made. The evaluation of Decision 4A & B, 5, and 6 will be done in cooperation with the EPA and the State. The results of Decisions 4A & B, 5, and 6 will be recorded in correspondence between the operator, EPA and the State. If EPA disagrees with a decision by the operator, EPA, in consultation with the State, will make the final decision subject to Dispute Resolution as provided in the Consent Decree.

4.0 REFERENCES

Asarco, 2002. "California Gulch Superfund Site – Yak Tunnel Operable Unit, Notification Pursuant to the Contingency Plan." Letter from Robert A. Litle, Manager Environmental Manager, to Stan Christensen, EPA Remedial Project Manager and Russ Allen, CDPHE. December 19

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McCulley, Frick & Gilman, Inc. (MFG), 1999. *Contingency Plan, Yak Tunnel Operable Unit, California Gulch Site, Leadville, Colorado.* August.

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MFG, Inc. (MFG), 2008a. *DRAFT Routine Monitoring Plan 2008, Yak Tunnel Operable Unit, California Gulch CERCLA Site, Leadville, Colorado.* February.

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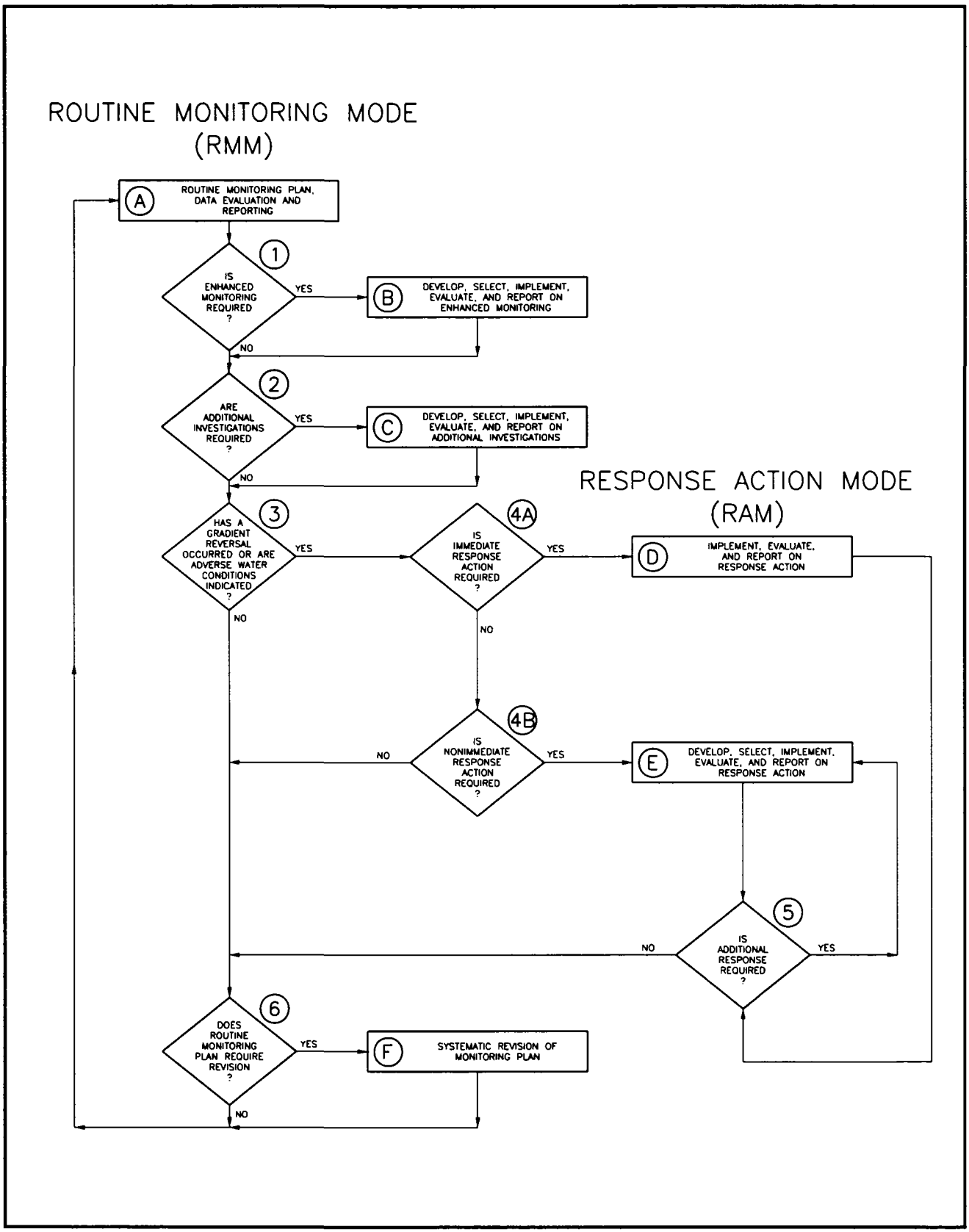
Table 1 **Conditions That Constitute Gradient Reversal and Adverse Water Conditions-Yak Tunnel Operable Unit**

Gradient Reversal Condition	
1.*	**A change in the direction of the hydraulic gradient between piezometers, or between piezometers and wells monitored pursuant to the RMP**
Adverse Water Conditions	
	Sudden change in head behind the Yak Tunnel Bulkhead, water levels behind the Blockage that exceed the performance standards defined in the Work Plan, or exceedence of 10,684' AMSL, where such conditions are unrelated to the operation of the water treatment plant or conveyance system.
3.	**A substantial rise in water levels in piezometers BBW-5 or BBW-8 as discussed in Section 2.3.3.2 of the RMP.**
4.	**The water from the Yak Tunnel during the non-peak season that significantly deviates from the historic range of pH and specific conductance.**
5.*	**The occurrence of a new seep/spring that is discharging to a stream or surface water body and is hydrogeologically connected to the Yak Tunnel where such seep/spring water exceeds the Yak Tunnel Treatment Plant effluent limitations defined in the Work Plan.**
6.	**An unexpected change or lack of change in water levels in piezometers BBW-5, BBW-10, or the Irene Shaft water level that is inconsistent with the Yak Tunnel blockage water level.**
7.	**A significant change in water quality at one or more of the monitoring points identified in the RMP where such change is not known to be caused by natural conditions or events.**
8.*	**Catastrophic plugging of the bulkhead intakes or pipes in which repeated O&M clearing procedures fail to restore flow.**
9.*	**Presence of Yak Tunnel water in the vicinity of a public water supply source or discharge of untreated Yak Tunnel water to a surface water body or stream, except where discharge is authorized by the EPA in consultation with the State.**

* The occurrence of Condition 5, Condition 8, or Conditions 1 and 9 (concurrently) will result in an immediate response action.



MFG, Inc. *consulting scientists and engineers*	FIGURE 1 CONTINGENCY PLAN FLOW CHART	Date: MAY 2008 Project: 180885/37 File: Figure-01.dwg

Glossary

Unless otherwise defined below, terms used in this Contingency Plan shall have the meaning assigned to them in the Work Plan.

ADVERSE WATER CONDITIONS. Conditions described in Table 1 of the CP.

BLOCKAGE. An obstruction to groundwater movement in the subsurface due to rockfalls collapse, sedimentation, or plugging of a conduit for water such as a tunnel, drift, stope, winze, or fault. A localized blockage may cause flow in one pathway to be restricted and water to back up until another flow path is encountered.

CONTINGENCY PLAN. The plan that describes options or contingencies that will be undertaken in the event that a predetermined set of undesirable hydrologic conditions occurs. The Contingency Plan for the Yak Tunnel Operable Unit describes the undesirable conditions that will be monitored, the type of monitoring program that is required to detect their occurrence, and the actions that will be taken to control or mitigate these conditions.

HYDRAULIC GRADIENT REVERSAL. A change in groundwater elevations that causes the direction of the hydraulic gradient to reverse away from the Yak Tunnel.

PARAMETER. A monitored attribute of the Yak Tunnel Hydrologic System.

MONITORING POINT. The location at which an indicator or parameter is monitored, such as the location of a given piezometer or seep.

MONITORING WELL. A well designed specifically for the collection of groundwater quality samples. Groundwater elevation measurements can also be made at monitoring wells.

PIEZOMETER. A well designed specifically for measurement of groundwater elevations at a given location and depth. Piezometers are not intended for groundwater quality sampling.

RESPONSE ACTION. An action that can be taken to mitigate or control an undesirable hydrologic condition such as a gradient reversal away from the Yak Tunnel or the occurrence of a new seep or spring that discharges low quality water into a surface water body. Response actions will be selected from a range of potentially applicable actions and will be developed or modified to meet site-specific conditions and response goals. The effectiveness of a given response action will be evaluated using criteria developed specifically for each action.

ROUTINE MONITORING. The Routine Monitoring Mode of Operation of the Contingency Plan during which the Routine Monitoring Plan is implemented.

ROUTINE MONITORING PLAN. The plan that describes the objectives, monitoring points, indicators, indicator thresholds, sampling and laboratory methods, quality assurance procedures,

data evaluation methods, and reporting requirements that will be implemented during the baseline and routine monitoring programs.

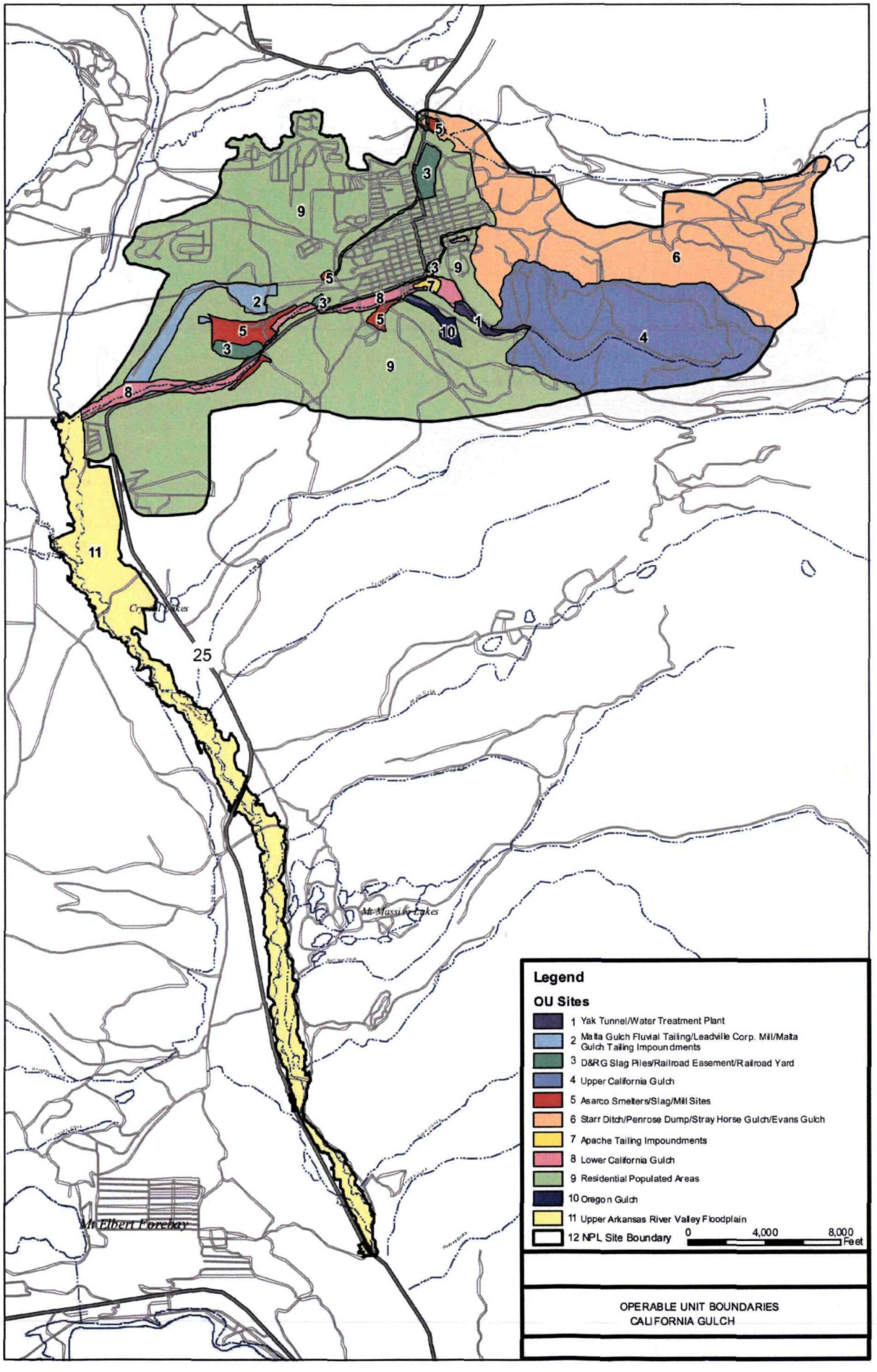
YAK TUNNEL HYDROLOGIC SYSTEM. The subsurface flow system that consists of the entire length of the Yak Tunnel and groundwater which flows to or from the Yak Tunnel.

APPENDIX B
To Consent Decree

OU4, commonly known as Upper California Gulch, shall mean the area hydrologically drained by California Gulch from immediately upstream of the Yak Portal to the headwaters of the gulch. The area covers approximately 2.4 square miles and contains mine waste piles, mill tailing and fluvial tailing material.

OU8, commonly known as Lower California Gulch, shall mean the 500-year floodplain of California Gulch from immediately below the boundary of OU1 to the point of the confluence of California Gulch with the Arkansas River, including the Colorado Zinc Lead Tailing Impoundment. The point of confluence is defined as the location where the western boundary of OU8 meets the eastern boundary of the 500-year floodplain of the Arkansas River, including the former Colorado Zinc Lead Tailing as defined in the Draft Tailing Impoundment Remedial Investigation Report, February 1992, Chapter 6, as previously located in California Gulch, north of U.S. Highway 24, approximately one mile southwest of Leadville, and directly northwest of the Stringtown area. OU8 shall not include tributaries to California Gulch, the Apache tailing impoundments (OU7), the Colorado Zinc Lead mill facility, the Denver and Rio Grande Western Railroad slag piles and railroad easements, and smelter sites.

OU10, commonly known as Oregon Gulch, shall mean the 500-year floodplain of Oregon Gulch from its headwaters to its confluence with Lower California Gulch. OU10 includes the Oregon Gulch Tailing Impoundment and former miscellaneous tailing and contaminated sediment previously located within the 500-year floodplain of Oregon Gulch.


Legend
OU Sites
1 Yak Tunnel/Water Treatment Plant
2 Malta Gulch Fluvial Tailing/Leadville Corp. Mil/Malta Gulch Tailing Impoundments
3 D&RG Slag Piles/Railroad Easement/Railroad Yard
4 Upper California Gulch
5 Asarco Smelters/Slag/Mill Sites
6 Starr Ditch/Penrose Dump/Stray Horse Gulch/Evans Gulch
7 Apache Tailing Impoundments
8 Lower California Gulch
9 Residential Populated Areas
10 Oregon Gulch
11 Upper Arkansas River Valley Floodplain
12 NPL Site Boundary
0
4,000
8,000
Feet
25
Mt Elbert Forebay
Mt Massive Lakes
OPERABLE UNIT BOUNDARIES
CALIFORNIA GULCH

APPENDIX D
TO CONSENT DECREE

OU4, OU8, and OU10
Operations and Maintenance Plan
California Gulch Superfund Site
May 2008

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 DESCRIPTION OF REMEDIAL WORK AND CONTROLS 2

2.1 Operable Unit 4 2

2.1.1 Reconstructed Stream Channel 4 (RSC-4) 3

2.1.2 AY-Minnie 3

2.1.3 North Mike 4

2.1.4 Colorado Number 2 4

2.1.5 Nugget Gulch 5

2.1.6 Printer Girl 6

2.1.7 Agwalt 7

2.1.8 Garibaldi 7

2.1.9 Mab 9

2.2 Operable Unit 8 9

2.2.1 FTS-6 9

2.2.2 FTS-3 10

2.2.3 California Gulch Near Ski Club 10

2.2.4 FTS-1 11

2.2.5 FTS-2 11

2.2.6 California Gulch Near Airport Gulch 11

2.2.7 FTS-8 12

2.2.8 Non-Residential Soils 12

2.3 Operable Unit 10 13

2.3.1 Tailing Impoundment 13

2.3.2 Diversion Ditches and Channels 13

2.3.3 Seep Collection System 15

2.3.4 Reconstructed Channel 16

2.3.5 Access Road Gates 17

3.0 INSPECTION AND MAINTENANCE AND PERFORMANCE STANDARDS 18

4.0 REPORTING AND DOCUMENTATION 22

5.0 REFERENCES 23

APPENDICES

Appendix A Inspection Forms

Appendix B Location Figures

Figure 1	Site Location Map, OU4
Figure 2	Reconstructed Stream Channel 4 (1/4), OU4
Figure 3	Reconstructed Stream Channel 4 (2/4), OU4
Figure 4	Reconstructed Stream Channel 4 (3/4), OU4
Figure 5	Reconstructed Stream Channel 4 (4/4), OU4
Figure 6	AY-Minnie (UCG-81), OU4
Figure 7	Nugget Gulch North Mike (UCG-85), OU4
Figure 8	Nugget Gulch Colorado Number 2 (UCG-71), OU4
Figure 9	Printer Girl (UCG-92A), OU4
Figure 10	Agwalt (104), OU4
Figure 11	Garibaldi Sub-Basin (UCG-109A), OU4
Figure 12	Garibaldi (121), OU4
Figure 13	Mab-Iron Hill (UCG12)
Figure 14	Site Location Map, OU8
Figure 15	Site Location Map, OU10
Figure 16	Oregon Gulch Tailing Impoundment and Seep Collection System, OU10
Figure 17	Interceptor Trench – OU10

1.0 INTRODUCTION

This plan describes the procedures for performance of operations and maintenance (O&M) within Operable Units 4, 8 and 10 of the California Gulch Superfund Site. The purpose of this plan is to ensure that the completed remedial action work and controls continue to function as constructed. Activities to be performed as part of the O&M process are described in the following sections. Section 2.0 discusses the specific items to be inspected in Operable Units (OU) 4, 8, and 10; Section 3.0 discusses the inspection and maintenance and performance standards; and Section 4.0 discusses the inspection and maintenance reporting.

2.0 DESCRIPTION OF REMEDIAL WORK AND CONTROLS

The following subsections describe the remedial work, controls, and their intended purposes in OU4, OU8 and OU10. The controls in OU4, OU8, and OU10 generally consist of surface water structures consisting of diversion channels, reconstructed channels, channel bank riprap, flow/sediment check structures, revegetation, and regraded and covered waste rock and tailing materials. The as-built details of the controls are presented in the following:

- Completion Report for Upper California Gulch Operable Unit 4 (MWH and MFG, 2003),
- Completion Report for Lower California Gulch Operable Unit 8 (MWH and MFG, 2003), and
- Final RA Completion Report for Oregon Gulch Operable Unit 10 (SMI and TerraMatrix, 1999).

Diversion channels and reconstructed channels outside of California Gulch are designed to convey either the 100-year, 24-hour or 100-year, 2-hour precipitation event (whichever is larger) and reconstructed channels in California Gulch are designed to convey either the 500-year, 24-hour or 500 year, 2-hour precipitation event (whichever is larger). The OU10 seep collection system is designed to capture and either drain or pump toe seepage or shallow alluvial groundwater present at the toe of the Oregon Gulch tailing facility to the Oregon Gulch pumphouse for transfer and treatment at the Yak water treatment plant.

2.1 Operable Unit 4

Operable Unit 4 is commonly referred to as "Upper California Gulch" and is shown on Figure 1. Operable Unit 4 is defined as the area hydrologically drained by California Gulch from the headwaters of the gulch to immediately upstream of the Yak Tunnel Portal. The operable unit has been subdivided into six areas consisting of:

1) Garibaldi sub-basin,
2) Whites Gulch sub-basin,
3) Nugget Gulch sub-basin,
4) AY-Minnie,
5) Iron Hill, and
6) Fluvial Tailing Site 4 (Reconstructed Stream Channel 4) and South area.

Remedial work within this operable unit consisted of diversion channels, reconstruction of existing channels, revegetation, and stabilization of channels and waste rock piles. .

2.1.1 Reconstructed Stream Channel 4 (RSC-4)

As shown on Figures 2 through 5, reconstructed stream channel #4 consists of approximately 1.5 miles along California Gulch from approximately the Yak Tunnel Portal to the upstream end of the Printer Girl mine site (Fluvial Tailing Site 4 and South Area sub-basin). This channel is composed of a concrete channel, channel bank riprap, channel margin revegetation and riprap check structures. The purposes of these controls include: (1) to reduce erosion or remobilization of tailing materials, (2) reduce potential metal leaching from fluvial tailing materials, (3) maintain channel conveyance capacity through engineered remedies , and (4) maintain channel integrity by promoting non-erosive flow.

The concrete channel segments were designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. Channel depths generally range from 3.4 to 5.3 feet in the upper section and from 2.9 to 5.5 feet in the lower section. Channel bank riprap was designed and constructed to provide bank stabilization. Particular channel margin segments were revegetated to stabilize soils, sediments or tailing materials within the channel margins through the emergence and establishment of vegetative cover. Riprap check structures were designed and constructed to reduce sediment loading within the channel and to promote non-erosive channel flow.

2.1.2 AY-Minnie

The AY-Minnie waste rock pile (UGC-81) is located where California Gulch and Nugget Gulch intersect on the lower hillside of the south facing slope (AY-Minnie sub-basin) and is shown on Figure 6. The controls at this site consist of concrete/riprap channel AYC-1, AYC-1/Nugget Gulch riprap check structures (gabion baskets), concrete channel AYC-2, AYC-2 culvert, and AYC-2/California Gulch stilling basin. The purpose(s) of these controls include: (1) to divert water around the AY-Minnie waste rock pile, (2) reduce erosion or remobilization of waste rock materials, (3) reduce potential metal leaching from waste rock materials, (4) maintain channel conveyance capacity through sediment load reduction controls, and (5) maintain channel integrity by promoting non-erosive flow.

Diversion channel AYC-1 was designed and constructed to convey the peak flow from the 100-year, 24-hour storm event and diversion channel AYC-2 was designed and constructed to convey the peak flow from the 100-year, 2-hour storm event. Channel AYC-1 consists of approximately 1192 feet of concrete lined channel and 428 feet of riprap lined channel. Channel AYC-2 is a concrete lined channel that is approximately 583 feet long.

Channel AYC-1 has a depth of approximately 0.9 feet in the concrete lined section and 1.0 to 1.3 feet in the riprap lined section. The base width of the concrete lined portion of AYC-1 generally ranges from 1.0 to 1.1 feet and the side slopes of the concrete portion of the channel range from approximately 0.8:1 to 1.1:1 and slopes on the riprap portion range from 1.4:1 to 2.7:1.

Channel AYC-2 ranges in depth from approximately 0.8 to 1.8 feet. The base of AYC-2 varies in width from approximately 0.9 feet in the upstream portion to 1.1 feet in the down stream section. Side slopes of this channel range from approximately 0.8:1 to 0.9:1.

Riprap check structures and the stilling basin were designed and constructed to reduce sediment loading within the channel and to promote non-erosive channel flow. The AYC-2 culvert was designed to convey flow under County Road 2 to California Gulch and prevent damage to the road.

2.1.3 North Mike

The North Mike waste rock pile (UCG-85) is located in the Nugget Gulch sub-basin on the hill slope east of the North Moyer and Moyer mine areas. The North Mike is shown on Figure 7. This waste rock pile was removed and placed on the Colorado Number 2 waste rock pile. The controls at this site consist of revegetation of the area where the waste rock pile was removed and a buttress wall which was designed and constructed to stabilize the toe of the slope. The purpose of these controls is to prevent erosion and stabilize the hillside.

2.1.4 Colorado Number 2

The Colorado Number 2 waste rock pile (UCG-71) is located in the Nugget Gulch sub-basin, just below the topographic divide that separates Nugget Gulch and Stray Horse Gulch. As shown on Figure 8, the controls at this site consist of regrading and covering the waste rock pile, establishing revegetation along the toe of the waste rock pile and providing riprap Channel NGC-

3. The purposes of these controls include: (1) to divert water around the Colorado Number 2 waste rock pile, (2) reduce erosion or remobilization of waste rock materials, (3) reduce potential metal leaching from waste rock materials, (4) promote positive drainage from the waste rock pile, and (5) stabilize the toe of the waste rock pile.

Diversion channel NGC-3 was designed and constructed to convey the peak flow from the 100-year, 24-hour and 100-year, 2-hour storm events. Channel NGC-3 consists of subchannels NGC-3A which is approximately 201 feet long, NGC-3B which runs for approximately 254 feet, and NGC-3C which is approximately 140 feet long. Both sub-channels NGC-3A and -3B are riprap lined and NGC-3C is erosion control block lined.

Channel NGC-3A ranges in depth from approximately 0.4 feet on the upstream side to 0.6 feet on the downstream portion with side slopes of the channel ranging from approximately 3.7:1 to 11.7:1. Channel NGC-3B ranges in depth from approximately 0.5 feet on the upstream side to 0.7 feet on the downstream portion with side slopes of the channel ranging from approximately 3.5:1 to 7.8:1. Channel NGC-3 has a depth of approximately 0.7 feet over it length. The base of NGC-3 ranges from approximately 1.1 feet on the upstream side to 1.7 feet on the downstream portion with side slopes of the channel ranging from approximately 2.0:1 to 2.6:1

2.1.5 Nugget Gulch

Nugget Gulch is the primary channel for the watershed that contains the Colorado #2 and North Mike waste rock piles. The controls at this location, shown on Figure 7, consist of block Channel NGC-5 and margin/bank, Channel NGC-5 culverts, concrete Channel NGC-1, and NGC-1 culvert. The purposes of these controls include: (1) reduce erosion or remobilization of sediments, (2) maintain channel integrity by promoting non-erosive flow, (3) maintain integrity of the North Mike buttress wall, and (4) prevent erosion/damage to roadways through the use of culverts.

Channels NGC-1 and NGC-5 were designed and constructed to convey the peak flow from the 100-year, 2-hour storm event. Concrete lined Channel NGC-1 is approximately 618 feet long, and block lined channel NGC-5 runs for approximately 171 feet. Channel NGC-1 has an approximate channel depth that ranges from 1.3 to 1.4 feet, a base that ranges from approximately 1.0 to 1.4 feet wide, and side slopes that range from 1.1:1 to 1.4:1. Channel

NGC-5 has an approximate channel depth that ranges from 1.6 to 1.8 feet, a base that is approximately 1.2 feet wide, and side slopes that range from 1.3:1 to 2.0:1.

Channel NGC-1 was designed to convey flow past the toe of the North Mike and prevent erosion of the buttress wall and slope toe. The culvert at the end of NGC-1 and the culvert near the center of NGC-5 was designed and constructed to convey flow under and prevent damage to dirt roads within the area.

2.1.6 Printer Girl

As shown on Figure 9, the Printer Girl waste rock pile (UCG-92A) is located in the lower reach of the Whites Gulch sub-basin, approximately 700 feet upstream of County Road #2. The controls at this location consist of Channel RSC-5, rock gabion drop structures, Channel PGC-1, Channel PGC-1 culvert, Channel PGC-2, and Channel PGC-2 culvert. The purposes of these controls include: (1) to divert water around and off of the Printer Girl waste rock pile, (2) reduce erosion or remobilization of waste rock materials, (3) reduce potential metal leaching from waste rock materials, (4) maintain channel conveyance capacity through sediment load reduction controls, and (5) maintain channel integrity by promoting non-erosive flow.

Diversion channels PGC-1 and -2 were designed and constructed to convey the peak flow from the 100-year, 24-and 100-year, 2-hour storm events. The PGC-1 and -2 culverts were constructed to convey flow under and prevent damage to the dirt road.

Channel PGC-1 consists of approximately 227 feet of concrete lined channel. Channel PGC-1 ranges in depth from approximately 0.7 feet on the upstream side to 1.6 feet on the downstream portion. The base of PGC-1 is approximately 1.1 feet wide and the side slopes of the channel range from approximately 0.4:1 to 1.1:1.

Channel PGC-2 is a riprap lined channel that is approximately 230 feet long, the upper portion of this channel has a geosynthetic clay liner (GCL) under the riprap. Channel PGC-2 ranges in depth from approximately 1.4 feet on the upstream side to 1.2 feet on the downstream portion. The base of PGC-2 ranges from approximately 3.4 feet wide on the upstream portion to 2.0 feet wide on the downstream section. The side slopes of the channel range from approximately 0.9:1 to 1.6:1.

Rock gabion check structures were designed and constructed in the riprap lined channel RSC-5 to reduce sediment loading within the channel and to promote non-erosive channel flow. Channel RSC-5 varies in depth from approximately 0.8 to 1.9 feet over the reconstructed length. The base of RSC-5 ranges from approximately 5.4 feet wide on the upstream portion to 12.1 feet wide on the downstream section. The side slopes of the channel range from approximately 1.3:1 to 2.8:1.

2.1.7 Agwalt

The Agwalt waste rock pile (UCG-104) is shown on Figure 10 and is located in the upper reach of the Whites Gulch sub-basin. The controls at this location consist of concrete Channel A, concrete Channel B, and the portal collection pipe outlet. The purpose(s) of these controls include: (1) to divert water around and off of the Agwalt waste rock pile, (2) reduce erosion or remobilization of waste rock materials, (3) reduce potential metal leaching from waste rock materials, and (4) minimize channel discharge erosion by promoting non-erosive flow.

Diversion channels A and B were designed and constructed to convey the peak flow from the 100-year, 24-hour storm events. Both of these channels are concrete lined and have energy dissipating concrete aprons at the channel outlet. Channel A is approximately 330 feet long and Channel B extends for approximately 359 feet. Channel A has a depth of approximately 1.1 feet and Channel B has depths that range from approximately 0.7 to 0.9 feet. The base of both ditches is approximately 1-foot wide and the sides of the ditches are at 1:1 slopes. The portal collection system consists of a 20 foot long, 6-inch HDPE pipe, located in the portal, which conveys flows into a concrete sump; an 8-inch HDPE pipe which is approximately 290 feet long, is connected to the sump and conveys portal water downstream of the waste rock pile.

2.1.8 Garibaldi

The Garibaldi sub-basin (UGC-109A) and Garibaldi (UCG-121) are located in the upper reach of California Gulch and are shown on figures 11 and 12, respectively. The Garibaldi sub-basin (UGC-109A) controls consist of concrete Channel GWC-1, concrete Channel GWC-2, culvert 1, and Channel RSC-1. The purposes of these controls include: (1) to divert water around the Garibaldi sub-basin waste rock pile, (2) reduce erosion or remobilization of waste rock materials, (3) reduce potential metal leaching from waste rock materials, (4) maintain channel conveyance

capacity through sediment load reduction controls, and (5) maintain channel integrity by promoting non-erosive flow.

For the Garibaldi sub-basin, diversion channel GWC-1 was designed to convey the peak flow from the 100-year, 24-hour storm event and diversion channel GWC-2 was design to convey the peak flow from the 100-year, 2-hour storm event. Both channels GWC-1 and -2 are concrete lined. Channel GWC-1 is approximately 533 feet long, has channel depths that range from approximately 0.8 to 0.9 feet, a base that is approximately 1 foot wide, and side slopes that range from 1:1 to 1.3:1. Channel GWC-2 is approximately 402 feet in length, has an approximate channel depth of 1.2 feet, a base that is approximately 1 foot wide, and side slopes that range from 0.9:1 to 1.3:1. The culvert at the end of GWC-1 and -2 was designed to convey flow under and prevent damage to the dirt road. Rock gabion check structures at RSC-1 were designed and constructed to reduce sediment loading within the channel and to promote non-erosive channel flow.

The Garibaldi (UGC-121) controls consist of vegetated Ditch 1, concrete Ditch 2, concrete Ditch 3, concrete Ditch 4, and portal collection pipe outlet. The purposes of these controls include: (1) to divert water around and off the Garibaldi waste rock pile, (2) reduce erosion or remobilization of waste rock materials, and (3) reduce potential metal leaching from waste rock materials.

The Garibaldi diversion Ditches 2, 3, and 4 were designed and constructed to convey the peak flow from the 100-year, 24-hour storm event. Vegetated Ditch 1 is a preexisting diversion ditch and is located on the southeast side of the Garibaldi waste rock pile. Ditches 2, 3, and 4 are concrete lined. Ditch 2 is approximately 190 feet long and has an approximate depth of 1 foot. Ditches 3 and 4 are each approximately 720 feet in length. Ditch 3 ranges in depth from approximately 1.3 feet on the upstream side to 2.3 feet on the downstream portion. Ditch 4 ranges in depth from approximately 2.4 to 2.6 feet over its length. The base of all three ditches is approximately 1 foot wide and the sides of the ditches are at 1:1 slopes. The portal collection system consists of a 20 foot long, 6-inch HDPE pipe, located in the portal, which conveys flows into a concrete sump; a 6-inch HDPE pipe, which is approximately 160 feet long, is connected to the sump and conveys portal water into Ditch 4.

2.1.9 Mab

The Mab (UCG-12) is located in the upper reach of the Iron Hill sub-basin drainage, on the Northeast slope of Carbonate Hill and is shown on Figure 13. The controls at this site consist of a waste rock pile regrading, covering, and toe revegetation. The purposes of these controls include: (1) reduce erosion or remobilization of waste rock materials, (2) reduce potential metal leaching from waste rock materials, (3) promote positive drainage from the waste rock pile, and (4) stabilize the toe of the waste rock pile.

2.2 Operable Unit 8

Operable Unit 8 is commonly referred to as "Lower California Gulch" and is shown on Figure 14. Operable Unit 8 is defined as the 500-year floodplain of California Gulch from immediately below the Yak Tunnel Water Treatment Plant to the point of the confluence of the California Gulch with the Arkansas River, including the Colorado Zinc-Lead Tailing (USEPA, 2000). Remedial work within this operable unit consisted of reconstruction and stabilization of selected reaches of California Gulch, reinforcement of stream banks, removal of the CZL tailings, removal of stream sediment and fluvial tailing, and revegetation.

2.2.1 FTS-6

Fluvial Tailing Site #6 consisted of reconstructing the historic California Gulch Channel and abandoning the elevated channel between the OU1 channel on the upper end and the Apache Tailing Impoundment channel on the lower end. The controls at this site consist of the reconstructed California Gulch channel, erosion resistant vegetated overbanks, and channel transitions from OU1 and Apache Tailing Impoundment. The purpose(s) of these controls include: (1) to reduce erosion or remobilization of tailing/waste rock materials, (2) reduce potential metal leaching from tailing/waste rock materials, and (3) maintain channel integrity by promoting non-erosive flow.

Reconstructed channel FTS-6 was designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. The FTS-6 channel is rock mattress lined. Selected channel margin segments were regraded and revegetated to stabilize soils, sediments, waste rock or

tailing materials within the channel margins through the emergence and establishment of vegetative cover.

2.2.2 FTS-3

Fluvial Tailing Site #3 consisted of reconstructing a portion of California Gulch Channel that extends from the downstream side of the County Road 6 intersection with California Gulch to approximately 1000 feet upstream of where Georgia Gulch enters the California Gulch channel. The controls at this site consist of the reconstructed California Gulch channel, placement of channel bank riprap at three areas, and revegetation. The purpose(s) of these controls include: (1) to reduce erosion or remobilization of sediments and tailing material, (2) maintain channel conveyance capacity through sediment load reduction controls, and (3) maintain channel integrity by promoting non-erosive flow.

Reconstructed channel FTS-3 was rock mattress lined and designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. Selected channel margin segments were revegetated to stabilize soils, sediments, or tailing materials within the channel margins through the emergence and establishment of vegetative cover. Three sections were reinforced with riprap which was sized to be stable under the 500-year, 24-hour storm event. Riprap was placed over a non-woven geotextile at or above the 500-year storm event water elevation

2.2.3 California Gulch Near Ski Club

This reinforced stream bank section of California Gulch extends from downgradient of the Ski Club to where California Gulch crosses under Highway 24. This section of California Gulch had historic breaches of a berm on the north side of the channel. Remedial work at this site included widening the stream channel, regrading the existing berm, and placing filter fabric and riprap on the regraded embankment. The purpose of these controls include: (1) to reduce erosion or mobilization of sediments and (2) maintain channel conveyance capacity through sediment load reduction.

The widened portions of the channel in the reinforced sections were designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. Riprap used in the reinforced

sections was placed over a non-woven geotextile and was sized to be stable under the 500-year, 24-hour storm event.

2.2.4 FTS-1

Fluvial Tailing Site #1 consists of tailing and alluvial/tailing adjacent to California Gulch. Work at this site consisted of regrading the existing tailing, reinforcing the stream side of the tailing, and revegetation of the top of the regraded tailing. The purposes of these controls include: (1) to reduce erosion or remobilization of sediments and tailing material, and (2) maintain channel conveyance capacity through sediment load reduction controls.

Riprap used to reinforce and stabilize the tailing was sized to be stable under the 500-year, 24-hour storm event. Riprap was placed over a non-woven geotextile at or above the 500-year storm event water elevation.

2.2.5 FTS-2

Fluvial Tailing Site #2 consists of tailing and alluvial/tailing adjacent to California Gulch. Work at this site consisted of regrading the north bank, stabilizing the stream bed through the construction of berms, reinforcing the stream banks adjacent to OU5 and the CZL tailing area, and revegetation. The purposes of these controls include: (1) to reduce erosion or remobilization of sediments and tailing material, and (2) maintain channel conveyance capacity through sediment load reduction controls.

Riprap used to reinforce and stabilize the tailing was sized to be stable under the 500-year, 24-hour storm event. Riprap was placed over a non-woven geotextile at or above the 500-year storm event water elevation.

2.2.6 California Gulch Near Airport Gulch

This reinforced stream bank section of California Gulch extends from the southeast side of the A-V Smelter Site to where California Gulch crosses under Highway 24. This section of California Gulch had historic breaches of a berm on the north side of the channel. Remedial work at this site included widening or removing sediment from the stream channel, regrading the existing berm, and reinforcing the regraded embankment. The purposes of these controls include:

(1) to reduce erosion or mobilization of sediments, and (2) maintain channel conveyance capacity through sediment load reduction.

The widened portions of the channel in the reinforced sections were designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. Riprap used in the reinforced sections was placed over a non-woven geotextile and was sized to be stable under the 500-year, 24-hour storm event.

2.2.7 FTS-8

This section of channel extends from where California Gulch crosses under Highway 24 to the confluence with the Arkansas River. Remedial work at this site included filling in and revegetation of tailing removal areas, removing sediment from the stream channel, regrading and reinforcing an existing berm, and the construction of new berms along unstable braided reaches. The purposes of these controls include: (1) to reduce erosion or remobilization of sediments and tailing, (2) reduce the potential for leaching metals from tailing, (3) maintain channel conveyance capacity through sediment load reduction, and (4) maintain channel integrity by promoting non-erosive flow.

The reinforced sections were designed and constructed to convey the peak flow from the 500-year, 24-hour storm event. Riprap used in the reinforced sections was placed over a non-woven geotextile and was sized to be stable under the 500-year, 24-hour storm event. Selected channel segments were revegetated to stabilize soils, sediments, or tailing materials within the channel margins through the emergence and establishment of vegetative cover.

2.2.8 Non-Residential Soils

Several non-residential soil areas which historically had poor or fair vegetation were defined along California Gulch. Remedial work on Non-Residential Soil Areas 1, 2, 3, 4, and 5 consisted of regrading the areas, applying soil amendments, and revegetating the areas. The purposes of these controls include reducing erosion, ponding, leaching and airborne transportation of soil particles.

2.3 Operable Unit 10

Operable Unit 10 is commonly referred to as "Oregon Gulch" and is shown on Figure 15. Operable Unit 10 is defined as the 500-year floodplain of Oregon Gulch from its headwaters to the confluence with California Gulch (USEPA, 1997). Remedial work within this operable unit consisted of removal of stream sediment and tailing from lower Oregon Gulch, reconstruction and stabilization of selected reaches of Oregon Gulch, reinforcement of stream banks, stabilization of the Oregon Gulch Tailing impoundment, construction of diversion channels, installation of a seep collection system, and revegetation.

2.3.1 Tailing Impoundment

Oregon Gulch Tailing impoundment is a tailing impoundment consisting of mill tailing from the Resurrection mill and material from cleanup of other sites located within the California Gulch CERCLA site. The Oregon Gulch Tailing impoundment is shown on Figure 16. The remedial work at this site consisted of regrading the top of the tailing impoundment, placing a cover over the impoundment, and revegetation of the cover. The purpose of these controls include: (1) reduce erosion or remobilization of tailing material, (2) reduce potential metal leaching from tailing materials, (3) promote positive drainage from the tailing impoundment, and (4) stabilize the toe of the impoundment.

The cover for the top of the tailing impoundment consists of a geosynthetic infiltration barrier, geocomposite drainage layer, followed by an 18-inch soil layer. The cover for the tailing embankment consists of a reinforced geosynthetic infiltration barrier, geocomposite drainage layer, and an 18-inch rock layer. The cover was designed to be erosionally stable under the 100-year, 24-and 100-year, 2-hour storm events.

2.3.2 Diversion Ditches and Channels

As shown on figures 15 and 16, four diversion ditches/channels were constructed or reconstructed to prevent run-on to the Oregon Gulch Tailing Impoundment. These ditches/channels consist of the Upper Oregon Gulch Channel, East Diversion Ditch, South Diversion Ditch, and Drop Channel. The purpose(s) of these controls include: (1) to divert water around and off of the tailing impoundment, (2) reduce erosion or remobilization of tailing

materials, (3) reduce potential metal leaching from tailing materials, (4) maintain channel conveyance capacity through sediment load reduction controls, and (5) maintain channel integrity by promoting non-erosive flow.

All four diversion ditches/channels were designed and constructed to convey flows from the 100-year, 24-hour and 100-year, 2-hour storm events. The East Diversion Ditch is approximately 1075 feet long, has a depth that ranges from approximately 0.1 to 0.8 feet, and side slopes range from approximately 9:1 to 416:1. The East Diversion Ditch was constructed with an underlying GCL and drainage layer. Approximately 1700 feet of 4-inch perforated pipe was installed on top of the drainage layer to convey water to the South Diversion Ditch. A second 4-inch perforated pipe was installed for the last 500 feet of the East Diversion Ditch to increase the flow capacity. Filter fabric and soil were placed over the drainage layer and the ditch was revegetated.

The reconstructed Upper Oregon Gulch Channel is approximately 455 feet long, has a depth that ranges from approximately 0.5 to 0.9 feet, and top width that ranges from approximately 5.3 to 6.6 feet. The Upper Oregon Gulch Channel was constructed with an underlying GCL and an 8-inch filter material layer that extended upstream approximately 100 feet from the intersection of the South and East Diversion Ditches. The remaining upstream portion of channel was constructed with a filter material layer placed over excavated subgrade. Both portions of the channel had a filter fabric placed over the filter layer and erosion control blocks installed over the fabric.

The South Diversion Ditch is approximately 930 feet long, has a depth that ranges from approximately 0.8 to 1.4 feet, a base width that ranges from 1.9 to 5.0 feet, and side slopes that range from approximately 1.7:1 to 6.9:1. A groundwater interceptor trench was installed in the upper portion of this channel. The interceptor trench was excavated to a depth of approximately 6 feet and a width of 3 feet. The trench was lined with filter fabric and a 30-foot long high density polyethylene pipe was installed, which daylights in the ditch. The trench was backfilled with gravel which was covered with filter fabric. The South Diversion Ditch was constructed with an underlying GCL, a 6-inch filter material layer, and a top riprap layer. At the downstream portion of the South Diversion Ditch, three berms were constructed to contain flow within the channel. Two of the berms are constructed of compacted borrow material, and the third is along

the upstream face reinforced with riprap overlying filter fabric. A gabion check dam was also installed in the lower portion of this channel.

The Drop Channel is approximately 700 feet long, has a depth that ranges from approximately 0.7 to 0.9 feet, and a top width that ranges from 4.6 to 6.8 feet. The channel is constructed of erosion control blocks overlying filter fabric. At the confluence of the Drop Channel with Lower Oregon Gulch, a riprap outlet apron was installed.

2.3.3 Seep Collection System

The Oregon Gulch seep collection system consists of a toe drain seep collection system and a shallow alluvial groundwater interceptor trench near the toe of the tailing dam. The seep collection system is shown on Figure 16 and the interceptor trench is shown on Figure 17. The toe drain seep collection system was installed at the base of the tailing to capture water that historically surfaced at the toe of the tailing dam. Water captured by the drain is piped to a holding tank in the pumphouse. The shallow alluvial groundwater interceptor trench was installed down gradient of the pumphouse and water captured by this trench is pumped back to the holding tank in the pumphouse. Water contained in the pumphouse holding tank is pumped to the Surge Pond at the Yak Water Treatment Plant, where it is treated and discharged to California Gulch. A secondary holding tank in the pumphouse provides for emergency overflow from the primary holding tank in case of pump failure. The purpose of these systems and controls is to reduce the quantity of poor quality alluvial groundwater and seep water entering lower Oregon Gulch.

High-level water sensors installed in the pumphouse holding tank and in one of the vertical pipes of the alluvial groundwater interceptor trench actuate an alarm at the Yak Water Treatment Plant to provide notice of an abnormally high water level in the pumphouse tank or in the trench, so necessary maintenance or repair actions can be undertaken. Maintenance or repair actions typically performed are related to either pump repair/replacement or a pipeline blockage due to scale build-up within the pipeline or an ice blockage. The holding tank pump and trench pump are maintained in inventory at the Yak Water Treatment Plant. In the event a pump requires replacement, a new pump is ordered to replenish the inventory stock. If a pipeline blockage

occurs, the pipeline section is either cleaned out with a sewer snake or jetted with hot water to clear the blockage.

Flow and pumping rates are seasonally variable with base flow rates averaging approximately 0.5 to 1.0 gallon per minute and spring season or storm event flows averaging approximately 3 to 10 gallons per minute. Flow and pumping rates will be maintained to maximize water collection within the seepage collection systems and interceptor trench and to preclude visible seepage expressions or saturated bog conditions within the area of the collection systems

The toe drain seep collection system was constructed in 1998 and 1999. The collection system was constructed by excavating a trench, installing filter fabric at the base of the trench, and placing approximately 320 feet of collector pipe on the filter fabric. The trench was then backfilled with drainage gravel which was covered with filter fabric and covered with compacted borrow material. The borrow material was covered with a geomembrane which was installed below a GCL. Initially the collector pipe discharged to a concrete ditch, the ditch was replaced with a buried outlet pipe to allow year around operation.

In June of 2006, the shallow alluvial groundwater interceptor trench was installed approximately 50 feet down gradient of the pump house. The alluvial groundwater collection system was constructed by excavating a trench to a depth of approximately 7 feet, installing a PVC liner at the base of the trench, backfilling the trench with washed drainage gravel and then covering the gravel with a PVC liner. The top PVC liner was covered with 1.5 feet to 2.5 feet of soil. Two slotted vertical PVC pipes were installed in the center of the trench at depths between 8 feet and 9 feet below ground surface. Pumps are installed in the vertical pipes to pump water collected in the trench to the pumphouse holding tank.

Monitoring well OG1TMW3 was installed in August 1991. It was drilled to a depth of 19.6 feet and screened in shallow alluvium from 9.2 to 19.2 feet below ground surface (bgs). The purpose of well OG1TMW3 is to monitor shallow alluvial groundwater.

2.3.4 Reconstructed Channel

The reconstructed channel of lower Oregon Gulch extends from the toe of the tailing impoundment to the confluence with California Gulch and is shown on Figure 15. The channel

reconstruction is designed to: (1) reduce infiltration of surface water and minimize leaching of metals from sediments, (2) reduce erosion and mobilization of sediments, (3) maintain channel integrity by promoting non-erosive flow, and (4) maintain channel conveyance capacity through sediment load reduction controls.

The channel and overbanks were designed and constructed to be stable under the 500-year storm event. The riprap portion of the Oregon Gulch channel was designed and constructed to convey flows from the 10-year storm event with the overbank constructed to be stable for the 500-year event. An approximate 500 feet reach of upstream of County Road 6 was constructed to convey the 500-year event within the riprap. The channel has a lower limestone layer covered with a filter fabric which is overlain by riprap.

The portion of channel, which extends from the pumphouse to the confluence with the Drop Channel, is approximately 465 feet long and has depths ranging from approximately 1 to 1.4 feet. On this portion of the channel, erosion control matting was installed on both sides of the channel.

2.3.5 Access Road Gates

Permanent access gates were installed on the North and South access roads to prevent unauthorized vehicle access to the Oregon Gulch tailing and pumpback facilities.

3.0 INSPECTION AND MAINTENANCE AND PERFORMANCE STANDARDS

Bi-annual (twice per year) inspections will be performed in late spring or early summer after snowmelt has occurred and in mid- to late fall. Certain controls at OU-10 will be inspected and recorded on a daily or weekly basis as described below. The following sub-sections present the inspection and maintenance and performance standards associated with the remedial work and controls listed in Section 2.0.

- *Concrete-Lined Channels*:
  - Inspection and Maintenance. Concrete-lined channels will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Quantities of sediment less than 10 cubic yards may be placed next to the channel, in areas that will minimize remobilization. Larger quantities of sediment that can not be placed adjacent to a channel will be placed adjacent to the rock covered Colorado No. 2 waste rock pile in OU4 or at other locations within the Site as approved by the EPA and the State. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.
  - Performance Standard. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Culverts:*
  - Inspection and Maintenance. Culverts will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culverts will be repaired or replaced. Erosion under or around the culverts will be repaired. Rock or sediment greater than two inches will be removed or flushed from culverts.
  - Performance Standard. Culverts will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Revegetated Channels and Ditches*:
  - Inspection and Maintenance. Revegetated channels will be inspected for erosion/scour, sediment collection, and vegetative cover. Sediment and material in excess of two inches in depth will be removed. Quantities of sediment less than 10 cubic yards may be placed next to the channel, in areas that will minimize remobilization. Larger quantities of sediment that can not be placed adjacent to a channel will be placed adjacent to the rock covered Colorado No. 2 waste rock pile in OU4 or at other locations within the Site as approved by the EPA and the State. Scour deeper than two inches below the base of the channel or rills and/or gullies on the channel sideslopes deeper than two inches in depth will be repaired.
  - Performance Standard. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Riprap-Lined Channels, Banks, and Berms*:

- Inspection and Maintenance. Riprap-lined channels, banks, and berms will be inspected for erosion and uniformity of rock placement and in the case of channels, capacity restriction. For channels, sediment and material in excess of two inches in depth above the top of the riprap will be removed. Quantities of sediment less than 10 cubic yards may be placed next to the channel, in areas that will minimize remobilization. Larger quantities of sediment that can not be placed adjacent to a channel will be placed adjacent to the rock covered Colorado No. 2 waste rock pile in OU4 or at other locations within the Site as approved by the EPA and the State. Areas in which riprap has been displaced to expose the channel, bank, or berm subgrade will be repaired with rock meeting the as-built specifications in the completion report and material restricting the channel capacity will be removed.
- Performance Standard. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Reno Mattress-Lined Channels and Gabion Structure:*
  - Inspection and Maintenance. Reno mattresses and gabions will be inspected for structural integrity. Damaged mattresses and baskets will be repaired. Erosion under or around the mattresses or gabions will be repaired.
  - Performance Standard. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Erosion Control Block-lined Channels.*
  - Inspection and Maintenance. Channels constructed using erosion control blocks will be inspected for eroded or broken blocks and erosion of the channel banks. Sediment and material in excess of one inch in depth above the top of the blocks will be removed. Quantities of sediment less than 10 cubic yards may be placed next to the channel, in areas that will minimize remobilization. Larger quantities of sediment that can not be placed adjacent to a channel will be placed adjacent to the rock covered Colorado No. 2 waste rock pile in OU4 or at other locations within the Site as approved by the EPA and the State. Damaged or eroded blocks which cause the channel subgrade to be exposed will be repaired or replaced with blocks meeting the as-built specifications in the completion report to maintain channel integrity.
  - Performance Standard. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

- *Revegetated Areas.*
  - Inspection and Maintenance. Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Inspected areas will include channel banks, floodplains, non-residential soils, embankment toes, tailing and waste rock areas, as identified in Section 2. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for

agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season.

- Performance Standard. Vegetated areas will be maintained for the intended purpose described in Section 2, by a) maintaining erosional stability of, and preventing migration of mine waste from, engineered remedies, b) maintain surface drainage on engineered remedies as designed, and c) ensuring vegetative cover as provided in Section 2.

- *Drains/Outlets.*
  - Inspection and Maintenance. Portal/interceptor drains and collection pipes will be inspected to ensure that they are free-flowing and that there is no observed flow emanating from the portal collection systems or interceptor drains other than the designed outlets.
  - Performance Standard. Drains and pipes determined to be obstructed or plugged will be cleared and will be maintained for the intended purposes as describe in Section 2.

- *OU 10 Toe Drain/Interceptor Trench Pumpback Systems.*
  - Inspection and Maintenance. Operational checks of the toe drain outlet pipe and the shallow alluvial groundwater interceptor trench at the base of the Oregon Gulch tailing dam will be conducted on a three times per week basis, unless circumstances (e.g., heavy snow, maintenance at other areas, etc) prevent such checks. These checks will include visible observation of flow from the toe drain outlet pipe into the holding tank and the operational status of the interceptor trench pumps, pumphouse tanks and pumphouse pumps. Flow rates from the toe drain outlet pipe and water pumped from the interceptor trench will be measured weekly. Seepage water collected in the pumphouse will be pumped to the Yak Water Treatment Plant for treatment and discharge to California Gulch.
  - Performance Standard. These facilities will be maintained to ensure they are operating for the designed purposes of the seep collection system, described in Section 2, by capturing and treating the toe seep and shallow alluvial groundwater collected in the Interceptor Trench.

Any abrupt or sudden decrease in flow from either the toe drain outlet pipe or the interceptor trench unrelated to precipitation/snowmelt events or seasonal variations will be investigated to determine if the toe drain and interceptor trench systems are functioning as designed. In addition, the area around the pumphouse and immediately (50 feet) down gradient of the toe drain collection system or interceptor trench will be checked for surface seeps, saturated soil conditions, or standing water on a weekly basis. Any surface seepage flow or saturated soil conditions observed emanating from the toe drain system or the shallow alluvial groundwater interceptor trench other than at the designed outlets will be investigated to determine the source of the flow. Should such conditions be observed, the conditions will be verbally reported to EPA and the State within 5 days, and further discussions included in the Monthly Progress Report for OU1.

- *Cover Rock on Non-Revegetated Waste Piles.*
  - Inspection and Maintenance. Cover rock will be inspected to ensure that it is intact and preventing erosion. Areas in which rock has been displaced that causes the cover subgrade to be exposed will be replaced with rock meeting the design specifications to maintain cover integrity. Erosion rills or gullies will be repaired.
  - Performance Standard. The cover rock will be maintained for the intended purpose described in Section 2, by a) maintaining erosional stability of, and preventing migration of mine waste on, engineered remedies, b) maintain surface drainage on engineered remedies as designed.

- *Sedimentation Basins.*
  - Inspection and Maintenance. Sedimentation basins/structures will be checked for capacity. Sediment accumulated greater than six inches in depth in a basin will be removed. Quantities of sediment less than 10 cubic yards may be placed next to sedimentation basins, in areas that will minimize remobilization. Larger quantities of sediment that can not be placed adjacent to a sedimentation basin will be placed adjacent to the rock covered Colorado No. 2 waste rock pile in OU4 or at other locations within the Site as approved by the EPA and the State.
  - Performance Standards. Sedimentation basins will be maintained for the intended purpose and as-built functions as described in Section 2.

- *Monitoring Well OG1TMW3.*
  - Inspection and Maintenance. Monitoring well OG1TMW3 will be sampled once yearly in September or October. The sample collected from OG1TMW3 will be analyzed for dissolved zinc and cadmium and the results will be reported in the annual inspection report. Increases in zinc or cadmium concentrations at monitoring well OG1TMW3 of greater than 20 percent compared to prior sampling period will be investigated to determine if the toe drain and interceptor trench systems are functioning as designed.

  - Performance Standards. Monitoring well will be maintained, or replaced if the well fails, to ensure continued effective monitoring of the shallow aquifer downgradient from the interceptor trench.

4.0 REPORTING AND DOCUMENTATION

A report will be prepared and submitted to Region 8 of the U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) prior to the end of each year (December 31) documenting the inspection and maintenance activities. The report will discuss the inspection and include: (1) completed copies of the inspection forms contained in Appendix B, (2) photographs of areas where inspections and maintenance were performed, and (3) maintenance activities performed. The daily/weekly checks and flow measurements for the OU-10 seep collection system will be summarized in the annual report.

Prior to undertaking a non-routine maintenance activity, a design and construction plan, including any investigation or analysis of the problem, will be prepared and submitted to the EPA and the State for approval. After the non-routine maintenance activity is completed, a completion report that documents the activities that were performed, construction as-built drawings and records (if applicable), and any planned maintenance activities will be submitted to EPA and the State. Non-routine maintenance activities are defined as activities that result in construction of a new control facility or modifications to an existing facility that alter or improve its original design or existing constructed condition.

All notices or other communications required under this plan shall be submitted to the following:

- Stan Christensen, U.S. EPA, Region 8

with a copy to:

- Doug Jamison, Colorado Department of Public Health & Environment

Any party may change its recipient notices under this Work Plan upon 10 days prior written notice to the other parties.

5.0 REFERENCES

Montgomery Watson Harza and Shepherd Miller, Inc. (MWH/SMI), 1998. Final Construction Plan for Upper California Gulch Operable Unit 4. Prepared for Resurrection Mining Company. July.

Montgomery Watson Harza and Shepherd Miller, Inc. (MWH/SMI), 2001. Construction Plan for Lower California Gulch Operable Unit 8. Prepared for Resurrection Mining Company. May.

Montgomery Watson Harza and MFG, Inc. (MWH/MFG), 2003. Completion Report for Upper California Gulch Operable Unit 4. Prepared for Resurrection Mining Company. February.

Montgomery Watson Harza and MFG, Inc. (MWH/MFG), 2003. Completion Report for Lower California Gulch Operable Unit 8. Prepared for Resurrection Mining Company. July.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1997. Final Focused Feasibility Study for Oregon Gulch Operable Unit 10. Prepared for Resurrection Mining Company. June.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1997. Draft Focused Feasibility Study for Lower California Gulch Operable Unit 8. Prepared for Resurrection Mining Company. September.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1997. Final Remedial Design Work Plan Oregon Gulch Operable Unit 10. Prepared for Resurrection Mining Company. October.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1998. Final Focused Feasibility Study for Upper California Gulch Operable Unit 4, Volume 1. Prepared for Resurrection Mining Company. January.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1998. Draft OU10 Remedial Action Work Plan. Prepared for Resurrection Mining Company. June 19.

Shepherd Miller, Inc. and TerraMatrix (SMI/TMI), 1999. Final RA Completion Report for Oregon Gulch Operable Unit 10. Prepared for Resurrection Mining Company. November.

U.S. Environmental Protection Agency (EPA), 1997. Record of Decision, Oregon Gulch Operable Unit 10, California Gulch Superfund Site. August.

U.S. Environmental Protection Agency (EPA), 1998. Record of Decision, Oregon Gulch Operable Unit 4, California Gulch Superfund Site. March.

U.S. Environmental Protection Agency (EPA), 2000. Record of Decision, Lower California Gulch Operable Unit 8, California Gulch Superfund Site. September.

APPENDIX A

TO OU4, OU8 AND OU10

OPERATIONS AND MAINTENANCE PLAN

INSPECTION FORMS

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Date:

Inspected By:

Weather:

General Notes/Comments:

RSC-4

1. Channel Concrete Integrity:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flow for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel Overbank Riprap:

Inspection/Performance Standard - Riprap-lined will be inspected for erosion and uniformity of rock placement and in the case of channels, capacity restriction. Areas in which riprap has been displaced to expose the bank subgrade will be repaired with rock meeting the as-built specifications in the completion report and material restricting the channel capacity will be removed. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

3. Channel Margin Revegetation – erosion/scour:

Inspection/Performance Standard - Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

4. Riprap Check Structures, Debris/Sedimentation:

Inspection/Performance Standard – Sedimentation basins/structures will be checked for capacity. Sediment accumulated greater than six inches in depth in a basin will be removed. Sedimentation basins will be maintained for the intended purpose and as-built functions as described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

AY-Minnie

1. Channel AYC-1 Concrete/Riprap Integrity, Sedimentation:

Inspection/Performance Standard – Concrete-lined portion of channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.

Riprap-lined portion of channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced to expose the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report and material restricting the channel capacity will be removed. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel AYC-2 Concrete Integrity, Sedimentation, Stilling Basin, Culvert Integrity:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culverts will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culverts. Culvert and channel will be maintained to convey flow for the designed purpose(s) and as-built function(s) described in Section 2.

3. Nugget Gulch Outlet @ AYC-1, Headcutting /Gabion Integrity:

Inspection/Performance Standard – Gabions will be inspected for structural integrity. Damaged baskets will be repaired. Erosion under or around the gabions will be repaired. Gabions will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

North Mike

1. Erosion/Scour in Revegetation areas:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

2. Erosion at Toe of Slope/Buttress wall:

Inspection/Performance Standard – Buttress wall will be inspected to ensure that it is intact and preventing erosion. Missing rock will be replaced as required to maintain toe integrity. Eroded areas will be repaired and buttress wall will be maintained for the designed purpose(s) and as-built function as describe in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Colorado No. 2

1. Cover Rock Integrity:

Inspection/Performance Standard – Cover rock will be inspected to ensure that it is intact and preventing erosion. Areas in which rock has been displaced that causes the cover subgrade to be exposed will be replaced with rock meeting the design specifications to maintain cover integrity. Erosion rills or gullies will be repaired and the cover rock will be maintained for the intended purpose described in Section 2.

2. Toe Revegetation—erosion/scour:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

3. Channel NGC-3A, B, & C Riprap/Erosion Block Channel Integrity:

Inspection/Performance Standard – Riprap-lined channels will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced to expose the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report. Channel constructed using erosion control blocks will be inspected for eroded or broken blocks and erosion of the channel banks. Sediment and material in excess of one inch in depth above the top of the blocks will be removed. Damaged or eroded blocks which cause the channel subgrade to be exposed will be repaired or replaced with blocks meeting the as-built specifications in the completion report. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Nugget Gulch

1. Channel NGC-5 Overall Channel Integrity, Margin Erosion, Culvert:

Inspection/Performance Standard – Channels will be inspected for eroded or broken blocks and erosion of the channel banks. Sediment and material in excess of one inch in depth above the top of the blocks will be removed. Damaged or eroded blocks which cause the channel subgrade to be exposed will be repaired or replaced with blocks meeting the as-built specifications in the completion report.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culvert will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culvert. Culvert and channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel NGC-1 Concrete Integrity, Culvert Integrity:

Inspection/Performance Standard– Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culvert will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culvert. Culvert and channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Printer Girl

1. Channel RSC-5 Riprap, Sedimentation:

Inspection/Performance Standard – Riprap-lined channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced to expose the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report.

Reno mattresses and gabions will be inspected for structural integrity. Damaged mattresses and baskets will be repaired. Erosion under or around the mattresses or gabions will be repaired. Channel will be maintained to convey flow for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel PGC-1 Concrete Integrity, Sedimentation, Culvert Integrity:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culvert will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culvert. Culvert and channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

3. Channel PGC-2 Riprap, Sedimentation, Culvert Integrity:

Inspection/Performance Standard – Riprap-lined channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced to expose the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culvert will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culvert. Culvert and channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Aqwalt

1. Channel A Concrete Integrity, Sedimentation, Sediment Retention Structure:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel B Concrete Integrity, Sedimentation:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

3. Portal Collection Pipe Outlet:

Inspection/Performance Standard – Portal/interceptor drains and collection pipes will be inspected to ensure that they are free-flowing and that there is no observed flow emanating from the portal collection systems or interceptor drains other than the designed outlets. Drains and pipes determined to be obstructed or plugged will be cleared and will be maintained for the intended purposes as describe in Section 2.

Suggested Maintenance

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Garibaldi

1. Concrete Channel GWC-1 & GWC-2, Concrete Integrity, Sedimentation, Culvert Integrity:

Inspection/Performance Standard – Concrete-lined channels will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced.

Culvert will be inspected for damage, capacity restriction, and adjacent erosional problems. Damaged culvert will be repaired or replaced. Erosion under or around the culvert will be repaired. Rock greater than two inches will be removed or flushed from culvert. Culvert and channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Riprap Channel RSC-1 Riprap Integrity, Sedimentation:

Inspection/Performance Standard – Riprap-lined channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced and exposed the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

3. Vegetated Ditch 1, Sedimentation, Erosion:

Inspection/Performance Standard – Grass-lined channel will be inspected for erosion/scour, sediment collection, and vegetative cover. Sediment and material in excess of two inches in depth will be removed. Scour deeper than two inches below the base of the channel or rills and/or gullies on the channel sideslopes deeper than two inches in depth will be repaired. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

4. Concrete Ditch 2, Concrete Integrity, Sedimentation:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

5. Concrete Ditch 3, Concrete Integrity, Sedimentation:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 4 (OU4) INSPECTION AND MONITORING REPORT

Garibaldi (continued)

6. Concrete Ditch 4, Concrete Integrity, Sedimentation, Riprap Outlet Apron:

Inspection/Performance Standard – Concrete-lined channel will be inspected for cracking, settling, sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material in excess of one inch in depth will be removed. Cracks greater than one-quarter inch in width will be sealed or repaired. Damaged sections (that do not convey the design flow), will be repaired or replaced. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

7. Portal/Interceptor Drains, Free Flow:

Inspection/Performance Standard – Portal/interceptor drains and collection pipes will be inspected to ensure that they are free-flowing and that there is no observed flow emanating from the portal collection systems or interceptor drains other than the designed outlets. Drains and pipes determined to be obstructed or plugged will be cleared and will be maintained for the intended purposes as describe in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Mab

1. Erosion/Scour in Revegetation Area:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

2. Cover Rock:

Inspection/Performance Standard – Cover rock will be inspected to ensure that it is intact and preventing erosion. Areas in which rock has been displaced that causes the cover subgrade to be exposed will be replaced with rock meeting the design specifications to maintain cover integrity. Erosion rills or gullies will be repaired and the cover rock will be maintained for the intended purpose described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspection Summary

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 8 (OU8) INSPECTION AND MONITORING

Date:

Inspected By:

Weather:

General Notes/Comments:

FTS-6

1. Overall Channel Integrity:

Inspection/Performance Standard – Reno mattresses and gabions will be inspected for structural integrity. Damaged mattresses and baskets will be repaired. Erosion under or around the mattresses or gabions will be repaired. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Erosion/Scour of Overbank/Floodplain:

Inspection/Performance Standard – Revegetated overbanks will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. Channel banks will be inspected for erosional stability. Eroded areas will be repaired. Channel banks will be maintained for the designed purpose(s) and as-built function described in Section 2.

3. OU1/Apache Channel Transitions:

Inspection/Performance Standard – Channel banks and the transition will be inspected for erosional stability. Eroded areas will be repaired. Channel banks and the transition will be maintained for the designed purpose(s) and as-built function described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

FTS-3

1. Overall Channel Integrity:

Inspection/Performance Standard – Reno mattresses and gabions will be inspected for structural integrity. Damaged mattresses and baskets will be repaired. Erosion under or around the mattresses or gabions will be repaired. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Erosion/Scour of Overbank/Flooplain/Streambank Riprap/Non-Res Soils Reveg Areas:

Inspection/Performance Standard – Riprap-lined channel banks will be inspected for erosion and uniformity of rock placement. Riprap will be replaced or added as necessary. Revegetated overbanks will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. Channel banks will be maintained for the designed purpose(s) and as-built function as described in Sect. 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 8 (OU8) INSPECTION AND MONITORING

California Gulch Near the Ski Club

1. Embankment Riprap:

Inspection/Performance Standard – Riprap-lined berms will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced and exposed the berm subgrade will be repaired with rock meeting the as-built specifications in the completion report. Berms will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

2. Erosion/Scour of Revegetated Embankment:

Inspection/Performance Standard – Revegetated areas will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. Vegetated areas will be maintained for the designed purpose(s) and as-built function described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

FTS-1

1. Sideslope Riprap:

Inspection/Performance Standard – Riprap-lined banks will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced and exposed the bank subgrade will be repaired with rock meeting the as-built specifications in the completion report. Banks will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

2. Erosion/Scour of Revegetated Surface:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 8 (OU8) INSPECTION AND MONITORING

FTS-2

1. Embankment Riprap:

Inspection/Performance Standard – Riprap-lined banks will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced and exposed the bank subgrade will be repaired with rock meeting the as-built specifications in the completion report. Banks will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

2. Erosion/Scour of Revegetated Berm Areas:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

California Gulch Near Airport Gulch

1. Embankment Riprap:

Inspection/Performance Standard – Riprap-lined banks and berms will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced and exposed the bank or berm subgrade will be repaired with rock meeting the as-built specifications in the completion report. Banks and berms will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

2. Low-flow Channel Integrity:

Inspection/Performance Standard – Channel will be inspected for sediment build up, capacity restriction, and adjacent erosional problems. Sediment and material restricting the channel capacity will be removed, as necessary. Channels will be maintained to convey flows for the designed purpose(s) and as-built function described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 8 (OU8) INSPECTION AND MONITORING

Lower FTS-8

1. Embankment Riprap:

Inspection/Performance Standard – Riprap-lined banks and berms will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced, and exposed the bank or berm subgrade, will be repaired with rock meeting the as-built specifications in the completion report. Banks and berms will be maintained for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

2. Erosion/Scour of Revegetated Areas:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Non-Residential Soils

1. Erosion/Scour Within Revegetation Area:

Inspection/Performance Standard – Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

Suggested Maintenance/Notes/Comments:

Maintenance Performed:

Notes/Comments:

Inspection Summary

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 10 (OU10) INSPECTION AND MONITORING

Date:

Inspected By:

Weather:

General Notes/Comments:

East Diversion Channel

1. Channel Integrity, Scour/Sedimentation :

Inspection/Performance Standard – Grass-lined channel will be inspected for erosion/scour, sediment collection, and vegetative cover. Sediment and material in excess of two inches in depth will be removed. Scour deeper than two inches below the base of the channel or rills and/or gullies on the channel sideslopes deeper than two inches in depth will be repaired. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

South Diversion Ditch

1. Channel Riprap Integrity, Sedimentation:

Inspection/Performance Standard – Riprap-lined channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced and exposed the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel Margin Stability:

Inspection/Performance Standard – Riprap-lined banks will be inspected for erosion and uniformity of rock placement. Areas in which riprap has been displaced and exposed the bank subgrade will be repaired with rock meeting the as-built specifications in the completion report. Channels will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 10 (OU10) INSPECTION AND MONITORING

Drop Channel

1. Overall Channel Integrity:

Inspection/Performance Standard – Channel constructed using erosion control blocks will be inspected for eroded or broken blocks and erosion of the channel banks. Sediment and material in excess of one inch in depth above the top of the blocks will be removed. Damaged or eroded blocks which cause the channel subgrade to be exposed will be repaired or replaced with blocks meeting the as-built specifications in the completion report to maintain channel integrity. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance

Maintenance Performed:

Notes/Comments:

Reconstructed Lower Channel

1. Channel Riprap Integrity:

Inspection/Performance Standard - Riprap-lined channel will be inspected for erosion, uniformity of rock placement, and capacity restriction. Sediment and material in excess of two inches in depth above the top of the riprap will be removed. Areas in which riprap has been displaced and exposed the channel subgrade will be repaired with rock meeting the as-built specifications in the completion report. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

2. Channel Margins, Erosion/Scour:

Inspection/Performance Standard – Channel margins will be inspected for erosional stability. Eroded areas in excess of six inches deep will be repaired. Channel margin will be maintained for the designed purpose(s) and as-built function (s) as described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 10 (OU10) INSPECTION AND MONITORING

Tailing Impoundment

1. Vegetative Cover, Erosion/Scour:

Inspection/Performance Standard - Areas revegetated during remedial construction will be inspected for erosional stability and vegetative cover. Erosion rills or gullies in excess of two inches deep in revegetated areas will be repaired. In addition, vegetative areas will be inspected for the presence of bareground areas. Areas void of or containing little vegetation which are larger in area than 100 ft^2 will be considered bareground areas. Identified bareground areas will be assessed for agronomic conditions, and any necessary soil amendments identified by the agronomic assessment will be completed and the area will be reseeded during next spring or fall planting season. Vegetated areas will be maintained for the intended purpose described in Section 2.

2. Surface settlement:

Inspection/Performance Standard – The tailing cover will be inspected for settlement and ponding. Settled areas will be repaired to minimize ponding. The cover will be maintained for the designed purpose and as-built function described in Section 2.

3. Embankment Rock Cover:

Inspection/Performance Standard - Cover rock will be inspected to ensure that it is intact and preventing erosion. Areas in which rock has been displaced that causes the cover subgrade to be exposed will be replaced with rock meeting the design specifications to maintain cover integrity. Erosion rills or gullies will be repaired and the cover rock will be maintained for the intended purpose described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Reconstructed Upper Channel

1. Channel Integrity, Sedimentation:

Inspection/Performance Standard – Channel constructed using erosion control blocks will be inspected for eroded or broken blocks and erosion of the channel banks. Sediment and material in excess of one inch in depth above the top of the blocks will be removed. Damaged or eroded blocks which cause the channel subgrade to be exposed will be repaired or replaced with blocks meeting the as-built specifications in the completion report to maintain channel integrity. Channel will be maintained to convey flows for the designed purpose(s) and as-built function(s) described in Section 2.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspector's Signature_____ Owner's Signature_____ Date_____

Resurrection Mining Company	OPERABLE UNIT 10 (OU10) INSPECTION AND MONITORING

Seep Collection System

1. Interceptor Pipe at base of Tailing Dam, Flowing:

Inspection/Performance Standard – Check that the toe drain is flowing three times per week. Maintain the tailing toe collection system for the designed purpose and as-built function as described in Sections 2 and 3.

2. Storage Tank and Pumpback System, Floor Seepage Collection, Sump System in Pumphouse:

Inspection/Performance Standard – Check the pumphouse and equipment three times per week. Maintain the pumpback facilities to pump collected water to the Surge Pond as described in Section 2.

3. Interceptor Trench Pump Working/Flowing:

Inspection/Performance Standard – Check the operational status of the trench pumps three times per week. Maintain the trench collection system for the designed purpose and as-built function as described in Sections 2 and 3.

4. Surface Seepage/OG1TMW3 Well Sampling and Analysis

Inspection/Performance Standard – Check the area around the pumphouse and immediately (50 feet) down gradient of the interceptor pipe and trench for surface seeps on a weekly basis. Maintain the trench and tailing toe collection system to prevent seeps.

Monitoring well OG1TMW3 will be sampled annually either during the month of September or October, a sample collection will be analyzed for total metals (Zinc, Cadmium) by an outside laboratory. Should metals analytical results exceed the previous analytical results for either metal in excess of 20%, an investigation will be conducted to further evaluate the performance and effectiveness of the seep collection systems as described in Section 3.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Access Road Gates

1. Upper Gate:

Inspection/Performance Standard – Maintain in working order to allow access and exclude unauthorized traffic.

2. Lower Gate:

Inspection/Performance Standard – Maintain in working order to allow access and exclude unauthorized traffic.

Suggested Maintenance:

Maintenance Performed:

Notes/Comments:

Inspection Summary

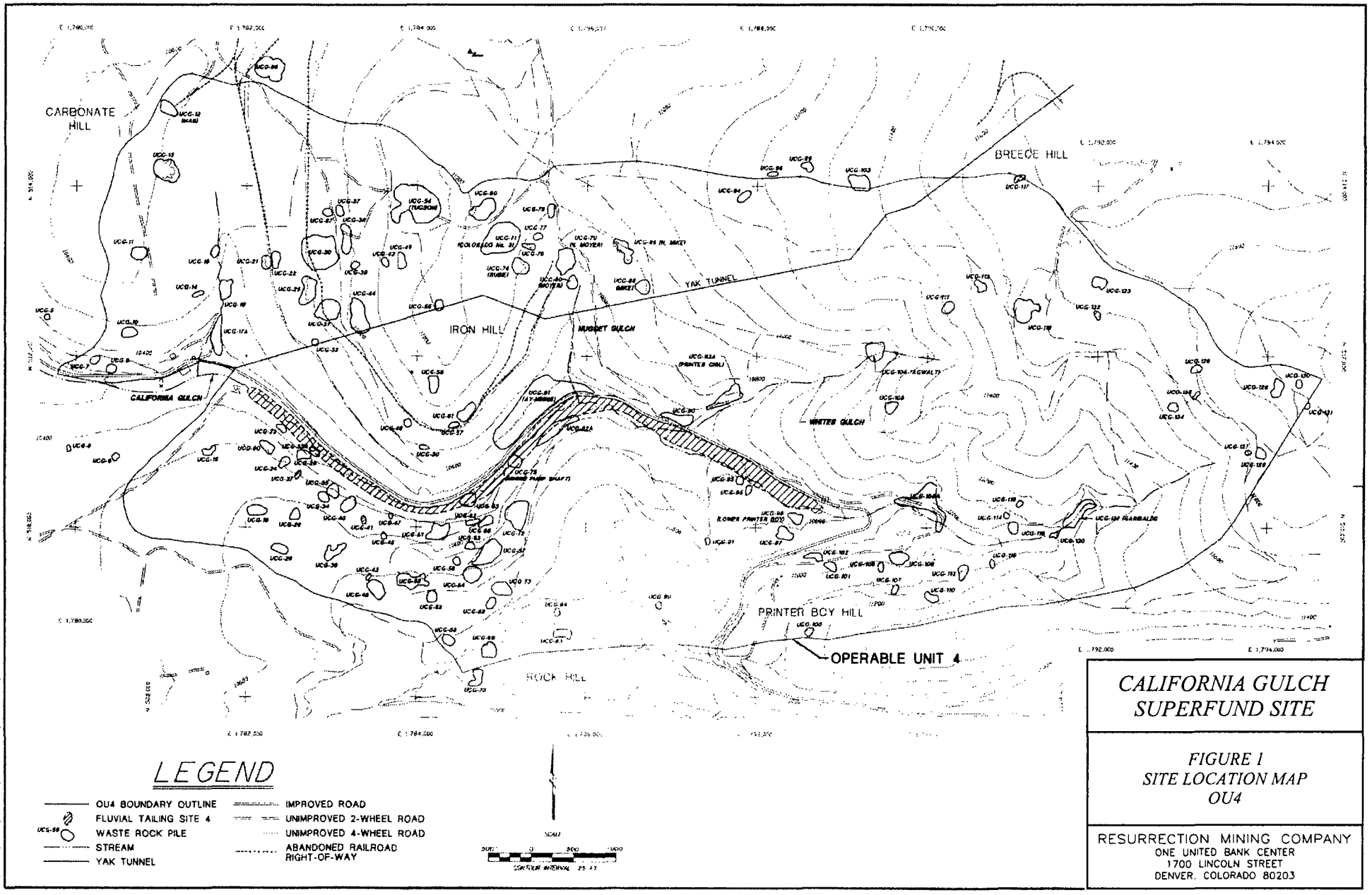
Inspector's Signature_____ Owner's Signature_____ Date_____

APPENDIX B

TO OU4, OU8 AND OU10

OPERATIONS AND MAINTENANCE PLAN

LOCATION FIGURES



CALIFORNIA GULCH SUPERFUND SITE

FIGURE 1
SITE LOCATION MAP
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

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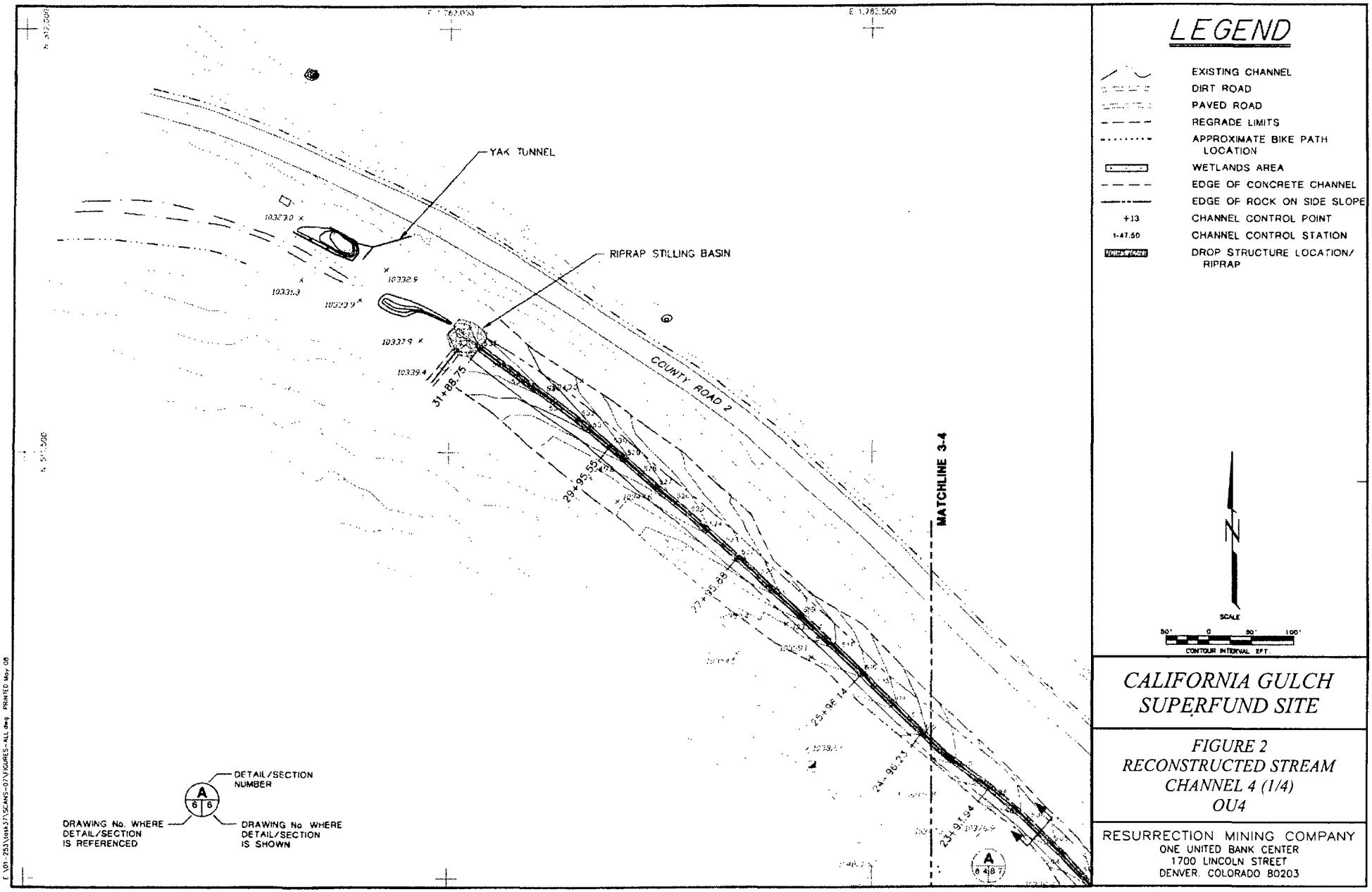

LEGEND

- EXISTING CHANNEL
- DIRT ROAD
- PAVED ROAD
- REGRADE LIMITS
- APPROXIMATE BIKE PATH LOCATION
- WETLANDS AREA
- EDGE OF CONCRETE CHANNEL
- EDGE OF ROCK ON SIDE SLOPE
- +13 CHANNEL CONTROL POINT
- 1+47.50 CHANNEL CONTROL STATION
- DROP STRUCTURE LOCATION/ RIPRAP

N

SCALE
50' 0 50' 100'
CONTOUR INTERVAL 5FT.

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 2
RECONSTRUCTED STREAM CHANNEL 4 (1/4)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

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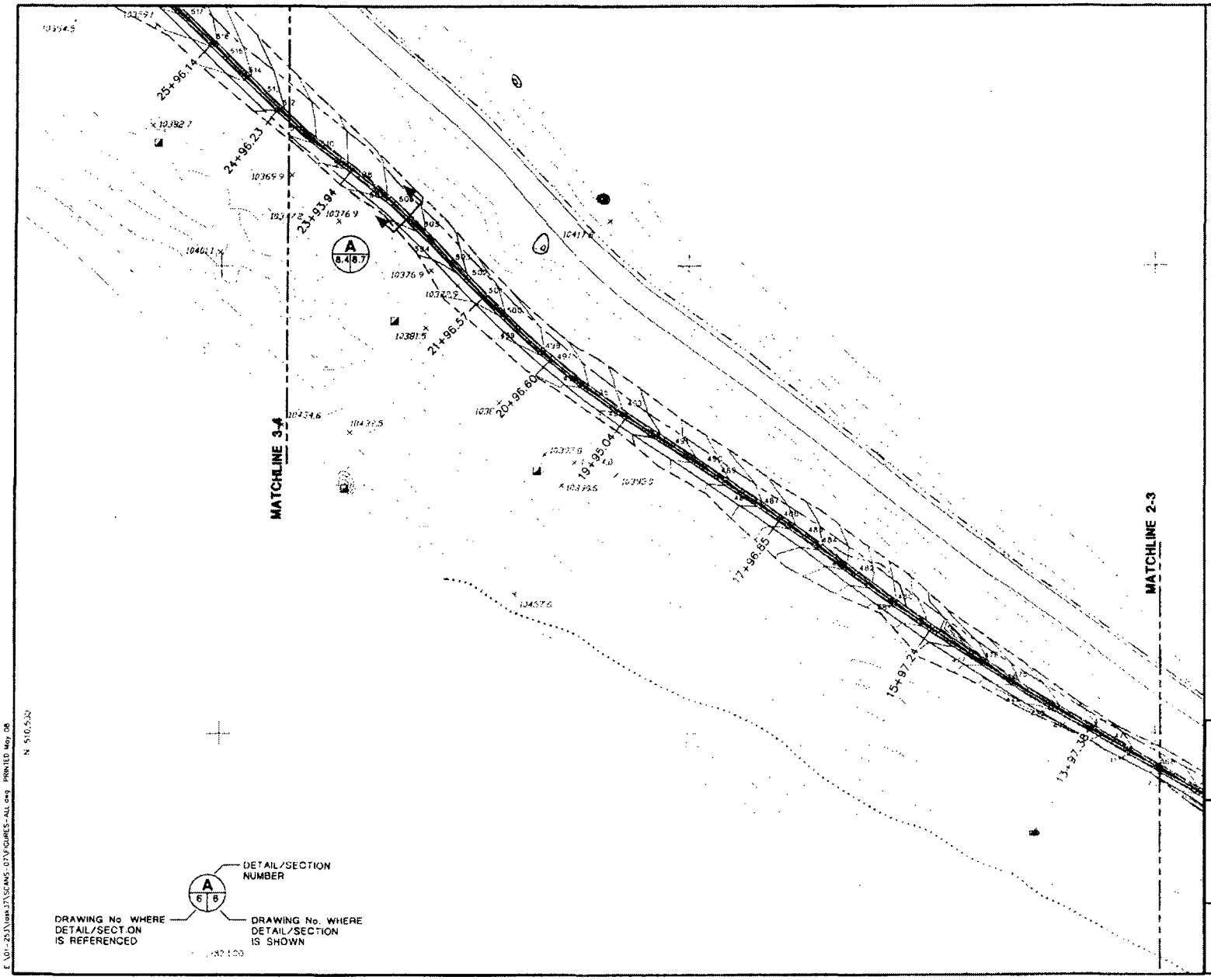

LEGEND

- EXISTING CHANNEL
- DIRT ROAD
- PAVED ROAD
- REGRADE LIMITS
- APPROXIMATE BIKE PATH LOCATION
- WETLANDS AREA
- EDGE OF CONCRETE CHANNEL
- EDGE OF ROCK ON SIDE SLOPE
- +13 CHANNEL CONTROL POINT
- 1+47.80 CHANNEL CONTROL STATION
- DROP STRUCTURE LOCATION/ RIPRAP

N

SCALE
50' 0 50' 100'
CONTOUR INTERVAL 2FT.

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 3
RECONSTRUCTED STREAM CHANNEL 4 (2/4)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

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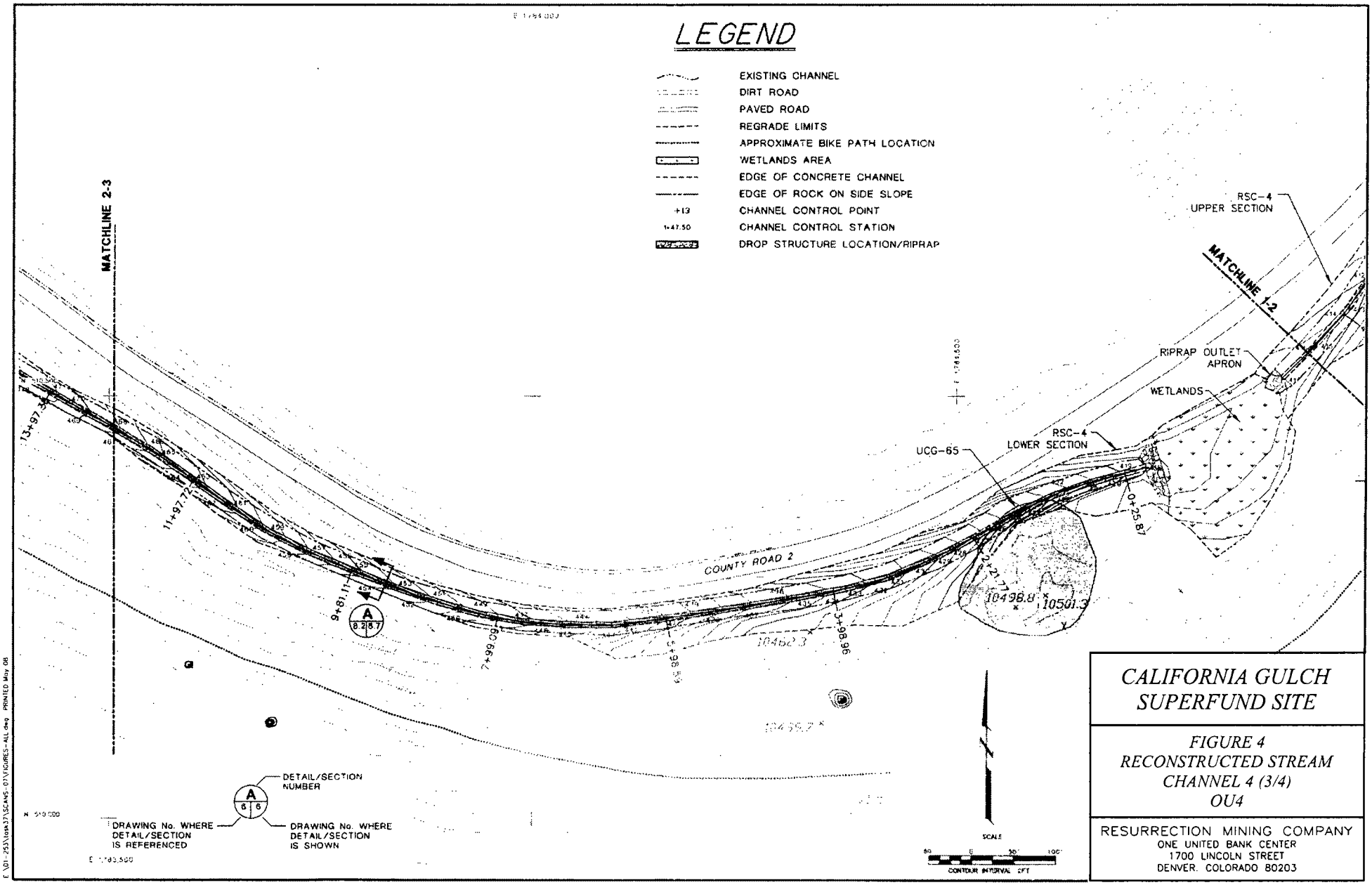
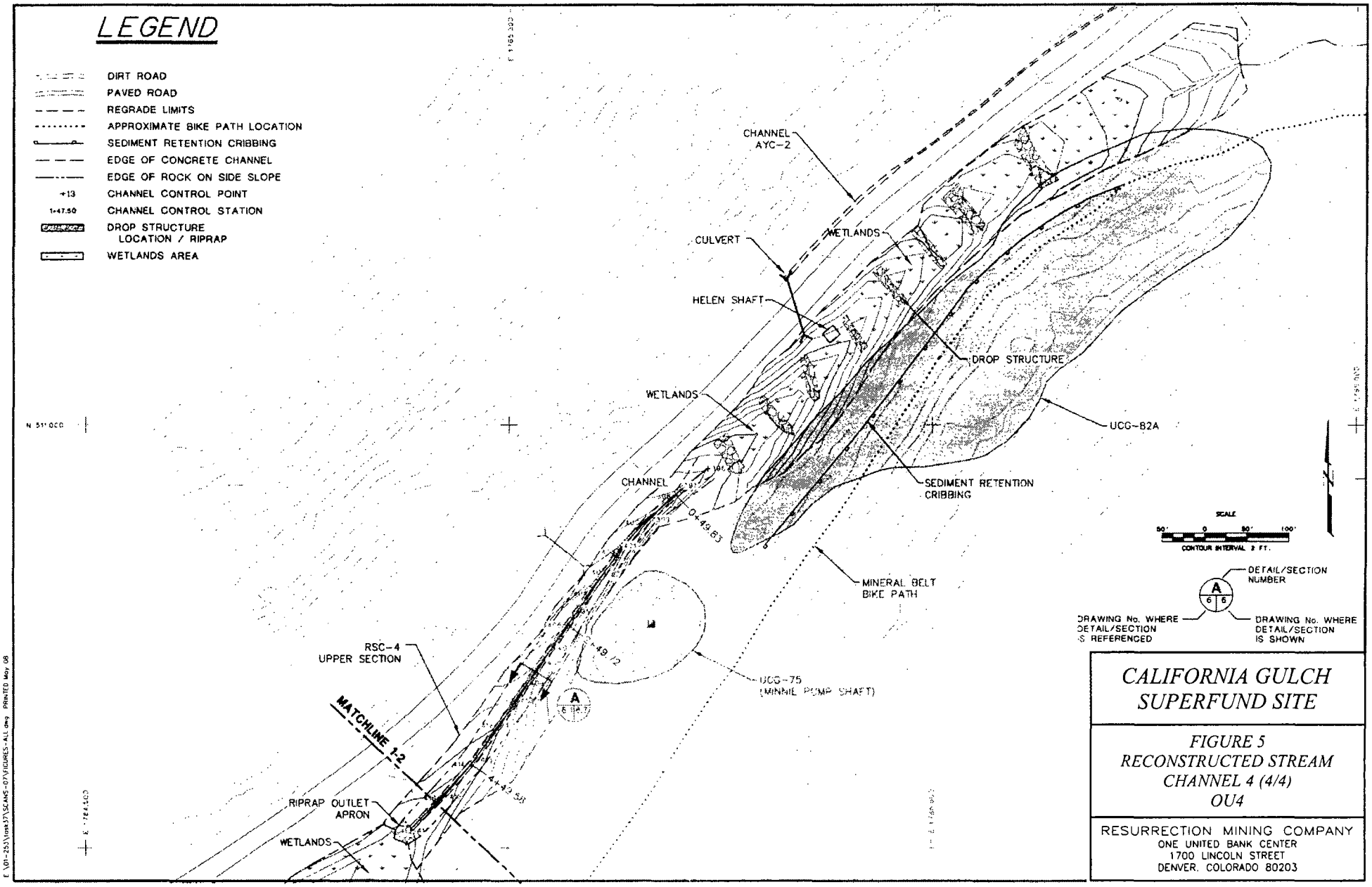


CALIFORNIA GULCH SUPERFUND SITE

FIGURE 4
RECONSTRUCTED STREAM CHANNEL 4 (3/4)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

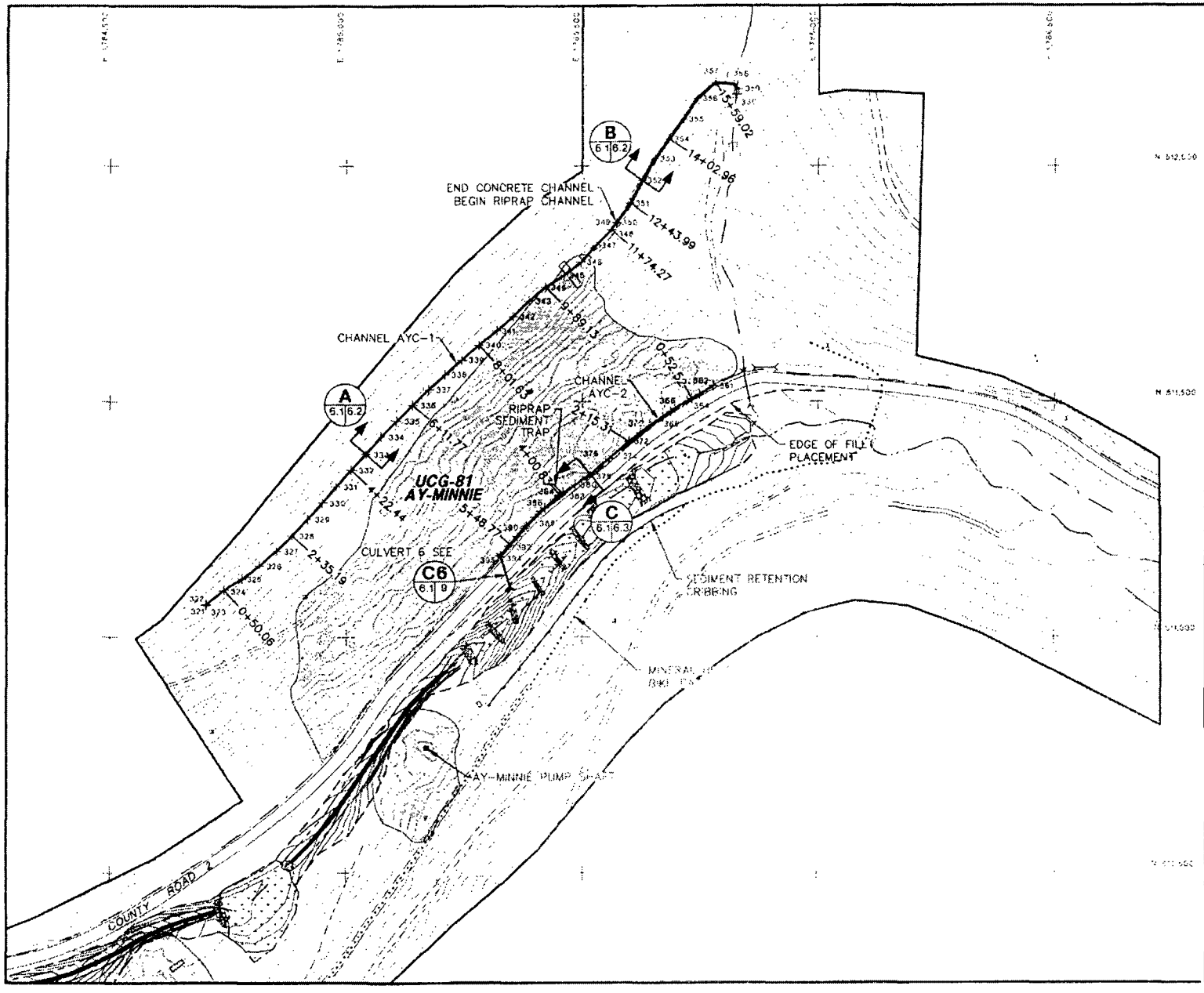
F:\01-253\loss37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



CALIFORNIA GULCH SUPERFUND SITE

FIGURE 5
RECONSTRUCTED STREAM CHANNEL 4 (4/4)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203



LEGEND

- APPROXIMATE EXTENT OF ORIGINAL WASTE ROCK PILE
- CONTOURS
- EXISTING CULVERT
- AS-BUILT CHANNEL CENTERLINE
- AS-BUILT CHANNEL EDGE OF CONCRETE
- +1 AS-BUILT CHANNEL CONTROL POINT
- 0+18.23 AS-BUILT CHANNEL CONTROL STATION
- AS-BUILT CULVERT LOCATION
- BIKE PATH
- SEDIMENT RETENTION CRIBBING
- WETLAND AREA

NOTES:
1) EXISTING TOPOGRAPHY FROM SURVEY CONDUCTED BY INTRASEARCH INC., ENGLEWOOD, COLORADO 80111 OCTOBER 20, 1998).

2) AS-BUILT DATA FROM FIELD SURVEYS COMPLETED BY DEL MONT CONSULTANTS, MONTROSE, COLORADO 81402, SUMMER 1999 & 2000

SCALE
100' 0 100' 200'
CONTOUR INTERVAL 2FT.

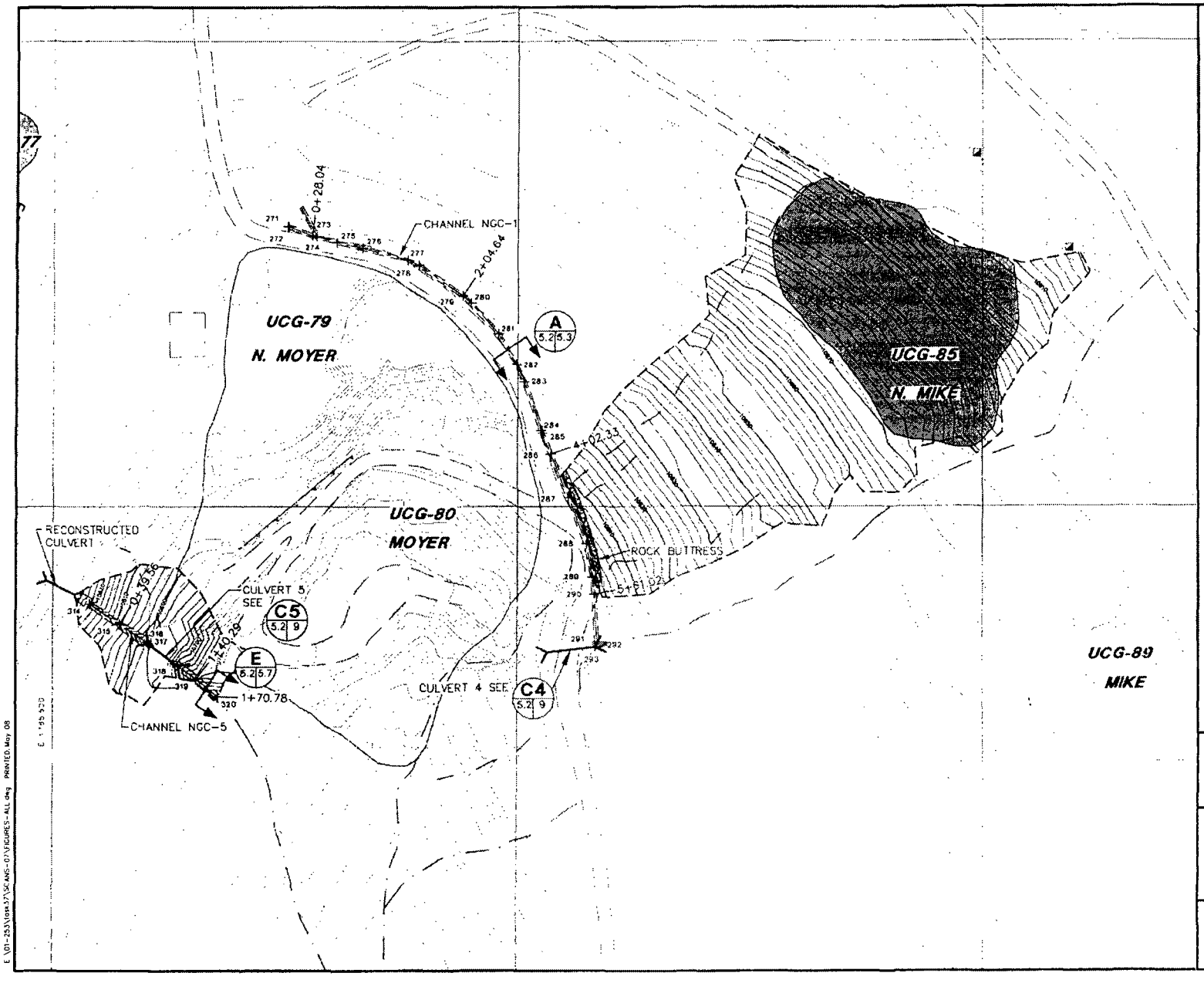
A
6 | 6
DETAIL/SECTION NUMBER
DRAWING No. WHERE DETAIL/SECTION IS REFERENCED
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 6
AY-MINNIE (UCG-81)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\Vol37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- REMOVED EXTENT OF ORIGINAL WASTE ROCK PILE
- APPROXIMATE EXTENT OF ORIGINAL WASTE ROCK PILE
- CONTOURS
- REGRADED CONTOURS
- REGRADE BOUNDARY
- AS-BUILT CHANNEL CENTERLINE
- AS-BUILT CHANNEL EDGE OF CONCRETE
- AS-BUILT CHANNEL CONTROL POINT
- AS-BUILT CHANNEL CONTROL STATION
- AS-BUILT CULVERT LOCATION

NOTES:
1) EXISTING TOPOGRAPHY FROM SURVEY CONDUCTED BY INTRASEARCH INC., ENGLEWOOD, COLORADO 80111 OCTOBER 20, 1995)

2) AS-BUILT DATA FROM FIELD SURVEYS COMPLETED BY DEL MONT CONSULTANTS, MONTROSE, COLORADO 81402, SUMMER 1999 & 2000.

N

SCALE
60' 0 80' 100'
CONTOUR INTERVAL 2FT

A
5 6
DETAIL/SECTION NUMBER
DRAWING No. WHERE DETAIL/SECTION IS REFERENCED
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 7
NUGGET GULCH
NORTH MIKE (UCG-85)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

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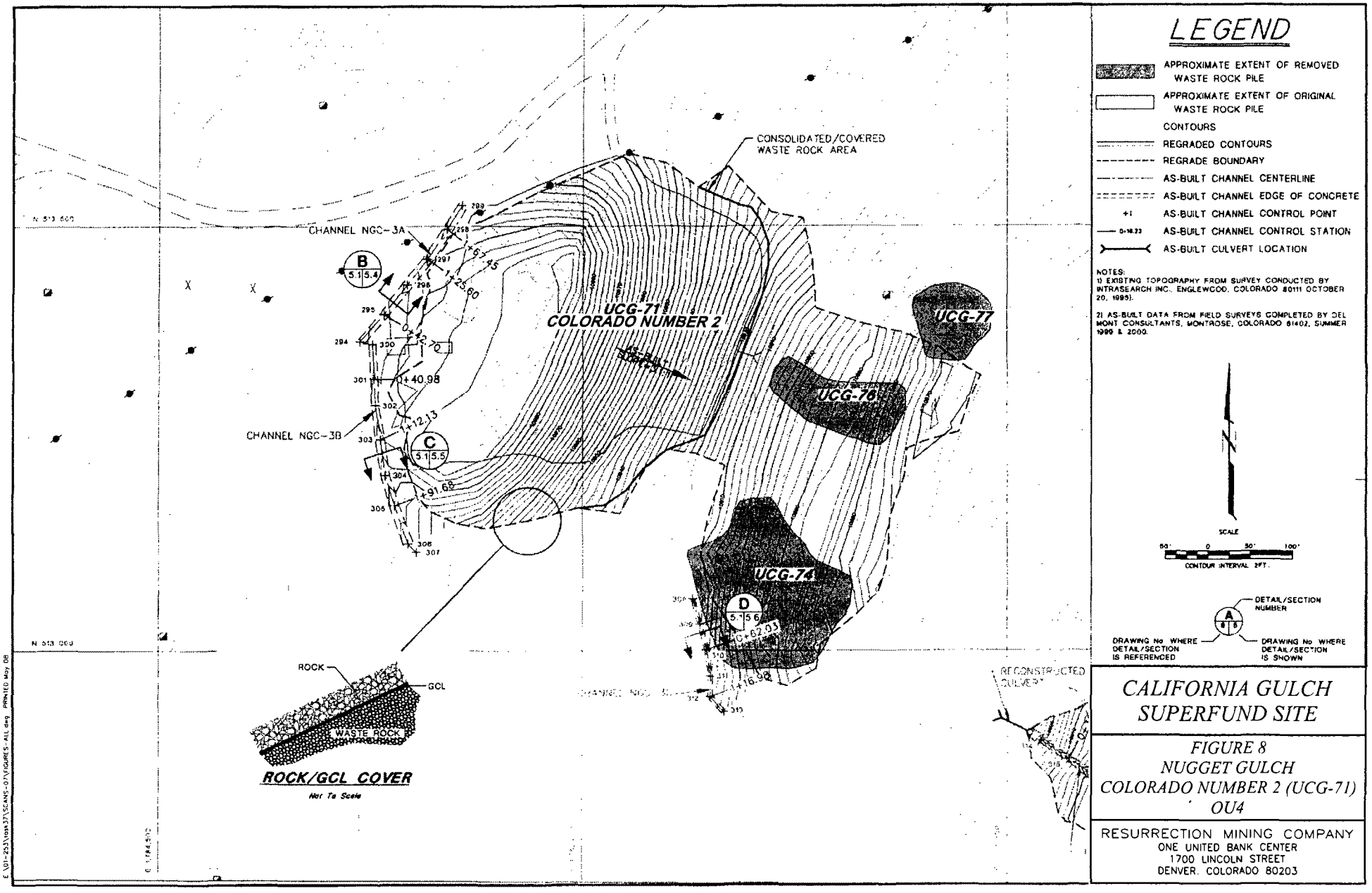
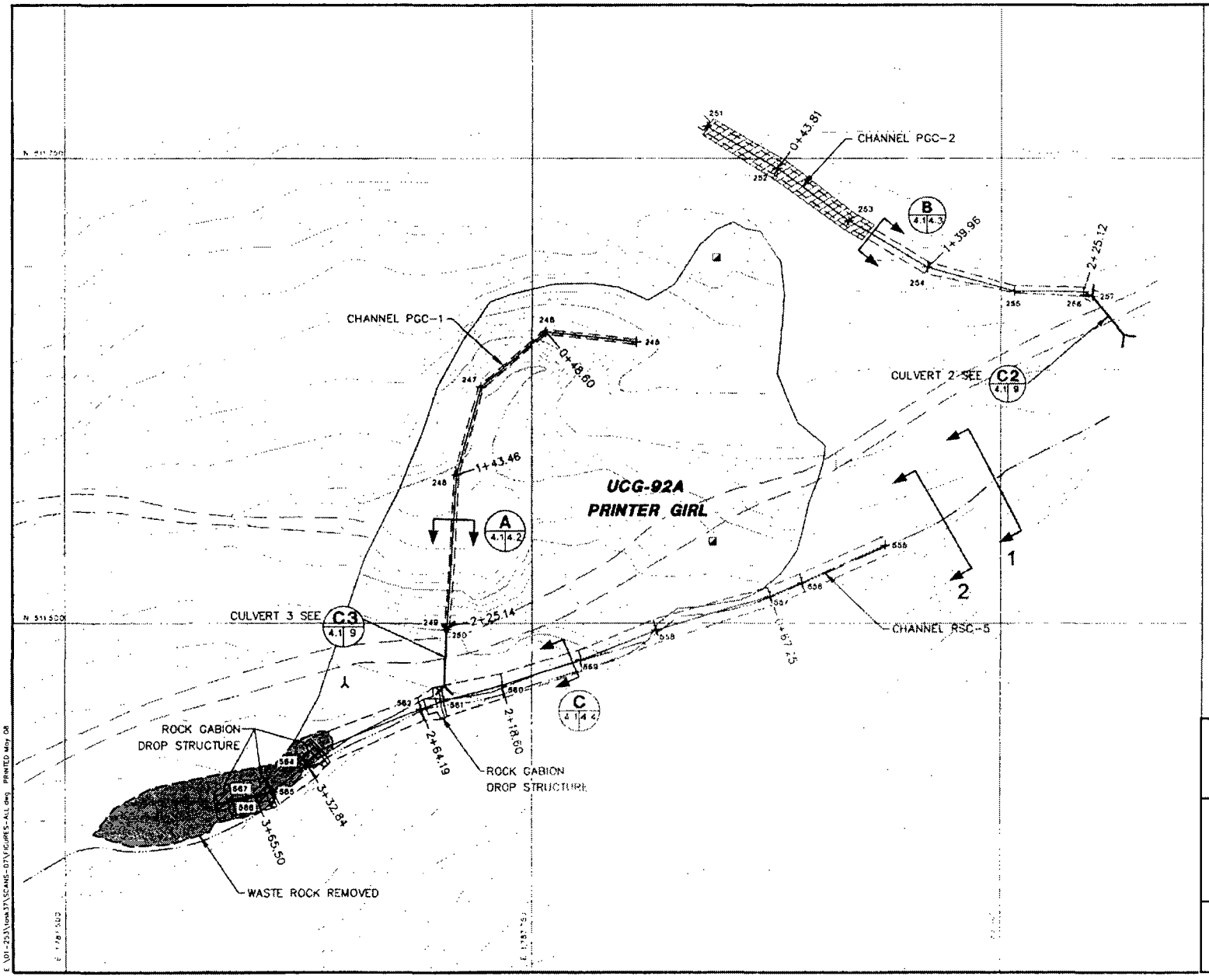


CALIFORNIA GULCH SUPERFUND SITE

FIGURE 8
NUGGET GULCH
COLORADO NUMBER 2 (UCG-71)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203



LEGEND

- REMOVED EXTENT OF ORIGINAL WASTE ROCK PILE
- APPROXIMATE EXTENT OF ORIGINAL WASTE ROCK PILE
- GCL
- CONTOURS
- REGRADED CONTOURS
- REGRADE BOUNDARY
- AS-BUILT CHANNEL CENTERLINE
- AS-BUILT CHANNEL EDGE OF CONCRETE
- +1 AS-BUILT CHANNEL CONTROL POINT
- 0+10.23 AS-BUILT CHANNEL CONTROL STATION
- AS-BUILT CULVERT LOCATION
- SHAFT
- PORTAL

NOTES

1) EXISTING TOPOGRAPHY FROM SURVEY CONDUCTED BY INTRASEARCH INC., ENGLEWOOD, COLORADO 80111 OCTOBER 20, 1995).

2) AS-BUILT DATA FROM FIELD SURVEYS COMPLETED BY DEL MONT CONSULTANTS, MONTROSE, COLORADO 81402, SUMMER 1999 & 2000.

N

SCALE

25' 0 25 50'

CONTOUR INTERVAL 5FT.

DETAIL/SECTION NUMBER

A
6 6

DRAWING No. WHERE DETAIL/SECTION IS REFERENCED

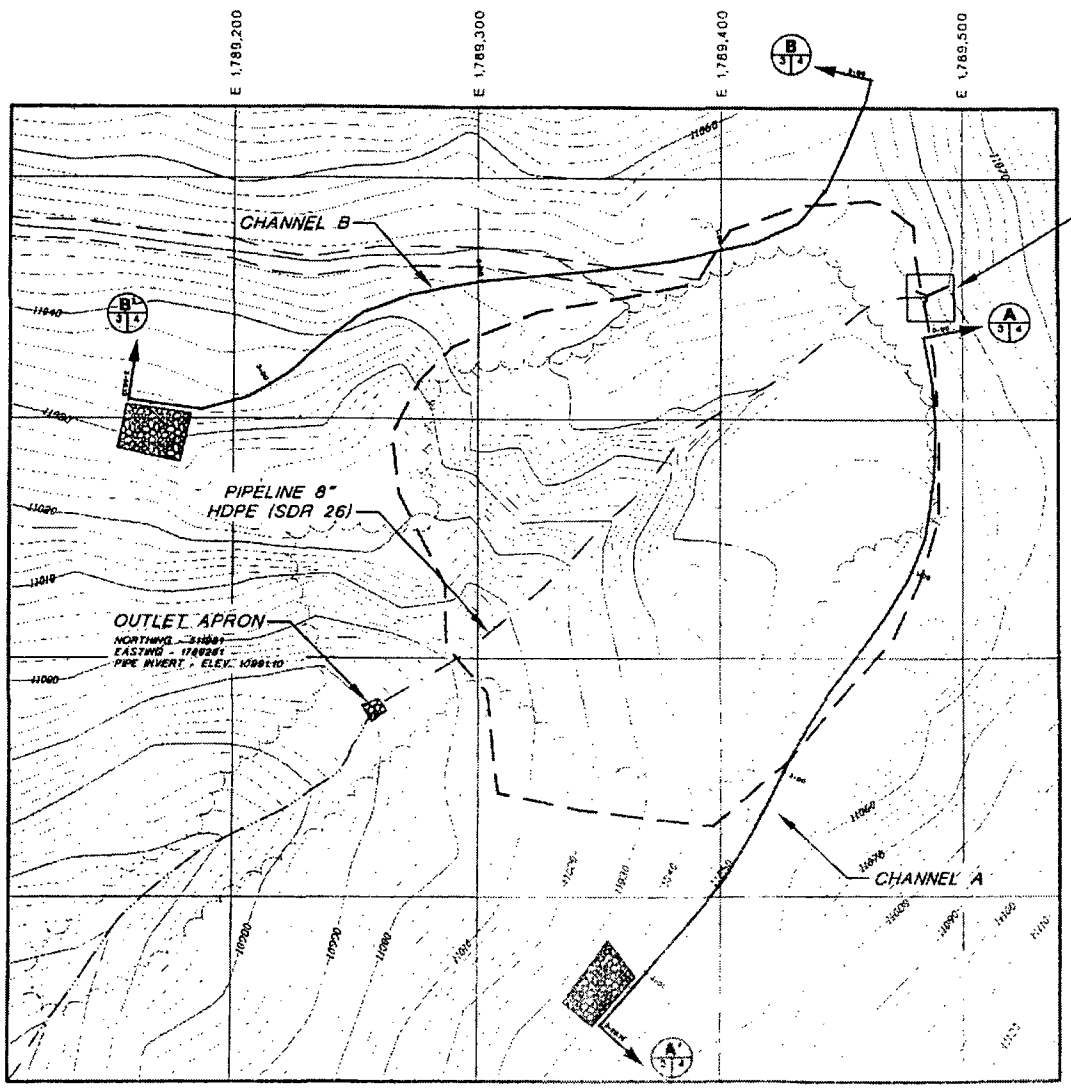
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 9
PRINTER GIRL (UCG-92A)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\1oxa37\SCANS-01\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- PILE LIMIT
- TREE LINE
- DIVERSION CHANNEL
- PIPELINE
- PORTAL
- PORTAL COLLECTION SYSTEM LOCATION
- STREAM
- OUTLET APRON LOCATION

N

SCALE

50' 0 25' 50'

CONTOUR INTERVAL 2FT.

DETAIL/SECTION NUMBER

DRAWING No. WHERE DETAIL/SECTION IS REFERENCED

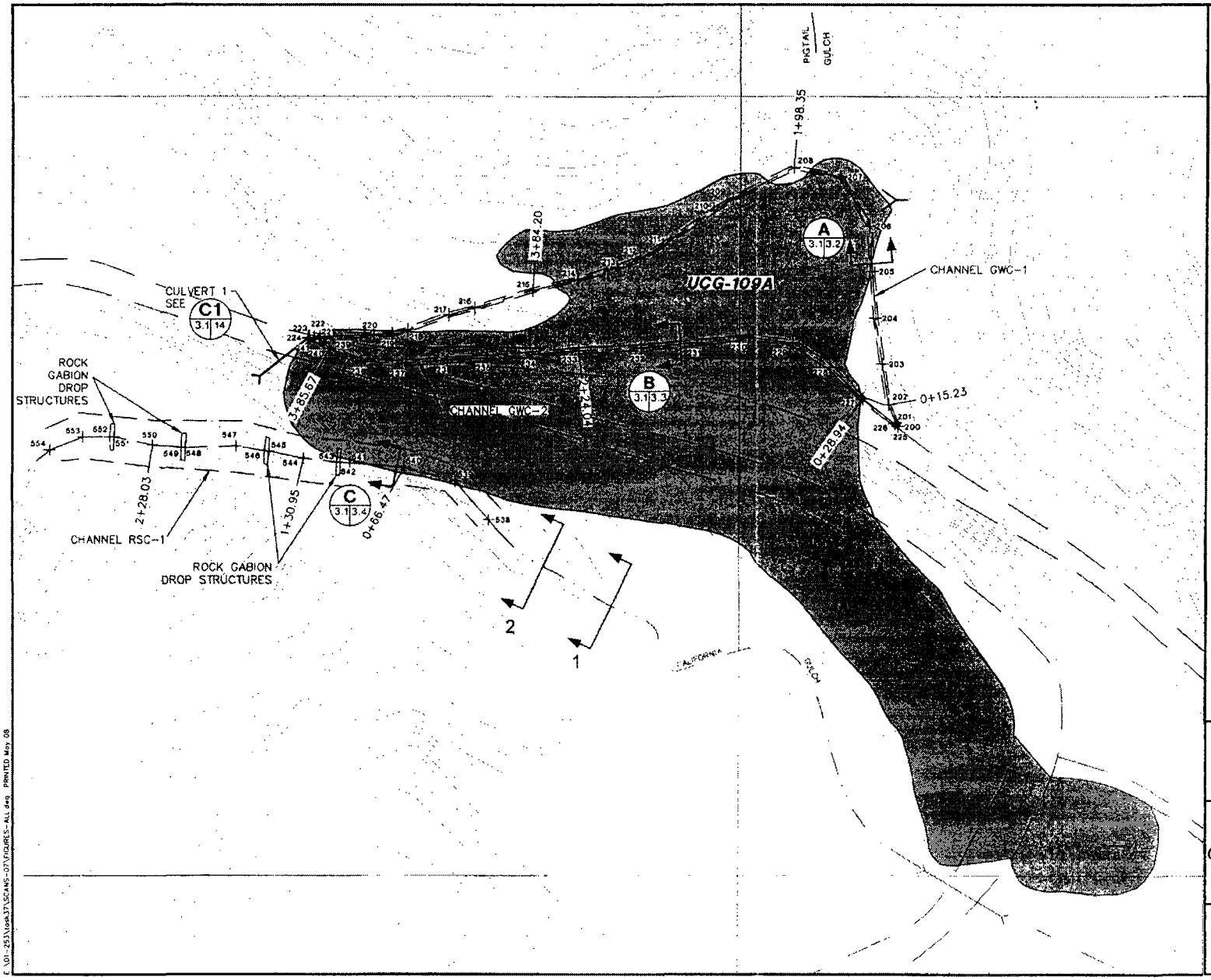
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 10
AGWALT (104)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\task3\SCANS-01\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- APPROXIMATE EXTENT OF WASTE ROCK
- CONTOURS
- AS-BUILT CHANNEL CENTERLINE
- AS-BUILT CHANNEL EDGE OF CONCRETE
- +1 AS-BUILT CHANNEL CONTROL POINT
- 0+15.23 AS-BUILT CHANNEL CONTROL STATION
- AS-BUILT CULVERT LOCATION
- EXISTING STEAM CHANNEL CROSS SECTION

NOTES:

1) EXISTING TOPOGRAPHY FROM SURVEY CONDUCTED BY INTRASEARCH INC., ENGLEWOOD, COLORADO 80111 OCTOBER 20, 1995).

2) AS-BUILT DATA FROM FIELD SURVEYS COMPLETED BY DEL MONT CONSULTANTS, MONTROSE, COLORADO 81402, SUMMER 1999, 2000 & 2001

SCALE

30' 0 30' 60'

CONTOUR INTERVAL 2 FT.

DETAIL/SECTION NUMBER

A
6 6

DRAWING No. WHERE DETAIL/SECTION IS REFERENCED

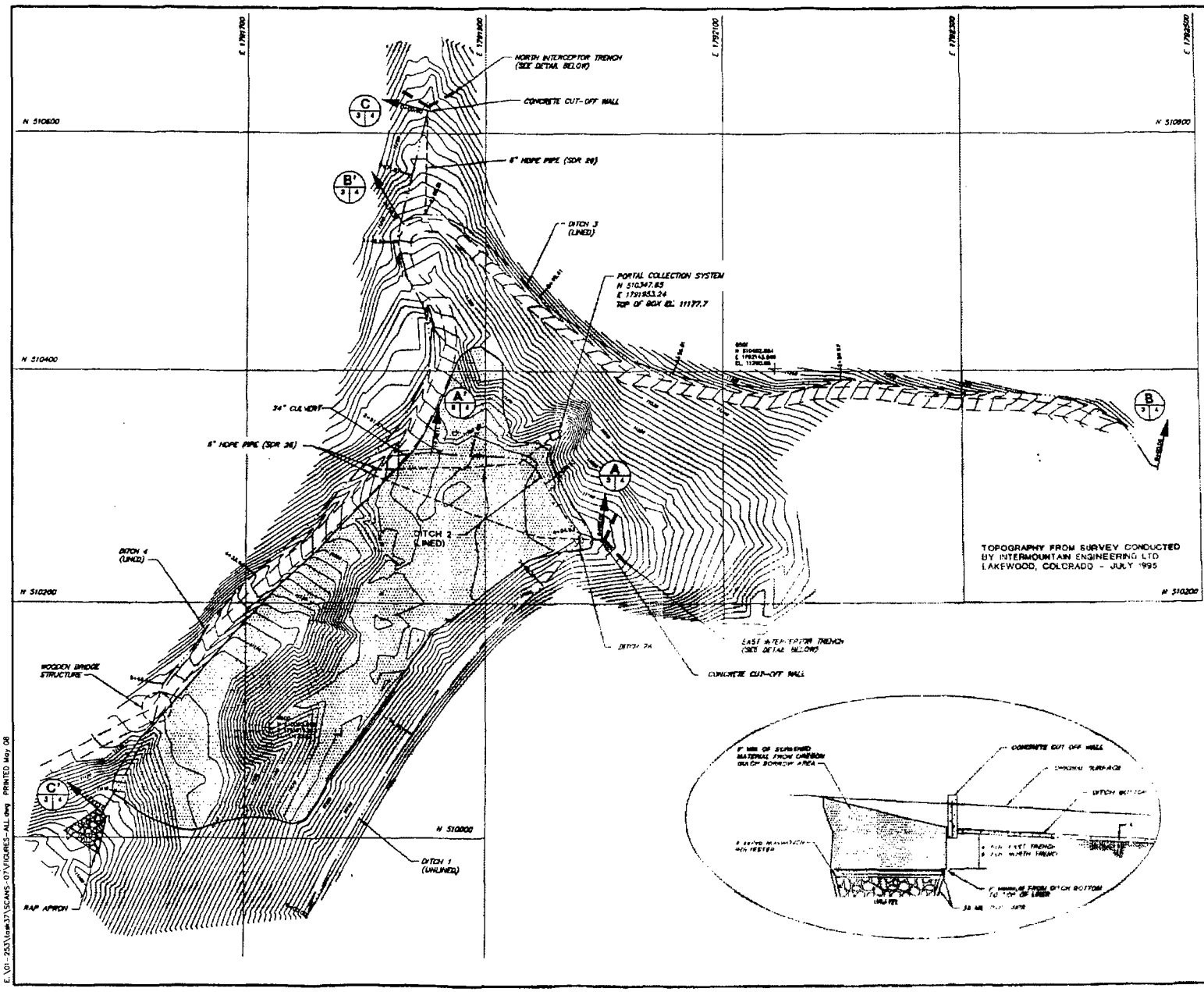
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 11
GARIBALDI SUB-BASIN (UCG-109A)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\task37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- 10' CONTOUR LINE
- 2' CONTOUR LINE
- LIMITS OF WASTE ROCK
- AS-BUILT CONTROL STATION
- ROAD
- CONTROL POINT

N

SCALE

40' 0 40' 80'

CONTOUR INTERVAL 8FT.

DETAIL/SECTION NUMBER

DRAWING No. WHERE DETAIL/SECTION IS REFERENCED

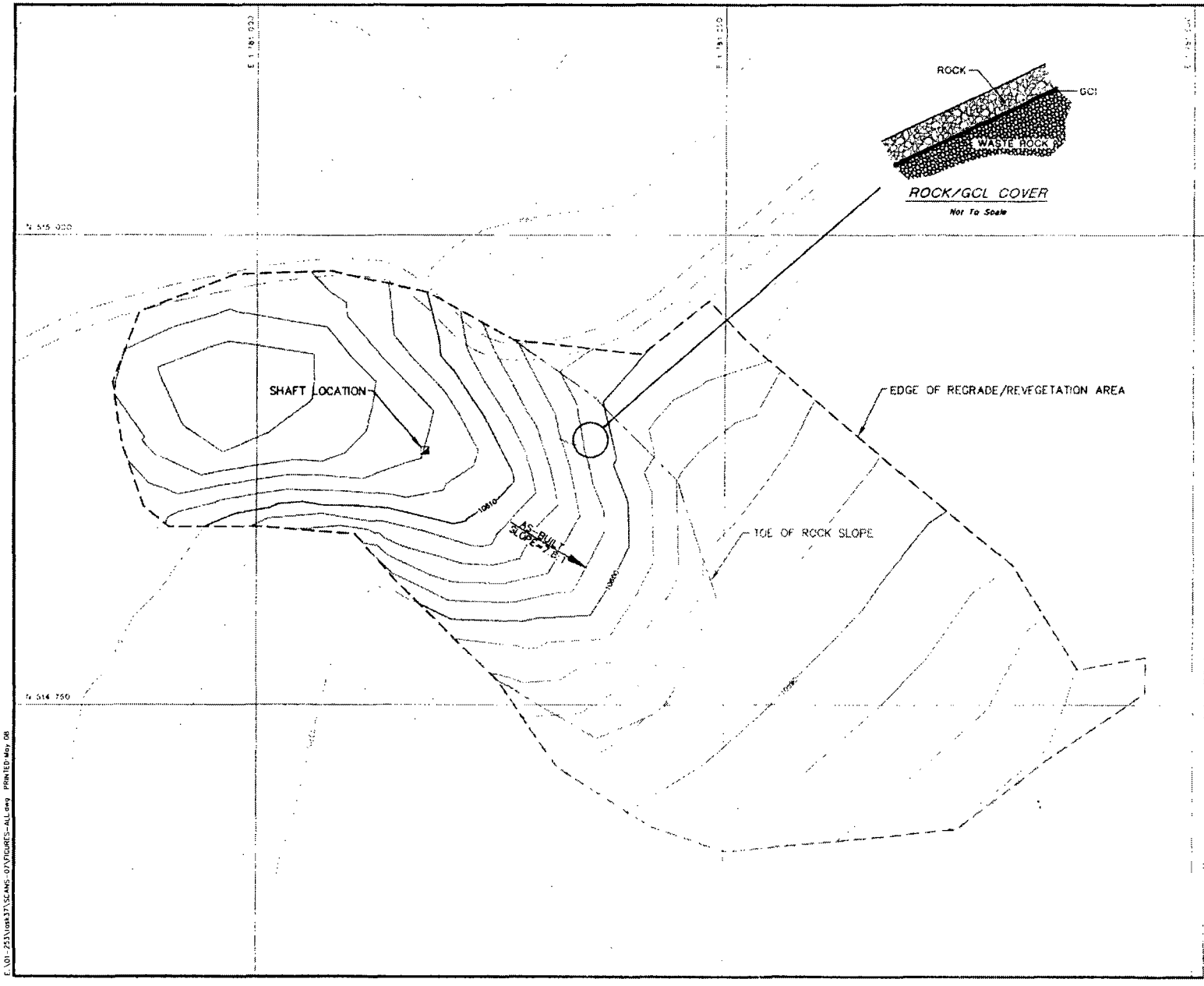
DRAWING No. WHERE DETAIL/SECTION IS SHOWN

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 12
GARIBALDI (121)
OU4

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\task37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- DIRT ROAD
- UNDISTURBED CONTOURS
- REGRADED CONTOURS
- EDGE OF REGRADED AREA
- TOE OF ROCK SURFACE
- REGRADED / COVERED WASTE ROCK

NOTES:
1) ORIGINAL TOPOGRAPHY FROM SURVEY CONDUCTED BY INTRASEARCH INC., ENGLEWOOD, COLORADO 80111 (OCTOBER 20, 1995).

2) AS-BUILT INFORMATION FROM FIELD SURVEYS CONDUCTED BY DELMONT CONSULTANTS, INC. MONTROSE, COLORADO (1999 & 2000)

N

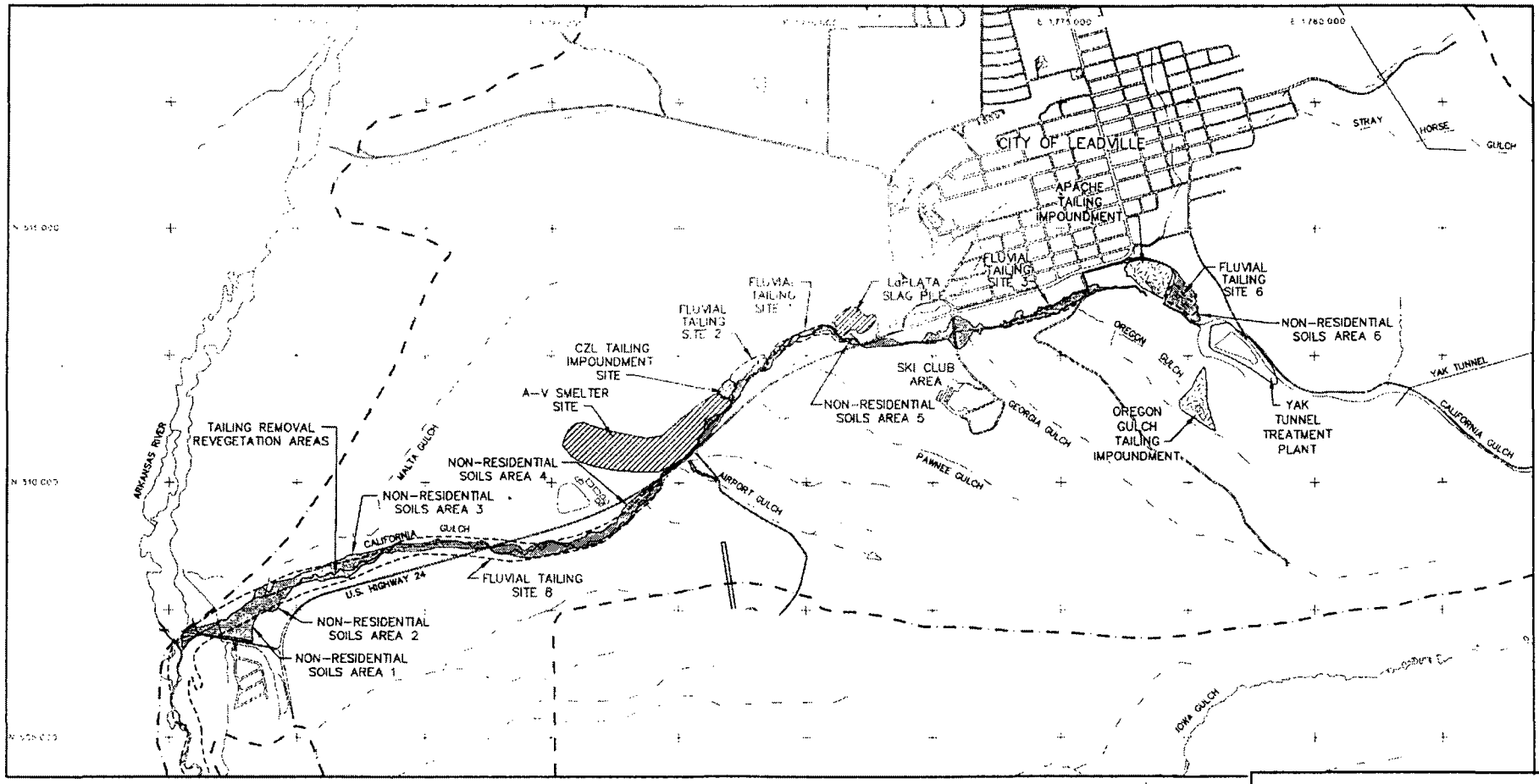
SCALE
25' 0 25' 50'
CONTOUR INTERVAL 2FT.

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 13
MAB-IRON HILL (UCG12)

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\task37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



LEGEND

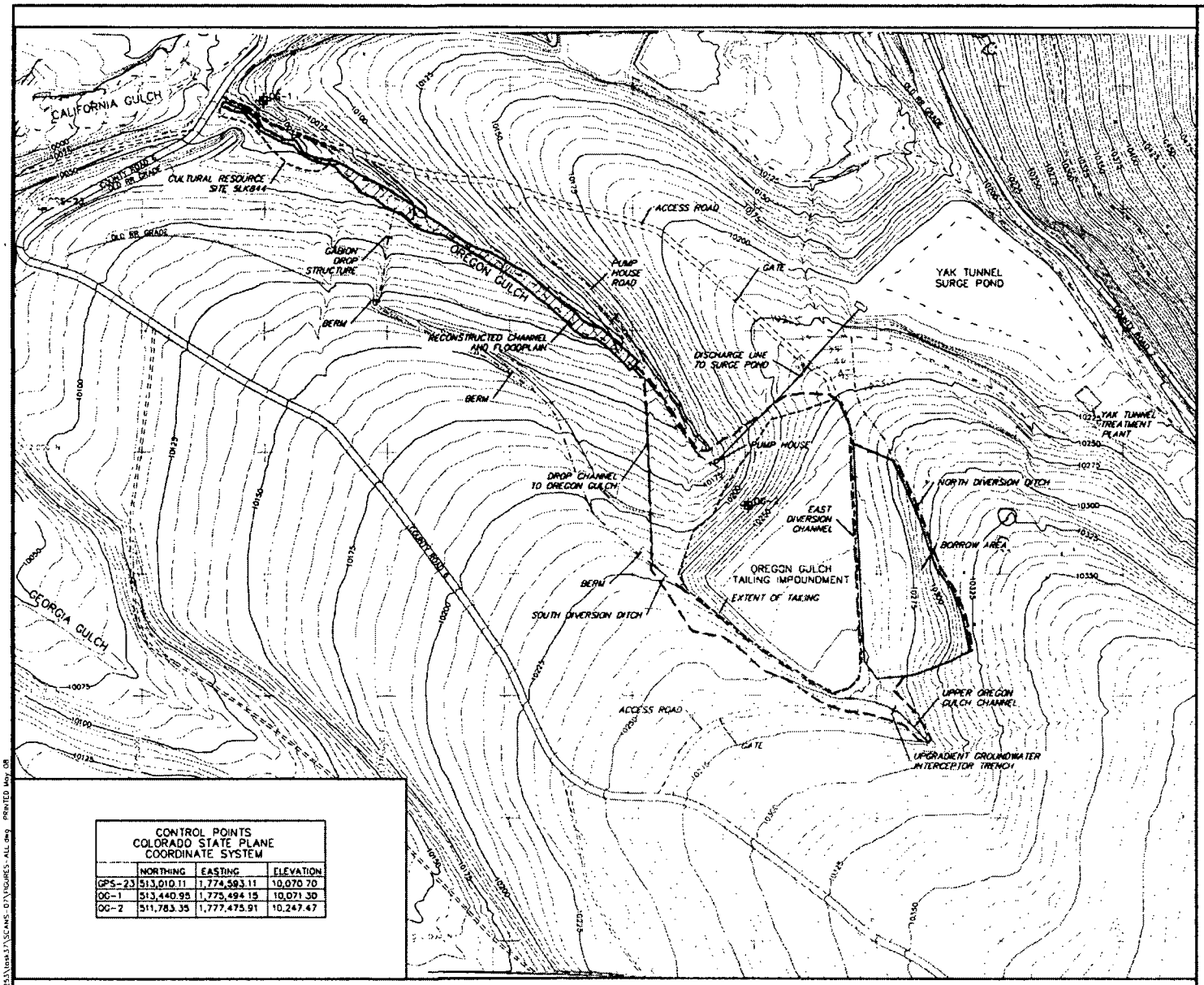
- CALIFORNIA GULCH SITE BOUNDARY
- OPERABLE UNIT 8 BOUNDARY
- FLUVIAL TAILING SITE BOUNDARY
- SLAG PILE
- TAILING IMPOUNDMENT

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 14
SITE LOCATION MAP
OU8

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\Work37\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



CONTROL POINTS
COLORADO STATE PLANE
COORDINATE SYSTEM

	NORTHING	EASTING	ELEVATION
GPS-23	513,010.11	1,774,593.11	10,070.70
OG-1	513,440.95	1,775,494.15	10,071.30
OG-2	511,783.35	1,777,475.91	10,247.47

LEGEND

- CONTOURS
- GRAVEL ROAD
- PAVED ROAD
- STREAM CHANNEL
- DITCH
- POND
- MINE SHAFT
- ABANDONED RAILROAD GRADE
- LIMIT OF RECLAMATION
- DIVERSION CHANNELS
- LIMIT OF TAILINGS

NOTE:

TOPOGRAPHY PROVIDED BY INTRASEARCH, INC., ENGLEWOOD, COLORADO, OCT. 1995 AND SURVEYS PERFORMED BY DELMONT CONSULTANTS IN 1999.

N

SCALE

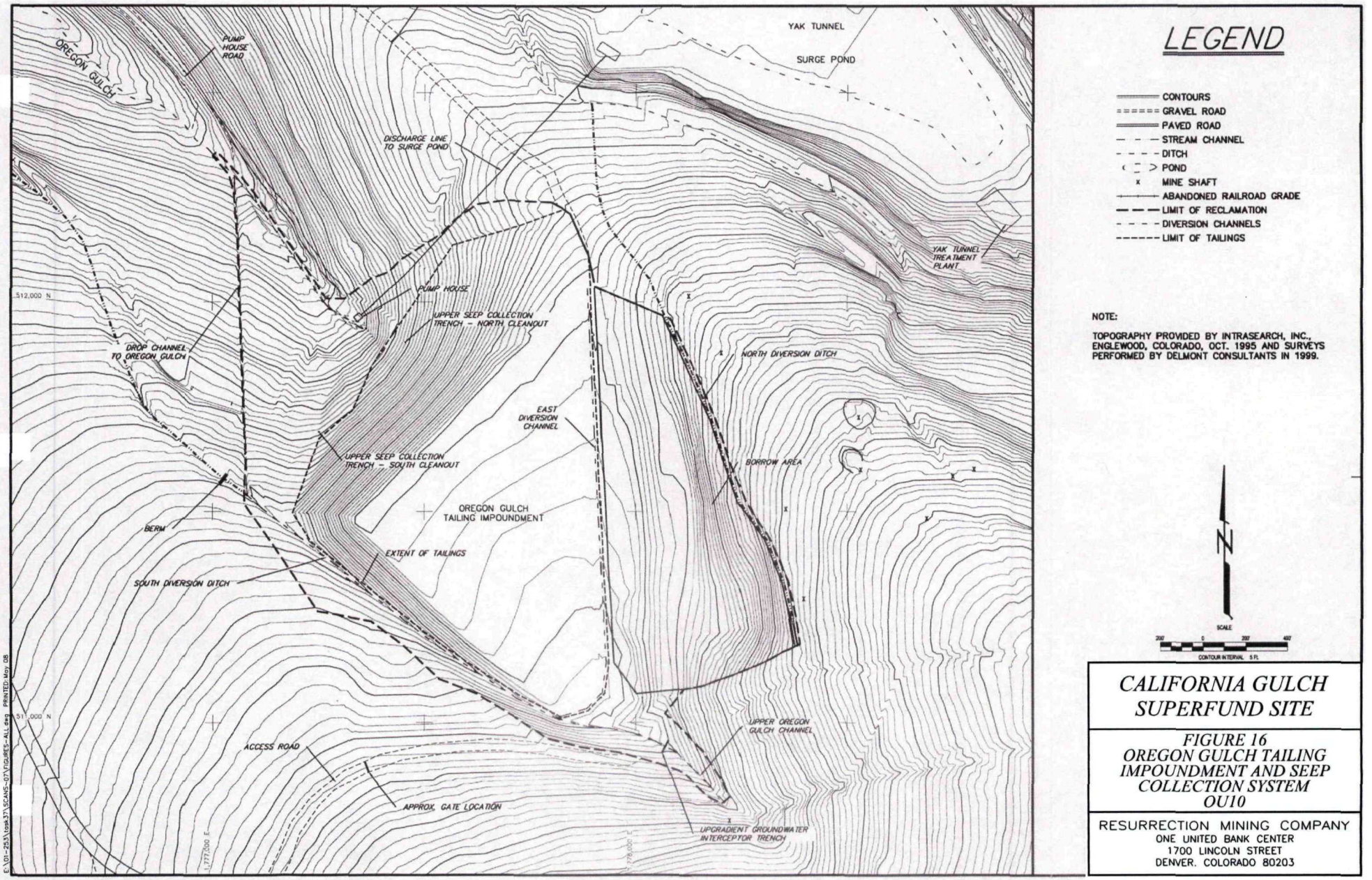
CONTOUR INTERVAL 5 FT.

CALIFORNIA GULCH SUPERFUND SITE

FIGURE 15
SITE LOCATION MAP
OU10

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

E:\01-253\task3\SCANS-07\FIGURES-ALL.dwg PRINTED May 08



LEGEND

- CONTOURS
- GRAVEL ROAD
- PAVED ROAD
- STREAM CHANNEL
- DITCH
- POND
- MINE SHAFT
- ABANDONED RAILROAD GRADE
- LIMIT OF RECLAMATION
- DIVERSION CHANNELS
- LIMIT OF TAILINGS

NOTE:

TOPOGRAPHY PROVIDED BY INTRASEARCH, INC., ENGLEWOOD, COLORADO, OCT. 1995 AND SURVEYS PERFORMED BY DELMONT CONSULTANTS IN 1999.

N

SCALE

200 0 200 400

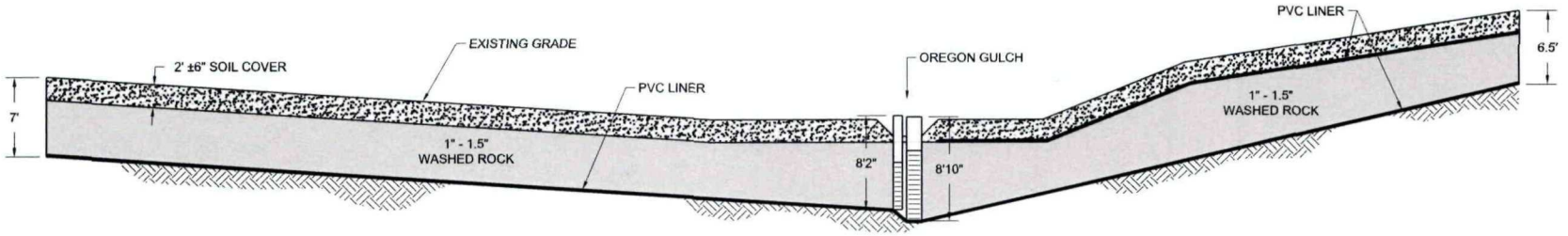
CONTOUR INTERVAL 5 FT.

CALIFORNIA GULCH SUPERFUND SITE

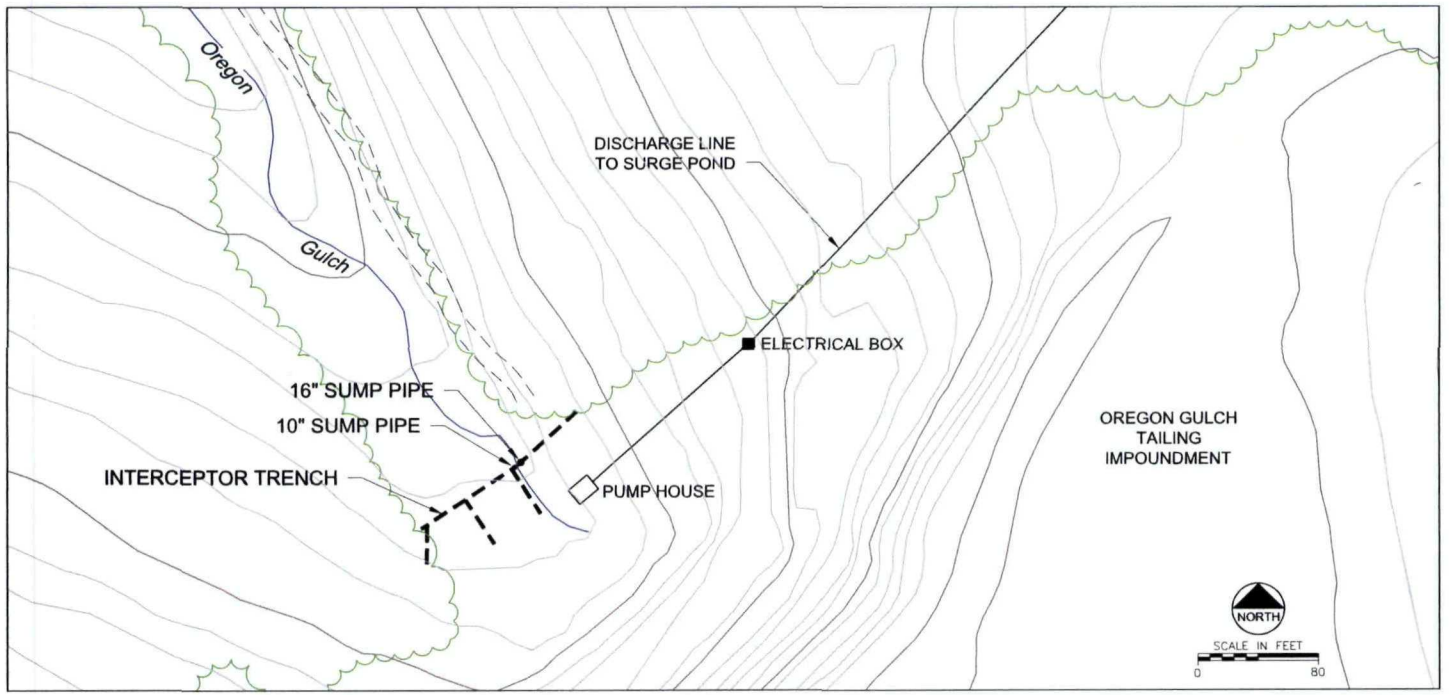
FIGURE 16
OREGON GULCH TAILING IMPOUNDMENT AND SEEP COLLECTION SYSTEM
OU10

RESURRECTION MINING COMPANY
ONE UNITED BANK CENTER
1700 LINCOLN STREET
DENVER, COLORADO 80203

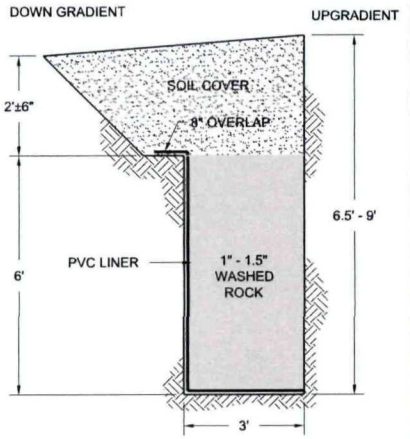
E:\01-253\Task 37\SCANS-07\FIGURES-ALL.dwg PRINTED: May 08



TRENCH PROFILE
NOT TO SCALE



PLAN VIEW OF TRENCH
SCALE: 1" = 80'



TRENCH SECTION
NOT TO SCALE

FIGURE 17
INTERCEPTOR TRENCH - OU10

MFG, Inc.
consulting scientists and engineers

Date: MAY 2008
Project: 180885
File: OG-TRENCH-01.DWG

E:\01-253\2006\OG-TRENCH-01.dwg

APPENDIX E
TO CONSENT DECREE

BLACK CLOUD MINE RECLAMATION PLAN AND SCHEDULE
LEADVILLE, COLORADO

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 RECLAMATION PLAN POST-MINE LAND USE 2
3.0 RECLAMATION PLAN BACKGROUND 2
3.1 Material Characterization 2
3.2 Material Volume Estimates 3
3.3 Material Management Options 3
3.4 Screening Disposal Options 4
4.0 RECLAMATION AND CLOSURE PLAN 5
4.1 Reclamation and Closure By Site 5
4.2 Reclamation of Surface Structures 11
4.3 Erosion and Sediment Control 16
4.4 Iowa Gulch Tailing Impoundment Future Use 17
4.5 Revegetation 17
4.6 Environmental Protection Facilities 20
4.7 Emergency Management 23
4.8 Spill Reporting 24
5.0 WATER MANAGEMENT 25
5.1 Surface Water 25
5.2 Surface and Ground Water Sampling 26
6.0 RECLAMATION SCHEDULE 33
6.1 Schedule 33
Year 1 following court entry of the Consent Decree 33
Year 2 following court entry of the Consent Decree 34
Year 3 following court entry of the Consent Decree 34
Year 4 following court entry of Consent Decree 35
Year 5 following court entry of Consent Decree 36
Year 6 through 9 following court entry of the Consent Decree 36
7.0 PERFORMANCE STANDARDS 37
7.1 Reclamation Measures - Materials Handling 37
7.2 Water - General Requirements 37
7.3 Groundwater - Specific Requirements 38
7.4 Wildlife 38
7.5 Topsoiling 38
7.6 Revegetation 39

LIST OF FIGURES

Figure 1 Black Cloud Mine Project Areas
Figure 2 Proposed Grading for Impoundment Cover
Figure 3 Debris Cell Location
Figure 4 Debris Cell Cross Section

LIST OF TABLES

Table 1 – Revegetation Seed Species and Application Rates
Table 2 – Black Cloud Mine Water Monitoring

APPENDIX

Appendix A Standard Operating Procedures
O&M SOP-1 Decontamination
O&M SOP-2 Well Water Level Measurement
O&M SOP-3 Field Instrument Calibration and Operation
O&M SOP-4 Groundwater Monitoring Well Sampling
O&M SOP-5 Surface Water Sample Collection
O&M SOP-6 Sample Handling, Documentation, and Analysis
O&M SOP-7 Field QA/QC Samples

1.0 INTRODUCTION

The Black Cloud Mine is located in the Leadville mining district of Lake County, Colorado. Mining at the Black Cloud Mine ceased in 1999. Provisions for reclaiming the Black Cloud Mine were established in a reclamation permit (Permit No. M-1977-218-UG), which was issued by the Colorado Mined Land Reclamation Board (MLRB) to Asarco, Incorporated (ASARCO). Pursuant to the Consent Decree entered into by and among the United States, State of Colorado, Newmont USA Limited and Resurrection Mining Company, to which this Reclamation Plan and Schedule is appended, the MLRB permit will be terminated or otherwise released, and Newmont/Resurrection (the Operator) will be responsible for reclaiming the Black Cloud Mine, in accordance with the terms of the Consent Decree and this Reclamation Plan.

The MLRB permit requirements for reclaiming the Black Cloud Mine were set forth in Technical Revision (TR) 6 of the MLRB permit, and were further refined in TR-7 and TR-8. The approved reclamation requirements were developed following thorough geotechnical and geochemical analysis by URS Greiner Woodward Clyde (URS) as presented in the URS report entitled "Black Cloud Mine Reclamation and Closure Plan, Leadville, Colorado" (2001). Those hydrological, geotechnical and geochemical analyses were previously reviewed by MLRB and the Division of Reclamation, Mining and Safety (DRMS), and provide the technical basis for the reclamation measures set forth herein.

The purpose of this Reclamation Plan is to establish the reclamation measures and schedule that Newmont/Resurrection will implement at the Black Cloud Mine to meet the post-mining land uses identified in Section 2.

The Black Cloud Mine site to be addressed or reclaimed pursuant to this Reclamation Plan and Schedule is situated in the areas identified on Figure 1. The facilities to be reclaimed are identified below:

Iowa Gulch Mine Facilities:

- The Black Cloud shaft and waste rock piles
- The Iowa Gulch tailing impoundment and surface structures
- The Iowa Gulch borrow area located west of the tailing impoundment
- The Black Cloud crusher/mill, shops, warehouse, offices, and ancillary facilities
- The Helena shaft, surface structures, and waste rock pile
- The Julia Fiske shaft, surface structures and waste rock pile

Idaho Park Mine Facilities:

- The Irene shaft, surface structures and waste rock pile
- The Eclipse waste rock pile

2.0 RECLAMATION PLAN POST-MINE LAND USE

The objective of this Reclamation Plan and Schedule is to reclaim the Black Cloud Mine to post-mine land uses consistent with past and potential future uses of the land. These uses will include industrial, recreation, and wildlife land uses. The Leadville area is an area economically dependent on and interested in preserving its historic mining heritage. Thus, post-mine land uses of the Black Cloud facilities should contemplate preservation of this heritage using reclamation and closure practices which preserve or promote the Black Cloud area for purposes of recreation. Post-mine land uses will also allow potential future industrial uses of the facilities which support operation and maintenance of the Yak Tunnel blockage system.

3.0 RECLAMATION PLAN BACKGROUND

This Reclamation Plan and Schedule addresses reclamation and closure of mine waste rock, tailing and surface structures at the Black Cloud Mine using a closure strategy that was developed after consideration of multiple reclamation alternatives associated with previous:

- Material characterizations (geochemical assessments),
- Material volume estimates,
- Material management options, and
- Screening disposal options.

3.1 Material Characterization

Geochemical analysis was performed on samples of mine waste rock and tailing materials. The results were used to evaluate material characteristics and estimate the potential for Acid Rock Drainage (ARD) generation. Materials from each mine waste rock and tailing disposal area were classified according to results of the geochemical analyses. These classifications were then used, to segregate materials for final reclamation and closure.

Mine waste rock and tailing areas were classified into three categories: (1) acid generating, (2) potentially acid generating, and (3) non-acid generating. Materials were then classified in each category from most to least ARD reactive as follows:

Acid Generating

- Iowa Gulch tailing impoundment
- Helena Mine waste rock pile
- Eclipse Mine waste rock pile
- Black Cloud East Mine waste rock pile

Potentially Acid Generating

- Black Cloud West Mine waste rock pile
- Iowa Gulch dam embankment
- Irene Mine waste rock pile

Non-Acid Generating

- Julia Fisk Mine waste rock pile

Materials classified as potentially acid generating when possible, were treated as acid generating.

3.2 Material Volume Estimates

Estimated material volumes for each mine waste rock and tailing area from greatest to least are as follows:

• Iowa Gulch tailing impoundment	1,250,000 cy (cubic yards)
• Iowa Gulch dam embankment	475,000 cy
• Irene waste rock pile	95,000 cy
• Black Cloud East waste rock pile	72,000 cy
• Eclipse waste rock pile	57,000 cy
• Black Cloud West waste rock pile	34,000 cy
• Julia Fisk waste rock pile	13,000 cy
• Helena waste rock pile	11,500 cy

3.3 Material Management Options

Material management options evaluated either capping mine waste rock and tailing areas in place or removing and hauling the material to an alternate location (i.e., offsite, central repository, or underground). Each mine waste rock pile and tailing area was evaluated individually and consideration was given to either leaving the material in-place or moving it. Recommendations to leave certain

materials in place were based on several factors, including: (1) material volume (i.e., cost to relocate), (2) material properties (i.e., saturated tailing), (3) historic value or interest, (4) Superfund liability, and/or (5) no reclamation was required.

Based on that analysis, materials generated from mining at the Black Cloud mine will be reclaimed as follows:

Materials to be left in place:	**Justification**
Iowa Gulch tailing	Size, volume, and risk
Iowa Gulch dam embankment	Size, volume and risk
Irene waste rock pile	Historic Value, volume, minimal acid potential
Julia Fisk waste rock pile	Non-acid generating
Eclipse waste rock pile	Cap and reclaim
Materials to be moved:	
Helena waste rock pile	ARD potential and proximity to Iowa Gulch
Black Cloud East waste rock pile	ARD potential
Black Cloud West waste rock pile	ARD potential

3.4 Screening Disposal Options

Disposal options that were evaluated for materials to be moved as part of final reclamation included:

- Mine Shaft Backfilling
- Relocation to the Iowa Gulch Tailing Impoundment (Central Mine Waste Repository)

Shaft Backfill

Using waste rock to backfill below mine shaft plugs was evaluated as a reclamation option for the Black Cloud, Irene, Julia Fisk, and Eclipse shafts. The mine waste rock materials would potentially serve as a suitable backfill material below the structural plugs. The material would be located in an anaerobic environment with limited access to oxygenated surface water. The material would mitigate a large subsurface void and would minimize the potential for long-term subsidence. Each shaft is located adjacent to their respective mine waste rock area, resulting in a short material haul and making for economic closure. The shafts would be sealed with a structural surface plug.

Central Mine Waste Rock/Tailing Repository

The largest quantity of mine waste rock and tailing is contained in the Iowa Gulch tailing dam embankment and pond (Iowa Gulch). The estimated combined volume of all other mine materials at the site represents about 16 percent of the total material volume contained in Iowa Gulch. The Iowa Gulch dam is a well-constructed engineered fill that meets acceptable stability criteria. The tailing material contained in the pond is reactive, yet is fine and has a very low-permeability. If additional mine materials were placed in the pond, those materials would be underlain by 50 to 100 feet of low permeability tailing. The material that forms the dam embankment is non-reactive.

Benefits would be achieved from locating the mine waste rock and tailing that would be moved as part of reclamation to this single location. First, the material would be placed under one single engineered cap. The area is a location which infiltration through the facility could be collected. Year-round site access is available via a maintained county roadway and long-term monitoring can occur at one location. Most importantly, the Iowa Gulch tailing impoundment is in good condition, well constructed and is a suitable central repository for all remaining mine waste materials at the site. Therefore, Iowa Gulch was selected as a central repository for waste rock and tailing that would be moved pursuant to the reclamation plan.

4.0 RECLAMATION AND CLOSURE PLAN

Section 4 identifies the reclamation and closure requirements associated with mine waste rock areas, tailing areas, shafts, and surface structures at the Black Cloud Mine.

4.1 Reclamation and Closure By Site

Each mine waste rock and tailing area has been evaluated on an individual basis. Reclamation alternatives were considered and screened as a conceptual review of advantages and disadvantages. Reclamation requirements have been selected based on site-specific requirements, material properties, and site limitations. These selected and accepted reclamation and closure actions are described below.

Black Cloud Waste Rock

The Black Cloud waste rock is divided into East and West based on the material characterization. The Black Cloud West waste rock is typically comprised of host rock and has the lower ARD potential. The Black Cloud East waste rock contains more ore and concentrate and has a relatively high ARD potential. All the Black Cloud waste rock is to be removed to the natural ground surface and placed in the Iowa Gulch impoundment.

The waste rock will be needed for fill in the pond and will be useful for stabilizing the soft tailing as discussed below. The more reactive Black Cloud East waste rock will be placed near the interior of the tailing pond and surrounded by less reactive Black Cloud West waste rock. The Black Cloud waste rock will be placed in deep areas of the decant pond against the south pond slope.

The exposed subgrade soils will be graded and revegetated. If the subgrade soils will not support the establishment of vegetation, soil amendments or spreading of suitable soil or growth medium sourced from onsite or imported from offsite will be undertaken.

Helena Mine Waste Rock

The Helena mine waste rock is highly reactive and was determined to be producing ARD. The Helena mine waste rock will be removed down to the natural subsoils and placed in the Iowa Gulch pond. The waste rock will be placed near the center of the pond. Some of this required reclamation was done in 2004. The Helena waste rock was excavated and relocated into the Iowa Gulch pond in an area east of the splitter dike. This rock will be moved to the approved location in the center of the pond west of the splitter dike. The area of the 2004 waste rock removal project will be thoroughly inspected, and any remaining waste rock will be removed. The exposed subgrade and surrounding area will be stabilized and reclaimed. This reclamation will include any necessary stream bank stabilization and revegetation. If the subgrade soils will not support the establishment of vegetation, soil amendments or spreading of suitable soil or growth medium sourced from onsite or imported from offsite will be undertaken.

Julia Fisk Mine Waste Rock

The Julia Fisk mine waste rock was found to be unreactive and consists primarily of dolomite and limestone. However, given the small volume of the material, the actual benefit of excavating the material is limited. The Julia Fisk mine waste rock was reclaimed in place in 2006. Weed control measures and other maintenance will continue until vegetation is established.

Eclipse Mine Waste Rock

The Eclipse mine waste rock was found to be reactive and has significant potential for generating ARD. The Eclipse mine waste rock will be reclaimed in place. Sideslopes of the Eclipse mine waste rock will be recontoured to an approximate 3H:1V slope and the top surface will be graded to an approximate 1.5 percent grade to allow drainage. Following final grade work, a 12 inch layer of dolomite waste rock from the Irene Mine will be placed over the regraded mine waste rock surface and a 6 inch layer of U.S. EPA Kids First soil stockpiled at the Yak Treatment and at the Eclipse Dump will be used to cap the dolomite

covering. The topsoiled surface will be revegetated with seed species identified in Table 1. Areas below the Eclipse Dump that have been denuded of vegetation by acidic runoff from the dump will also be revegetated.

The upland diversion ditches located immediately above the waste rock pile will be backfilled and graded. With the installation of the EPA upgradient diversion channel to prevent run on to the Ibex/Irene/Eclipse Mine areas, the pre-existing diversion ditches are neither necessary nor desirable.

Irene Waste Rock

The Irene waste rock was found to be generally non-reactive with small isolated pockets of potentially reactive material with a low potential for generating ARD. The Irene Mine is a valuable historic resource; the waste dump pile was mostly emplaced prior to 1960. The Irene waste dump pile has minimal acid generation potential and the EPA constructed upgradient diversion channel prevents run on to the Irene Mine. Therefore, the Irene mine waste rock pile will be left in place.

The side slopes will remain undisturbed and the surface graded to drain to the south and converted to a parking lot. Surface water diversion channels will be evaluated during design and sized to divert surface water runon around the existing facility. The existing pond to the south will be backfilled and the area graded to drain.

Iowa Gulch Tailing Impoundment/Embankment

The Iowa Gulch tailing impoundment consists of the Iowa Gulch dam embankment and the tailing material contained in the pond. The material at the interior of the dam varies from potentially reactive to non-reactive. The exterior slopes are comprised of benign talus fill and require no action. Slope stability analysis has shown the dam to be well constructed and stable. The Iowa Gulch dam and impoundment will be left in place. The Iowa Gulch dam crest and tailing pond surface will be reclaimed as described below.

Material Placement

Tailing deposited in the Iowa Gulch pond has a range of material size and consistency. Course tailing consisting of the poorly graded sand with silts is generally deposited around the perimeter of the pond. The course tailing is well drained and will serve as a good foundation for the cover. The tailing becomes progressively more fine toward the center and the decant pond area. The material nearest to the decant pond area consist of fine silts and clays. This material is soft and has poor drainage characteristics. In

this area, the tailing is also still saturated. This soft material will deform and flow, creating difficult construction conditions. The pond interior in the south decant area contains the finest material and will be the most difficult work location.

A firm foundation will be required on which to construct the final cover. Special soft ground construction techniques will be used to stabilize soft tailing areas and create firm foundation on which to construct the final cover. The cover subgrade preparation will require controlled dewatering, selected placement of the mine waste rock, and careful foundation preparation.

Dewatering

The dewatering of the Iowa Gulch tailing impoundment will be performed using various dewatering and water management options. These options include:

- Dewatering of the decant pond using centrifugal pumps. . The water removed from the decant pond would consist of suspended solids, decant water and pore fluid.
- The collection and pumping of the tailing impoundment toe drain seepage water from the seepage collection systems.
- Subsequently, the collected decant water and/or toe drain seepage water would be conveyed either to the Black Cloud shaft for subsequent removal by the Yak Tunnel blockage pump and treatment at the Yak water treatment plant or conveyed directly to the Yak water treatment plant, or may be treated at a water treatment plant constructed in Iowa Gulch.. The infrastructure to allow the conveyance of this water to the Black Cloud shaft or from the Black Cloud shaft to the Yak water treatment plant is currently in place.

Material Blending

With the pond dewatered, mine waste rock can be placed within the Iowa Gulch pond. Mine waste rock can either be spread in lifts with the most reactive materials placed at the center and surface of the pond or blended into a homogeneous mass. Blending is technically difficult and not economically practical because of the difficulty associated with developing a homogeneous mass and the cost associated with material handling, screening and blending the materials.

Therefore, waste rock will be placed in the Iowa Gulch pond in thin lifts. Highly ARD materials, such as the Helena Mine waste rock, will be placed in the most central area of the impoundment or at the surface. Less reactive waste rock will be placed at the perimeter of the pond and used to stabilize the soft tailing.

Foundation Preparation

Once the main pond is dewatered, mine waste rock will be selectively placed and used to create a firm subgrade near the deepest part of the pond. Soil reinforcement such as a woven geotextile will be used in areas to bridge soft tailing as necessary. It is expected that a geotextile will be rolled out over the tailing surface and then the granular waste rock from the Black Cloud West will be placed over the geotextile. The reinforced soil fill will be placed in soft tailing areas until a firm working platform is established for the final cover.

Iowa Gulch Tailing Pond Final Cover

After mine waste rock has been placed, the surface of the Iowa Gulch tailing pond will be covered with a soil cover designed to reduce surface infiltration. The final cover is designed to:

- Promote stormwater runoff
- Reduce infiltration
- Maintain separation between the soil cover, mine waste rock and tailing in the subgrade
- Buffer infiltrating water
- Provide a rooting zone for vegetative cover
- Maximize evapotranspiration

Surface Grading

The surface of the Iowa Gulch tailing pond will be graded to drain. The final cover will be constructed at a slope that considers long-term consolidation settlement. The surface of each pond will be graded to a uniform slope of about 1.5 percent to promote sheet flow. A plan view showing the proposed cap grade is shown on Figure 2.0.

The surface of both the east and west pond will be sloped to drain to the south. Stormwater runoff from the cover will be collected in channels along the south edge of the pond. The splitter dike will serve as stormwater divide with stormwater flowing to either the east or west.

One surface water diversion channel will be located along the south perimeter of the main (west) pond. The channel will drain stormwater to the west and then turn north along the northwest groin. A buried pipe or lined open channel will carry the stormwater down the northwest groin to an outfall in Iowa Gulch. A second surface water diversion channel will be located along the south perimeter of the east pond. This channel will flow to the east and then north into Iowa Gulch.

Infiltration Reduction

Several stormwater infiltration designs were evaluated and it was determined a soil cover design using infiltration water storage would be constructed. Therefore, mine waste rock and other fills as subgrade fill will be placed in thin compacted lifts beneath the cover. Compacting the material will reduce the pore volumes and decrease their permeability. The Helena waste rock contain plastic fines and when compacted will produce a relatively low permeability fill.

Material Separation

The surface of the Iowa Gulch tailing pond will be stabilized using a reinforced granular soil fill to establish a firm working platform. Once a firm suitable working platform is established, the surface will be sloped to a uniform slope to the south. The tailing pond surface will then be covered with a geotextile. The geotextile will be placed to maintain separation between the soil cover, the mine waste rock, and the tailing subgrade, and prevent materials from commingling. The geotextile will be placed over the amended mine waste rock and tailing and then overlain by 6 inches of crushed talus borrow material and then by 18 inches of revegetated growth medium as described below.

Infiltration Buffering and Capillary Break

Some water will infiltrate to the tailing surface regardless of the cap design. A layer of talus material will be added to buffer infiltrating water and provide a capillary break between the soil cover and the underlying mine materials. A 6-inch layer of crushed talus gravel will be placed at the pond surface to raise the pH of infiltrating water, provide a hydrologic control, and a physical material separation.

Evapotranspiration

Land use of the reclaimed tailing impoundment is limited due to altitude, climate and topographic features. The final cover is designed to control erosion and initiate fundamental ecological processes to promote natural succession and develop a diverse, self-sustaining vegetative cover. The cover is designed to allow the establishment of native and naturalized species. Initially, the reinstated vegetation will be a mixture of pioneer and higher-order species, which will undergo succession change over time to provide a more diverse and ecologically stable group of species, which resembles the principle vegetation types of the area.

Eighteen inches of soil or growth medium will be placed over a 6-inch crushed talus gravel buffer layer. The cover will provide a relatively deep rooting layer, which will enhance vegetation establishment and

growth beyond that expected for directly established vegetation. The soil cover will include material from a stockpile located to the east of the east pond, imported growth medium from the Robinson/Chapman Placer near Leadville, imported compost, or other locally available and approved soil/growth medium sources.

Potential upward migration of acidity and soluble metals into the rooting zone will be prevented by the capillary break, buffer layer. Consequently, the proposed cover design supports the use of an "agricultural" type vegetation establishment strategy, which does not require the use of specific metal- or acid adapted varieties of plant species and only basic chemical amendment (fertilization) of the final substrate cover will be required.

The cap will be vegetated with selected native grasses and forbs to develop a self-sustaining ecosystem that will maximize long-term vegetative success. A list of proposed species is presented in Table 1 below.

Table 1 – Revegetation Seed Species and Application Rates

Common Name – Variety	Scientific Name	Native or Introduced	Application Rate (pls)	Seeds Per Sq, Ft.
Grasses, Rushes and Sedges:				
Streambank Wheatgrass- Sodar	*Agropyron riparium*	Native	2	6.5
Slender Wheatgrass-Native	*Agropyron trachycaulum*	Native	2	7.3
Mountain Brome-Bromar	*Bromus marginatus*	Native	1	1.6
Red Top	*Agrostis alba*	Introduced	0.5	57.3
Brown Top (Colonial Bentgrass)	*Agrostis capillaries*	Introduced	0.5	57.3
Sheep Fescue-Bighorn	*Festuca ovina*	Native	0.5	7.8
Hard Fescue-Durar	*F. ovina v. duriuscula*	Native	0.5	6.5
Creeping Red Fescue, Slender	*Festuca rubra v. unknown*	NA	2	25.3
Timothy-Climax	*Phleum pretense*	Introduced	0.5	14.3
Forbs:				
Alsike Clover	*Trifolium hybridum*	Introduced	0.25	3.9
Birdsfoot Trefoil-Empire	*Lotus corruculatus*	Introduced	0.25	2.4

4.2 Reclamation of Surface Structures

Buildings and other structures located on the site will be demolished and removed unless otherwise discussed below. Building materials, when possible, will be salvaged for resale. Plant and other related equipment will also be sold for scrap or market value. The remaining non-salvageable, non-hazardous material and other debris excluding concrete will hauled to the Lake County Landfill, located approximately 10 miles from the mine. Materials classified as hazardous such as reagents or other mining related substances will be managed or disposed of in accordance with applicable federal, state and local regulations.

All materials removed from the site will be cleaned, degreased, or washed as necessary. Concrete structures and foundations will be demolished and covered with natural soils onsite. Foundations of the assay lab, oil house, scale house, and timber shed will be demolished by blasting and using a hydraulic hammer. The resulting debris will be placed as fill along the north hillside as part of the site regrading plan. Near surface and subgrade concrete structures will be buried in place. Surface water diversion channels will be constructed to collect and convey water away from buried foundations and structures. A summary of reclamation surface structures is presented below, by site.

Black Cloud Mine

Mine and mill buildings and other structures located on site will be demolished and removed, except as described below. The Yak tunnel blockage pumping facilities will continue to be operated and maintained pursuant to the OU 1 Work Plan. The Black Cloud mine hoisting equipment and support facilities (i.e., hoist house, headframe, shaft house, shaft, electrical infrastructure, etc.) will be required for the continued operation and maintenance of the Yak tunnel blockage pumping facilities and potential future underground access to the Yak tunnel. In addition, the Black Cloud mine office and access roadway will be used to support and access the Yak tunnel blockage pumping facilities. The mine office telecommunication system is an integral operating component of the Yak tunnel blockage pumping system.

In addition, it is proposed that the MLRB and the DRMS allow those Black Cloud surface structures which do not interfere with the removal of the Black Cloud East and West waste rock piles to remain in place for a two-year period, while further evaluations are conducted to determine if maintaining these facilities, such as the crushing, milling and mine support facilities, would benefit the Leadville mine tourism community. The Leadville mining district has a long and diverse mining and milling history, and this mining heritage is not only a common interest of local and regional residents, but a substantial economic staple of the community. Although at one time, the local landscape had numerous mine and mill facilities encompassed within it, today the Black Cloud facilities represent the only comprehensive collection of surface mine and mill facilitates.

Following the two-year evaluation period, and as identified in the reclamation schedule, these facilities would be demolished and removed, unless it is determined, with DRMS's approval, that preservation of these facilities is appropriate. As referenced above, facilities that provide support to the Yak tunnel blockage pumping system or re-entry of the Yak tunnel would be maintained. Reclamation would include salvaging the majority of site equipment and steel building exteriors, and demolishing and disposing of

structures. Salvaging equipment, including power related equipment will consist of dismantling, cleaning and decontaminating, painting, and moving the equipment to a staging area to be sold. All fences, underground utility piping, tanks, and concrete foundations and walls will be demolished and disposed of in either an off-site landfill or an on-site repository as identified in Figure 3.0. Excavating of materials associated with the demolition will likely encounter debris and this material will be segregated and hauled to an offsite landfill. Mine waste rock, tailing or residual concentrate encountered will be hauled to the Iowa Gulch tailing impoundment. The site will be regraded and the natural soils used to cover concrete debris. The area will be graded to promote stormwater runoff and revegetated. If the subgrade soils will not support the establishment of vegetation, soil amendments or spreading of suitable soil sourced from onsite or imported from offsite will be undertaken.

Helena Mine

Buildings associated with the Helena Mine will be demolished and the existing electrical facilities such transformers and winches will be removed and salvaged. The demolished structures will be salvaged and non-salvaged materials hauled to a landfill or placed in an on-site repository (Figure 3.0). Above-ground concrete foundations will be demolished and placed in the Iowa Gulch tailing impoundment or hauled to a landfill or placed in an on-site repository. The shaft will be plugged as described below. The surrounding area will be regraded to promote uniform stormwater runoff, covered with soil, and revegetated.

Julia Fisk Mine

Reclamation of the Julia Fisk Mine will consist of demolishing and removing the existing facilities. The Julia Fisk shaft has been plugged and the headframe removed. The two warehouse structures will be demolished and salvaged, Materials not salvaged will be hauled to a landfill or placed in an on-site debris cell (Figure 3.0). Concrete foundations above grade will be demolished and placed in the Iowa Gulch tailing impoundment or hauled to a landfill or placed in an on-site repository. The Julia Fisk waste rock pile was reclaimed in 2006. Therefore, weed control measures and other maintenance will continue until vegetation is established.

Eclipse Mine

Reclamation of the Eclipse Mine waste rock will include reclaiming the Eclipse mine waste rock in place as described in the waste rock section. Most above-surface structures, utilities and other concrete structures have been removed, any remaining structures will be demolished or covered in place. Any materials from demolition will be either hauled to the Black Cloud Mine or the local landfill. The Eclipse

shaft has been backfilled and sealed. The Eclipse mine area will be regraded to promote stormwater runoff, covered with soil from the EPA Kid's First stockpiles at the Eclipse and the Yak water treatment plant, and revegetated.

Irene Mine

Equipment associated with the Irene Mine hoist works will be left in place to support current Yak tunnel blockage monitoring and future possible Yak tunnel blockage pumping operations and/or Yak tunnel re-entry access. The hoist house, shaft house, hoist, functional electrical infrastructure, headframe, and shaft will be left in place. Concrete foundations not associated with the above identified structures will be left in place in their present condition.

The surface of the mine waste rock pile will be graded to drain and covered with either an imported road base substrate or asphalt for parking. The surface water diversion facilities will be inspected and improved where necessary. Existing structures not functional or supporting the hoist operations such as the substation, power poles, and the water storage pond to the south of the site will be demolished, removed and surface soils graded to drain and revegetated.

Iowa Gulch Tailing Impoundment

Structures associated with the Iowa Gulch tailing impoundment consist of the water treatment plant located at the toe of the tailing impoundment and the crossing in Iowa Gulch. The water treatment plant structures will be assessed for possible future use with the Black Cloud tailing dewatering and Yak tunnel blockage operations. Should the structures be determined functional and serve use with these water treatment operations, the structures will be incorporated into future water treatment design and operation. Any current water treatment plant components that do not have future utility will be dismantled and salvaged for resale or disposal. Should the structures be determined of no future use, the structures will be demolished and salvaged. The Iowa Gulch Water Treatment building and associated pipelines will be demolished and removed if the operator has demonstrated that the Yak or any new water treatment plant has adequate capacity to treat waters from the Iowa Gulch tailings facility through at least one spring/summer/fall season and DRMS provides demolition approval. Any building materials not salvaged will be either hauled off-site for disposal or place in an on-site debris cell (Figure 3.0). The area will be regraded to promote stormwater drainage and revegetated.

Underground Workings and Shaft Plugging

The Julia Fisk and Eclipse shafts have previously been plugged by ASARCO. The Black Cloud and Irene shafts will not be plugged as the shafts provide or could provide access and service to the Yak tunnel blockage pumping system and possible future underground entrance to the Yak tunnel. The Helena mine shaft will be closed with a surface seal as described below. Mine waste rock materials from the Black Cloud West waste rock area will be used as backfill material below the structural plug. It is estimated that approximately 25 lcy (loose cubic yards) of waste rock materials will be required to plug the Helena Shaft. The Helena Shaft will be closed by backfilling the shaft with Black Cloud West waste rock materials and then constructing a structural surface plug. Mine waste rock will be placed in a controlled manner using a conveyor or other suitable method to avoid bridging. Mine waste rock will be placed as backfill to a depth of approximately 30-feet from the shaft collar surface. The next 20-feet of fill will be placed in compacted lifts using a crane and tamping weight. The remaining 10-feet will be backfilled with a reinforced concrete plug. As an alternative to this closure, a 20-foot thick plug of polyurethane foam may be installed and overlain by a reinforced concrete cap.

With regards to the Black Cloud and Irene shafts, timber or steel caps will be installed to preclude possible unauthorized access to the shaft compartments. The timber or steel placements will be installed to prevent unauthorized access, but allow necessary planned access through locked access gates or removal of the temporary placements.

Debris Cell Construction

An estimate of approximately 25,000 cubic yards of material (approximately 25 percent of the standing volume of the structure) was identified for Black Cloud structural demolition debris on-site disposal should the mill and other surface facilities be removed. The current mine bench which the facilities are located on is approximately 800 feet long and an average of 400 feet deep. The cut bank to the north of the mine bench is approximately 30 feet on average. The structural debris would be placed inside and to the north of the mill foundation, which would be left in place and act as a repository for the debris as identified in Figure 3.

The mill building foundation is approximately 250 feet long and 150 feet deep from the edge of the cut bank to the front of the building foundation. A debris cell 250 feet long and 200 feet wide and 14 feet deep would be of sufficient size to hold 25,000 cubic yards of debris. Due to the depth of the cut bank and approximated contouring, it is expected that the cell could accommodate up approximately 35,000 cubic yards of debris. The purpose of the cell would be to cover mill building foundation in place and

provide cover and fill materials taken from the west end of the mine bench. A minimum of 3 feet of cover material would be placed over the structural debris as illustrated in Figure 4.

It is intended that only inert debris would be placed in the cell and the limited wooden structures or materials would be removed prior to demolition. Since most of the buildings or structures are metal construction, very little wooden materials is associated with the structures. In demolition of these buildings and structures, many of the items will be sold separately or salvaged, thus reducing the volume of material available for on-site disposal. This sale/salvage process would allow ample opportunity to further identify and remove non-inert material. The limited quantity of non-inert materials not salvaged or recycled, will be transported to an appropriately licensed landfill. No hazardous or asbestos containing materials will be placed within the debris cell.

Materials to be placed within the debris cell will be appropriately sized to fit within the cell, and the materials will be placed in layers with the largest and heaviest items placed along the bottom and the smaller lighter items on top. Clean fill material will be placed in the voids of each layer to stabilize the debris and prevent settling.

Unnamed Adit Closure

An unnamed adit located south of the east pond produces seepage at a rate of approximately 10 gallons per minute. This seepage will be piped to the water treatment operations as discussed below and the adit portal will be evaluated to ensure portal access is precluded.

4.3 Erosion and Sediment Control

Sediment and erosion control measures will be implemented during closure. The sediment and erosion controls will be monitored and maintained until disturbed surfaces are stabilized and vegetation is established. The measures will consist of best management practices (BMPs) to control and minimize erosion and sedimentation during and following construction, and to minimize the transport of stormwater sediments or other constituents to receiving waters during construction activities. BMPs will include installation of silt fences, bale or rock check dams, diversion dikes, or sediment traps in areas disturbed by construction. Surface roughing or tracking will be used on bare soil surfaces to minimize erosion. Temporary mulch and/or temporary seeding will be applied to disturbed areas prior to the winter season. Following completion of construction, all disturbed or reclaimed surfaces will be seeded and mulched. Monitoring and maintenance of vegetative areas will be conducted for a minimum period of four years during the post-closure period, and will continue until vegetation is adequately established. The

monitoring will consist of identifying areas of erosion or bare ground that require stabilization or reseeding.

4.4 Iowa Gulch Tailing Impoundment Future Use

The Iowa Gulch Tailing Impoundment will be reclaimed as described in Sections 4.1, 4.2 and 4.3; and pursuant to the schedule outlined in Section 6. Although these reclamation activities will be completed in any event, a final reclamation design or use of the Iowa Gulch Tailing Impoundment may be modified to accommodate the placement of sludge from the Yak Tunnel Water Treatment Plant. It is expected that this modified design would involve construction of small, isolated, geomembrane lined cells (approximately ¼ to ½ acre in size), along the final contoured surface. The 18 inch soil or growth medium substrate placed along the final contoured surface during final reclamation would be salvaged and stockpiled for future use. In the event the operator decides to implement this modified design prior to release of the Black Cloud Mine performance guarantee, a proposed Environmental Protection Facility (EPF) design, construction, and operation plan would be completed and submitted to DRMS, in accordance with the EPF process set forth in Section 4.6 below.

4.5 Revegetation

A revegetation plan for the final reclamation covers has been developed.

After surface regrading and soil or growth medium application, physical and chemical amendments may be incorporated into the upper 6 inches of the substrate to enhance growth plant germination and establishment. Generic amendment additions to be applied to soil and non-soiled surfaces after agronomic testing and analysis may include:

- Organic matter (low)
- Nitrogen (as urea)
- Phosphorus (as single superphosphate)
- Potassium (as potassium chloride)
- Trace elements as required

Amendments to non-soiled surfaces will include:

- Organic matter
- Limestone
- Phosphate (as triple superphosphate or rock phosphate)
- Nitrogen (as urea)

- Potassium (as potassium chloride)
- Trace elements as required

Low N: high P slow release formulation fertilizers will be applied throughout the revegetation period. Application rates will be determined later and will be based on nutrient deficiencies identified through agronomic testing.

Maintenance and stability of reclaimed areas will depend upon the establishment of nutrient cycles within the rooting zone. At high altitude sites nitrogen cycling is regulated primarily by free-living bacteria and blue-green algae. Commercially available nitrogen fixing organisms of this type will be applied with the hydraulic seeding mixture.

Species Selection

The successful establishment of pioneer vegetation will depend upon identification and selection of native species that are adapted to the sub-alpine environment of the Leadville area, a seed species list has been determined as provided in Table 1.

Establishing Vegetation

All soil amendments will be worked into the upper 6 inches of the substrate. Reclaimed surfaces will be drilled seeded or hydraulically seeded. On upper, horizontal surfaces, seeds will be sown by drilling 2 to 3 inches deep. The drill seeder application rate of 40 viable seeds per square foot will applied along reclaimed areas that allow conventional agricultural equipment use. These areas include surfaces such as the tailing impoundment surface and sidehill areas with slope gradients no greater than 4H:1V. Protection against erosion will be afforded by crimping straw mulch into the surface.

Surfaces that are seeded hydraulically will use a stepwise approach to surface amendment, seeding and erosion control. The following procedure is conventional:

- Hydraulic application of organic matter, lime and fertilizer, as appropriate;
- Hydraulic seeding with 10 to 25 percent application of erosion resistant fiber;
- Seedbed preparation or scarification to blend soil amendments and bed applied seed; and
- Hydraulic application of remaining 75 to 90 percent of fiber cover, with tackifer.

The final fiber layer will contain a biodegradable, non-toxic tackifer adhesive, to provide an erosion resistant cover. Hydraulic or broadcast seeding rates shall be 80 viable seeds per square foot.

Vegetation Monitoring

Final surface reclamation will be developed over a post-closure period that will continue until vegetation is adequately established with the following approximate management phases:

- Phase 1: active soil and vegetation management (re-application of fertilizer and soluble organic amendments, if necessary (1 to 2 years);
- Phase 2: passive land management (2-3 years of basic monitoring and maintenance; as required) and
- Phase 3: natural vegetation development and succession to achieve long term reclamation performance.

Phases 1 and 2 will be based upon a monitoring program to evaluate reclamation performance and the quality and direction of successional change in soils and vegetation. During the first 1 to 3 years, the management requirements will focus on improving soil fertility and over seeding, if necessary to improve soil fertility and over seeding, if necessary, to increase species diversity. When monitoring data indicate that reinstated vegetation and soil conditions have the potential to be self-sustaining, the maintenance program may be discontinued.

A period of 2 to 3 years is often required to monitor reclamation performance to assess plant and soil development towards a self-sustaining system. Maintenance requirements, if any, will be determined from the results of the monitoring program. Reclamation performance monitoring will be performed annually, and will include analysis of key indicator variables to evaluate the direction and quality of change in both soil and vegetation development parameters. Vegetation and soil development parameters to be included in the monitoring program are:

Vegetation Parameters

- Species relative abundance
- Species density
- Vegetative basal cover
- Vegetation shoot cover
- Vegetation condition

Soil Parameters

- pH
- total exchange capacity
- cation exchange capacity
- total organic carbon
- total nitrogen
- mineralized nitrogen
- available phosphorus

In addition to these measurements, total and available concentrations of selected metals in the rooting zone will be measured, if necessary or required.

Weed Control Management

Noxious or undesirable weed populations will be controlled in accordance with local and state requirements. Weed control measures will consist of the following:

1) Methods of weed control consisting of physical, chemical or biological treatment shall be employed for all prohibited noxious or undesirable weed species. Specific weed control methods employed will depend upon the location, vegetative stand (native or reclaimed), and proximity to surface water courses. All weed control will be conducted in accordance to local and state requirements by a certified/licensed weed management professional.

4.6 Environmental Protection Facilities

Any newly constructed facilities or installations at the Black Cloud Mine will follow the DRMS Environmental Protection Facilities (EPF) design, construction, operation and certification process identified below providing the facility or installation meets the DRMS EPF definition, A "Environmental Protection Facility" or "EPF" means a structure designed, constructed and operated for control or containment of designated chemicals, acid mine drainage, or toxic or acid-forming materials that will be exposed or disturbed as a result of reclamation of the Black Cloud Mine. Existing facilities described in this Plan are not considered EPFs, and this EPF process will not be required for completing reclamation of those facilities.

EPF - Design and Construction Requirements

(1) Unless otherwise specified by the DRMS or MLRB, construction of EPFs shall be done in phases. No construction work shall begin on any subsequent phase of an EPF without first obtaining DRMS acceptance.

(2) No liner of any kind shall be installed where climatic conditions are not within design or manufacturer recommendations, and accepted by the DRMS.

(3) EPFs shall be appropriately designed for their intended purpose and shall consider site specific conditions and on or off-site impacts to human health, property and the environment.

(4) It will be the operator's responsibility to provide adequate Quality Assurance/Quality Control (QA/QC) or certification for construction of EPFs.

(5) No chemicals or toxic or acid forming materials shall be placed in constructed EPFs until the MLRB or DRMS accepts the certification of the facility, or phase thereof, that precedes placement.

Construction - Acceptance of Certification

(1) Written acceptance of certification for EPFs under this Paragraph shall be separate from any other documents issued by the DRMS or MLRB.

(2) Unless otherwise required by the DRMS, the operator must provide a certified verification by a professional engineer or other appropriately qualified professional that confirms the EPF was constructed in accordance with the approved design plan.

(3) The DRMS shall review and accept or reject all such certifications.

Cessation of Construction

(1) Barring an action by the MLRB, cessation will only apply to the activities that are directly affected by the site-specific engineering step(s) that do not yet have certification.

(2) For any phase of certifiable inspection for which certification is not provided the operator shall cease the construction of the EPF and will postpone the execution of subsequent phases of construction or operation until any required inspections have been performed and the requisite certification has been provided to and accepted by the DRMS.

(3) Cessation of construction shall not be deemed to apply to corrective construction actions nor shall it apply to construction of facilities that are designed, and that will serve, to correct the lack of certification.

(4) The DRMS has discretion to allow construction to proceed upon determination by the DRMS that proceeding is the best remedy.

EPF Certification and Inspection

General Provisions - Inspections and Certifications

(1) All construction work required to prepare EPF's to receive chemicals, toxic-forming or acid-forming materials that produce acid mine drainage, shall be subject to the following:

(a) the frequency and scheduling of DRMS inspections shall be determined by the DRMS and in consultation with the operator; and

(b) the DRMS shall provide a list of the required inspections to the operator.

(2) The DRMS may require the operator to take corrective actions necessary to obtain and verify certification of a construction phase for the EPF's. The corrective actions so specified shall be those normally specified by a qualified professional.

Phased Construction Inspections

(1) DRMS will give inspections of phased EPF construction priority over other inspections and shall conduct such inspections as soon as possible to:

(a) meet the agreed upon construction schedule;

(b) protect, as necessary, structures or facilities; and

(c) facilitate orderly and efficient construction and operation.

(3) At a minimum, general inspection phases shall include the following, as applicable:

(a) foundation preparation inspection shall occur when the vegetation, topsoil and subsoil have been salvaged and the foundation has been configured, compacted to design specifications, and dressed to receive underdrain systems where required;

(b) earthen construction inspection shall occur at appropriate phases in the completion of any excavated slopes or embankment construction for facilities designed to hold or contain toxic or acid forming materials or chemicals or acid mine drainage-forming materials;

(c) identification of all wet or seep areas;

(d) any areas of structural instability;

(e) under-drains or groundwater interceptor systems, after drain materials (including any piping and required filters) have been installed, but prior to covering of drains with soil;

(f) all phases of primary and secondary liner installation, including material processing, placement, and compaction of earthen materials, and placement and testing of any fabric seams and repairs;

(g) all leak detection systems, including bedding materials, piping, fluid collection and removal systems, and monitoring systems prior to covering with any material in such a manner to deny inspection access; and

(h) the protective armor and drainage layers (including placement and compaction of armor and drainage material), prior to loading with ore, mining waste, or tailings.

4.7 Emergency Management

During conductance of reclamation of the Black Cloud Mine, the following Emergency Management procedures shall be conducted.

The operator shall notify the DRMS, as soon as reasonably practicable, but no later than twenty four (24) hours, after having knowledge of a failure or imminent failure of either of the following:

(a) any impoundment, embankment, stockpile or slope that poses a reasonable potential for danger to human health, property or the environment; or

(b) any Environmental Protection Facility designed to contain or control chemicals or process solutions. Telephone notice shall be given to the DRMS staff as follows:

(c) during regular business hours (8:00 am to 5:00 pm, on working days), the notice shall be given to the DRMS.

(d) outside regular business hours, or if the DRMS cannot be contacted, notice shall be given to the Colorado Department of Local Affairs, Office of Emergency Management. Specify to this agency, that the emergency authority is coordinated through the Division of Reclamation, Mining and Safety, and to activate that Division's response network.

Notice shall contain the following information (to the extent known at the time of the notice, and so long as no delay occurs in reporting results):

(a) that this is notification of an emergency condition at the Black Cloud Mine near Leadville in Lake County;

(b) the nature of the condition including any chemicals and toxic or acid producing materials involved;

(c) an estimate of the quantity of any chemical, toxic or acid-forming material that has been or could be released;

(d) the time and duration of the occurrence and if it is on-going, or urgency of the pending situation;

(e) any known or anticipated impacts to human health, property or the environment;

(f) precautions and corrective actions taken; and

(g) the name(s) and contact number(s) for persons to be contacted for further information and response by the DRMS.

As soon as practicable after an emergency situation or condition is reported and addressed, the operator shall provide a written report of the event to the DRMS. The report shall provide a description of:

(a) actions taken to respond to and correct the emergency situation or condition;

(b) any known or anticipated adverse impacts to human health, property or the environment;

(c) name(s), address(s), telephone and facsimile numbers of the contact person for additional information and follow-up by the DRMS;

(d) monitoring and analyses that are necessary to evaluate the situation and corrective actions, copies of all pertinent data; and

(e) results of the investigation to assess the conditions or circumstances that created the emergency situation, and what corrective or protective measures will be taken to prevent a similar event from occurring in the future.

Within 20 days of the onset of such an event, the operator shall furnish DRMS a written report, signed by the operator's project manager, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within 30 days of the conclusion of such an event, the Operator shall submit a report setting forth all actions taken in response thereto.

4.8 Spill Reporting

DRMS shall be notified of a spill of any toxic or hazardous material or chemical, including spills of petroleum products, that occurs within the Black Cloud Mine and which would be required to be reported to any Division of the Colorado Department of Public Health and the Environment, the National Response Center, the Colorado Emergency Planning Commission, any local Emergency Planning Commission, local Emergency Planning Committee, or the State Oil Inspector. In the event of such spill, the spill shall be reported to CDRMS

1) within 24 hours of the time the spill is reported to any other agency(ies) with jurisdiction over the spill. The DRMS project coordinator will be notified and if he/she is not immediately available, any DRMS Minerals Program Field Office or the Minerals Program Denver Office, will be contacted via either phone, facsimile, or email;
2) included in the notice shall be any relevant information known at the time contact is made with the DRMS that would assist the DRMS in assessing spill seriousness, such as:
    a. operation name, DRMS former permit number and name of person reporting the spill,
    b. telephone number of a responsible company official for the DRMS staff to use as a contact,
    c. date and time of spill,
    d. type of material spilled (Chemical Abstracts Service or CAS number if applicable, from the material safety data sheet),

e. estimate of the amount spilled, whether any material has left the former permit area, and where the spilled material went,

f. weather conditions,

g. initial measures taken to contain and clean up spill

3) the DRMS shall be copied on any correspondence and/or written reports provided to other agencies. Supplement those reports if necessary to include the information outlined in 2 CCR 407-1, Rule 3.1.13(2).

5.0 WATER MANAGEMENT

5.1 Surface Water

Several surface water management alternatives have been considered for the following water sources prior to, during and after reclamation:

- Dewatering of the Iowa Gulch tailing impoundment decant pond prior to reclamation, which consists of precipitation and the tailing impoundment toe drain seepage water that is currently captured and pumped to the decant pond.
- Tailing impoundment toe drain seepage water during and following reclamation. The seepage water emerges at the dam toe at three locations, with the combined flow reported to currently range from about 100 to 250 gpm. It is expected that the seepage flow will decrease following reclamation.
- Seepage from the historic mine adit located south of the east pond during and following closure. The flow from the adit is estimated to be approximately 10 gpm and currently drains to the east pond.

Water management alternatives that were considered included both onsite and offsite active water treatment. With either water treatment alternative, a new collection system will be constructed at the toe of the tailing impoundment to collect and convey the toe drain seepage water to a treatment plant. Construction of a collection and conveyance system will also be required for the seepage from the historic mine adit. Onsite water treatment envisions construction of a new water treatment plant downgradient of the Iowa Gulch Tailing Impoundment with discharge of treated water to Iowa Gulch pursuant to CDPS Permit No. CO-0000591. Offsite treatment considers treatment at the Yak Tunnel Water Treatment Plant by conveying the water by pumping or gravity flow through the existing pipeline constructed from the Black Cloud Shaft to the Yak Tunnel Water Treatment Plant for the Yak tunnel blockage pumping or construction of a new pipeline. Modification or expansion of the existing Yak water treatment plant would likely be required to manage the combined flows from the Yak Tunnel system and the Black Cloud waters. Treatability testing of the Black Cloud waters may be required to determine treatment effectiveness of the combined waters. However, treatment of the Black Cloud water at the Yak Tunnel Water Treatment Plant may be more cost-effective than constructing a new treatment plant in Iowa Gulch,

and may result in more efficient management of the combined waters and treatment residuals at a single facility. Treatment and discharge of Black Cloud waters at the Yak Tunnel Water Treatment Plant would be subject to the terms of the Consent Decree and the OU1 Work Plan. Onsite or offsite treatment will be determined following further evaluation of post-reclamation flow quantities and quality, treatability testing, and cost.

The Iowa Gulch Water Treatment building and associated pipelines will be demolished and removed if the operator has demonstrated that the Yak or any new water treatment plant has adequate capacity to treat waters from the Iowa Gulch tailings facility through at least one spring/summer/fall season and DRMS provides demolition approval.

5.2 Surface and Ground Water Sampling

Quarterly surface and ground water sampling will be to be conducted and the associated analytical data will be reported to DRMS prior to December 1 of each year. Analysis of constituents listed in the following table will be completed. Sampling and data analysis will be conducted consistent with the measures set forth below. Ground water monitoring well MW-5 is a point of compliance. If a numeric protection level as identified in Table 2 is exceeded at the point of compliance, DRMS will be notified within 5 working days after the operator has knowledge of such an exceedence to consult on re-sampling and other necessary actions.

Table 2 – Black Cloud Mine Water Monitoring

Analyte	Numeric Protection Level (NPL) (mg/L) at MW-5	Source of NPL	Analytical Method	Analytical Detection Limit (mg/L)
Dissolved Zinc	0.5	Stream Standard	200.7	0.008
Dissolved Copper	0.05	Stream Standard	200.8	0.005
Dissolved Lead	0.16	Ambient	200.8	0.005
Dissolved Mercury	0.001	Stream Standard	245.1	0.0002
Dissolved Cadmium	0.005	Ground Water Standard	200.8	0.00025
Dissolved Manganese	4.4	Stream Standard	200.7	0.004
Total Cyanide	0.2	Ground Water Standard	M335.4	0.02
Total Dissolved Solids	1,040	Ambient	2540D	20.0
Alkalinity	Report	NA	310.1	1.0
Hardness	Report	NA	SM2340B	1.0
Sulfate	1,300	Ambient	375.4	25.0
Total Ammonia as N	Report	NA	350.1	0.2
Nitrate-Nitrite	Report	NA	353.2	0.02
Temperature	Report	NA	Field	NA
pH	Report	NA	Field	NA
Conductivity	Report	NA	Field	NA
Depth to Water	Report	NA	Field	NA

Sampling Locations

Surface and ground water sampling will be completed in accordance with this Plan. This sampling and analysis will include sampling and analysis of the following locations and constituents and detection limits identified in Table 2:

Groundwater Wells	Surface Water
MW-1	SW-5
MW-2	
MW-3	
MW-4	
MW-5	
MW-6	

Laboratory Analytical Methods, Detection Limits, and Reporting Limits

Table 2 presents the method for analysis, and method detection limit(s) (MDL) for each analyte that is required to be monitored under this plan. Depending on the laboratory used, the laboratory analytical equipment employed to conduct the requested analysis, and the laboratory QA/QC protocol and analysis; and the MDL limits may change over time. The DRMS shall be notified of any changes in the analytical laboratory used and any changes in the MDL limits as discussed in Table 2.

Field Measurements and Sampling Procedures

The following sections provide a summary of procedures for field measurements and sampling. The SOPs are provided in Appendix A.

Sample Collection

Groundwater samples will be collected according to the methods described in SOP-4, Ground Water Monitoring Well Sampling. Surface water samples will be collected according to the methods described in SOP-5, Surface Water Sample Collection. Non-dedicated or non-disposable sampling equipment will be decontaminated prior to collection of every sample according to the methods described in SOP-1, Decontamination. Details of field quality control sampling is provided below and accordance with SOP-7, Field QA/QC Samples. Details of sample collection documentation, sample containment,

preservation, identification, labeling and shipping is provided below and will be performed according to the procedures described in SOP No. 6- Sample Handling, Documentation, and Analysis

Groundwater Level Measurement

Manual groundwater level measurements from the MW wells will be performed according to the methods described in SOP-2, Well Water Level Measurement. Water level monitoring equipment will be decontaminated prior to use according to the methods described in SOP-1, Decontamination

Equipment Calibration, Operation, and Maintenance

Proper maintenance, calibration, and operation of each instrument shall be required of the operational personnel or field technician(s) conducting routine monitoring activities. All instruments and equipment used will be maintained, calibrated, and operated according to the manufacturer's guidelines and recommendations.

Appendix A contains detailed SOPs on calibration, operation, and maintenance for the following:

Well Water Level Measurement – SOP-2

Field Instrument Calibration and Operation – SOP-3

For equipment not covered in the SOPs, the operator personnel or field technician will refer to the specific manufacturer's instructions.

Sample Identification and Labeling

Samples collected during monitoring 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. Detailed procedures for sample identification and labeling are provided in SOP-6, Sample Handling, Documentation, and Analysis in Appendix A.

Sample Containers, Preservatives, and Holding Times

The following sections provide information on sample containers, preservatives, and holding times. Additional information is provided in SOP-6, Sample Handling, Documentation, and Analysis in Appendix A. Sample container size and type, the type of preservative, and holding times should be verified with the analytical laboratory prior to sample collection.

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, certified commercially-cleaned sample containers will be obtained from the contract 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. In general, 500 ml glass or polyethylene bottles will be used for the collection of water samples that will be submitted for analysis of the general chemical constituents, major inorganic constituents, and metals.

Sample Preservation

Samples are preserved in order to prevent or minimize chemical changes that could occur during transit and storage. Either use of pre-preserved sample bottles from the contract analytical laboratory or 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 when necessary, stored on ice in coolers prior to shipping. Chemical preservatives will be prepared, measured, and added to the sample bottles by the analytical laboratory prior to sample container shipment or the sampler(s) immediately after sample collection. All preservatives used will be provided by the analytical laboratory and use of the preservative should be coordinated with laboratory personnel.

Sample Holding Times

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 the sample collection and analysis and/or extraction, based on the nature of the analyte of interest, the preservation method, and chemical stability factors. 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. General holding time guidelines are provided in SOP-6, Sample Handling, Documentation, and Analysis in Appendix A.

Sample Preparation and Shipping

After collection, samples will be labeled and prepared as described in previous sections, and when necessary placed on ice in an insulated cooler. The sample containers will be placed in re-closeable plastic storage bags and wrapped in protective packing material. Samples will then be placed right side up in a cooler with ice (double-bagged using plastic trash bags) for delivery to the laboratory.

Samples will be hand delivered or shipped by overnight express carrier for delivery to the analytical laboratory. All samples must be shipped for laboratory receipt and analysis within holding time(s). This may require daily shipment of samples with short holding times.

Sample Documentation and Tracking

Field notes and chain-of-custody (COC) information are an important part of field measurements and sample collection. The procedures for field notes and COC are discussed below and in SOP-6, Sample Handling, Documentation, and Analysis in Appendix A.

Field Notes

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, if appropriate, 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 field log book with consecutively numbered pages or on field data sheets. Specific information to be recorded and documented is contained in SOP-6.

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

Sample Chain-of-Custody

During field sampling activities, traceability of the sample must be maintained from the time the sample(s) 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, if these results are used to support litigation, and for minimizing the possibility of sample mix-up.

The primary objective of COC procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the time they are collected through laboratory analysis and

their introduction as evidence. Specific procedures to follow and information to be recorded and documented on COC forms is contained in SOP-6. Copies of all COC documentation will be maintained sampling personnel.

Quality Assurance/Quality Control

Quality assurance and quality control protocols serve to assure that the data collected pursuant to this plan meet specified standards of precision, accuracy, representativeness, comparability, and completeness.

The operator may utilize one or more laboratories to perform chemical analyses of samples collected during the monitoring of the Black Cloud Reclamation Plan. The laboratory contracted for analysis must be accredited by the Colorado Certification Program.

The operator will require the laboratory to process all samples submitted according to the specific protocols for sample custody, holding times, analysis, reporting, and associated laboratory QA/QC. The designated laboratory QA/QC specialist and client services representative will maintain contact with the Black Cloud supervisor to ensure that protocols are followed

The laboratories contracted by the operator will be required to allow access to employees of DRMS and their authorized representatives at reasonable times to inspect or review equipment, practices, or operations regulated or required under this plan.

Over time, the operator may wish to change laboratories that have been contracted to perform sample analyses. The operator will notify DRMS of any intended laboratory change and allow at least 30 days for DRMS approval prior to the commencement of any change.

Quality Assurance/Quality Control Samples

Quality control of field measurement data will involve (1) the collection of QC samples such as field duplicates, equipment rinsate samples, and field blanks, in accordance to the procedures described in SOP-6, Field QA/QC Samples, and (2) adherence to the sampling procedures described in the SOPs provided in Appendix A. Internal laboratory QC analysis checks (e.g., spikes, duplicates, blanks, etc.) will be performed for the quarterly sample collections.

In addition to the collection of field QC samples, adequate control of field measurements will be maintained through adherence to the equipment calibration, operation, and maintenance procedures described in the SOPs provided in Appendix A. Control of documentation practices will be accomplished

through routine checking of field books or forms, required checking and sign-off on chain-of-custody forms, and random spot checks of sampling activities for conformance to SOPs.

Laboratory QC checks will include the analysis of blank, duplicate, and matrix spike or matrix spike duplicate samples; calibration checks; and internal standards as required by the analytical methods referenced in Table 2, in each individual laboratory's QA Plan, or the State of Colorado Certification Program. In the case of matrix spike and matrix spike duplicate samples, predetermined quantities of stock solutions of certain analytes will be added to a sample matrix by the laboratory prior to sample extraction, digestion and analysis. These samples will then be analyzed to assess analyte stability and recovery throughout the entire analytical procedure.

Data Management

Water level, and water quality data collected during routine monitoring will be input into a project specific database. The database will be maintained on a computer and structured so that all tasks associated with electronic data transfer from the analytical laboratory, data entry, processing, analysis, and reporting can be accomplished in an efficient and verifiable manner. Data and reports will be maintained and retained.

Data Validation

An important part of quality assurance is data validation of the analytical results. The quality of data obtained for monitoring purposes will initially be assessed by comparing the data against historic data and looking for significant deviations. Analytical results will be evaluated to ensure that compliance with sampling procedures and documentation practices described in this plan and the SOPs have been met and that the analytical results are complete. Finally, the precision and accuracy of the data will be evaluated by: (1) calculating the relative percent difference and percent spike recovery, (2) ensuring that holding times have been met, (3) reviewing laboratory blank data for contamination, and (4) a review of reporting or practical quantitation limits.

The relative percent difference (RPD) between sample duplicate and matrix spike sample duplicate samples will be calculated and used to assess analytical precision. An RPD of less than 20 will be required to pass validation.

6.0 RECLAMATION SCHEDULE

The construction season in the Leadville mining district typically begins in June and continues through October each year. The following lists provide a breakdown of tasks to be initiated and completed, in each specified construction season. The tasks are generally listed in the order of timing of initiation, although many tasks will be occurring simultaneously. DRMS may conduct inspections of the Black Cloud Mine as set forth in the Consent Decree.

6.1 Schedule

If the Consent Decree becomes effective prior to March 1st of a given year, the following reclamation schedule shall be required to commence that year. If the Consent Decree becomes effective after March 1st of a given year, the following reclamation schedule shall be required to commence in the following calendar year. However, nothing herein precludes the operator from commencing reclamation work in any given year regardless of when the Consent Decree becomes effective as long as the operator can meet the reclamation schedule below.

Token progress on initiated or continuing reclamation tasks in any year of the following schedule will not be considered to meet the scheduled requirements.

Year 1 following court entry of the Consent Decree

- Mobilize reclamation equipment and personnel to the Black Cloud Mine.
- Initiate dewatering the Iowa Gulch Tailing Impoundment decant pond and convey the water to either the Black Cloud shaft or a water treatment plant constructed in Iowa Gulch or the Yak Tunnel Water Treatment Plant.
- Initiate excavation of channel around and upgradient of tailing pond.
- Route unnamed adit discharge to the Yak tunnel blockage pipeline; safety seal the unnamed adit.
- Initiate removal from site and proper disposal of all unneeded fuel, lubricants, chemicals, and any trash and debris unsuitable for onsite burial.
- Initiate demolition of structures necessary for removal of the Black Cloud East and West waste rock pile removal. Structures may include the laboratory, timber shop, scale house, and oil house. The hoist house, head frame, Black Cloud Shaft, electrical infrastructure, and necessary support facilities would remain for continued operation and maintenance of the Yak tunnel blockage pumping facilities. The crusher, conveyors, mill and concentrator would also remain as an optional component in the approved reclamation plan.
- Clean out and demolish Julia Fisk structures.
- Place timber or steel cap on the Irene Shaft.

- Sort and stabilize demolition debris, and properly dispose of debris unsuitable for onsite disposal or salvage.
- Rubblize foundations of Year 1 demolished structures and cover in place.
- Initiate removal and proper disposal or resale of infrastructure or equipment not necessary to support operation of the Yak Tunnel blockage pumping and tailing impoundment dewatering systems. Infrastructure includes: mill PCB transformer, other unneeded transformers, above and below ground tanks, mine and mill equipment, etc.
- Winterize the site and demobilize to extent necessary.

Year 2 following court entry of the Consent Decree

- Mobilize reclamation equipment and personnel to the Black Cloud Mine.
- Continue dewatering of the Iowa Gulch Tailing Impoundment decant pond, as necessary.
- Continue excavation of channel around and upgradient of tailing pond.
- Continue removal from site and proper disposal of all unneeded fuel, lubricants, chemicals, and any trash and debris unsuitable for onsite burial.
- Complete demolition of structures necessary for removal of the Black Cloud East and West waste rock pile. Structures may include the laboratory, timber shop, scale house, and oil house. The hoist house, head frame, Black Cloud Shaft, electrical infrastructure, and necessary support facilities would remain for continued operation and maintenance of the Yak tunnel blockage pumping facilities. The crusher, conveyors, mill and concentrator would also remain as an optional component in the approved reclamation plan.
- Continue removal and proper disposal or resale of infrastructure or equipment not necessary to support operation of the Yak Tunnel blockage pumping and tailing impoundment dewatering systems. Infrastructure includes: mill PCB transformer, other unneeded transformers, above and below ground tanks, mine and mill equipment, etc.
- Crush and stockpile 24,000 tons of aggregate in talus borrow area.
- Grade berm to backfill historic water tank above the Irene Shaft.
- Grade Irene waste rock pile and parking area, construct parking lot.
- Grade Eclipse waste rock pile, spread Kid's first soil, seed, fertilize, and mulch.
- Sort and stabilize demolition debris, and properly dispose of debris unsuitable for onsite disposal or salvage.
- Rubblize foundations of Year 2 demolished structures and cover in place.
- Winterize the site and demobilize to extent necessary.

Year 3 following court entry of the Consent Decree

- Mobilize reclamation equipment and personnel to the Black Cloud Mine.
- Continue dewatering of the Iowa Gulch Tailing Impoundment decant pond, as necessary.
- Complete excavation of channel around and upgradient of tailing pond.

- Continue removal from site and proper disposal of all unneeded fuel, lubricants, chemicals, and any trash and debris unsuitable for onsite burial.
- Continue removal and proper disposal or resale of infrastructure or equipment not necessary to support operation of the Yak Tunnel blockage pumping and tailing impoundment dewatering systems. Infrastructure includes: mill PCB transformer, other unneeded transformers, above and below ground tanks, mine and mill equipment, etc.
- Initiate placement of geosynthetics onto the tailing surface as needed to allow access by earthmoving equipment.
- Initiate haulage of crushed rock from talus borrow area and spread in tailing impoundment.
- Initiate excavation and hauling of Black Cloud waste rock piles to disposal location in the Iowa Gulch tailing impoundment.
- Relocate Helena waste rock to main tailing pond.
- Initiate compaction of mine waste rock in Iowa Gulch tailing impoundment.
- Demolish buildings and structures in Helena Mine area.
- Plug and cap Helena Shaft.
- Sort demolition debris, and properly dispose of debris unsuitable for onsite disposal or salvage.
- Rubblize foundations of Year 3 demolished structures and cover in place.
- Winterize the site and demobilize to extent necessary.

Year 4 following court entry of Consent Decree

- Mobilize reclamation equipment and personnel to the Black Cloud Mine.
- Complete dewatering of the Iowa Gulch Tailing Impoundment decant pond.
- Continue removal and proper disposal or resale of infrastructure or equipment not necessary to support operation of the Yak Tunnel blockage pumping and tailing impoundment dewatering systems. Infrastructure includes: mill PCB transformer, other unneeded transformers, above and below ground tanks, mine and mill equipment, etc.
- Continue removal from site and proper disposal of all unneeded fuel, lubricants, chemicals, and any trash and debris unsuitable for onsite burial.
- Complete placement of geosynthetics onto the tailing surface as needed to allow access by earthmoving equipment.
- Complete haulage of crushed rock from talus borrow area and spread in tailing impoundment.
- Complete excavation and hauling of Black Cloud waste rock piles to disposal location in the Iowa Gulch tailing impoundment.
- Complete compaction of mine waste rock in Iowa Gulch tailing impoundment.
- Final grade Black Cloud Mine waste rock piles.
- Initiate demolition of mine and mill structures at the Black Cloud surface plant not necessary to Yak tunnel blockage pumping facilities or re-entry of the Yak tunnel or if Mill facilities are not determined to be appropriate for preservation.

- Sort demolition debris, and properly dispose of debris unsuitable for onsite disposal and salvage.
- Rubblize foundations of Year 4 demolished structures and cover in place.
- Winterize the site and demobilize to extent necessary.

Year 5 following court entry of Consent Decree

- Mobilize reclamation equipment and personnel to the Black Cloud Mine.
- Complete removal from site and properly dispose of all unneeded fuel, lubricants, chemicals, and any trash and debris unsuitable for onsite burial.
- Complete removal and proper disposal or resale of infrastructure or equipment not necessary to support operation of the Yak Tunnel blockage pumping and tailing impoundment dewatering systems. Infrastructure includes: mill PCB transformer, other unneeded transformers, above and below ground tanks, mine and mill equipment, etc.
- Complete demolition of all remaining mine and mill structures at the Black Cloud surface plant not necessary to Yak tunnel blockage pumping facilities or re-entry of the Yak tunnel or if Mill facilities are not determined to be appropriate for preservation.
- Sort demolition debris, and properly dispose of debris unsuitable for onsite disposal. Transport off-site debris unsuitable for onsite disposal and salvage materials.
- Construct and prepare debris cell, place debris, and reclaim the onsite debris cell, if Mill facilities are not determined to be appropriate for preservation. If the debris cell cannot be constructed as planned because the mill building will be preserved and remain, then debris will be properly disposed of off site.
- Grade Black Cloud Mine surface plant area.
- Prepare roadways at Julia Fiske and Helena areas for placement of plant media (compacted roadways to be loosened through excavation, ripping and grading).
- Excavate and transport off-site borrow materials to the mine site for use as growth medium.
- Complete spreading plant growth media in tailing impoundment, Black Cloud and Helena areas, seed, fertilize, and mulch.
- Demobilize the site.
- The Iowa Gulch Water Treatment building and associated pipelines will be demolished and removed if the operator has demonstrated that the Yak or any new water treatment plant has adequate capacity to treat waters from the Iowa Gulch tailings facility through at least one spring/summer/fall season and DRMS provides demolition approval.

Year 6 through 9 following court entry of the Consent Decree

Monitoring, maintenance, and repair of reclaimed areas. If the vegetation monitoring data indicate that reinstated vegetation and soil conditions do not have the potential to be self-sustaining at the conclusion of a four year period, monitoring, maintenance, and repair of reclaimed areas will continue until the vegetation and soil conditions demonstrate being self-sustaining.

7.0 PERFORMANCE STANDARDS

7.1 Reclamation Measures - Materials Handling

(1) Grading shall be carried on so as to create a final topography appropriate to the final land uses described in the Reclamation Plan.

(2) Where backfilling is a part of the plan, overburden and waste materials shall be placed to ensure adequate compaction for stability and to prevent leaching of toxic or acid-forming materials.

(3) All grading shall be done in a manner to control erosion and siltation of the affected lands, to protect areas outside the affected land from slides and other damage.

(4) All refuse and acid-forming or toxic producing materials shall be handled and disposed of in a manner that will control unsightliness and protect the drainage system from pollution.

(5) Any drill or auger holes that are part of the mining operation shall be plugged with non-combustible material, which shall prevent harmful or polluting drainage. Adits and shafts shall be closed where applicable ,and practicable, backfilled and graded in a manner consistent with the post mine land use.

(6) Maximum slopes and slope combinations shall be compatible with the configuration of surrounding conditions and selected land use. In all cases where a lake or pond is produced as a portion of the Reclamation Plan, all slopes, shall be no steeper than a ratio of 2:1 (horizontal to vertical ratio), except from 5 feet above to 10 feet below the expected water line where slopes shall be not steeper than 3:1.

(7) All mined material to be disposed of within the affected area must be handled in such a manner so as to prevent any unauthorized release of pollutants to the surface drainage system.

(8) No unauthorized release of pollutants to groundwater shall occur from any materials mined, handled or disposed of within the affected area.

7.2 Water - General Requirements

(1) Hydrology and Water Quality: Disturbances to the prevailing hydrologic balance of the affected land and of the surrounding area and to the quantity or quality of water in surface and groundwater systems during reclamation shall be minimized by measures, including, but not limited to:

(a) compliance with applicable Colorado water laws and regulations governing injury to existing water rights;

(b) compliance with applicable federal and Colorado water quality laws and regulations for the protection of surface waters, including statewide water quality standards and site-specific classifications and standards adopted by the Water Quality Control Commission, or with the OU1 Work Plan effluent limits for any discharges from the Yak water treatment plant or expansion thereof;

(c) compliance with applicable federal and Colorado dredge and fill requirements, subject to CERCLA Section 121(e), 42 U.S.C. 9621(e) as applicable; and

(d) removing temporary or large siltation structures from drainageways after disturbed areas are revegetated and stabilized, if required by the Reclamation Plan.

(2) Earth dams, if necessary to impound water, may be constructed if the formation of such impoundments will not damage adjoining property or conflict with water pollution laws, rules or regulations of the federal government, the state of Colorado or with any local government pollution ordinances.

(3) All surface areas of the affected land, including spoil piles, shall be stabilized and protected so as to effectively control erosion.

7.3 Groundwater - Specific Requirements

(1) The numeric protection levels set forth in Section 5.2 above shall not be exceeded at Well MW-5.

(2) Procedures for establishing compliance with new standards promulgated by the WQCC. WQCC standards promulgated after this reclamation plan and schedule is approved: If there is a reasonable potential to exceed groundwater quality standards promulgated after this Reclamation Plan is approved, including any State-wide groundwater standards or standards for applicable areas classified by the WQCC, the DRMS shall provide a notice of the applicable groundwater quality standards and shall afford a reasonable opportunity for submittal of an application, in accordance with the terms of the consent decree, to modify the plan as necessary to implement such groundwater quality standards.

(3) Release of Reclamation Liability will be completed after demonstration to the satisfaction of the CDRMS, that reclamation has been achieved so that existing and reasonably potential future uses of groundwater are protected.

7.4 Wildlife

(1) All aspects of reclamation under this plan shall take into account the safety and protection of wildlife on the site, and along all access roads to the site with special attention given to critical periods in the life cycle of those species which require special consideration (e.g., elk calving, migration routes, peregrine falcon nesting, grouse strutting grounds).

(2) Habitat management and creation, as part of this reclamation plan, shall be directed toward encouraging the diversity of both game and non-game species, and shall provide protection, rehabilitation or improvement of wildlife habitat. Newmont/Resurrection is encouraged to contact the Colorado Division of Wildlife and/or federal agencies with wildlife responsibilities to see if any unique opportunities are available to enhance habitat and/or benefit wildlife which could be accomplished within the framework of this reclamation plan and costs.

7.5 Topsoiling

(1) Where possible, topsoil shall be removed and segregated from other spoil. If such topsoil is not replaced on a backfill area within a time frame short enough to avoid deterioration of the topsoil, vegetative cover or other means shall be employed so that the topsoil is preserved from wind and water erosion, remains free of any contamination by toxic or acid-forming material, and is a usable condition for reclamation.

(2) Where practicable, woody vegetation present at the site shall be removed from or appropriately incorporated into the existing topsoil prior to excavation within the affected areas. A reasonable effort to ensure that existing vegetation is put to a beneficial use such as firewood, mulching, lumber, etc. will be conducted.

(3) Topsoil stockpiles shall be stored in places and configurations to minimize erosion and located in areas where disturbance by ongoing reclamation operations will be minimized. Such stockpile areas are subject to all reclamation requirements. Immediate planting of an annual and/or perennial cover crop on topsoil stockpiles may be required for the purpose of stabilization.

(4) Once stockpiled, the topsoil shall be rehandled as little as possible until replacement on the regraded, disturbed area. Relocations of topsoil stockpiles will require DRMS approval in accordance with procedures described in the consent decree.

(5) Measures shall be taken as necessary to assure the stability of replaced topsoil on graded slopes such as roughing in final grading to eliminate slippage zones that may develop between the deposited topsoil and heavy textured spoil surfaces.

(6) If, in the discretion of the DRMS, existent topsoil is of insufficient quantity or of poor quality for sustaining vegetation, and if other materials can be shown to be more suitable for vegetation requirements, then the applied topsoil shall be removed, segregated, or covered in a manner such other materials which are best able to support vegetation and shall, to the extent necessary, be imported from the Robinson/Chapman Placer near Leadville or other suitable and properly permitted offsite borrow sources the needed quantities of plant growth media.

(7) When growing media is placed, it shall be done in as even a manner as possible. Fertilizer or other soil amendments shall be added, if required in the Reclamation Plan or as the soil tests indicate.

(8) Vegetative piles shall be removed from the area or utilized in accordance with the Reclamation Plan.

7.6 Revegetation

(1) In those areas where revegetation is part of the Reclamation Plan, the reclaimed land shall be revegetated in such a way as to establish a diverse, effective, and long-lasting vegetative cover that is capable of self-regeneration without continued dependence on irrigation, soil amendments or fertilizer, and is at least equal in extent of cover to the natural vegetation of the surrounding area.

(2) Implementation of the revegetation plan shall provide for the greatest probability of success in plant establishment and vegetation development by considering environmental factors such as seasonal patterns of precipitation, temperature, wind; soil texture and fertility; slope stability; and direction of slope faces. Similar attention shall be given to biological factors such as proper inoculation of legume seed, appropriate seeding and transplanting practices, care of forest planting stock, and restriction of grazing during initial establishment. The DRMS, in consultation with the Landowner and the local Soil Conservation District, if any, shall determine when grazing may start.

(3) To insure the establishment of a diverse and long-lasting vegetative cover, appropriate techniques of site preparation and protection such as mechanical soil conditioning by discing and ripping; mulching; soil amendments and fertilizers; and irrigation shall be employed.

(4) Methods of weed control shall be employed for all prohibited noxious weed species, and whenever invasion of a reclaimed area by other weed species seriously threatens the continued development of the desired vegetation. Weed control methods shall also be used whenever the inhabitation of the reclaimed area by weeds threaten further spread of serious weed pests to nearby areas.

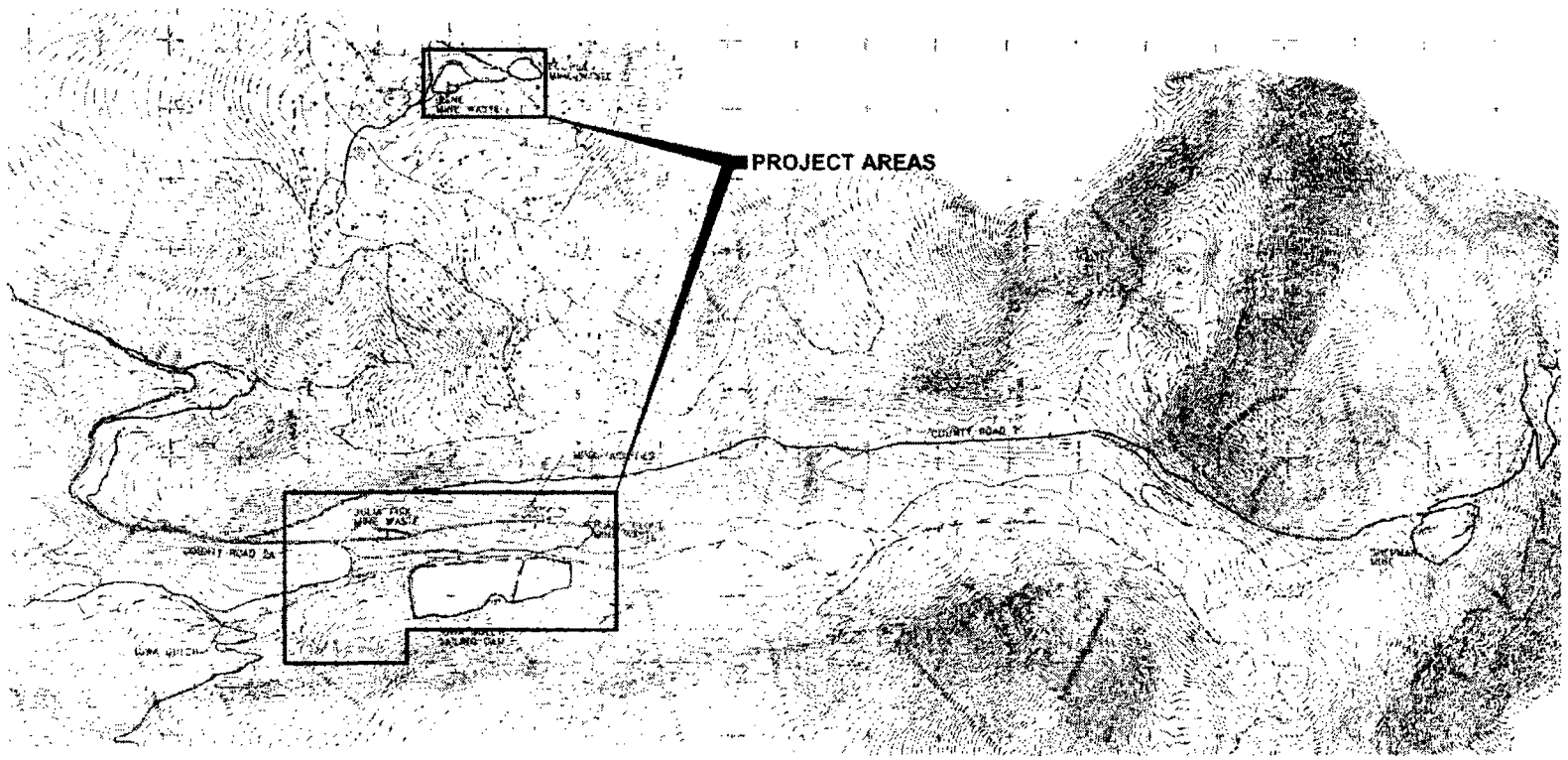
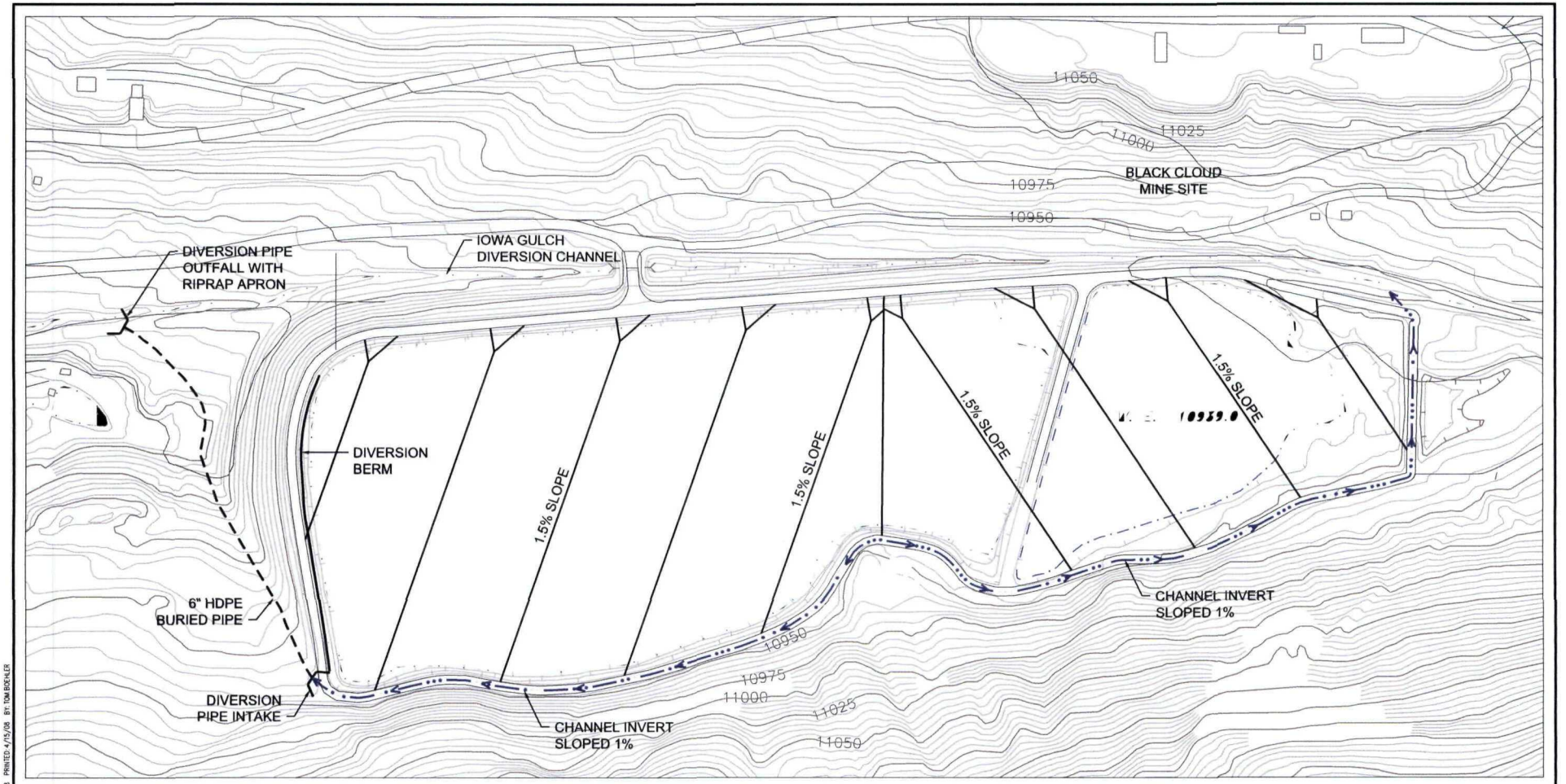


FIGURE 1
BLACK CLOUD MINE
PROJECT AREAS

MFG, Inc consulting scientists and engineers	Date APRIL 2008 Project 180885x33 File FIGS-1-2.DWG



NORTH

SCALE IN FEET

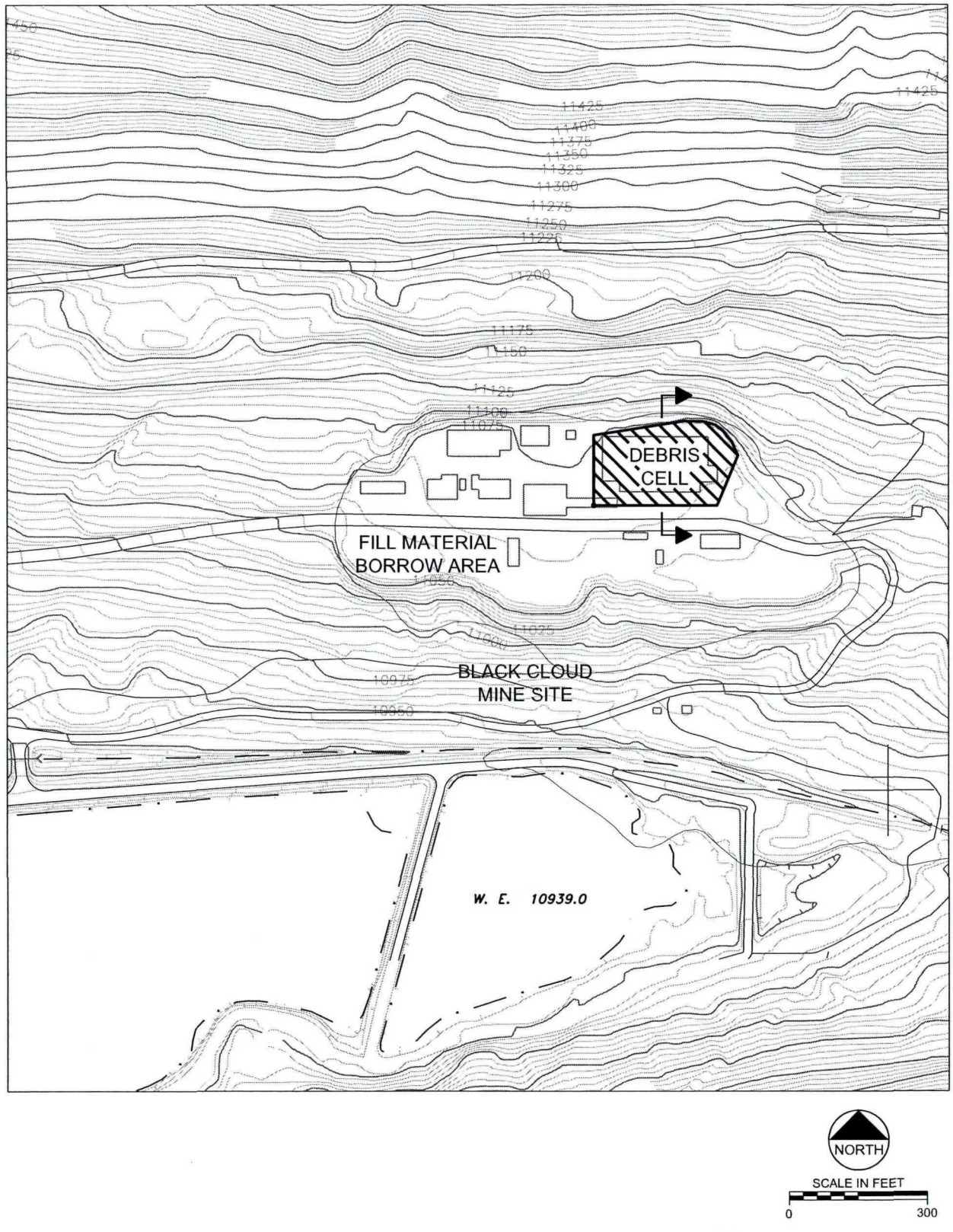
0 200

FIGURE 2
PROPOSED GRADING
FOR IMPOUNDMENT COVER

MFG, Inc.
consulting scientists and engineers

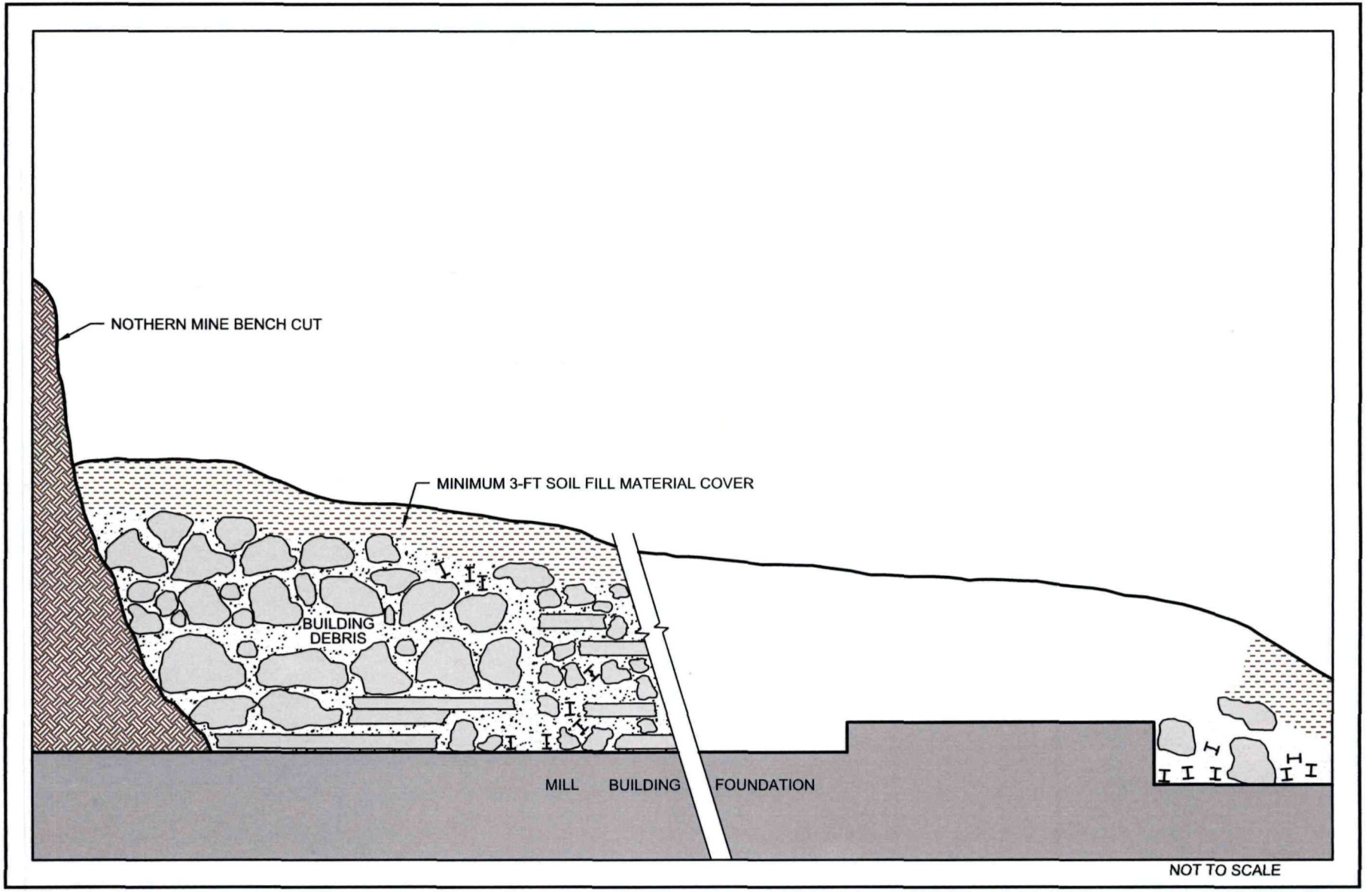
Date: APRIL 2008
Project: 180885/T35
File: GRADING-01.DWG

E:\180885\Task35\GRADING-01.dwg SAVED 4/15/08 PRINTED 4/15/08 BY TOM BECHLER



MFG, Inc. *consulting scientists and engineers*	FIGURE 3 DEBRIS CELL LOCATION

Date:	APRIL 2008
Project:	180885/T35
File:	DEBRIS-CELL.DWG



MFG, Inc. *consulting scientists and engineers*	FIGURE 4 DEBRIS CELL CROSS SECTION	Date: APRIL 2008 Project: 180885\T35 File: XSEC-DEBR.dwg

APPENDIX A
STANDARD OPERATING PROCEDURES

O&M SOP-1

SOP Date: April 2008

DECONTAMINATION

1.0 INTRODUCTION AND TYPES OF CONTAMINATION

The purpose of this document is to define the standard procedure for decontamination associated with reclamation efforts pursuant to the Black Cloud Reclamation Plan. 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 personnel and sampling equipment (e.g., bailers, pumps, tubing) is therefore 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 sampling equipment that has been exposed to known or suspected hazardous materials (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 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 Wastewater

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

2.2.6 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

O&M SOP-2

SOP Date: April 2008

WELL WATER LEVEL MEASUREMENT

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for measuring water levels in wells used for the Black Cloud Reclamation Plan. This procedure describes equipment and field procedures necessary to collect water level measurements. This procedure is intended to be used together with other SOPs. SOP No. 1 describes decontamination procedures which are applicable to this SOP.

2.0 WATER LEVEL MEASUREMENT PROCEDURES

2.1 Equipment List

The equipment necessary to measure water levels includes:

- Electric water level indicator capable of producing measurements to a precision of 0.01 ft
- Field data sheets
- Field notebook
- Sprayer filled with deionized or distilled water
- Appropriate health and safety equipment

2.2 Measurement Procedures

This section gives the sequence of events to follow when measuring water levels.

- Before any measurement is taken, the water level probe shall be decontaminated. Decontamination procedures are discussed in SOP #1 and Section 2.3 of this SOP.
- Test the water level probe to verify that it is working properly. Push the circuit test button to verify that the light/buzzer is working. This button tests only the light/buzzer. Dip the water level probe into water to verify that the water level probe is working properly. Note that deionized or distilled water, due to its low conductivity, will not trigger a response.
- Unlock and open the well. Follow all health and safety procedures and, if necessary, let the well vent any gases that may be present in the well casing.
- After opening the well cover, locate the measuring point for water level measurements. The measuring point for the water level is usually the top of the polyvinyl chloride (PVC) well casing or top of the PVC drop pipe, not the top of the protective casing. If not already marked and described, the measurement should be taken either from the point where the PVC casing elevation was measured or from the north side of the PVC casing, if possible. The point should be marked and described for easy identification.

- To measure the static water level, lower the water level probe into the well until the buzzer/light indicates that the probe tip has contacted water. By raising and lowering the water level probe and adjusting the sensitivity to indicate when the probe is contacting the water, the depth to water shall be measured to the nearest 0.01 foot. Record the water level depth in the field logbook or field data sheet. Then recheck the measurement before removing the water level probe from the well. Compare the most recent measurement with past measurements and verify that the new measurement is reasonable before leaving the well. If the measurement does not seem reasonable, measure the water level again.
- If the well is dry, record the maximum depth measured (e.g., dry to 85 feet).
- When raising or lowering the water level probe from the well, exercise great care to avoid pulling the probe wire over the well casing or the protective casing. Even PVC pipe can damage the water level probe and connecting cable if they are not handled properly.
- Section 2.4 describes the documentation required. If measurements are taken over a several-day period, the date and time of each measurement should be clearly indicated in the field book or on the water sampling forms.

2.3 Decontamination

The water level indicator must be decontaminated before using, between wells, and at the conclusion of measurements. The probe will be decontaminated according to the procedure for decontamination of sampling equipment described in SOP #1. 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. Probe decontamination can be completed at the wells.

2.4 Documentation

Documentation necessary for performing water level monitoring shall be recorded in the field logbook or on field data sheets (as shown in SOP No. 3 and only used if the wells are also to be sampled) and shall include, as appropriate:

- Personnel who performed the measurement
- Date
- Time
- Well number
- Depth to water from the measurement point
- Description of the measurement point location for the well (if different from previous measurement point)
- Well probe serial/identification number
- All calculations performed.

The field logbook or field data sheets used during water level measurement activities shall include any other observations made while measuring water levels. The pages of the field book or the field data sheets shall be legible, signed, and dated.

3.0 CALIBRATION

The length of the water level measurement probe cord will be calibrated when there is reason to suspect that the cord may have been stretched or damaged. The calibration check consists of laying out 100 ft tape next to 100 ft of the probe cord. Note any measurement discrepancies between the two at 2-ft intervals.

The procedures followed during any calibration and verification of equipment shall be documented in the field notebook along with any calculations. If a correction is required, the probe will be tagged to indicate the correction.

O&M SOP-3

SOP Date: April 2008

FIELD INSTRUMENT CALIBRATION AND OPERATION

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for calibrating/checking pH, and conductivity meters used to measure field parameters for the Black Cloud Reclamation Plan. This procedure is intended to be used together with other SOPs. SOP No. 1 describes decontamination procedures which are applicable to this SOP.

2.0 FIELD METER CALIBRATION AND MEASUREMENT

Generic operational procedures are presented in this SOP. Instrument specific manufacturer's operation manuals should be referred to for more detailed instructions for the operation of any instrument.

2.1 pH Meter

The pH meter shall be calibrated each day before use for sample collection. The pH meters used at the treatment plant (both inline and during routine monitoring) will be checked (calibration check) daily and calibrated as needed. Calibration and operation of the pH meter shall be performed according to the manufacturer's specific instructions. In general, calibration is done by adjusting the meter with standard buffers that bracket the expected pH of the field water. Although the procedures described in this section are generic, they were generally written for Hach Company SensION ph meters.

2.1.1 Required pH Measurement Equipment

Use the following apparatus and supplies for measuring pH in the field:

- Portable pH meter
- Spare pH probe
- pH electrode storage solution
- Extra batteries
- Beakers
- Buffer solutions of pH 4, 7, and 10
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent
- Calibration Data Sheet.

Determine the pH from a water sample as soon as possible after collecting it. Determine the pH by the electrometric method using standard buffer solutions for calibration. The electrometric method is the preferred method because of its greater accuracy and ease of measurement.

Either a glass electrode and a reference electrode, or a combination electrode, which combines the glass membrane electrode and the reference electrode, shall be used.

The pH meter shall automatically compensate for temperature and be capable of calibration with a three-point (using three buffers) slope adjustment method. The meter shall have a precision of at least 0.05 pH units.

2.1.2 pH Meter Calibration Procedures

Before collecting samples, calibrate the pH meter in accordance with the manufacturer's instructions using calibration solutions. The field sampling technician shall record all pH measurement data, including calibration dates and times, readings, the meter number, and sample temperatures on a Calibration Data Sheet.

The field sampling technician shall be familiar with the meter and shall follow the manufacturer's instructions for calibrating and using the meter. Check the pH calibration immediately after calibration and at the end of the day against an appropriate buffer. Thoroughly document all calibration checks, including the buffer readings and temperatures, on the Calibration Data Sheet. The field sampling technician shall do the following when calibrating the meter according to the manufacturer's procedures:

- Condition pH electrodes by soaking them for at least one hour in pH electrode storage solution. pH electrodes that have been properly stored in pH electrode storage solution do not need to be conditioned.
- Buffer solutions of 4, 7, and 10 will be used for calibration and an appropriate buffer solution for calibration checks. Use aliquots of the buffer solutions once and then discard the aliquots.
- Before immersing the probe(s) into the buffer or sample, rinse the probe with deionized or distilled water and blot it dry with clean Kimwipes® (or equivalent) and then rinse the probe with the buffer or sample. Protect the glass tip of the probe from abrasion and scratching.
- Calibrate the meter with three buffer solutions (three-point slope adjustment).
- Turn the instrument on and immerse the probe into the 7 pH buffer and allow to equilibrate until the display lock is enabled. Press the **CAL** button, **Standard** and 1 will be displayed and then press the **READ/ENTER** button. When the reading has stabilized, the standard number will change to **2**. Remove the probe from the 7 pH buffer and rinse with deionized water. Place the probe into the 10 pH buffer and press **READ/ENTER**. When the reading has stabilized the standard number will change to **3**. Remove the probe from the 10 pH buffer and rinse with deionized water. Place the probe into the 4 pH buffer and press **READ/ENTER**. When the reading has stabilized the **Store** and **?** will appear. To save the calibration and return to the reading mode, press **ENTER**. To review and document the calibration data on the Field Parameter Instrument Calibration Data Sheet press the **REVIEW** key. The display will show the standard number, standard pH, and temperature. Press the **UP** arrow once. The meter will continue to scroll through the standard information with each press of the up arrow key until the slope information is

displayed. Record the calibration data on the Calibration Data Sheet. Press **EXIT** to exit the Cal Review mode.

- Immediately after calibration perform a calibration check by measuring at least the 7 pH buffer or other appropriate buffer and recording the values on the Calibration Data Sheet. Other standard may need to be checked depending on the water to be measured. If the calibration check buffer varies by more than 0.2 pH units then the meter shall be recalibrated.
- If the calibrated slope of the pH meter deviates significantly from its theoretical value, test for a potentially defective electrode or contaminated buffer solution.
- Slow instrument response (long time to stabilize) may indicate that the pH probe should be replaced.
- Always use the same electrode for measurements that was used for calibration. Recalibrate the meter if the electrode is replaced or the batteries are changed.

2.1.3 pH Measurement

The sampler shall measure pH as follows:

1. If the pH is measured in a container, rinse the sample container with deionized water and then rinse it three times with the sample water prior to measurement. Rinse the pH probe with deionized water and, if possible, blot the probe dry with clean Kimwipes® or equivalent then rinse the pH probe with sample water. Be sure to protect the fragile glass bulb at the end of the probe from damage.
2. Immerse the electrode in the water, allow the pH reading to stabilize, and monitor the drift of the instrument. Do not immerse the electrode above the top of the pH probe. When the pH reading stabilizes (i.e., the meter beeps and the display lock is enabled), record the temperature to the nearest 0.1 °C and the pH reading to the nearest 0.01 unit.
3. Between measurements, store the electrode in Hach pH electrode storage solution or equivalent solution, if possible, or put a cotton swab soaked in electrode solution in the protective cap of the electrode.
4. Measure the pH of samples within a short period of time after sampling and on a separate aliquot of the sample.
5. Store the electrode on a short-term basis (between measurements/up to one week) in the Hach pH electrode storage solution or place a cotton swab that has been soaked in pH electrode storage solution in the pH probe protective cap. Do not store the electrode in deionized water, as this will shorten the electrode life.
6. Avoid prolonged exposure of the pH meter and probe to sunlight.

2.2 Conductivity Meter

The conductivity meter shall be calibrated each day before use for sample collection. The conductivity meters used at the treatment plant (both inline and during routine monitoring) will be checked (calibration check) daily and calibrated as needed. Calibration and operation of the conductivity meter shall be performed according to the manufacturer's specific instructions. In general, a single point calibration (near midrange of expected values) is performed and then the calibration is checked by checking with standards that bracket the expected value of the sample

water. Although the procedures described in this section are generic, they were generally written for Hach Company sensION conductivity meters.

Electrical conductivity, or specific conductance, is the ability of water to conduct an electric current and depends on the concentration of ions in solution. The relationship between conductivity and the concentration of dissolved solids is approximately linear for most natural waters. Changes in this relationship indicate changes in the proportions of different salts and, therefore, changes in the sources of dissolved substances that enter the water body.

For measuring conductivity in the field, the meter shall have an automatic temperature compensator and shall display conductivity directly in units of microsiemens per centimeter (µS/cm) or in millisiemens per centimeter (mS/cm) corrected to a temperature of 25 °C.

Electrical conductivity shall not be measured on a sample that was first used to measure pH. Potassium or silver chloride that diffuses from the pH probe can alter the conductivity of the sample.

2.2.1 Required Conductivity Measurement Equipment

Use the following apparatus and supplies for measuring conductivity in the field:

- Conductivity meter
- Extra batteries
- Calibration solutions (one near the midpoint and two which bracket expected sample values)
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent
- Beakers
- Calibration Data Sheet

2.2.2 Conductivity Meter Calibration

Before collecting samples, calibrate the conductivity meter using calibration solutions in accordance with the manufacturer's instructions. The sampler shall record all conductivity measurement data, including calibration dates, readings, the meter number, and sample temperatures on a Calibration Data Sheet.

Reagent-grade potassium chloride (KCl) or other equivalent solutions are universally used as reference solutions to calibrate conductivity equipment. The reference solutions are also used to check the accuracy of the meter. The conductivity of the reference solutions that are used to calibrate the meter should bracket the expected range of the conductivity of the water samples. Commercially prepared calibration standards are available from laboratory suppliers at many standard concentrations.

The sampler shall calibrate the meter as follows:

Calibrate the meter according to the manufacturer's instructions.

Verify that the automatic temperature compensation is on by looking for the thermometer icon. If **Off** is displayed next to the thermometer icon then the automatic temperature compensation is off. If **Off** is displayed then refer to the owner's manual to turn the automatic temperature compensation on.

Before immersing the probe(s) into the standard, rinse the probe with deionized or distilled water and blot it dry with clean Kimwipes® (or equivalent) and then rinse the probe with the standard.

Immerse the probe in the midpoint standard solution. Agitate the probe to dislodge bubbles in the cell. Avoid resting the probe on the bottom or side of the container.

Press **CAL**. The last calibration value will appear. Refer to the owner's manual to initially set the calibration value to the appropriate value then subsequent calibrations will display the value automatically. Press **ENTER** when the reading is stable the calibration is automatically stored and the instrument returns to the reading mode. Note the calibration data on the Calibration Data Sheet.

Check the calibration by measuring the end point standards and recording the check data on the Calibration Data Sheet. If the check values are not within 10 percent of the standard value then the instrument must be recalibrated.

An end of day calibration check shall be made by measuring the end point standards and recording the check data on the Calibration Data Sheet. If the check values are not within 10 percent of the standard value then it must be noted on the Ground Water Sampling Data Sheets for the samples collected that day.

2.2.3 Conductivity Measurement

Measure conductivity immediately after a sample is collected. Record conductivity readings to the nearest 1 µS/cm (for samples with conductivities less than 2,000 µS/cm) or 0.01 mS/cm (for samples with conductivities greater than 2.00 mS/cm), corrected to 25°C.

The sampler shall measure conductivity as follows:

1. Rinse the probe with deionized water and blot the probe dry with clean Kimwipes® or equivalent, without wiping the plating on the cell. Rinse the probe with sample water.
2. Insert the probe into the sample solution. Immerse the tip to or beyond the vent holes and agitate the probe vertically. Make sure that air bubbles are not trapped near the temperature sensor. Avoid resting the probe on the bottom or side of the container. Allow the reading to stabilize before recording measurements. Record the conductivity and temperature of the sample.
3. Verify that the correct units (µS/cm) or mS/cm) are indicated on the Ground Water Sampling Data Sheet.

4. During normal use, rinse the probe thoroughly with deionized water between measurements to minimize the buildup of interfering substances on the probe element.
5. Avoid prolonged exposure of the probe to sunlight.

2.2.4 Field Calibration Checks

In order to determine if the pH meter and conductivity meter measurements are accurate, the pH meter and conductivity meter calibrations shall be checked against a known standard immediately after calibration and at the end of the day. If the conductivity meter reading differs by more than 10 percent from the check standard, the conductivity meter shall be re-calibrated. If the pH reading differs by more than 0.2 pH units from the check standard, the pH meter shall be re-calibrated. All check standard readings and re-calibrations shall be recorded in the Calibration Data Sheet.

3.0 DOCUMENTATION

Record all calibration and calibration check data on the Calibration Data Sheet or in the field book.

ATTACHMENT A
CALIBRATION DATA SHEET

CALIBRATION DATA SHEEET

Date: _____ Time: _____ Personnel: _____

pH Meter Calibration pH Meter Number: _____

Buffer: 7 Measured Value: _____ Temperature _____ °C

Buffer: 4 Measured Value: _____ Temperature: _____ °C

Buffer: 10 Measured Value: Temperature: _____ °C

Slope: _____

pH Meter Calibration Check (Immediately After Calibration)

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

pH Meter Calibration Check (At End of Day) Time: : _____

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Buffer: _____ Measured Value: _____ Temperature: _____ °C

Conductivity Meter Calibration Conductivity Meter Number: _____

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Conductivity Meter Calibration Check (Immediately After Calibration)

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Conductivity Meter Calibration Check (At End of Day) Time: _____

Standard: _____ µS/cm Measured Value: _____ µS/cm Temperature: _____ °C

Comments:

_____
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O&M SOP-4

SOP Date: April 2008

GROUNDWATER MONITORING WELL SAMPLING

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for collecting groundwater samples pursuant to the Black Cloud Reclamation Plan. 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 Black Cloud Reclamation Plan.

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

- SOP 1 Decontamination
- SOP 2 Monitoring Well Water Level Measurement
- SOP 3 Field Instrument Calibration and Operation
- SOP 6 Sample Handling, Documentation, and Analysis
- SOP 7 Field QA/QC Samples

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 polypropolene 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 polypropolene 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.

2.2.2 Instrument Calibration

Electronic equipment used during sampling includes a pH meter with temperature scale, a conductivity meter. and 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. Specific instructions pH, conductivity, and turbidity instruments are given in SOP 3.

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.
- Following SOP 2 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 ±0.2 pH unit and conductivity and temperature readings within ±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

a) 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.

b) 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.

c) 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.

d) 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.

e) Place samples on ice in a cooler.

(f) Record time of sampling.
(g) Replace and lock well cap.
(h) 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® bag for disposal with the personal protective equipment.
- Any reusable filtering equipment will be decontaminated in accordance with SOP No. 1.

2.2.6 Field Quality Assurance/Quality Control Procedures and Samples

The well sampling order will be dependent on expected levels of contamination in each well, if known, and will be determined prior to sampling. Quality assurance/quality control (QA/QC) samples will be collected during groundwater sampling as specified in SOP 7.

2.3 Sample Handling

Sample containers and preservatives are specified in SOP No. 6, Sample Handling, Documentation and Analysis. Samples will be labeled and handled as described in SOP No. 6. The parameters for analysis are specified in the Black Cloud Reclamation Plan.

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:

Evacuation Volume [gal] = (Total Depth [ft] - Water Level Depth [ft]) x 0.1632 gal/ft

	=	gallons/well casing volume

For 4-inch well:

Evacuation Volume [gal]	=	(Total Depth [ft] - Water Level Depth [ft]) x 0.6528 gal/ft
	=	gallons/well casing volume

For 6-inch well:

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.

ATTACHMENT A
GROUNDWATER DATA SHEET

GROUNDWATER DATA SHEET

IDENTIFICATION
Sample Location_____ Date _____ Time _____Page__of_____

Sample Control Number_____ Samplers: _____
WEATHER CONDITIONS
Ambient Air Temperature: ____ °C ☐ _____ °F ☐ Not Measured? ☐
Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐
WELL MEASUREMENTS (Measurements made from top of PVC casing)
Depth to Static Water:_____feet Total Depth of Well:_____ feet Feet of water:_____
2-inch = 0.163 gal/ft 4-inch = 0.65 gal/ft 6-inch = 1.47 gal/ft
1 Casing Volume:_____ gallons 3 Casing Volumes:_____ gallons
Depth Pump Installed:_____ feet Volume water purged_____ Gallons

Well purged with: _____

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp.° °C ☐ °F ☐	Comments

Final Sample Parameters

Sample Date	Sample Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)
Was a field blank collected? Yes ☐ No ☐ (sample control number_____)
Was a rinsate sample collected? Yes ☐ No ☐ (sample control number_____)

Notes: _____

O&M SOP-5

SOP Date: April 2008

SURFACE WATER SAMPLE COLLECTION

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard procedure for collection of surface water samples pursuant to the Black Cloud Reclamation Plan. This procedure gives descriptions of equipment, field procedures, and QA/QC procedures necessary to collect surface water samples from streams. The sample locations and frequency of collection are specified the Black Cloud Reclamation Plan.

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

- SOP 1 Decontamination
- SOP 3 Field Instrument Calibration and Operation
- SOP 6 Sample Handling, Documentation, and Analysis
- SOP 7 Field QA/QC Samples

2.0 SURFACE WATER SAMPLING

2.1 Sampling Methods

This section discusses the criteria for the selection of sampling methods and equipment. The selection of sampling methods and equipment is based on sample type, flow conditions, and data quality objectives stated in the sampling workplan.

- Use a dipper or a beaker to collect surface water samples and distribute the sample water into the sample bottles. Alternately, pump directly from the stream into the sample bottles with a peristaltic pump and Tygon or silicon tubing, or immerse the bottles in the center of flow with the bottle mouth facing up stream. 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.

2.2 Equipment List

Sample bottles with preservatives added (preservatives may be added in the field) will be obtained from the analytical laboratory. Several extra sample bottles will be obtained in case of breakage or other problems.

Equipment used during surface water sample collection is listed on the field equipment checklist (see Attachment A). This list will be checked before departing to the field.

Filtered water samples should be withdrawn first and then filtered samples may be taken with a peristaltic pump.

2.3 Sampling Procedures

This section gives the step-by-step procedures for collecting samples in the field. Observations made during sample collection should be recorded on the Surface Water Data Sheet (Attachment B).

2.3.1 Decontamination Equipment

Before any sampling begins, and between samples, all sample collection equipment shall be decontaminated. If dedicated equipment is used, it will be rinsed with deionized water. If nondedicated equipment is used, it will be washed with Alconox Soap (or equivalent), rinsed with potable water, then rinsed with deionized water, and placed in clean plastic bags. Mobile decontamination supplies will be provided so that equipment can be decontaminated in the field. See SOP No. 1 for additional information on decontamination procedures.

2.3.2 Instrument Calibration

Electronic equipment used during sampling may include a pH meter with temperature scale and a conductivity meter. Before going into the field, the sampler shall verify that all of these are operating properly. The pH and conductivity meters require calibration prior to use every day. Calibration times and appropriate readings will be recorded in the field notebook. Specific instructions for calibrating the pH meter and conductivity meter are given in SOP 3.

2.3.3 Filtering Samples

Total metals, conductivity, pH, and solids analyses are performed on unfiltered samples. Samples will be filtered in the field by using a disposable 0.45µm membrane filter apparatus and peristaltic or hand vacuum pump. Note: sample analysis may not include all parameters discussed in this section.

Filtered samples will be collected according to the following procedure:

- Assemble filter device according to manufacturer's instructions.
- Filter sample by pumping it through Tygon® or silicone tubing and an in-line filter using a peristaltic pump.
- 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.
- Dispose of the used filter cartridge and tubing.

2.3.4 Field Quality Assurance/Quality Control Samples

Field QA/QC sample collection is discussed in SOP 7.

2.4 Sample Handling

Sample containers and preservatives are specified in SOP No. 6, Sample Handling, Documentation, and Analysis. Samples will be labeled and handled as described in SOP No. 6.

2.5 Documentation

A Surface Water Data Sheet will be completed at each sample location. Items not applicable to the sampling will be labeled as not applicable (NA). The information on the data sheet will include the following:

- Sampling location
- Date and time of sampling
- Weather conditions
- Persons performing sampling
- Conductivity, temperature, and pH during sampling
- Color, odor, and cloudiness of the water
- Sample identification numbers
- Identification numbers of any QC samples from site
- Any irregularities or problems which may have a bearing on sampling quality

ATTACHMENT A
FIELD EQUIPMENT CHECKLIST

FIELD EQUIPMENT CHECKLIST

Sampling Equipment

Conductivity Meter
pH meter w/temperature scale
Conductivity standards
pH Buffers
Containers for field parameter measurement
Samplers for all sampling conditions (i.e., dip sample)
Sample bottles
Sample labels
Peristaltic pump
Tygon or silicon tubing
Disposable Filters
Plastic storage bags for samples
Coolers containing sample containers
Blue ice
Extra sample containers
Chain-of-custody forms
Gloves

Personal Equipment

Disposable gloves
Wrist or pocket watch
Rain gear
Duct tape
Pocket knife
First aid kit

Decontamination Equipment

Alconox or a nonphosphate detergent, such as Liquinox
Buckets with lids
Brushes
Distilled water
Potable water
Decon water containers
Paper towels
Clean plastic bags

Forms and Supplies

Chain-of-Custody Forms
Sample container labels
Applicable SOPs, equipment manuals, work plan and other required documentation
Chain-of-Custody Checklist
Surface Water Data Collection Sheet and Discharge Measurement Note
Logbook

ATTACHMENT B
SURFACE WATER DATA SHEETS

SURFACE WATER DATA SHEET

IDENTIFICATION

Sample Location_____ Date _____ Time _____ Page_ of
Sample Control Number_____ Samplers _____

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C ☐ °F ☐ Not Measured? ☐
Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

INSTRUMENT CALIBRATION

pH pH meter number:
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Buffer _____ Measured Value _____ Temperature _____ °C ☐ °F ☐
Conductivity Meter Calibration/Measurement Meter number:
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐
Standard Value _____ µS/cm Measured Standard Value _____ µS/cm Temperature _____ °C ☐ °F ☐

SAMPLE LOCATION DESCRIPTION

_____
_____
_____
_____

SAMPLE COLLECTION PROCEDURE

_____
_____
_____
_____
_____

Final Sample Parameters

Sample Date	Sample Time	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)
Was a field blank collected? Yes ☐ No ☐ (sample control number_____)
Was a rinsate sample collected? Yes ☐ No ☐ (sample control number_____)
Notes _____
_____
_____
_____
_____

O&M SOP-6

SOP Date: April 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 required for the Black Cloud Reclamation Plan. 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 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:

R-MW1-01-042308

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 (e.g., MW1 Monitoring Well No. 1). The next field identified is the type of sample being collected; this is used to identify whether the sample is a primary (01), field duplicate (02), field blank (03), or equipment rinsate (04). The final field contains the date in a month-day-year format to allow data in the analytical database to be easily sorted. For example, the sample identified above was collected on April 23, 2008. Table 1 provides a list of the possible code entries for each of the data fields for routine monitoring samples.

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 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.

The chemical constituents for which samples from all current sampling programs will be analyzed are summarized the Black Cloud Reclamation Plan.

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 1. 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[1]	Filtration[2]	Preservation	Holding Time[3]
Total alkalinity (as $CaCO_3$)	P,G	No	Cool, 4°C	7 days[4]
Total dissolved solids	P,G	Yes	Cool, 4°C	7 days
Cyanide (total)	P,G	No	Cool, 4°C, NaOH to pH >12	12 days
Mercury	P,G	Yes	HNO_3 to pH<2	28 days
Nitrate-Nitrite	P	No	H_2SO_4 to pH <2	28 days
Sulfate	P,G	Yes	Cool, 4°C	28 days
Dissolved metals[5]	P,G	Yes	Cool, 4°C, HNO_3 to pH <2	6 months
Ammonia as N	P	No	H_2SO_4 to pH <2	28 days

[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 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.
[5] Metals in this category are listed the Black Cloud Reclamation Plan.

O&M SOP-7

SOP Date: April 2008

FIELD QA/QC SAMPLES

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard protocols for sampling field QA/QC samples required for the Black Cloud Reclamation Plan. This procedure is intended to be used together with other SOPs and is referenced in all SOPs that apply to sampling.

All QA/QC samples will be collected following procedures presented in SOP 4 Ground Water Monitoring Well Sampling and SOP 5 Surface Water Sample Collection.

2.0 SAMPLING FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND SAMPLES

Quality assurance/quality control (QA/QC) samples will be collected during surface and groundwater sampling. QA/QC samples are designed to help identify potential sources of sample contamination and evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

Field QA/QC samples consist of duplicates, rinsate blanks, and field blanks. The water quality sampling investigation will include collecting QA/QC samples at a minimum rate of 1 duplicate, 1 rinsate blank, and 1 field blank collected per sample event.

An equipment rinsate sample of the sampling equipment is intended to check if decontamination procedures have been effective. For the well sampling operation, a rinsate sample will be collected from the decontaminated sampling equipment (bailer or pump) or filter equipment before it is used to obtain the sample. Deionized water will be rinsed over the decontaminated sampling apparatus and transferred to the sample bottles. The same parameters that are being analyzed in the groundwater samples will be analyzed in the rinsate samples. The rinsate sample is assigned a QA/QC sample identification number (SOP 6 Sample Handling, Documentation, and Analysis), stored in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within the holding times. Rinsate sample(s) will be collected at a minimum rate of 1 per every sample event.

Duplicate samples are samples collected side-by-side to check for the natural sample variance and the consistency of field techniques and laboratory analysis. A duplicate sample will be collected at the same time the primary sample is collected. The primary sample bottle for a given set of analyses (e.g. total alkalinity) will be filled first, then the duplicate sample bottle of that same set of analyses (e. g. total alkalinity) will be filled before proceeding onto the next set of bottles. The order of the bottle set filling shall be: 1) total alkalinity; 2) cyanide, total; 3)

Nitrate-Nitrite and Ammonia as N; 4) Sulfate and TDS; and 5) dissolved metals. The duplicate sample will be handled in the same manner as the primary sample. The duplicate sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped promptly to the laboratory so that analyses can be performed within holding times. Duplicate samples will be collected at a minimum rate of 1 per every sample event.

Field blanks check for contamination of samples due to factors at the sampling site. For a field blank, deionized water will be poured into the sample containers at the sample site at the same time the water sample is collected. The sample will be analyzed for the same parameters as the samples being collected with that blank. The sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped to the laboratory with the other samples. Field blank samples will be collected at a minimum rate of 1 per every sample event.

APPENDIX F TO CONSENT DECREE
(Part F1 and Part F2)

APPENDIX F1
To Consent Decree

A. REQUIREMENTS FOR ENVIRONMENTAL COVENANTS

Where Settling Defendants are required, pursuant to Paragraphs 37 and 38 of the Consent Decree, to place Environmental Covenants on property to which Settling Defendants own the entire fee title, the Environmental Covenants shall include the following terms and restrictions. The Environmental Covenants shall be granted as to those properties listed in Appendix F2 to which Settling Defendants will own the entire fee title upon completing the property transfer with Asarco LLC pursuant to the Settlement Agreement among Settling Defendants, Asarco LLC and the Res-Asarco Joint Venture. If the Settling Defendants, the State and EPA subsequently agree that as the result of completing the property transfer with Asarco LLC, Settling Defendants own the entire fee title in other claims that are not listed in Appendix F2, and (i) such claims are situated entirely within the boundaries of the California Gulch Superfund Site, or (ii) such claims are listed on Attachment 3 to this Appendix, Settling Defendants will provide an Environmental Covenant on such claims. The Environmental Covenant will contain the terms for the Zone A claims, unless the State, EPA and Settling Defendants agree that no use restrictions are necessary.

1. Access to the property in Zones A, B and C, and the Black Cloud Mine tailings facility, as described on the list of properties attached as Appendix F2, will be provided for the purpose of determining compliance with the terms of the Environmental Covenants..

2. For the property in ZONE A as described in Part A of the list of properties attached as Appendix F2:

a. No Residential Use, Day Care Centers or Schools, as defined in Section D, shall be allowed on the property. No portions of Parks or Open Space (as defined in Section D 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 State water quality standards for the beneficial use to which the water is being applied. Treatment must meet the relevant State standards that are in place at the time of use. The current standards can be found in Table 1 of Attachment 3 to this Appendix.

3. For the property in ZONE B as described in Part B of the list of properties attached as Appendix F2:

a. No Residential Use, Day Care Centers or Schools, as defined in Section D, shall be allowed on the property. No portions of Parks or Open Space (as defined in

Section D 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 State water quality standards for the beneficial use to which the water is being applied. Treatment must meet the relevant State standards that are in place at the time of use. The current standards can be found in Table 1 of Attachment 3 to this Appendix.

c. No uses or activities that would disturb or have the potential to disturb caps, covers or other revegetated areas, or otherwise interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the response actions that have been or will be performed or instituted on the property including, without limitation, water treatment plants, retaining ponds, adits, roads, ditches, pipelines, utility corridors, waste disposal facilities, monitoring wells, signs and governmental use restrictions and controls, shall be allowed. These restrictions will not apply to any future mineral prospecting, exploration or mining activities conducted on the property in accordance with the Colorado Mined Land Reclamation Act and implementing regulations.

4. For property in ZONE C as described in Part C of the list of properties attached as Appendix F2:

No use of untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch for drinking, domestic, or agricultural purposes shall be allowed. This covenant does not restrict the use of groundwater that is treated to meet then promulgated State water quality standards for the beneficial use to which the water is being applied. Treatment must meet the relevant State standards that are in place at the time of use. The current standards can be found in Table 1 of Attachment 3 to this Appendix.

5. For Properties at the Black Cloud Mine tailings facility as described in Part D of the list of properties attached as Appendix F2

No uses or activities that would in any manner interfere with or adversely affect the implementation, integrity, or protectiveness of the reclamation and closure actions that have been or will be performed or instituted on the property including, without limitation, revegetated areas, retaining ponds, adits, roads, ditches, pipelines, utility corridors, waste disposal facilities, tailings ponds, monitoring wells, signs and governmental use restrictions and controls, shall be allowed. These restrictions will not apply to any future mineral prospecting, exploration or mining activities conducted on the property in accordance with Colorado Mined Land reclamation Act and implementing regulations.

6. Exception for Remedial Actions, Reclamation and Operations and Maintenance of Remedies

The Environmental Covenants for all property in Zones A, B and C and at the Black Cloud Mine tailings facility shall not restrict any use of, or activities on, the properties for purposes of implementing any Work under the Consent Decree.

B. TERMINATION OF ENVIRONMENTAL COVENANTS

Consistent with C.R.S. 25-15-319(1)(h), Environmental Covenants required under the Consent Decree shall be terminated in whole or in part when, in addition to satisfying the requirements of C.R.S. 25-15-321(3) and (5), the following showings are provided to the State. Consistent with C.R.S. 25-15-321(6), the State shall make a determination on all applications to terminate an Environmental Covenant within 60 days after receipt of such application.

1. For the property in ZONE A as described in Part A of the list of properties attached as Appendix F2:

a. Restrictions on Residential Use and other uses specified in paragraph A.2.a. shall be terminated on all or part of the property if Settling Defendants demonstrate to the State 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 an Environmental Covenant shall be conducted in accordance with Attachment 1.

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 Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of terminating an Environmental Covenant shall be conducted in accordance with Attachment 2.

2. For the property in ZONE B as described in Part B of the list of properties attached as Appendix F2:

a. Restrictions on uses or activities that would disturb or have the potential to disturb caps, covers or revegetated areas, or interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the response actions that have been or will be performed or instituted on the property shall be

terminated if the waste in place within the area proposed for disturbance is removed, or response facilities on the property are dismantled with the approval of EPA and the State.

b. Restrictions on Residential Use and other uses specified in paragraph A.3.a. shall be terminated on all or part of the property if Settling Defendants demonstrate to the State that (i) 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, and (ii) the provisions of subpart B.2.a., above, have been met. This 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 an Environmental Covenant shall be conducted in accordance with Attachment 1.

c. 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 Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of terminating an Environmental Covenant shall be conducted in accordance with Attachment 2.

3. For the property in ZONE C as described in Part C of the list of properties attached as Appendix F2:

Restrictions on using untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch for drinking, domestic, and agricultural purposes shall be terminated if Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of terminating an Environmental Covenant shall be conducted in accordance with Attachment 2.

4. For Properties at the Black Cloud Mine tailings facility as described in Part D of the list of properties attached as Appendix F2:

Restrictions on uses or activities that would disturb or have the potential to disturb caps, covers or revegetated areas, or interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the reclamation actions that have been or will be performed or instituted on the property shall be terminated if the waste in place within the area proposed for disturbance is removed or response facilities on the property are dismantled with the approval of EPA and the State.

5. ***Other grounds for terminating the Environmental Covenants:***

In addition to the grounds for termination set forth in Sections B.1 through B.4, the Environmental Covenants shall also be terminated as to one or more properties if it is demonstrated to the State that the proposed termination will ensure protection of human health and the environment, in accordance with C.R.S. 25-15-319(1)(h).

C. MODIFICATION OF ENVIRONMENTAL COVENANTS.

Consistent with C.R.S. 25-15-319(1)(h), Environmental Covenants required under the Consent Decree shall be modified in whole or in part when, in addition to satisfying the requirements of C.R.S. 25-15-321(3) and (5), the following showings are provided to the State. Consistent with C.R.S. 25-15-321(6), the State shall make a determination on all applications to modify an Environmental Covenant within 60 days after receipt of such application.

1. For the property in ZONE A as described in Part A of the list of properties attached as Appendix F2:

a. Restrictions on Residential Use and other uses specified in paragraph A.2.a. shall be modified on all or part of the property if Settling Defendants demonstrate to the State 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 Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of modifying an Environmental Covenant shall be conducted in accordance with Attachment 2.

2. For the property in ZONE B as described in Part B of the list of properties attached as Appendix F2:

a. 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 Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2.

Any ground water sampling conducted for purposes of modifying an Environmental Covenant shall be conducted in accordance with Attachment 2.

3. For the property in ZONE C as described in Part C of the list of properties attached as Appendix F2:

Restrictions on using untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch for drinking, domestic, or agricultural purposes shall be modified to eliminate the restriction against one or more of these uses if Settling Defendants demonstrate to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of modifying an Environmental Covenant shall be conducted in accordance with Attachment 2.

4. ***Other grounds for modifying the Environmental Covenants:***

In addition to the grounds for modification set forth in Sections C.1 through C.3, the Environmental Covenants shall also be modified as to one or more properties if it is demonstrated to the State that the proposed modification will ensure protection of human health and the environment, in accordance with C.R.S. 25-15-319(1)(h).

D. ENVIRONMENTAL COVENANT 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.

ATTACHMENT 1
TO APPENDIX F1
SOIL SAMPLING AND ANALYSIS PLAN

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 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 2
TO APPENDIX F1
GROUNDWATER SAMPLING AND ANALYSIS PLAN

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

Parameter	Domestic Water Supply and Drinking Water Standards	Agricultural Standards
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
pH	6.5 – 8.5	6.5-8.5

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 polypropolene 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 polypropolene 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 ±0.2 pH unit and conductivity and temperature readings within ±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® 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:

Evacuation Volume [gal] = (Total Depth [ft] - Water Level Depth [ft]) x 0.1632 gal/ft

= gallons/well casing volume

For 4-inch well:

Evacuation Volume [gal] = (Total Depth [ft] - Water Level

Depth [ft]) x 0.6528 gal/ft

= gallons/well casing volume

For 6-inch well:

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.

GROUNDWATER DATA SHEET

IDENTIFICATION

Sample Location_____ Date _____ Time _____Page__of_

Sample Control Number_____ Samplers: _____

WEATHER CONDITIONS

Ambient Air Temperature: ____ °C ☐ _____ °F ☐ Not Measured? ☐

Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

WELL MEASUREMENTS (Measurements made from top of PVC casing)

Depth to Static Water:_____feet Total Depth of Well:_____ feet Feet of water:_____

2-inch = 0.163 gal/ft 4-inch = 0.65 gal/ft 6-inch = 1.47 gal/ft

1 Casing Volume:_____ gallons 3 Casing Volumes:_____ gallons

Depth Pump Installed:_____ feet Volume water purged_____ Gallons

Well purged with: _____

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp.° °C ☐ °F ☐	Turbidity (visual estimate)	Comments

Final Sample Parameters

Sample Date	Sample Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C ☐ °F ☐	Turbidity (NTU)

Was a duplicate sample collected? Yes ☐ No ☐ (sample control number_____)

Was a field blank collected? Yes ☐ No ☐ (sample control number_____)

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[1]	Filtration[2]	Preservation	Holding Time[3]
pH	P,G	No	Cool, 4°C	7 days[4]
Specific conductance	P,G	No	Cool, 4°C	28 days
Total alkalinity (as $CaCO_3$)	P,G	Yes	Cool, 4°C	7 days[4]
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_3 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_2SO_4 to pH <2	28 days
Total Phosphorus	P,G	Yes	Cool, 4°C, H_2SO_4 to pH <2	28 days
Orthophosphate	P	Yes	Cool, 4°C	48 hours
Radionuclides (total)	P,G	No	HNO_3 to pH <2	6 months
Radionuclides (dissolved)	P,G	Yes	HNO_3 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_3 to pH <2	6 months
Total metals	P,G	No	Cool, 4°C, HNO_3 to pH <2	6 months
Total recoverable metals	P,G	No	Cool, 4°C, HNO_3 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.

ATTACHMENT 3
TO APPENDIX F1

Mineral Survey Number	Claim Name
472	Jamie Lee
644	Cora Bell
731	Erie
1176	Little Galesburg
1177	Free America #2
3723	Northside
12305	OK
12305	Five Percent

APPENDIX F2
To Consent Decree

Properties for Environmental Covenants

A. Zone A Properties

Mineral Survey Number	Claim Name
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

Mineral Survey Number	Claim Name
735	McDermith Placer Tract B
735	McDermith Tract A
735	McDermith Tract D
735	McDermith Tract E
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

Mineral Survey Number	Claim Name
1935	Revenue Cutter
2334	Colonel Sellers
2633	S.T.X.
2651	Minnesota
2678	Ulster
2688	Elva Elma (Producing Claim)
2715	Kayserine
2717	Rebel
2730	Fluddin
2840	Minnie
2887	A.B
2920	Old Rye
3092	L.M.
3111	Nettie L.
3141	Daniel O'Connell
3154	Sedalia
3155	Bob Ingersol
3156	N. Rollins
3161	Milton
3162	Ontario
3166	Pauline
3168	Satellite
3169	Ida & Alice
3217	Lillie
3437	Edith Tangent
3487	Leo
3630	Red Porphyry
3822	Bulldozer
3877	Old Maid
4163	Unknown Claim Name
4167	Unknown Claim Name
4244	General Grant
4253	Frank
4254	Laurel W.
4299	K.R.L
4337	Baby
4542	Mosquito
4624	My Day
4626	Hermes
4893	Triangle
5596	Hidden Treasure
5631	Triangle
6269	Unknown Claim Name
6918	Midland
8036	Margaret (Producing Claim)
8514	Unknown Claim Name
8521	Scraps
8727	Sheridan
8982	Grover Cleveland
8990	Terrible No. 1
8990	Terrible No. 2
8990	Terrible No. 4
9099	Lincoln & Joiner
9261	Unknown Claim Name
9522	Whip

Mineral Survey Number	Claim Name
9530	Eclipse
9530	Eclipse
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

B. Zone B Properties

Mineral Survey Number	Claim Name
217	Stone
274	Seventy-Six
300	Wm. Moyer Placer
341	Thompson Placer
378	Robinson Placer (all less tract 1,2,3)*
378	Robinson Placer Tract 3
410	Montgomery
441	Mike
442	Thomas Starr
443	Goodell
455	Uncle Sam
457	Eliza
460	Hope
469	Quartzite
475	Swamp Angel
490	Gilt Edge
502	Wild Cat
518	Little Johnny
545	Little Stella
563	Graham Placer
592	John Leary
643	Black Prince
735	McDermtih Placer Tract C
790	A.Y.
845	Rubie
917	Black
918	Ulster
947	Arnold Placer

Mineral Survey Number	Claim Name
969	Iron Rock
975	Minnie
989	Cleora Tract A
1036	Chas G. Arnold Placer
1124	Little Hattie
1326	Capitol
1427	Garden City
1619	Alma
1627	Antioch
2163	Lady Adele
2291	Charlie B.
2296	Smasher
2309	Fortune
2364	Chapman Placer Mine Tract 3
2496	Accident
3004	R.J.
3069	Helen
3438	Fanny
3500	Golden Gate
3556	Champion
3901	Lupe, Lupe(No. End), Lupe(So. End)
4080	Gaw Placer
4668	Cache
4668	Loop (Part of Cache,Hoop & Loop)
5541	Carr
6279	Xmas
7230	Bonnie Kate
13097	Constance
13167	Free Coinage
15320	Mabel
17841	Ausable
18136	Adirondack
18590	Hand Saw
1610 A.M.	Confident
768 A.M.	Ocean Wave

Note: * Environmental Covenant will be provided on surveyed portion of Robinson Placer that encompasses the Oregon Gulch Tailing Impoundment seep collection system and conveyance channel

C. Zone C Properties

Mineral Survey Number	Claim Name
1243	Coon Valley
1277	First National
2361	Alhambra Placer Tract 2
4229	Bessie Stewart
7928	Unkown Claim Name
9918	Unkown Claim Name

D. Black Cloud Tailings Properties

Mineral Survey Number	Claim Name
1536	Clear Grit
1778	Ella Beeler
2249	Montreal
2619	Slide
3160	American Liberty
3398	Constance
3391	Jane Eugene
3604	Almeda
3605	Josie
4033	Helena
4724	Bank
4727	Little Fred
4728	Eagle
4728	Iowa
5740	Harry Steele
9304	Tyrant Lode
15908	Lady Alice

APPENDIX G
TO CONSENT DECREE

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 _____ day of _____, _____ 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 dated _____, 2008 among Resurrection, Newmont USA Limited ("Newmont"), the State of Colorado and the United States ("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 an 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 an 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
1700 Lincoln Street, Suite 3600
Denver, CO 80203

And

Director of Reclamation and Closure
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

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

10) 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.

Resurrection has caused this instrument to be executed this ____ day of _____, _____.

Resurrection Mining Company

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of Resurrection Mining Company

_____
Notary Public

_____
Address

_____

My commission expires:_____

Accepted by the Colorado Department of Public Health and Environment this ____ day of _____, _____.

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of the Colorado Department of Public Health and Environment.

_____
Notary Public

_____
Address

_____

My commission expires:_____

ATTACHMENT 1

TO ENVIRONMENTAL COVENANT

THE PROPERTY

[INSERT LIST OF SUBJECT ZONE A PROPERTY FROM APPENDIX F2]

ATTACHMENT 2

TO ENVIRONMENTAL COVENANT

SOIL SAMPLING PROCEDURES

[INSERT ATTACHMENT 1 FROM APPENDIX F1]

ATTACHMENT 3

TO ENVIRONMENTAL COVENANT

GROUNDWATER SAMPLING PROTOCOLS

[INSERT ATTACHMENT 2 FROM APPENDIX F1]

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 _____ day of _____, _____ 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 dated _____, 2008 among Resurrection, Newmont USA Limited ("Newmont"), the State of Colorado and the United States ("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 the 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 standards that are in place at the time of use.

c. No uses or activities that would disturb or have the potential to disturb caps, covers or other revegetated areas, or otherwise interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the response actions that have been or will be performed or instituted on the property including, without limitation, water treatment plants, retaining ponds, adits, roads, ditches, pipelines, utility corridors, waste disposal facilities, monitoring wells, signs and governmental use restrictions and controls, shall be allowed. These restrictions will not apply to any future mineral prospecting, exploration or mining activities conducted on the property in accordance with the Colorado Mined Land Reclamation Act and implementing regulations.

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, or 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, or 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 an Environmental Covenant shall be conducted in accordance with Attachment 3.

c. Restrictions on uses or activities that would disturb or have the potential to disturb caps, covers or revegetated areas, or interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the response actions that have been or will be performed or instituted on the property shall be terminated if the waste in place within the area proposed for disturbance is removed, or response facilities on the property are dismantled with the approval of EPA and the State.

d. 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 an 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 land use prohibited under Sections 1.a or 1.c.

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
1700 Lincoln Street, Suite 3600
Denver, CO 80203

And

Director of Reclamation and Closure
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

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.

Resurrection has caused this instrument to be executed this ____ day of _____, _____.

Resurrection Mining Company

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of Resurrection Mining Company

_____
Notary Public

_____
Address

_____

My commission expires:_____

Accepted by the Colorado Department of Public Health and Environment this ____ day of _____, _____.

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of the Colorado Department of Public Health and Environment.

_____
Notary Public

_____
Address

_____

My commission expires:_____

ATTACHMENT 1

TO ENVIRONMENTAL COVENANT

THE PROPERTY

[INSERT LIST OF ZONE B PROPERTY FROM APPENDIX F2]

ATTACHMENT 2

TO ENVIRONMENTAL COVENANT

SOIL SAMPLING PROCEDURES

[INSERT ATTACHMENT 1 FROM APPENDIX F1]

ATTACHMENT 3

TO ENVIRONMENTAL COVENANT

GROUNDWATER SAMPLING PROTOCOLS

[INSERT ATTACHMENT 2 FROM APPENDIX F1]

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 _____ day of _____, _____ 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 dated _____, 2008 among Resurrection, Newmont USA Limited ("Newmont"), the State of Colorado and the United States ("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.

No use of untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch 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 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 using untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch for drinking, domestic, and agricultural purposes shall be terminated if Owner demonstrates to the State that concentrations of the constituents listed in Table 1 of Attachment 2 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 2. Any ground water sampling conducted for purposes of terminating an Environmental Covenant shall be conducted in accordance with Attachment 2.

b. In addition to the grounds for termination set forth in Sections 3.a , 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 otherwise be addressed in a manner that 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 using untreated alluvial groundwater from wells located on the property within 500 feet of California Gulch for drinking, domestic, or

agricultural purposes shall be modified to eliminate the restriction against one or more of these uses if Owner demonstrates to the State that concentrations of the constituents listed in Table 1 of Attachment 2 in the subject groundwater do not exceed State water quality standards in existence at the time of the application for the beneficial use that will be allowed as a result of the modification. Current water quality standards are set forth in Table 1 of Attachment 2. Any ground water sampling conducted for purposes of modifying an Environmental Covenant shall be conducted in accordance with Attachment 2.

b. In addition to the grounds for modification set forth in Section 4.a, 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) No Liability. The Department does not acquire any liability under State law by virtue of accepting this Covenant.

8) 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.

9) 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
1700 Lincoln Street, Suite 3600
Denver, CO 80203

And

Director of Reclamation and Closure
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

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

Resurrection has caused this instrument to be executed this ____ day of _____, _____.

Resurrection Mining Company

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of Resurrection Mining Company

_____
Notary Public

_____
Address

_____

My commission expires:_____

Accepted by the Colorado Department of Public Health and Environment this ____ day of _____, _____.

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of the Colorado Department of Public Health and Environment.

_____
Notary Public

_____
Address

_____

My commission expires:_____

ATTACHMENT 1

TO ENVIRONMENTAL COVENANT

THE PROPERTY

[INSERT LIST OF SUBJECT ZONE C PROPERTY FROM APPENDIX F2]

ATTACHMENT 2

TO ENVIRONMENTAL COVENANT

GROUNDWATER SAMPLING PROTOCOLS

[INSERT ATTACHMENT 2 FROM APPENDIX F1]

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 _____ day of _____, _____ 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 dated _____, 2008 among Resurrection, Newmont USA Limited ("Newmont"), the State of Colorado and the United States ("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 and EPA as a third party beneficiary, and declares that the Property as described in Attachment A 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.

No uses or activities that would in any manner interfere with or adversely affect the implementation, integrity, or protectiveness of the reclamation and closure actions that have been or will be performed or instituted on the property including, without limitation, revegetated areas, retaining ponds, adits, roads, ditches, pipelines, utility corridors, waste disposal facilities, tailings ponds, monitoring wells, signs and governmental use restrictions

and controls, shall be allowed. These restrictions will not apply to any future mineral prospecting, exploration or mining activities conducted on the property in accordance with the Colorado Mined Land Reclamation Act and implementing regulations.

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 uses or activities that would disturb or have the potential to disturb caps, covers or revegetated areas, or interfere or have the potential to interfere with or adversely affect the implementation, integrity, or protectiveness of the reclamation actions that have been or will be performed or instituted on the property shall be terminated if the waste in place within the area proposed for disturbance is removed or response facilities on the property are dismantled with the approval of EPA and the State.

b. In addition to the grounds for termination set forth in Section 3.a, 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) Modification.

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 demonstrates 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 land use prohibited under Section 1.

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.

109) 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
1700 Lincoln Street, Suite 3600
Denver, CO 80203

And

Director of Reclamation and Closure
Resurrection Mining Company
1700 Lincoln Street, Suite 3600
Denver, CO 80203

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

Resurrection has caused this instrument to be executed this ____ day of _____, _____.

Resurrection Mining Company

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of Resurrection Mining Company

_____
Notary Public

_____
Address

_____

My commission expires:_____

Accepted by the Colorado Department of Public Health and Environment this ____ day of _____, _____.

By:_____

Title:_____

STATE OF _____)
) ss:
COUNTY OF_____)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of the Colorado Department of Public Health and Environment.

_____
Notary Public

_____
Address

_____

My commission expires:_____

ATTACHMENT 1

TO ENVIRONMENTAL COVENANT

THE PROPERTY

[INSERT LIST OF SUBJECT BLACK CLOUD MINE TAILINGS PROPERTY FROM APPENDIX F2]

APPENDIX H
TO CONSENT DECREE

Description of the Yak Tunnel Costs Model

The purpose of the Yak Tunnel Costs Model (the "Yak Model") is to estimate, based on certain known costs and assumptions, the net present value of the operator's costs (e.g. labor, chemical, sludge disposal, repairs and replacements) to perform the OU1 Work for the next 100 years. The Yak Model is an excel workbook containing the tabs described below. These tabs summarize the model inputs and the formulae that were used to calculate the initial 100 year cost estimate and then present value that estimate back to year one of the model. These formulae will be used, with updated actual cost inputs or current projections as applicable, to update the present value calculation every five years, as described below and in Section XVII of the Consent Decree (Performance Guarantee for Work at OU1). The model attempts to use current data where possible to provide the most realistic estimate.

Tab	***Description***
2	Summary of Model Inputs
3	Operating and Maintenance Cost Model
4	Sludge Disposal Vendor Costs
5	Analysis of Chemical Usage
6	Payments for Chemicals
7	Analysis of February 2007 Contractor Labor
8	Resurrection Operating Labor
9	Analysis of Labor Costs ($)
10	Analysis of Gas and Electric: Xcel Energy
11	Plant Operations Reimbursable Field Supplies, Excluding Chemicals and Electricity
12	Summary of Contractor Total Costs by Month
13	Gallons Per Minute (Influent)
14	Monthly Flows (Gallons) from Water Sources at Yak Water Treatment Plant *Source: Appendix A from Monthly 8920 Reports to the EPA*
15	Total Gallon (Influent) *Source: Appendix A from Monthly 8920 Reports to the EPA*
16	Replacement Cost Analysis
17	Service Lives
18	Yak Blockage Pipeline and Pump Installation
Lookup Model Year	A reference sheet used in the formulae of the Replacement Cost Analysis
19	Miscellaneous Expenses

To calculate the 100 year cost estimate, actual costs were analyzed and future costs were estimated. Most of the Yak operating costs are incurred by an outside contractor that operates the plant, and are itemized on monthly bills. Some costs, such as sludge disposal, are paid

directly by Resurrection Mining Company ("Resurrection"). Tab 2 of the Yak Model contains a summary of the various model inputs (see Attachment 1). Those inputs are broken down into four overall groups:

1. Inflation and Discount Rates
2. Variable Costs
3. Fixed Costs
4. Other

1. Inflation and Discount rates -

   The parties have agreed that a 7% discount rate will be used to calculate the net present value of future estimated costs using the following formula:

   [(1+Inflation Rate) * (1+7%)] – 1.

   For the initial cost estimate a 2.7% inflation rate was used. Beginning with the first five-year update, the inflation rate will be computed by averaging the yearly average Consumer Price Index – All Urban Consumer (CPI-U), U.S. city Average, all items, as published by the U.S. Department of Labor, Bureau of Labor Statistics for the 100-year period immediately preceding the model update year, or the longest period of data available if less than 100-years of CPI-U data exists. In the event that the CPI-U ceases to be published or is materially altered, the parties shall mutually agree upon an alternative index comparable to the CPI-U.

2. Variable Costs –

   These are costs that vary based on the source and amount of influent processed at the YAK Water Treatment Plant. These include the costs for pumping, sludge disposal, electricity and chemical reagents.

3. Fixed Costs –

   These costs are not directly impacted by the amount of influent processed at the Yak Water Treatment Plant, but rather are of a more constant or fixed amount or represent the cost of repair / replacement of equipment that will be required in the normal course of operation. These include the costs for labor, property taxes, laboratory costs, miscellaneous costs, and maintenance and repair costs.

4. Other –

   Other important variables used in the Yak Model to project the costs to implement the Yak Tunnel remedy include the volume of influent (i.e. gallons per minute) that is expected to be processed at the plant (which may be different before and after the desired level of the water table is reached), the level to which the water table should be drawn down behind the current blockage and the source of the influent. This section contains estimates for these items.

Using the inputs contained in Tab 2, actual cost data contained in the Yak Model (e.g. Tabs 4, 5, 6, 7 etc.) or referenced by the model (e.g. Tabs 12, 17, 18 etc.) and standard projection and discounted cash flow formulae and methodology, computations were made of the operating and maintenance costs for the next 100 years and then discounted back to year one. The results of those computations discounted back to year one are contained in and summarized in Tab 3 - Operating and Maintenance Cost Model.

The Consent Decree provides that the net present value to perform the OU1 Work for 100 years will be reevaluated at least every five years or earlier as provided in the Consent Decree. To perform this reevaluation, the actual operation and maintenance costs that were incurred since the previous review (or a projection, as appropriate) will be input to the Yak Model to calculate the net present value to perform the OU1 Work for the next 100 years.

If any party believes that an actual cost input reflects an anomalous condition that is not reflective of anticipated future costs, that party may provide data and analysis to rebut the use of actual cost input value(s). If the parties cannot agree on the appropriate input value(s), the dispute will be resolved pursuant to Section XXV of the Consent Decree (Dispute Resolution). The party proposing to deviate from using the actual costs incurred since the previous review will have the burden of proof to demonstrate that those costs do not reasonably reflect future anticipated costs.

As stated above, Tab 2 contains a summary of the various categories of cost inputs that are used to calculate the 100 year estimate. The model inputs include yearly inflation rates and discount rates, which are used to project costs into the future and then discount those costs back to year one. Updated information that will be input for the updated model runs will be collected from four primary sources:

1. Monthly Operating Reports
2. Contractor Monthly Billings
3. Resurrection General Ledger Data
4. Updated Information for the Replacement Cost Analysis (Tab 16)

1. Monthly Operating Reports-

   The Monthly Operating Reports contain various data elements that were used to develop the original cost estimates contained in the Yak Model. To complete the five (5) year updates and calculate the next 100 year estimate, the Monthly Operating Reports for the intervening period should be reviewed to accumulate the following information:

   a. Sludge Generated (see Tab 4)

   b. Chemicals used (see Tab 5)

   c. Gallons Per Minute - Influent by Source (see Tab 14)

   d. Total Gallons – Influent (see Tab 15)

2. Contractor Monthly Billings –

   A sample template for input of all the cost categories contained on the contractor's current monthly billings is included as Attachment 2 to this Appendix. For the five (5) year updates, actual contractor costs should be gathered by month at this level of detail. To the extent that new cost categories for implementing the OU1 remedy are found on the contractor's bills, those should be added to the template so that all applicable costs on each of the contractor's bills are captured and accumulated in the template. This information is necessary to evaluate the cost estimates for certain costs included in the Yak Model (e.g. Plant Labor, Other Operations, Maintenance, etc).

3. Resurrection General Ledger Data –

   A sample template for input of the applicable operating and maintenance costs contained on Resurrection's general ledger accounts is included as Attachment 3 to this Appendix. As part of the five (5) year updates, the cost inputs included in this template will be acquired for each month during the intervening period. To the extent that new accounts for Yak operating or maintenance costs are found in Resurrection's General Ledger, those will be added to the template so that all costs are captured and accumulated in the template. This information is necessary to evaluate the costs estimates for certain costs included in the Yak Model (e.g. Sludge Disposal, Labor, etc).

4. Updated Information for the Replacement Cost Analysis (Tab 16) –

   In connection with the development of the Yak Model, an equipment listing was prepared, including all significant pipe and equipment necessary to operate the plant. This listing was used as a basis of the "Replacement Costs Analysis" (Tab 16). A yearly replacement cost estimate was developed based on the equipment listing, current age of

equipment, estimated useful lives, estimated replacement costs and inflation factors. As part of the five (5) year updates, this schedule (Tab 16) will be reviewed to determine what changes, additions or deletions, if any, are required to estimate and adjust the replacement cost estimate for the next 100 year model period based on actual operating experience during the intervening period.

Attachment 1
to Appendix H

Yak WTP Operating Costs Model
Summary of Inputs

Description of Variable	Input Values	Basis for Five Year Update: Volume Basis	Basis for Five Year Update: Pricing Basis
Inflation			
- Capital Items	2.70%	Average of the CPI Indexes for the Immediately preceding 100 year CPI Indexes	
- Electricity	2.70%		
- Labor	2.70%		
- Other Operating Costs	2.70%		
Discount Rate, Year 1		Computed using the agreed upon forumla of: [(1+Inflation Rate) * (1+7%)] - 1	
Discount Rate, Year 2			
Discount Rate, Years 3 and 4			
Discount Rate, Years 5 and 6			
Discount Rate, Years 7 through 9			
Discount Rate, Years 10 through 19			
Discount Rate, Years 20 through 29			
Discount Rate, Years 30 on			
Variable Costs:			
Cost of Sludge per 1,000 Gallons of Influent, Blockage Reduction Period	$0.37075197	5 yr volume weighted ave	Current
Cost of Sludge per 1,000 Gallons of Influent, Post Blockage Reduction Period	$0.37075197	5 yr volume weighted ave	Current
Cost of Electricity per 1,000 Gallons of Influent	$0.40989505	5 yr volume weighted ave	
Cost of Chemicals per 1,000 Gallons of Influent	$0.34723290		
Fixed Costs:			
Plant Operations Labor Per Day--Blockage Reduction Period	$ 926	Projection or Current Hour estimate	Current Actual Rates
Estimated Labor Savings Per Day	$ 159		
Plant Operations Labor Per Day--Post Blockage Reduction Period	$ 767		
Resurrection Operations Labor Per Month--Blockage Reduction Period	$ 1,000		
Resurrection Operations Labor Per Month--Post Blockage Reduction Period	$ -		
Other Plant Operations Costs Per Month	$ 2,200	5 year average	
Plant Maintenance Labor Per Day	$ 147	5 year average	
Plant Replacement	See "Tab 16"		
Property Tax (per year)	$ 2,200	5 year average	
Laboratory Costs (per year)	$ 10,788		
Miscellaneous Expense (per month)	$ 3,123		
Other:			
Total Flow Blockage Reduction Period Flow (Gallons Per Minute)	800	Projection or Current Volume Estimate	
Total Flow Post Blockage Reduction Period Flow (Gallons Per Minute)	650		
Enter "1" for 150 ft or enter "2" for 0 ft	2		

Model Input - 150ft
Model Input - 0ft

Attachment 2
to Appendix H

Monthly Data Input

Instructions: Enter total for the month on the line provided
(one line per expense type.)

From Resurrection General Ledger

GL Account Number	Description	Year 1 Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Total
792000.111	Salary/Yak WTP O&M													-
792000.112	Salary OT/Yak WTP													-
792000.115	Burden/Yak WTP Maint													-
792000.212	Chemicals/Yak WTR O&M													-
792000.251	Fuel/Yak WTR Treatment Plant													-
792000.305	Splys/Yak WTP O&M													-
792000.308	Parts/Yak WTP O&M													-
792000.309	Pipe/Yak WTP O&M													-
792000.414	Electricity/Yak WTP O&M													-
792000.422	Other Utilities/Yak WTR O&M													-
792000.445	Contr Srvc/Yak Wtr Trtmnt Plnt													-
792000.447	Copies/Yak WTP O&M													-
792000.448	Maint/Yak WTP O&M													-
792000.471	Lease/Yak WTP O&M													-
792000.517	Courier/Yak Wtr O&M													-
792000.523	Permit/Yak Wtr Trtmnt Plant													-
792000.525	Phone/Yak Wtr O&M													-
792000.531	Travel/Yak WTP													-
792000.532	Meals/WTP O&M-Yak Wtr Mngmnt													-
793000.445	Contr Srvc/Sludge Management													-

Key:
Ties directly to model
Does not tie directly (not used anymore) included for observation

	Total Resurrection Operating Labor	-	-	-	-	-	-	-	-	-	-	-	-	-

Attachment 3
to Appendix H

Monthly Data Input

Instructions: Enter total for the month on the line provided (one line per expense type.)

From MFG Monthly Bill

Category	Description	Type	Year 1 Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Total
Administration Fee	Administration Fee	Administration Fee													-
Oregon Gulch	Reimbursables	Field Supplies													-
Oregon Gulch	Reimbursables	Personal Vehicle													-
Oregon Gulch	Reimbursables	Taxi/Prkg/Misc													-
Phase 1	MFG Equipment	MFG - Inhouse Equipment Rental													-
Phase 1	MFG Equipment	MFG - MFG Trucks 4X4													-
Phase 1	MFG Equipment	SM - Inhouse Equipment Rental													-
Phase 1	MFG Equipment	SM - SM Trucks 4X4													-
Phase 1	Outside Services	Equipment Rental													-
Phase 1	Outside Services	Subcontractors - Other													-
Phase 1	Professional Services	AutoCAD II													-
Phase 1	Professional Services	Project Assistant													-
Phase 1	Professional Services	Project III													-
Phase 1	Professional Services	Senior Consultant													-
Phase 1	Professional Services	Senior I													-
Phase 1	Professional Services	Senior II													-
Phase 1	Professional Services	Senior Staff													-
Phase 1	Professional Services	Staff I													-
Phase 1	Professional Services	Staff II													-
Phase 1	Reimbursables	Equipment Rental													-
Phase 1	Reimbursables	Field Supplies													-
Phase 1	Reimbursables	Lodging													-
Phase 1	Reimbursables	Meals & Per Diem													-
Phase 1	Reimbursables	MFG - Inhouse Field Supplies													-
Phase 1	Reimbursables	Personal Vehicle													-
Phase 1	Reimbursables	SM - Inhouse Office Supplies													-
Phase 1	Reimbursables	Taxi/Prkg/Misc													-
Phase 1	Reimbursables	Telephone & Fax Charges													-
Phase 1	Reimbursables	Vehicle Rental													-
Plant Equipment	Professional Services	Senior I													-
Plant Equipment	Professional Services	Senior Staff													-
Plant Equipment	Professional Services	Staff II													-
Plant Equipment	Reimbursables	Field Supplies													-
Plant Equipment	Reimbursables	Office Supplies													-
Plant Equipment	Reimbursables	Telephone & Fax Charges													-
Plant Maintenance	Outside Services	Consulting Services													-
Plant Maintenance	Outside Services	Equipment Purchase													-
Plant Maintenance	Outside Services	Equipment Rental													-
Plant Maintenance	Outside Services	Subcontractors - Other													-
Plant Maintenance	Professional Services	Staff II													-
Plant Maintenance	Professional Services	Technician I													-
Plant Maintenance	Professional Services	Technician II													-
Plant Maintenance	Professional Services	Technician IV													-
Plant Maintenance	Reimbursables	Airfare													-
Plant Maintenance	Reimbursables	Field Supplies													-
Plant Maintenance	Reimbursables	Lodging													-
Plant Maintenance	Reimbursables	Meals & Per Diem													-
Plant Maintenance	Reimbursables	Office Supplies													-
Plant Maintenance	Reimbursables	Shipping & Delivery													-
Plant Maintenance	Reimbursables	Taxi/Prkg/Misc													-
Plant Maintenance	Reimbursables	Telephone & Fax Charges													-
Plant Maintenance	Reimbursables	Vehicle Rental													-
Plant Management	MFG Equipment	MFG - MFG Trucks 4X4													-
Plant Management	MFG Equipment	Personal Vehicle													-
Plant Management	MFG Equipment	SM - Inhouse Equipment Rental													-
Plant Management	MFG Equipment	SM - SM Trucks 4X4													-
Plant Management	Outside Services	Consulting Services													-
Plant Management	Outside Services	Remediation Services													-
Plant Management	Outside Services	Subcontractors - Other													-
Plant Management	Professional Services	AutoCAD II													-
Plant Management	Professional Services	Project Assistant													-
Plant Management	Professional Services	Project II													-
Plant Management	Professional Services	Project III													-
Plant Management	Professional Services	Senior Consultant													-
Plant Management	Professional Services	Senior I													-
Plant Management	Professional Services	Senior II													-
Plant Management	Professional Services	Senior Staff													-
Plant Management	Professional Services	Staff I													-
Plant Management	Professional Services	Staff II													-
Plant Management	Reimbursables	Field Supplies													-
Plant Management	Reimbursables	Lodging													-
Plant Management	Reimbursables	Meals & Per Diem													-
Plant Management	Reimbursables	Office Supplies													-
Plant Management	Reimbursables	Personal Vehicle													-
Plant Management	Reimbursables	Taxi/Prkg/Misc													-
Plant Management	Reimbursables	Vehicle Rental													-
Plant Operation	Outside Services	Consulting Services													-
Plant Operation	Outside Services	Equipment Purchase													-
Plant Operation	Outside Services	Equipment Rental													-
Plant Operation	Outside Services	Laboratory Services													-
Plant Operation	Outside Services	Remediation Services													-
Plant Operation	Outside Services	Subcontractors - Other													-
Plant Operation	Professional Services	Project Assistant													-
Plant Operation	Professional Services	Staff II													-
Plant Operation	Professional Services	Technician I													-
Plant Operation	Professional Services	Technician II													-
Plant Operation	Reimbursables	Field Supplies													-
Plant Operation	Reimbursables	Health & Safety Supplies													-
Plant Operation	Reimbursables	Lodging													-
Plant Operation	Reimbursables	Meals & Per Diem													-
Plant Operation	Reimbursables	Office Supplies													-
Plant Operation	Reimbursables	Permits & Licenses													-
Plant Operation	Reimbursables	Seminars & Education													-
Plant Operation	Reimbursables	Shipping & Delivery													-
Plant Operation	Reimbursables	Telephone & Fax Charges													-
Plant Operation	Reimbursables	Vehicle Rental													-
Site Checks	Professional Services	Staff II													-
Site Checks	Professional Services	Technician I													-
Site Checks	Professional Services	Technician II													-
Site Checks	Professional Services	Technician IV													-
Site Checks	Reimbursables	Shipping & Delivery													-
Sludge Handling	Professional Services	Staff II													-
Sludge Handling	Professional Services	Technician I													-
Sludge Handling	Professional Services	Technician II													-
Sludge Handling	Professional Services	Technician IV													-
Sludge Handling	Reimbursables	Lodging													-
Sludge Handling	Reimbursables	Meals & Per Diem													-
Sludge Handling	Reimbursables	Personal Vehicle													-
Sludge Handling	Reimbursables	Telephone & Fax Charges													-
Surge Pond or Yak Maintenace	Outside Services	Subcontractors - Other													-
Surge Pond or Yak Maintenace	Professional Services	Staff II													-
Surge Pond or Yak Maintenace	Professional Services	Technician I													-
Surge Pond or Yak Maintenace	Professional Services	Technician II													-
Utilities	Outside Services	Equipment Rental													-
Yak Blockage Pumping	Outside Services	Subcontractors - Other													-
Yak Blockage Pumping	Professional Services	Senior I													-
Yak Blockage Pumping	Professional Services	Senior II													-
Yak Blockage Pumping	Reimbursables	Airfare													-
Yak Blockage Pumping	Reimbursables	Field Supplies													-
Yak Blockage Pumping	Reimbursables	Lodging													-
Yak Blockage Pumping	Reimbursables	Meals & Per Diem													-
Yak Blockage Pumping	Reimbursables	Taxi/Prkg/Misc													-
Yak Blockage Pumping	Reimbursables	Telephone & Fax Charges													-
Yak Blockage Pumping	Reimbursables	Vehicle Rental													-
		OTHER NOT LISTED (total)													-
		Total MFG Bill	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total From Face of MFG Bill													
		DIFFERENCE	-	-	-	-	-	-	-	-	-	-	-	-	

Individual Vendors Needed (Include in totals above and sum here separately by Vendor)

Xcel Energy															-
Pete Lien and Sons															-
AsNland Specialty Chemicals															-
Drew Industries															-
Harcros Chemical Group															-

From Other Internal Sources

		Property Tax													-
		Laboratory Costs													-

From MFG Monthly EPA Report

		Total Influent (Gallons)													-
		Oregon Gulch Influent													-
		% Oregon Gulch													

Summary

	Professional Services	Total Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
Oregon Gulch	Professional Services	Less: Oregon Gulch Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
		Less: Plant Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
		Less: Surge Pond or Yak Maintenance	-	-	-	-	-	-	-	-	-	-	-	-	-
		Operations Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
		Electricity	-	-	-	-	-	-	-	-	-	-	-	-	-
		Additives	-	-	-	-	-	-	-	-	-	-	-	-	-
	This is a plug	**Other Plant Operations Costs**	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Maintenance	Professional Services	Maintenance Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
Surge Pond or Yak Maintenace	Professional Services	Surge Pond Maint. Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
		Maintenance Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
MFG Equipment		MFG Equipment	-	-	-	-	-	-	-	-	-	-	-	-	-
	Equipment Purchase	Equipment Purchase	-	-	-	-	-	-	-	-	-	-	-	-	-
	Equipment Rental	Equipment Rental	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Maintenance	Outside Services	Consulting Services	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Maintenance	Outside Services	Subcontractors - Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Surge Pond or Yak Maintenace	Outside Services	Subcontractors - Other	-	-	-	-	-	-	-	-	-	-	-	-	-
		External Cost of Replacments/Repairs	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX I
TO CONSENT DECREE
ACCESS AND MATERIALS GRANT AND INDEMNITY

This Access and Materials Grant and Indemnity ("Grant") is entered into this __ day of _____, 200__, by Resurrection Mining Company ("Resurrection") and the Colorado Division of Reclamation, Mining and Safety, Department of Natural Resources, State of Colorado ("DRMS").

RECITALS

A. Pursuant to terms and limitations of that Consent Decree dated _____, 2008, by and between the United States of America, State of Colorado, Newmont USA Limited ("Newmont") and Resurrection, Newmont and Resurrection are required to reclaim the Black Cloud Mine in accordance with the Reclamation Plan and Schedule that is appended to the Consent Decree.

B. Resurrection is the owner of the barrow area which is located on Robinson Placer MS 378, Sections 25 and 26, T9S, R80W, 6th Prime Meridian, Lake County, Colorado, and the Kid's First Soil pile located on the Black Claim MS 917 and the Chas G. Arnold Placer MS 1036 (collectively "Premises"), including all rights and privileges thereto, including, without limiting the generality of the foregoing, all construction aggregate, including rock, sand, gravel, and fill or stockpiled topsoil which may be extracted and removed from the Premises ("Materials"). The Materials are expected to be used for reclamation of the Black Cloud Mine. (The borrow soil located at the Eclipse waste rock pile will be used to reclaim the Eclipse waste rock pile; only excess soil will be used for reclamation elsewhere at the Black Cloud Mine).

C. In the event Resurrection and Newmont fail to complete reclamation of the Black Cloud Mine to the performance standards set forth in the Reclamation Plan and Schedule, and DRMS must conduct reclamation of the Black Cloud Mine site, DRMS will require access to and the right to remove Materials from the Premises in order to use the Materials for reclamation.

Resurrection desires to grant to DRMS the right to access and remove Materials from the Premises solely for purposes of completing reclamation activities if DRMS is required to complete reclamation of the Black Cloud Mine.

NOW, THEREFORE, it is agreed as follows:

1. Grant. Resurrection hereby grants unto DRMS the right to enter upon the Premises and remove Materials from the Premises to use for reclamation of the Black Cloud Mine. This Grant shall run with the land and bind all successors and assigns. Resurrection shall record an executed copy of this Grant in the Clerk and Recorder's Office in Lake County, Colorado. Resurrection agrees not to take any actions that would prevent or unreasonably interfere with DRMS's ability to access the Premises and

remove the Materials, including but not limited to, selling or leasing the premises, unless Resurrection makes the title or lease subject to this Grant.

2. Term. This Grant shall be effective upon execution. The rights granted herein shall commence if and when the condition precedent as set forth in paragraph 3 below has been met, and this Grant shall terminate automatically upon the completion of the reclamation of the Black Cloud Mine site by DRMS, or if Resurrection and Newmont perform the reclamation, upon compliance with all requirements for release of the Black Cloud Mine Performance Guarantee. Upon termination of this Grant as provided herein, DRMS shall execute a written release of this Grant in a recordable form acceptable to Resurrection.

3. Conditions Precedent. DRMS's rights under this Grant shall be subject to the satisfaction of the following condition: The DRMS or the Mined Land Reclamation Board conduct a Work Takeover for the Black Cloud mine pursuant to procedures set forth in the Consent Decree.

4. Roads. In conducting its activities hereunder, DRMS shall use existing roads and gates, if any, whenever practicable and shall consult with Resurrection on the location of any proposed new roads. It is further understood that no fences shall be cut, removed or relocated by DRMS without prior notice to Resurrection.

5. Activities and Operations. DRMS agrees that all activities it undertakes affecting the Premises will be conducted in good and workmanlike manner. DRMS shall or DRMS shall require its contractors to keep and maintain the Premises in a clean, orderly and workmanlike condition free of accumulations of trash and waste materials, and to avoid unnecessary environmental impacts. All work on the Premises will be conducted in such manner to prevent, to the extent reasonably practicable, disruption or interference with the operations of Resurrection, its successors and assigns. Upon completion of such work, DRMS or its contractors and subcontractors shall remove all machinery, equipment, tools, supplies, trash and waste materials placed on the Premises by DRMS or its contractors, and reclaim all surface disturbance caused by or on behalf of DRMS. In no event shall DRMS be responsible for any unclean or unsafe condition that already exists on the Premises not caused or created by DRMS or its contractors, including but not limited to, any environmental contamination such as from pollutants, solid wastes, hazardous waste or hazardous substances as those terms are defined under state and federal law. Resurrection agrees to hold harmless and indemnify DRMS, the Department of Natural Resources, and State of Colorado for any and all damages, liability and costs including attorney fees incurred by DRMS by reason of any administrative, judicial or other action regarding existing conditions of the Premises. DRMS will require contractors who perform work on the Premises pursuant to a State contract to procure and maintain insurance coverage pursuant to the requirements and in the amounts set forth in Attachment A. Contractors will be required to submit to DRMS and Resurrection proof of said insurance and to comply with all other requirements set forth in Attachment A.

6. Notices. Any notice, consent, waiver, request or other communication provided for or required to be given under this Grant shall be in writing and shall be sufficiently given and shall be deemed given when delivered personally or when mailed by certified or registered mail, return receipt requested, postage prepaid, or when dispatched by nationally recognized overnight delivery service, in any event, addressed to the party's address as follows:

If to Resurrection

Resurrection Mining Company
Attn: Land Department
1700 Lincoln Street, Ste. 3700
Denver, CO 80203

If to DRMS

Division of Reclamation, Mining and Safety
Attn: Allen Sorenson
1313 Sherman Street, Room 215
Denver, CO 80203

Either party may change its designated notice recipient, by ten days prior written notice given as provided herein, provided that no party may require notice to be sent to more than two addresses. Any notice given in any other manner shall be effective only upon receipt by the addressee.

7. Miscellaneous. This Grant may not be amended, modified or supplemented except in a writing executed by Resurrection with the consent of DRMS.

IN WITNESS WHEREOF, this Grant is executed effective the day and year first above written.

Resurrection Mining Company

By: _____
Its: _____

Colorado Division of Reclamation, Mining and Safety

By: _____
Its: _____

Attachment A
To
Access and Materials Grant and Indemnity

Insurance Requirements

A. The contractor shall obtain at his own expense, and maintain at all times during the term of this contract, insurance listed below. Proof of insurance must be submitted on certificates showing the following minimum coverage:

1) Worker's Compensation Insurance as required by state statute, and Employer's Liability Insurance covering all of contractor's employees acting within the course and scope of their employment with a minimum limit of $1,000,000.00 per occurrence.

2) Commercial General Liability Insurance written on ISO occurrence form CG 00 01 10/93 or equivalent, covering premises operations, fire damage, independent contractors, products and completed operations, blanket contractual liability, personal injury, and advertising liability with minimum limits as follows:

a. $1,000,000 each occurrence;
b. $2,000,000 general aggregate;
c. $1,000.00 products and completed operations aggregate; and
d. $50,000.00 any one fire.

If any aggregate limit is reduced below $1,000,000 because of claims made or paid, the contractor shall immediately obtain additional insurance to restore the full aggregate limit and furnish to the State and Resurrection a certificate or other document satisfactory to the State showing compliance with this provision.

3) Automobile Liability Insurance covering any auto (including owned, hire and non-owned autos) with a minimum limit as follows: $1,000,000 each accident combined single limit. The policy shall be endorsed to provide sudden and accidental pollution coverage resulting from a covered accident.

B. The State of Colorado and Resurrection shall be named as additional insured on the Commercial General Liability and Automobile Liability Insurance policies (leases and construction contracts will require the additional insured coverage for completed operations on endorsements CG 2010 11/85, CG 2037 or equivalent). Coverage required of the contract will be primary over any insurance or self-insurance program carried by the State of Colorado.

C. The Insurance shall include provisions preventing cancellation or non-renewal without at least 45 days prior notice to the State and Resurrection by certified mail.

D. The contractor will require all insurance policies in any way related to the contract and secured and maintained by the contractor to include clauses stating

that each carrier will waive all rights of recovery, under subrogation or otherwise, against Resurrection and the State of Colorado, its agencies, institutions, organizations, officers, agents, employees and volunteers.

E. All policies evidencing the insurance coverages required hereunder shall be issued by insurance companies satisfactory to the State.

F. The contractor shall provide certificates showing insurance coverage required by this contract to the State and Resurrection within ten days of the notice of award. No later than 15 days prior to the expiration date of any such coverage, the contractor shall deliver the State and Resurrection certificates of insurance evidencing renewals thereof. At any time during the term of this contract, the State or Resurrection may request in writing, and the contractor shall thereupon within 10 days supply to the State or Resurrection, as applicable, evidence satisfactory to the State or Resurrection of compliance with the provisions of this section.