

**Non-Standard Joint Funding Agreement
For Water Resources Investigations**

**Between the
California Regional Water Quality Control Board, Lahontan Region
and
U. S. Geological Survey**

**For Implementation of a Groundwater Investigation of Chromium Occurrence,
El Mirage, California
Supplemental Environmental Project - Molycorp**

1: Background

- A. The Mountain Pass Mine and Mill is regulated under a series of Waste Discharge Requirements (WDRs) issued by the Lahontan Regional Water Quality Control Board (Water Board) and is operated by Molycorp Inc. (Molycorp). During operation of the facility Molycorp violated its waste discharge requirements for which the Water Board pursued enforcement action. The Water Board and Molycorp signed a Consent Judgment (Judgment - Case BCV 07833) effective June 29, 2004 settling all claims for civil liability and oversight costs as a result of Molycorp's operation from January 1, 1996 to June 29, 2004. The Judgment requires Molycorp to fund Supplemental Environmental Projects (SEPs) in the amount of \$1,000,000. The funds that will be used for such SEPs are deposited with the State of California Attorney General in a Litigations Deposits Funds (Fund) held in trust for the Molycorp SEPs. These funds have been deposited.
- B. On September 24, 2004, the Water Board solicited proposals for SEPs and in a February 9, 2005 meeting accepted five projects recommended in Water Board Agenda Item No. 6 for that meeting plus one additional project. One of the accepted projects was designated to investigate chromium occurrence in groundwater and the unsaturated zone in an area of El Mirage, California.
- C. This agreement between the Water Board and USGS is to carry out the project to investigate chromium occurrence in groundwater and the unsaturated zone in an area of El Mirage, California. Water Board SEP funding of \$280,000 is provided for completion of this project. The USGS will provide \$45,000 in matching funds which, combined with the Water Board funds, will cover the total projected cost of \$325,000. The USGS authority to enter into this agreement is 43 USC 50.
- D. The Scope of Work (SOW), including a budget summary, task list and project schedule were provided by USGS for the project based on the project proposal. The SOW is attached.
- E. This Non-Standard Joint Funding Agreement is being undertaken by the United States Geological Survey (hereinafter referred to as the USGS), and the Water Board, collectively referred to as "the parties", for completion of a study described in the attached Scope of Work, of chromium concentrations, chromium isotopes, and nitrate in the unsaturated zone and at the water-table interface in the area of El Mirage, California. USGS is also working

under the policies and guidelines of the USGS Cooperative Program for administering matching funds for this project.

- F. USGS is responsible for providing investigations and associated products in return for payment as described under this agreement. Water Board is, under this agreement, responsible for ordering payment of invoices generated under this agreement.
- G. Work will be performed in accordance with the Scope of Work that is attached and made part of this agreement by reference. A summary of Task/payment schedule is shown in Table 1.
- H. The Project Managers (or their representatives) are responsible to complete the terms and conditions of this agreement. The Project Managers may interpret the meaning of this agreement provided their decision remains within its terms.

2: Duration of Agreement

- A. The term of this agreement shall become effective when signed by the parties and continue to September 30, 2008 and may be extended by agreement but not beyond December 31, 2008. The Task deliverable schedule is identified in the SOW, Section 2, Table 1.

Table 1 Summary of Task Deliverables/Payment Schedule

Task No.	Task Description	Deliverable	Cost	Completion date	Invoice Date
1	Install two instrumented boreholes with soil and water samples.	Report describing the installation of boreholes.	\$130,000 *	11/1/06	12/1/06
2	Analyze soil pore water and cutting samples from borehole.	tabulated analyses results.	\$30,000 *	4/1/07	12/1/07
3	Borehole Monitoring	Summary evaluation of analytical data	\$60,000	10/31/07	12/1/07
4	Data interpretation/ final report preparation	Final report describing results of previous tests and monitoring including evaluation of data and conclusions.	\$60,000	9/30/08	10/30/08
5	Prepare Semi-annual status reports.	Status Reports to be submitted semi-annually.	NA	1/31/07 7/31/07 1/31/08 7/31/08	NA
Total Agreement Cost			\$280,000		

*USGS is contributing an additional \$45,000 split between Tasks 1 and 2. These funds are not shown in this table.

- B. The Water Board and USGS understand that task costs identified in Table 1 are projected and may interchange as the project progresses without exceeding the Water Board total of \$280,000 and the USGS total of \$45,000.

3: Agreement Outline

- A. The Water Board and USGS understand that task costs are projected. The USGS must base invoice costs on actual costs, not to exceed a total invoice cost of \$280,000.
- B. Funding provided by the USGS in support of this agreement shall not exceed \$45,000.00. Funding provided Water Board shall not exceed \$280,000. Funds not used in one Task may be carried over for use in another Task.

4: Invoicing and Payment Provisions

- A. USGS shall expend funds as required to complete the work as described in the SOW. USGS will invoice as described in this agreement for actual costs associated with full cost accounting not to exceed a total invoice of \$280,000. USGS will complete the drilling to the well depth and design that can be reached within the SEP funding amount available.
- B. The Water Board Project Manager shall review technical work on associated deliverables upon receipt of each semi-annual status report. These reviews shall be completed within 30 days of receipt of each status report. Disputes on technical work identified in the status reports shall be resolved according to the provisions in Section 6. In the case of a termination as identified in Section 5 any costs incurred on work identified in a status report not disputed within 30 days of receipt will be paid to USGS as long as the status report includes sufficient technical data that represent the results of the work performed up to that date.
- C. The Water Board Project Manager shall review the deliverables as they are completed and shall complete this review within 30 days. The Project Manager shall determine the acceptability of the technical work on behalf of the Water Board and approve invoices on this basis. Disputes shall be resolved according to the provisions in Section 6. Payment shall be distributed pursuant to payment provisions in this document. USGS will have the authority to issue an invoice 30 days after a deliverable is provided if no response to this review has been received from the Water Board.
- D. USGS shall submit an original invoice to the Water Board. Invoices shall be submitted by the USGS annually beginning with expenses incurred through December 1, 2006, in arrears, to the Water Board Project Manager based on submittal of deliverables described in Table 1 of this agreement. The Water Board will notify USGS within 10 days of determination of acceptability of invoice of any disputes regarding billing.
- E. Undisputed invoices shall be paid as instructed by the Water Board to the USGS within 60 days of receipt of invoice by the Water Board. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983.).

- F. Funding is based on submittal of the deliverables described in the attached SOW and identified in the SOW, Section 2A, Project Tasks.

5: Termination

- A. The Water Board may terminate this agreement should the USGS fail to perform the requirements contained herein at the time and in the manner herein provided. In the event of such termination, payment to the USGS for work performed up to the effective date of termination will follow the process described in Section four.
- B. Either party may terminate this agreement by providing the other party with 30 days written notice. Reasonable and pre-approved costs for deliverables received shall be paid up to the effective date of the termination.

6: Disputes

- A. Any disputes concerning this Agreement or the SOW should be initially identified through a written notice between the project managers for Water Board and the USGS. If requested by the Water Board, work will stop on the disputed item. Initially, the Project Manager will attempt to resolve the dispute. If unable to do so, the dispute will be elevated to the Assistant Executive Officer of the Water Board and the Deputy Director of the USGS California Water Science Center for resolution. If resolution of a dispute requires any amendment to this Agreement or the SOW, that amendment would be initiated.

7: Amendments

- A. By mutual agreement, any amendments to the Non-Standard Joint Funding Agreement or the SOW will be initiated through a written amendment between the project managers for the Water Board and the USGS. Such amendments must be signed by both parties to be effective. Work started prior to a fully executed amendment is done at the risk of the USGS without expectation of reimbursement.
- B. No alteration or variation of this agreement shall be valid unless made in writing and signed by both parties. No oral understanding or agreement not incorporated herein shall be binding on either of the parties.

8: Other Provisions

- A. Rights in Data – the USGS retains original records resulting from this program for a minimum of 5 years, and as requested by the Water Board, will provide copies of the records to the Water Board. The USGS reserves the right to publish the data collected under this Agreement and use it in related work.
- B. Responsibility of Parties –USGS' liability shall be governed by the provisions of the Federal Tort Claims Act (28 U.S.C. 2671 et seq.). In the absence of a statutory exception or federal constitutional principle the Water Board's liability shall be governed by the provisions of the California Tort Claims Act (Govt. Code 800 et seq.).

- C. Independent Status – USGS and the officers, agents and employees of the USGS, in the performance of this agreement, shall act in an independent capacity and not as officers, employees or agents of the Water Board.
- D. Assignment – this agreement is not assignable (to a third party) by the USGS in whole or in part without the approval of the Water Board. Such assignment must be accomplished by written amendment signed by both parties.
- E. Audits – USGS shall be responsible for ensuring the accuracy and propriety of all records related to this agreement and shall maintain all supporting documentation for purposes of compliance with this agreement for a period of three years following the completion of this agreement.
- F. Governing Law – this agreement is entered into in accordance with applicable state and federal law and shall be interpreted in accordance with the laws of the State of California and the United States.
- G. Severability – if any provision of this agreement is held invalid or unenforceable by any court of final jurisdiction, it is the intent of the parties that all other provisions of this agreement be construed to remain fully valid, enforceable, and binding on both parties.
- H. Post-Study Site Conditions – at the completion of this study, the USGS will pursue with the Water Board if any additional work is of interest pertaining to the drilling site. If not, the USGS will pursue with other customers. Whenever no future use for USGS studies is identified for the drilling site, the USGS will return the drilling site to its previous condition, which includes filling and covering the drill hole as required by applicable State and Local regulations and guidelines.

UNITED STATES GEOLOGICAL SURVEY/California Water Sciences Center	Regional Water Quality Control Board, Lahontan Region
Signature <u><i>William T. Sexton</i></u> Print William T. Sexton Title Regional Hydrologist, WR Date <u>6/29/06</u>	Signature <u><i>Harold J. Singer</i></u> Print Harold J. Singer Title Executive Officer Date <u>6/29/06</u>
USGS-Modoc Hall, CSUS 3020 State University Drive East, Ste. 3005 Sacramento, CA 95819 (916) 278-7275	14440 Civic Drive, Ste 200 Victorville CA 92392-2306 (760) 241-6593

SCOPE OF WORK

1. BACKGROUND

The Project Managers during the term of this agreement shall be:

California Regional Water Quality Control Board, Lahontan Region	United States Geological Survey Section/Unit: California Water Science Center
Project Manager: Cindi Mitton	Project Director: John Izbicki
14440 Civic Drive, Suite 200 Victorville, CA 92392	4165 Spruance Road, Suite 200 San Diego, CA 92101
Phone: (760) 241-6583	Phone: (619) 225-6131
Fax: (760) 241-7308	Fax: (619) 225-6101
e-mail: cmitton@waterboards.ca.gov	e-mail: jaizbick@usgs.gov

Direct all inquiries to the Project Managers. The parties may change their Project Managers at any time however each shall notify the other of the change within ten (10) days.

A. Scope and Objectives

Previous USGS work has shown that naturally occurring chromium VI concentrations in the western part of the Mojave Desert are high and natural concentrations in the apex and midfan portions of the Sheep Creek fan, weathered from ultramafic rock in the San Gabriel Mountains, can exceed the California Maximum Contaminant Level for chromium of 50 ug/L (Ball and Izbicki, 2004). This work and ongoing USGS studies of the movement of artificial recharge water through thick unsaturated zones underlying the Mojave Desert have shown that chromium VI concentrations are high in the unsaturated zone above the water-table and that chromium VI may be mobilized from alluvial material in the unsaturated zone by infiltrating water.

Recently, chromium VI has been measured at concentrations exceeding 100 ug/L in water-table observation wells at dairies to the west of an area of known chromium contamination near El Mirage, CA. The source of the high chromium concentrations in water from these wells is not known, but it may be related to either the 1) leaching of naturally occurring chromium from the unsaturated zone by the downward movement of water from irrigated agriculture and dairy operations, or 2) the lateral movement of high-chromium water through the saturated zone from the area of chromium contamination. Because of the chemical characteristics of sulfate, it is possible that high concentrations of sulfate, associated with infiltrating irrigation return and dairy wastewater, may enhance the mobilization of chromium from surface exchange sites on mineral grains in the unsaturated zone—further increasing chromium concentrations at the water table. In addition to high natural and

anthropogenic chromium, ground water in the study area (Figure 1) also has high nitrate concentrations

from agricultural and dairy operations in the area. The flux of nitrate from these sources to the underlying ground water and reactions that occur within the unsaturated zone beneath these irrigated lands are not known.

The purpose of this study is to determine the source of chromium, including speciation of chromium VI, in water table observation wells near a known source of chromium contamination. This study also will evaluate nitrate concentrations in sampled portions of the aquifer and the potential for denitrification within the unsaturated zone in areas with irrigated agriculture and dairy operations.

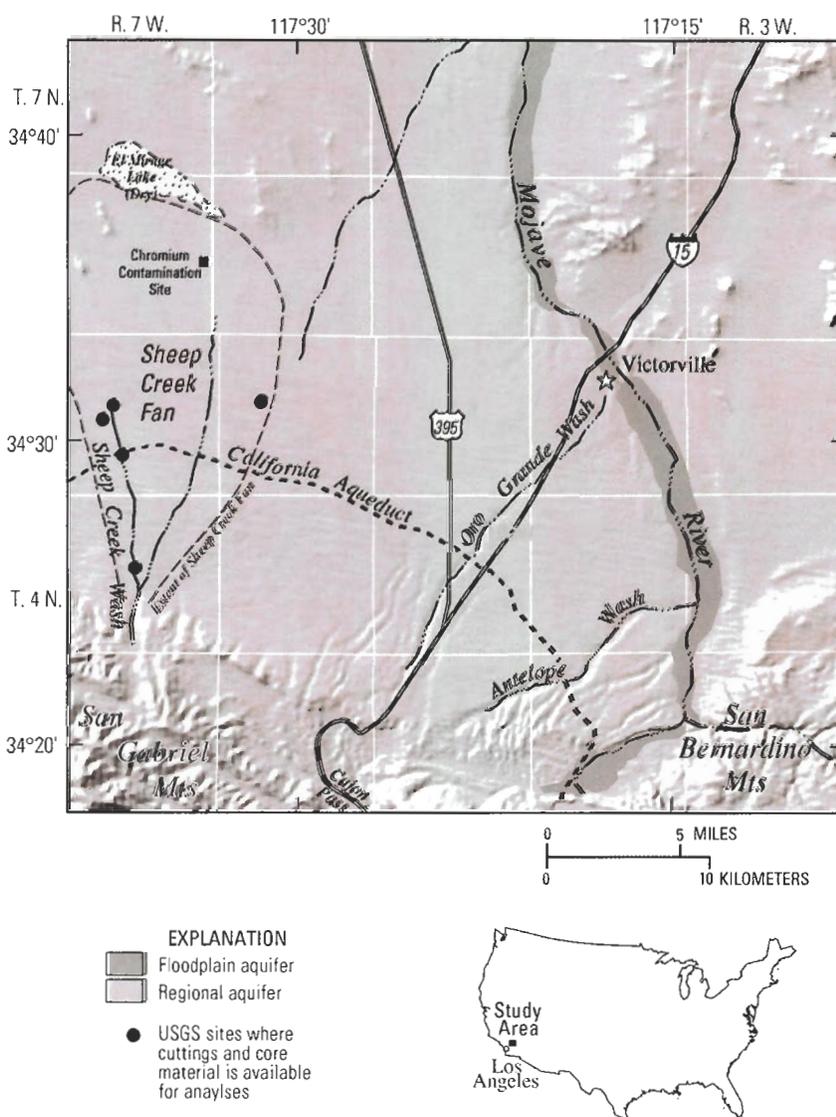


Figure 1. Location of study area.

2. WORK

The USGS shall be responsible for the work described below and preparation of products specified in this Scope of Work. The project covers those irrigated landuse areas of the El Mirage area of the Sheep Creek fan (Figure 1) and includes the following tasks.

A. **Project Tasks**

Task 1: Drilling and Instrumentation: Two instrumented boreholes will be installed at the dairy sites in areas where ground water and dairy wastewater have been used for irrigation to determine if naturally occurring chromium has been mobilized from the unsaturated zone. The boreholes will be drilled using appropriate drilling methods. When complete, each instrumented borehole will consist of as many as 5 heat-dissipation probes, 3 advanced tensiometers, 5 suction-cup lysimeters, and a water-table well to measure matric potential, and the quality of water in the unsaturated zone, and the quality of water at the water table. A data logger in a vault at land surface will be used to collect data from the heat-dissipation probes, advanced tensiometers, and pressure transducer in the wells at a 4-hour interval. The suction-cup lysimeters and wells will be sampled quarterly. The wells also serve as access tubes for electromagnetic (EM) logging tools used to verify instrument depths, identify perched layers, and determine changes in water content in the unsaturated zone between instruments.

During drilling, cuttings from the boreholes will be collected at 1-foot intervals and continuous core will be collected about 10 foot above and 10 foot below the water table. Cores also will be collected at selected depths elsewhere in the unsaturated zone. Cores material collected near the water table will be sampled at 0.5 ft intervals and pressure squeezed in the field to extract pore water. The specific conductance and pH of the pore water will be measured in the field. Background conditions have been determined from a well installed in the region in an area outside of irrigated lands.

The product of Task 1 will be two instrumented boreholes installed in the field and core material obtained for laboratory analyses and a report describing the well installation.

Task 2—Laboratory analysis of core material and cuttings: Pore water extracted from core material by pressure squeezing will be analyzed in the laboratory for chloride, sulfate, nitrate, nitrite, total chromium and chromium VI. Pore water extracted from the cores also will be analyzed for selected trace elements (including arsenic, vanadium, and uranium), and the stable isotopes of oxygen and hydrogen. Cuttings and core material also will be subsampled and leached in the laboratory using 1) water to extract soluble salts such as chloride, nitrate, and nitrite, and 2) using hydrochloride acid to solublize chromium and selected trace elements sorbed on mineral grains. Selected core material also will be analyzed for physical and hydraulic properties such as water content, matric potential, water retention, saturated, and unsaturated hydraulic conductivity.

Nitrogen concentrations (speciation analysis of nitrogen will be performed on some samples -Nitrate, Nitrite, and ammonia) in the unsaturated zone will be determined from analysis water extractions from cuttings and core material and from analysis of water from suction-cup lysimeters. The potential for denitrification will be determined by the presence of denitrifying bacteria and nitrate reducing bacteria cultured from core material collected during drilling. By-products of denitrification, such as nitrogen gas and changes in alkalinity of ground water, will be determined. Bacterial species

identification will be confirmed on the basis of genetic data [Terminal-Restriction Fragment Length Polymorphism (T-RFLP) and DNA sequencing]. The denitrifying and nitrate reducing bacteria concentrations will be correlated with nitrate concentrations extracted from core material and cuttings to determine depths in the unsaturated zone at which nitrate may be reduced. Results will be normalized to chloride concentration data obtained from water extracts from cuttings and core material to account for dilution and/or concentration from varying application, infiltration, and evaporation rates.

The product of Task 2 will be a physical, chemical, microbiological, and genetic data set describing material in the unsaturated zone at the 2 drill sites. Data will be tabulated and provided in a summary report.

Task 3—Monitoring: Instrumentation installed in the boreholes will be monitored for 1 year to determine the changes in matric potential and water quality in the unsaturated zone and changes in water level and water quality at the water table at the two instrumented sites. Data loggers at the site will collect data at 4 hour intervals and will be serviced at approximately 6 week intervals. Water from the suction-cup lysimeters will be sampled when data loggers are serviced water from water table wells will be analyzed twice during the study. Water from suction-cup lysimeters and water-table wells will be analyzed for field parameters, major ions, nutrients, selected trace elements, the stable isotopes of oxygen and hydrogen, and chromium isotopes.

The product of Task 3 will be a summary report that presents the physical, chemical, and isotopic data set and describes the changes in the unsaturated zone during the study period. (Data will be collected electronically every 6 weeks after instruments are downloaded and will be archived in the web-based USGS groundwater database.

Task 4—Data interpretation and report preparation: Physical and hydraulic data collected from the boreholes will be used with matric potential data from instruments within the boreholes to estimate water flux rates through the unsaturated zone to the water table. Water flux rates will be used with chemical data from suction-cup lysimeters to estimate the downward flux of chromium, nitrate and sulfate at selected depths within the unsaturated zone and the flux of these constituents to the water table. These data will be used to determine if high concentrations of chromium VI in water table wells are from the overlying unsaturated zone or if high-chromium water moved laterally in the saturated zone from another source. The chromium isotopic composition of the water will be compared to the isotopic composition of water in the overlying unsaturated zone and to the isotopic composition of water from wells at the Ducommun Aerostructures site to identify the source of chromium. The potential for additional chromium and trace element releases from the unsaturated zone will be determined from analyses of acid extractions from cuttings and core material.

Nitrogen flux rates within the unsaturated zone and to the water table will be estimated with water flux data in the same manner as chromium flux rates. The data collected during this study will be compared to data (nitrogen and microbiological) collected in another area of the Mojave Desert where septic wastewater from septic systems are migrating into the unsaturated zone (Yucca Valley, California).

The product of Task 4 will be a final report provided to the Regional Board describing the results of test-drilling, analysis, and monitoring at the site, including evaluation of the data and conclusions of the study. The results from this study will be applied to the

area around the boreholes as well as to other irrigated lands in the western Mojave Desert having similar water quality impacts.

Task 5 – Prepare Semi-Annual Status Reports: Reports describing the activities conducted during the previous six-month period will be provided throughout the duration of the program (Table 1. below). Reports will be submitted by the end of the month following each semi-annual period, by January 31 and July 31 of each year during the program.

Table 1. Schedule of Completion Dates

	Start	Complete	Product /Deliverable
Task 1	7/1/06	11/1/06	Two instrumented boreholes with soil and water samples report of well construction
Task 2	11/1/06	4/1/07	Summary of Soil sample results
Task 3	11/1/06	10/31/07	Summary of evaluation Analytical data
Task 4	10/01/07	9/30/08	Final Report
Task 5		1/31/07 7/31/07 1/31/08 7/31/08	Semi-annual Status Report

3. TASK BUDGET

A. Funding

The maximum amount to be provided by the Regional Water Quality Control Board under this agreement shall not exceed \$280,000 for the project (Tables 2 below).

The USGS has allocated \$45,000 in Federal Matching Funds (FMF) to assist with the collection and analysis of downhole samples.

The Water Board and USGS understand that task costs are projected and may interchange as the project progresses without exceeding the Water Board total of \$280,000 and the USGS total of \$45,000.

Table 2. Task Budget

	RWQCB SEP Funding	USGS Matching Funds*	Total
Task 1	\$130,000	\$22,500	\$152,500
Task 2	\$30,000	\$22,500	\$52,500
Task 3	\$60,000		\$60,000
Task 4	\$60,000		\$60,000
Total	\$280,000	\$45,000	\$325,000