

ERROL L. MONTGOMERY & ASSOCIATES, INC.



WATER RESOURCE CONSULTANTS

1550 East Prince Road
Tucson, Arizona 85719
(520) 881-4912
(520) 881-1609 Fax
www.elmontgomery.com

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Errol L. Montgomery, P.G.
William R. Victor, P.G.
Ronald H. DeWitt, P.G.
Mark M. Cross, P.G.
Dennis G. Hall, P.G.
Todd Keay, P.G.
James S. Davis, P.G.
Michael J. Rosko, P.G.
Daniel S. Weber, P.G.
Leslie T. Katz, P.G.
Dennis H. Shirley, P.G.
Jeffrey J. Meyer
Janis K. Blainer-Fleming
Hale W. Barter
Gregory L. Wallace

MEMORANDUM

DATE: February 13, 2008

TO: Beverly Everson, U.S. FOREST SERVICE

FROM: James Davis, ERROL L. MONTGOMERY & ASSOCIATES, INC.

cc: Salek Shafiqulla, U.S. FOREST SERVICE
Roger Congdon, U.S. FOREST SERVICE
Jamie Sturgess, ROSEMONT COPPER COMPANY
Kathy Arnold, ROSEMONT COPPER COMPANY

**SUBJECT: UPDATED GROUNDWATER MONITORING PROGRAM FOR
ROSEMONT MINE (FS MPO Comments – Item No. 6 [GW-5])**

This memorandum describes current plans for implementation of the groundwater monitoring program for the Rosemont Project and supersedes the Technical Memorandum dated November 5, 2007, which was in response to USFS comments on the Rosemont MPO. In general, the revised groundwater monitoring program is consistent with that described in the November 5 memorandum. The changes to the proposed groundwater monitoring plan relate chiefly to the number and locations of proposed wells, as well as the addition of piezometers and converted geotechnical boreholes to the monitoring plan. Location of the proposed wells, boreholes, piezometers, and converted geotechnical boreholes to be included in the revised monitoring program are shown on **Figure 1**.

This memorandum describes the updated, proposed groundwater monitoring program, including a work plan for installation of hydrogeologic characterization wells, piezometers, and boreholes, installation of monitoring equipment, implementation of the monitoring program, and preparation of an annual report of monitoring results. The principal objectives of the groundwater monitoring program will be: 1) to document potential impacts to groundwater levels and springs in and around the mine; and 2) to document groundwater quality before, during, and after mining operations.



PROPOSED GROUNDWATER MONITORING PROGRAM

GROUNDWATER LEVEL MONITORING

Groundwater levels and quality will be monitored at each existing well, proposed hydrogeologic characterization wells, piezometers, geotechnical boreholes which may be converted to piezometers, and when possible, at springs identified on **Figure 1**. Groundwater levels will be measured and recorded in accordance with the latest protocol of the Arizona Department of Environmental Quality (ADEQ) and/or as otherwise required by applicable environmental permits. Flow rate at each spring will be directly measured if sufficiently large, or will be visually estimated if too small to reliably measure. Photographs will be taken regularly at each spring to visually document flow rate and site conditions.

Groundwater level measurements will be obtained manually on a monthly basis, and at many wells will also be obtained continuously by installing and maintaining pressure transducers. Groundwater level monitoring may be expanded to include additional wells located south and east of the mine area, depending on well accessibility, location with respect to potential impact from groundwater pumping, and subject to permission of the well owners. Inspection of such additional wells is currently in progress.

Groundwater level measurements will be made by field personnel who have been properly trained in the use of groundwater level monitoring devices and equipment. The devices or equipment used will be capable of providing an accuracy level of at least 0.1 foot, and will be calibrated regularly to ensure this level of accuracy. For each measurement, the date, time, measured depth to water, the height of the measuring point above land surface, the measuring point reference datum, and names of field personnel will be recorded.

Pressure transducers and electronic dataloggers will be permanently installed at selected wells and piezometers to provide continuous documentation of groundwater level trends over time. During each monthly monitoring event, the dataloggers will be downloaded using a laptop computer or electronic hand-held device, and the data will be stored and retained in an electronic database. In wells and piezometers not equipped with continuous water level monitoring devices, water level measurements will be obtained manually.

GROUNDWATER QUALITY MONITORING

Water samples will be obtained from selected hydrogeologic characterization wells, piezometers, and operable existing wells, and when possible, springs shown on **Figure 1**. Water sampling will be conducted on a quarterly basis. The water samples will be submitted to a laboratory certified by the State of Arizona for environmental analyses. The samples will be submitted for analysis of the chemical constituents and parameters listed in **Table 1**. The samples will be analyzed using analytical methods approved by the ADEQ for environmental purposes.



Groundwater samples will be obtained using submersible electric pumps. Pumps will be operated using a portable electric generator. Groundwater pumped from the wells and piezometers during sampling operations will be discharged to land surface adjacent to each well or piezometer. Pre-pumping and pumping water levels, pumping rates, and water quality field parameters will be measured during sampling operations and recorded on field forms. The volumes of water purged (pumped) from the wells and piezometers prior to sampling will be in accordance with ADEQ groundwater monitoring protocol.

At the time of sampling, the pH, temperature, and specific electrical conductance of the water will be measured and recorded. Sampling containers prepared in advance by the environmental laboratory will be used. Each sample container will be labeled with a unique number or identifier and will be marked as to the type of preservative used. Following sample collection, sample containers will be maintained at a temperature of 4 degrees Celsius or less until they are delivered to the laboratory.

Document control and data management procedures will be followed to document sampling procedures and conditions, chain of custody for samples, laboratory analyses requested and conducted, and laboratory reports including analytical methods used and method detection limits. Items to be recorded for data management will include: site conditions, sampling personnel, visual observation of sample appearance, measurements of field parameters (pH, temperature, and specific electrical conductance), sample identification forms, analytical request schedules, and chain-of-custody documentation.

Chain-of-custody documentation will be verified for each sample. Sample identification will be confirmed by comparison of field sample identification sheets with analyses request schedules and laboratory reports. Verification of laboratory chemical analyses will include:

- Compare laboratory reports to analytical request schedules to confirm that correct analyses were conducted using appropriate analytical methods with acceptable detection limits;
- Review of laboratory report forms to confirm that analyses were conducted within allowable holding times;
- Calculate and/or recheck ion balances for the analyses of common constituents to document that the balances are within tolerable limits; and
- Compare results of laboratory chemical analyses for each sample to previous analytical results for samples obtained from the same source to confirm that results are representative of known conditions and/or to document potential changes in water quality.



WORK PLAN

The following tasks are proposed to implement the proposed groundwater monitoring program:

GROUNDWATER MONITORING

Under this task, quarterly groundwater level and groundwater quality monitoring will be conducted at proposed groundwater characterization wells and piezometers, potential geotechnical boreholes that may be converted to piezometers, existing water wells and boreholes, and springs, as shown on **Figure 1**. Installation and testing of proposed hydrogeologic characterization wells, piezometers, and geotechnical boreholes on USFS lands are described in the Drilling POO dated February 8, 2008. Additional characterization wells will be installed at locations on Rosemont lands shown on **Figure 1**.

Monitoring at existing wells, boreholes, and springs is on-going. Existing wells and boreholes proposed for monitoring have been identified in the field and where possible, groundwater samples and water level measurements will be obtained. Monitoring at proposed hydrogeologic characterization wells, piezometers, and converted geotechnical boreholes will begin soon after they are installed and tested. Quarterly site inspections will also be conducted at each of the 14 spring sites shown on **Figure 1**. Monitoring will be conducted as described previously in the Groundwater Monitoring Program section.

For purposes of this work plan, it is assumed that: 1) groundwater levels will be measured at approximately 30 proposed hydrogeologic characterization wells, approximately 15 to 20 piezometers, and approximately 20 existing wells and boreholes; and 2) water samples will be obtained for laboratory chemical analyses from most of the proposed hydrogeologic characterization wells, 4 to 6 existing water wells, and, when possible, at 14 springs. Water samples will be obtained from existing water wells if accessible to pumping equipment. Based on observations of low-flow spring conditions during most of the year, obtaining water samples from the springs may be infrequent.

PREPARATION OF INTERIM DATA TRANSMITTALS

During the course of hydrogeologic investigations and monitoring, interim data transmittals will be provided to USFS personnel as information becomes available. These interim data transmittals may include information such as:

- Locations of wells and piezometers
- Drilling logs and lithologic information
- Well or piezometer completion information
- Groundwater level data
- Results of hydraulic testing for installed wells and piezometers
- Results of laboratory chemical analyses of water samples



PREPARATION OF ANNUAL MONITORING REPORT

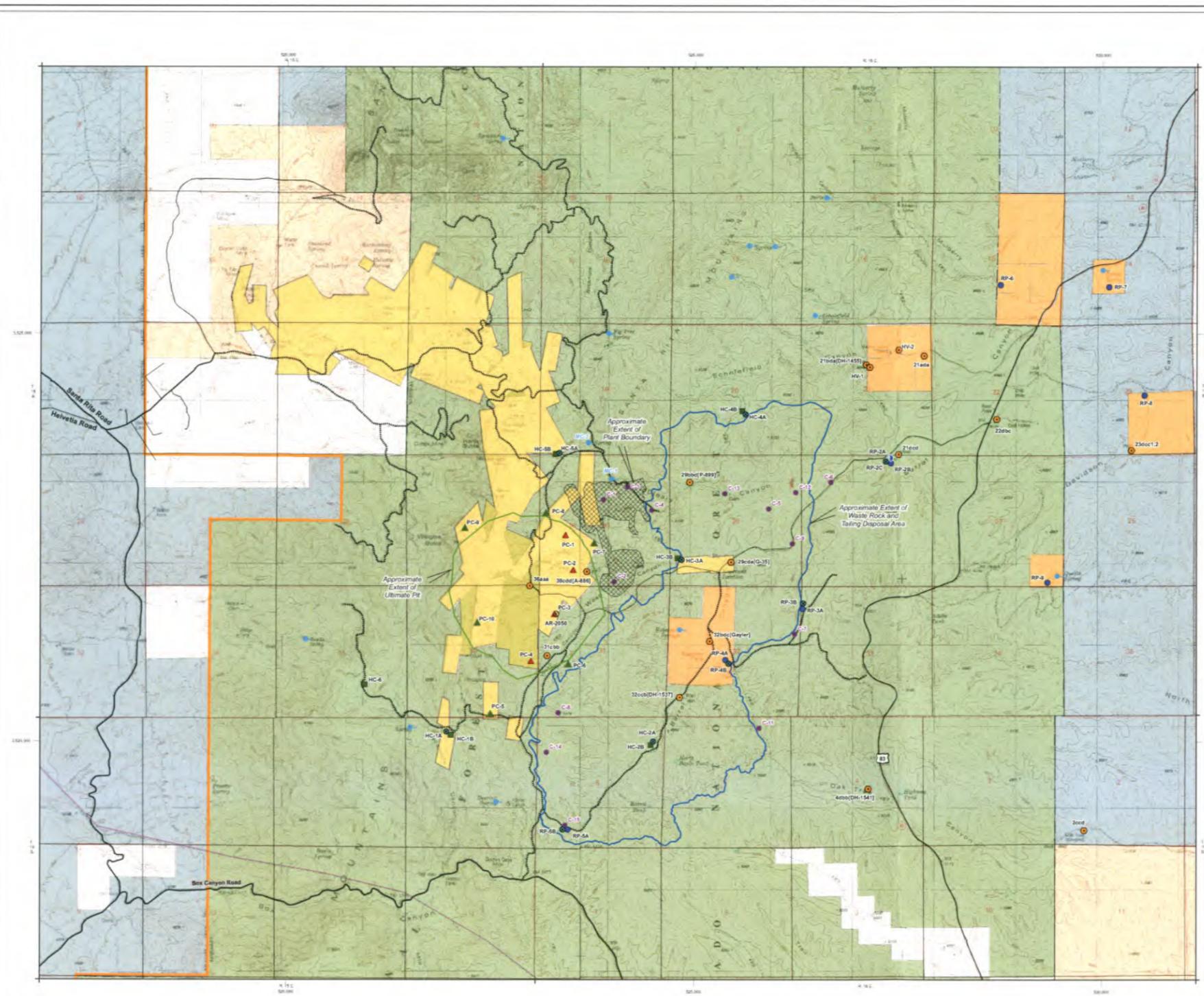
Following completion of well and piezometer installation and one-year of groundwater monitoring, a report documenting and summarizing hydrogeologic investigations and groundwater monitoring will be prepared. The report will document and summarize results of groundwater monitoring conducted during the previous year. The report will also summarize results of construction and testing for characterization wells and piezometers. The report will contain text, tables, and maps to document the following:

- Locations of wells and piezometers
- Drilling logs and lithologic information
- Schematic diagrams of proposed monitor wells and piezometers
- Groundwater level data, along with a hydrograph for each characterization well, and a water level contour map showing water level altitudes, flow direction, and depth to groundwater level
- Results of hydraulic testing and data analysis for installed wells and piezometers
- Results of laboratory chemical analyses of water samples

**TABLE 1. LIST OF CONSTITUENTS, PARAMETERS, AND
ANALYTICAL METHODS FOR
GROUNDWATER MONITORING PROGRAM
ROSEMONT PROJECT**

CONSTITUENT OR PARAMETER	ANALYTICAL METHOD
Calcium	M200.7 ICP
Magnesium	M200.7 ICP
Sodium	M200.7 ICP
Potassium	M200.7 ICP
Carbonate	SM2320B – Titration
Bicarbonate	SM2320B – Titration
Total Alkalinity	SM2320B – Titration
Chloride	325.2 / SM4500Cl-E
Sulfate	SM4500 SO4-D
Potassium	M200.7 ICP
Nitrate/Nitrite	M353.2 – H2SO4 preserved
Fluoride	SM4500F-C
pH	150.1 / SM4500H+ B
Total Dissolved Solids	160.1 / SM2540C
Elec. Conductance	120.1 / SM2510B
Aluminum	M200.7 ICP
Antimony	M200.8 ICP-MS
Arsenic	M200.8 ICP-MS
Beryllium	M200.8 ICP-MS
Barium	M200.7 ICP
Cadmium	M200.8 ICP-MS
Chromium	M200.7 ICP
Cobalt	M200.7 ICP
Copper	M200.7 ICP
Iron	M200.7 ICP
Lead	M200.8 ICP-MS
Manganese	M200.7 ICP
Mercury	M245.1 CVAA
Molybdenum	M200.7 ICP
Nickel	M200.7 ICP
Selenium	M200.8 ICP-MS
Thallium	M200.8 ICP-MS
Zinc	M200.7 ICP
Gross Alpha	M900.0
Radium 226	M903.1
Radium 228	M904.0
Total Uranium	M200.8 ICP-MS
Isotopic Uranium	Eichrom
Volatile Organic Compounds	M8260
Semi-Volatile Organic Compounds	M8270
Total Cyanide	M335.4 – Man. Distillation
Isotopic Oxygen	Mass Spectrometry
Isotopic Hydrogen	Mass Spectrometry





EXPLANATION

- Powerline
- Roads
- Rosemont Fee Land
- Rosemont Patented Mining Claims
- Santa Rita Experimental Range Boundary

Land Ownership Categories

- Bureau of Land Management
- Forest Land
- Private Land
- State Trust Land

Well Symbols

- Existing Pit Characterization Well
- Other Existing Water Well
- Existing Piezometer
- Spring or Seep
- Proposed Geotechnical Characterization Hole
- Proposed Characterization Well (50± feet depth)
- Proposed Characterization Well (250± feet depth)
- Proposed Characterization Well (500± feet depth)
- Proposed Characterization Well (1,000± feet depth)
- Proposed Pit Characterization Well (2,000± feet depth) and Piezometer Site



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EXISTING AND PROPOSED
GROUNDWATER CHARACTERIZATION
AND MONITOR WELLS

ERROL L. MONTGOMERY & ASSOCIATES, INC.
CONSULTANTS IN HYDROGEOLOGY
TUCSON, ARIZONA

February 5, 2008 FIGURE 1