

## Technical Memorandum

<b>To:</b>	John Hamrick, Vice President Milling	<b>From:</b>	David Levy, Ph.D.
<b>Company:</b>	Cotter Corporation	<b>Date:</b>	December 17, 2008
<b>Re:</b>	Fourth Quarter Status Update: Geochemical Source Investigation North and West of the Cotter Mill	<b>Project #:</b>	114-181-631 Task 103.01
<b>CC:</b>	Jim Cain, Environmental Coordinator/RSO		

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### INTRODUCTION

Cotter Corporation (Cotter) received a Notice of Violation (NOV) from the Colorado Department of Public Health and Environment (CDPHE, 2008a) regarding the Cañon City Milling Facility (Mill). The NOV indicates that groundwater north and west of the Mill, outside of the Restricted Area, contains levels of dissolved uranium that exceeds the recently promulgated Colorado groundwater standard of 30 micrograms per liter ( $\mu\text{g/L}$ ). The NOV also requires that Cotter take timely corrective action to mitigate contamination in the areas north and west of the Mill.

In response to the NOV, Cotter prepared a Proposed Corrective Action Plan (CAP) for groundwater north and west of the Mill which was submitted to the CDPHE in September 2008 (Cotter, 2008). The initial phase of the proposed CAP includes an investigation to characterize and delineate the area where groundwater exceeds Colorado water quality standards, and to the extent possible, characterize and identify sources. The CDPHE subsequently acknowledged (CDPHE, 2008b) that an aggressive approach to determining source areas is needed, and Tetra Tech personnel are currently actively engaged in evaluating geochemical data to determine likely source areas.

### CURRENT STATUS

In November 2008, Tetra Tech personnel attended two meetings with Cotter Corporation, and visited the Mill site to discuss historical operations and observe potential source areas. Cotter has provided extensive literature, GIS, and historical water quality information related to operations at the Mill. The following tasks have either been completed or are actively on-going to evaluate potential sources to the western flow path:

- Key documents related to site geology, hydrology, geochemistry, and Mill operations have been reviewed. Geo-referenced aerial photographs have also been studied to identify potential source areas related to previous ore storage locations, leach fields, and mill processing in the vicinity of the counter-current decantation (CCD) tanks.
- Twenty shallow ( $\leq 100$  ft bgs) groundwater monitoring wells were then selected for detailed geochemical evaluation: (1) Golf course area wells (037, 337, 803, 805, 806, 009, 338), (2) downgradient wells northeast of Mill (333, 344, 348, 368, 804), (3) downgradient wells north/northwest of Mill (802, 038, 346), (4) Mill Area/OPA wells (358, 035, 036, 701), and (5) upgradient (024).

- Trilinear diagrams were generated to compare the major ion chemistry of golf course wells to upgradient wells and known milling-related sources. The results indicate that the composition of water in Well 338 is consistent with mixing of upgradient water similar in composition to Wells 803 or 805, with downgradient water similar in composition to Wells 337 or 806.
- Historic trends in uranium and molybdenum concentrations in the selected monitoring wells have been compiled and are currently being evaluated with respect to timing, magnitude, and location to potential sources. Increasing uranium trends are apparent in golf course wells (803, 805, 338) and in several wells directly downgradient of the Mill (348, 346).

### **FIRST QUARTER 2009 ACTIVITIES**

Continued evaluation of potential sources of mill-related constituents to groundwater north and west of the Mill will include:

- Use of geochemical fingerprinting techniques to identify sources of uranium and molybdenum in groundwater, including evaluation of elemental ratios (e.g., U:Mo, U:V, Cl/SO<sub>4</sub>) in the selected wells with respect to timing, magnitude, and proximity to potential sources.
- Preparation of TDS isoconcentration maps to better understand the areal distribution of total chemical mass in groundwater near the Mill and outside of the Restricted Area.
- Application of geologic cross sections to better understand potential and/or preferential shallow groundwater flow pathways.
- Mixing calculations to evaluate potential existing pathways between upgradient and downgradient wells.
- Chemical analysis and volume estimation of soluble iron-sulfate salts in the vicinity of the CCD tanks.
- Detailed review of existing soil metal concentration data (e.g., EMS, 2005) in surface and subsurface soils in the vicinity of the Mill and previous ore storage locations. This information will be used in conjunction with the ongoing water quality investigation to select additional boring and monitoring well locations.
- Design of batch or column laboratory studies to evaluate the magnitude and mobility of mill-related constituents from vadose-zone soils collected from proposed borings.

An update of these proposed source investigation activities will be provided to CDPHE in April 2009.

**REFERENCES**

- Colorado Department of Public Health and Environment (CDPHE), 2008a. *Cotter Corporation Cañon City Mill, Colorado Radioactive Materials License 369-01, Notice of Violation*. Letter from Mr. Steve Tarlton, CDPHE, to Mr. John Hamrick, Cotter Corporation. July 27.
- Colorado Department of Public Health and Environment (CDPHE), 2008b. *Cotter Corporation Cañon City Mill, Notice of Violation Response*. Letter from Mr. Steve Tarlton, CDPHE, to Mr. John Hamrick, Cotter Corporation.
- Cotter Corporation, 2008. Letter Dated July 27, 2008, Colorado RML 369-01, Notice of Violation. Letter from Mr. John Hamrick, Cotter Corporation, to Mr. Steve Tarlton, CDPHE. September 26.
- Engineering Management Support, Inc. (EMS), 2005. *Alternatives Assessment, Old Ponds Area. Cotter Cañon City Mill Site*. Prepared for Cotter Corporation by Engineering Management Support, Inc., Arvada, Colorado. March.