Proposal:

Sampling and analytical testing of groundwater and surface water at the Colorado School of Mines Research Institute (CSMRI) has been conducted on a quarterly basis since early 2005 on four groundwater monitor wells (CSMRI-1, CSMRI -2, CSMRI -4 and CSMRI-5); since February 2007 on seven monitor wells (CSMRI-1B, CSMRI-6B, CSMRI-7B, CSMRI-8, CSMRI-9, CSMRI-10 and CSMRI-11); and two Clear Creek surface water locations (SW-1 and SW-2).

Tested compounds include radioisotopes (Ra-226, Ra-228, Th-228, Th-230, Th-232, and uranium), and metals (arsenic, barium calcium, cadmium, chromium, lead, manganese, mercury, molybdenum, potassium, silver, sodium, selenium, vanadium and zinc). The analytical results for select metals consistently indicate concentrations below detection limits for arsenic, barium, cadmium, chromium, lead, mercury, silver, and vanadium; and rare detects of molybdenum and selenium.

The metals arsenic, barium, cadmium, chromium, lead, mercury, silver, and vanadium have never been detected above their respective reporting limits. Molybdenum has been detected 29 times out of 90 unique samples with a maximum concentration of 0.05 milligrams per liter (mg/l); and selenium has been detected 11 times out of 90 unique samples with a maximum concentration of 0.034 mg/l.

Isotopic thorium (Th-228, Th-230, and Th-232) have each been tested 88 times at the CSMRI site. The maximum contaminant level (MCL) for drinking water is the sum of Th-230 and Th-232 at 60 picocuries per liter (pCi/l). No MCL has been established for Th-228. The maximum activity detected in a ground water sample at the CSMRI site is 1.25 pCi/l for the Th-230 isotope, well below the established MCL.

Because of the persistent non-detects and rare detects at very low concentrations, the Colorado School of Mines (CSM) requests that the metals arsenic, barium, cadmium, chromium, lead, mercury, silver, and vanadium; and the thorium isotopes be removed from the regularly scheduled quarterly sampling program. Rather these compounds would be sampled once a year (June).

Sampling and analytical testing for radium, calcium, magnesium, potassium, sodium, uranium, and zinc will continue on the existing quarterly schedule.

The persistence of elevated uranium detected at monitor well CSMRI-8 remains problematic. CSM would like to monitor for additional water quality parameters that would focus on adding site-specific analytical data to assess the persistence of this compound in the flood plain area. Limited data collected from monitor wells located in the flood plain area suggests oxygenated water from Clear Creek is mixing in the hyporheic zone under the flood plain, resulting in the enhanced solubility and mobility of uranium in the vicinity of CSMRI-8. With the continued flow of the hyporheic water farther downgradient under the flood plain towards CSMRI-4 and then to CSMRI-5, it is

likely that most of the available dissolved oxygen is being consumed, changing the water chemistry, and leading to lower uranium concentrations with flow distance.

The existing data set indicates that field measured parameters such as pH and conductivity, and laboratory measured analytes such as calcium, potassium, and sodium are slightly elevated to elevated at CSMRI-8 when compared to all other monitor wells at the CSMRI site. Possible reasons for the difference are theorized, but not known at the present time.

Beginning with the third quarter 2008 sampling event (September), CSM would like to add and record field measured dissolved oxygen (DO) and oxygen reduction potential (ORP) as all of the groundwater monitor wells are purged and also at the two surface water sampling locations. The measurement of these two parameters on a consistent basis through the seasonal influences of Clear Creek may verify the trends of dissolved oxygen in ground water in the flood plain area.

CSM will also add common anions (bicarbonate, carbonate, chloride, sulfate) and cations (calcium, magnesium, potassium, and sodium), laboratory derived anion/cation balance calculations, and total dissolved solids (TDS) to all monitor well sampling as part of the focused groundwater analysis.

Ferric iron (Fe^{+3}) and ferrous iron (Fe^{+2}) would be added to the revised analyte list at the three monitor wells (CSMRI-4, -5, and -8) that are located in the flood plain area of the CSMRI site. Monitor well CSMRI-1, located adjacent to Clear Creek and upstream of the flood plain area, would also be sampled for ferric and ferrous iron. We anticipate the presence of ferric iron to be higher in the upstream flood plain monitor well (CSMRI-8) which reduces to ferrous iron as groundwater in the flood plain area passes underneath monitor well CSMRI-4 and then to CSMRI-5. Testing for the ferric to ferrous iron relationship would verify the oxidizing to reducing conditions under the flood plain. Analytical data generated from the revised parameters would be incorporated into the quarterly reports. After several quarters of data, an assessment would be conducted to verify the relationship of DO, ORP and ferric to ferrous iron in the flood plain area.