

**STATEMENT OF BASIS  
CS MINING, LLC COPPER BENEFICIATION FACILITIES  
Ground Water Discharge Permit No. UGW010014**

I. Description of Facilities

CS Mining, LLC is expanding its copper mining and beneficiation operation in Beaver County, Utah. This expansion includes new plant facilities that will be supported by process water ponds and a new tailings impoundment. The proposed tailings facility will be located in the SW  $\frac{1}{4}$  of Section 5, SE  $\frac{1}{4}$  of Section 6, NE  $\frac{1}{4}$  of Section 7 and the NW  $\frac{1}{4}$  of Section 8, T. 27 S., R. 11 W., SLBM. The three process water ponds will be located in the NW  $\frac{1}{4}$  of Section 7, T. 27 S., R. 11 W., SLBM.

The facilities will store solutions and tailings as part of CS Mining's new copper cathode production process. Copper-bearing ore will be crushed and ground. Magnetite will be separated from the copper-bearing ore by magnetic separation for sale off-site. The non-magnetic material will be processed in a flotation circuit to separate acid-leachable (primarily oxides) ore from sulfide ore. Flotation agents are added to the ground ore in an aerated water suspension. The floatable ore, primarily sulfides, is dried and sold as concentrate. The ore that does not float, the underflow from the flotation tanks, contains oxide copper minerals that are acid soluble. The ore from the flotation process will be further processed in an acid leaching circuit that will produce a pregnant leach solution (PLS), that will be stored in a new PLS process water pond. This solution will be processed with solvent extraction and electrowinning, to produce copper cathodes. The barren process liquid remaining after solvent extraction is called raffinate and will be stored in a new raffinate process water pond, to be recycled for reuse in the acid leach process. One or two raffinate ponds will be constructed under this permit. All process water ponds will be double-lined to allow for detection of any leaks that may develop through the upper liner. In double-lined ponds, the upper liner serves to break the hydraulic head that the impounded liquid imposes on it, proportional to the depth of the liquid; therefore any leakage that may collect on the lower liner will not have significant hydraulic head that would tend to drive it through any holes that may develop in the lower liner. Under these conditions, it can be reasonably assumed that leakage through the upper liner at flow rates less than 200 gallons per acre of liner per day will not result in significant leakage through the lower liner into the subsurface.

Tailings from the flotation process will undergo leaching with recycled raffinate solution and sulfuric acid solution in a series of seven agitated tanks, followed by separation of solids and liquids in a counter-current decantation (CCD) circuit. Pregnant (metal-bearing) solution from this circuit is sent to the PLS pond for eventual processing with solvent extraction and electrowinning to produce copper cathodes. Tailings removed at the end of the CCD circuit process will be a slurry consisting of approximately 54% solids suspended in a liquid similar in composition to PLS.

CS Mining will construct a new Intermediate Tailings Disposal Facility (ITDF) to receive tailings from the acid leach circuit, in two small canyons east of the milling operations. Two dams will be constructed across these drainages to create an impoundment with a capacity of approximately 3 million cubic yards. Dam construction borrow will come from unconsolidated alluvium and weathered bedrock in both drainages and from the bedrock ridge between the two drainages. The ITDF is anticipated to have a life of 4 to 8 years and will allow ongoing production while design and permitting of a larger tailings impoundment is carried out.

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Following construction of starter dams, the dams will be raised in 10-foot increments using upstream methods, building upon tailings beaches formed by selective tailings deposition along the dam's upstream sides. Liquids from the tailings slurry will drain into the lower parts of the impoundment, where it will be collected and pumped back to the mill facilities for recycling.

Containment of tailings liquids will be enhanced by installation of a liner system. A 40-mil HDPE liner will be installed over the drainage bottoms and in those parts of the impoundments where water separated from the tailings will pond. A geo-composite liner (GCL), a woven mat containing bentonite, will cover the upper margins of the impoundment. Upon completion of the ITDF construction, approximately 80% of the impoundment will be lined with HDPE.

## II. Description of Site

The mill site and ITDF are located on the southern end of the Beaver Lake Mountains, in the Basin and Range geologic province. Late Paleozoic and Early Mesozoic sedimentary rocks in this area were folded and faulted during the Late Cretaceous Sevier Orogeny. These rocks were intruded by igneous rocks of latest Mesozoic to Tertiary age. Volcanic rocks were deposited over much of the region during the mid to late Tertiary age. In the late Tertiary and Quaternary age, fault-block mountain ranges and intervening valleys were formed, trending generally north-south.

CS Mining will mine three ore deposits from the Rocky Range, approximately 2 miles southeast of the mill facilities, and the adjacent pediment. Ore deposits in this area occur as skarns, metasomatically altered sedimentary rocks with replacement silicate minerals, abundant marble and local vein-like concentrations of copper oxide and lesser sulfide minerals. Copper occurs in the three deposits predominantly as oxide minerals. CS Mining will also process low-grade ore in a stockpile left by historic mining at the OK Mine, located in the Beaver Lake Mountains north of the mill facilities. This deposit was a mineralized breccia pipe in a granodiorite intrusive body.

The ITDF is located in an area underlain by alluvium and an unnamed Tertiary granodiorite. Investigations carried out by CS Mining and its predecessors at the site suggest that the bedrock underlying the alluvium at the ITDF site is fractured granodiorite. Test pits dug at the ITDF site show the igneous bedrock overlain by generally less than 10 feet of soil, alluvium and weathered bedrock.

Intrusive igneous rocks such as granodiorite have very low primary porosity and permeability; if the rock is fractured, the fractures may hold ground water. A 200-foot deep core hole and seismic surveys at the ITDF site indicate that the granodiorite bedrock is fractured with the following features: 1) fracturing is more intense at the core hole location below 130 feet depth, and; 2) the fracturing is likely to continue to an unknown distance below 200 feet. The core hole did not encounter ground water. It is unknown whether the fracturing is connected enough to form a single aquifer in the granodiorite, or whether the ground water encountered in the existing wells in the area represents different, unconnected zones of fracturing.

Available information about ground water conditions at the CS Mining project area is limited. However, ground water was encountered in the three water supply wells used by the mining operation and at monitor wells drilled by CS Mining's predecessor for a proposed leach pad that was not built. Driller's logs are available for the water supply wells. Well WW-3, located approximately one mile northwest of the ITDF site and up-gradient from it, encountered water at 186' below ground surface (bgs) when drilled in 2008. Well WW-6, approximately  $\frac{3}{4}$  mile southeast and down-gradient of the ITDF site,

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encountered water at 96' bgs in 2008. Both these wells were completed in bedrock, which the driller described as "dolomite", but which is more likely to be igneous rock considering the mapped surficial geology. Monitor wells drilled in 1996 near the existing and proposed mill facilities, located approximately ½ mile west of the ITDF site, were completed in intrusive igneous bedrock (granodiorite/quartz monzonite) and had an average depth to ground water of 167 feet bgs.

Ground water sampled in well WW-3 had total dissolved solids (TDS) content of 1410 mg/l; water from well WW-6 had TDS content of 1760 mg/l. Trace metals were below the ground water standards for these samples. Existing evidence, therefore, suggests that ground water in this area is Class II.

The project site has an arid climate. Average annual precipitation for Milford, UT, located approximately 9 miles southeast of the site, is 9 inches per year.

### III. Tailings Characteristics

Bench-scale acid leach testing was carried out on a composite bulk sample from the flotation tailings pond in 2013. The test replicated expected operating conditions. Tailings and sulfuric acid were added to the first of six agitated tanks, and the tailings were moved sequentially through the tanks with acid added to each tank to maintain the necessary pH. This test generated a tailings slurry comparable to that which would be pumped to the ITDF during mill operation. Samples of this tailings slurry were analyzed for chemistry and mineralogy; however, liquids were not separated from the slurry for analyses. The slurry samples were dried to a moisture content of less than 0.1% and the dried samples were subjected to extraction with deionized water in the meteoric water mobility procedure (MWMP) and with a weak inorganic acid solution in the synthetic precipitation leaching procedure (SPLP). The MWMP calls for equal masses of the sample and deionized water to be placed in a vertical column with the water placed on top of the sample, so it infiltrates through the sample and is collected at the bottom of the column. The resulting liquid is used in the analysis for selected solutes. Therefore, the analytical results from the MWMP should conservatively represent the concentrations of solutes that will be present in the tailings water stored in the ITDF. The SPLP results can be used to identify solutes that would be present in the tailings water, but it does not use a 1:1 ratio of sample to deionized water and so the solute concentrations from this extraction would not accurately mimic the concentrations in the tailings water.

Analytical results from these procedures are reported in Appendix C of CS Mining's permit application and summarized in Table 2 of the application. These results indicate that the tailings water would have TDS content of approximately 2400 mg/l, with significant content of calcium (550 mg/l) and sulfate (1500 mg/l); pH neutral to slightly alkaline, and trace metals at non-detectable levels except for antimony, which had an level of 0.019 in the MWMP extract solution as compared to the ground water standard of 0.006 mg/l.

After the mill start-up and disposal of tailings in the ITDF, tailings water will be sampled from the tailings water return line at the plant terminus of that line. Samples will be collected daily and analyzed for pH and electroconductivity. Following plant start-up and stabilization of the milling process, or after one month of operations (whichever comes first) a return-water sample will be collected and analyzed for pH, electroconductivity, TDS, major ions (Na, Ca, Mg, K, Cl, SO<sub>4</sub>), alkalinity, nitrate + nitrite, metals from Table 1 of UAC R317-6, gross alpha and Ra 226 + 228. Additional sampling will be done at monthly intervals for 90 days and quarterly thereafter.

#### IV. Monitoring

CS Mining shall monitor the leak detection sumps under the process water ponds. Any water recovered from the sumps will pass through a totalizer before being discharged back into the pond where it originated. CS Mining shall record daily totalizer readings for each process water pond. CS Mining shall keep records of whether fluids were present in the sumps on the weekly monitoring events, and if present, records of the daily volumes pumped from the sumps. If leakage into any process water pond leak detection sump exceeds 200 gallons per acre of liner surface per day (440 gal/day for a 2.2-acre pond), CS Mining shall notify DWQ by phone within 24 hours, and in writing within 5 days. Unless it can be demonstrated that the fluid in the sump is not wastewater which has leaked through the upper liner, CS Mining shall immediately begin activities to locate, isolate and repair any leaks in the upper pond liner. A report on the leakage and repair activities shall be submitted to DWQ within 30 days of the initial report of the leakage.

As stated in Part III, above, CS Mining shall sample and analyze the water drained from tailings deposited in the ITDF.

CS Mining will drill two monitor wells located at the toes of each dam across the two drainages where the ITDF is located. As stated in Part II, above, bedrock under the ITDF is granodiorite with very low primary porosity and permeability, but there is evidence of fracturing both at the ITDF site and also in other wells in the area. A core hole was drilled to 200 feet at the ITDF site and did not encounter ground water. CS Mining has committed to drill the two monitor wells to a depth of 500 feet; comparison with ground water elevations in other wells in the area suggests that ground water should be encountered above that depth. However, because ground water would be contained in discrete fractures within otherwise impermeable bedrock, there is a possibility that the monitor wells may not intersect a water-bearing fracture. Also, available evidence suggests that water drained from the acid leach tailings may have chemistry similar to the site's ground water, and it may be difficult to detect leakage from the ITDF by ground water monitoring.

If the drill holes for the monitor wells encounter ground water, the wells should be constructed and screened to sample the uppermost significant ground water encountered; preferably ground water that can be produced from the well in quantities that allow for standard well purging and sampling techniques.

Ideally, DWQ would like at least one monitor well capable of providing a ground water sample immediately down-gradient of the ITDF. If neither drill hole encounters ground water above the planned 500-foot depth, CS Mining shall propose an alternative plan for monitoring potential leakage from the ITDF within 90 days of drill hole completion.

If ground water monitoring is possible at one or both of the planned down-gradient monitor wells, samples from the wells will be analyzed for the same parameters that tailings water will be analyzed for, as listed in Part III above. During the first year of monitoring, CS Mining shall obtain eight samples from each well to define background water quality and its variability. Protection levels will be derived from this data for parameters that show the greatest difference in concentration between their levels in the tailings water and in the ground water.

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Water wells WW-3 and WW-6 shall be monitored to provide data on up-gradient and down-gradient water quality, respectively. CS Mining shall obtain a total of eight samples from all monitor wells to define background water quality, within the first year after permit issuance. Existing samples may be included in these eight, provided the same analytical methods were used. Following background monitoring, WW-3 shall be monitored semi-annually and the new wells and WW-6 monitored quarterly.

V. Closure Plan

One year prior to the final placement of tailings in the ITDF, CS Mining shall submit for DWQ review and approval a closure plan for the facility that is protective of waters of the state. The plan shall be based on an evaluation of the tailings for potential to leach contaminants, site conditions and the existing containment structures at the facility.

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