Western Copper Corporation

Project Proposal

Carmacks Copper Project
Yukon Territory

Appendix E4

Memorandum – Heap Rinsing Additional Information
(June 2006)

DRAFT MEMORANDUM

TO: Jonathan Clegg, Project Manager - Western Copper Corporation

CC: Dan Cornett, Principal – Access Consulting Group

FROM: Brad Thrall – Alexco Resource Corp.
Joseph Harrington – Green World Science

RE: Heap Rinsing Additional Information – Carmacks Copper Project

DATE: June 15, 2006

Alexco Resource Corp. has reviewed the Yukon Government Additional Information Request for the Carmacks Copper Project. The information presented in this response is primarily focused on column rinsing scale up and heap detoxification.

Column Rinse Test Scale Up Methodology

Column rinse tests have been previously conducted and reported demonstrating the technical feasibility of rinsing spent ore after copper acid leaching. Estimated heap rinsing timelines were previously presented in Alexco's January 2006 Detoxification and Rinsing Testwork Report. The January 2006 approach used to estimate heap rinsing times was based on applying the 200-day timeframe required in the column testwork to achieve a copper concentration in the effluent of <0.30 mg/l (MMER). The MMER criterion for copper and pH was used as a benchmark to determine overall rinsing requirements. By applying the application rate used in the small column test work and the number of column days to rinse the spent ore, the time for a commercial heap to be rinsed was estimated. Table 1 from the January 2006 report summarizes the scale-up data for Column 9. The estimated time of 4.5 years was an indicative estimate, based on accepted scale up approaches used in the industry. This time estimate will change depending on the application rate (lpm/m^2) to the heap and the total pumping rate of solution applied (m^3/hr), however the 4.5 years of rinsing was based on total pumping solution rate of 400 m^3/hr on a year round basis.

There are alternative approaches to estimating field conditions for rinsing based on column results. One of the alternative approaches suggested is the use of solution to ore ratios.

The ratio of rinse solution (liters) to weight of ore (kg.) can be determined at the end of the rinse period. An alternative approach suggested is to directly apply the calculated T/T ratio to the estimated tonnage of spent ore during operations (13,300,000 tonnes). The result is an estimate of the total volume of rinse solution required. Based on an assumed pumping capacity (400 m^3/hr), the timeframe required to apply the necessary rinse volume is determined. The rinsing results for Column 9 presented in the January 2006 report indicate that approximately 105 liters of solution was applied to the column in order to achieve a copper concentration of < 0.30 mg/l in the effluent. This amount of solution equates to 2.62 tonnes of solution per tonne of ore (105 liters / 40 kg.). By applying this ratio to the total tonnes of ore at the end of the mine life (13,300,000), an estimated time of 3,600 days is calculated. Alexco considered using this approach when preparing estimated heap rinsing timeframes but this approach has been demonstrated to significantly over-predict field conditions when the T/T ratio is developed directly from small columns.

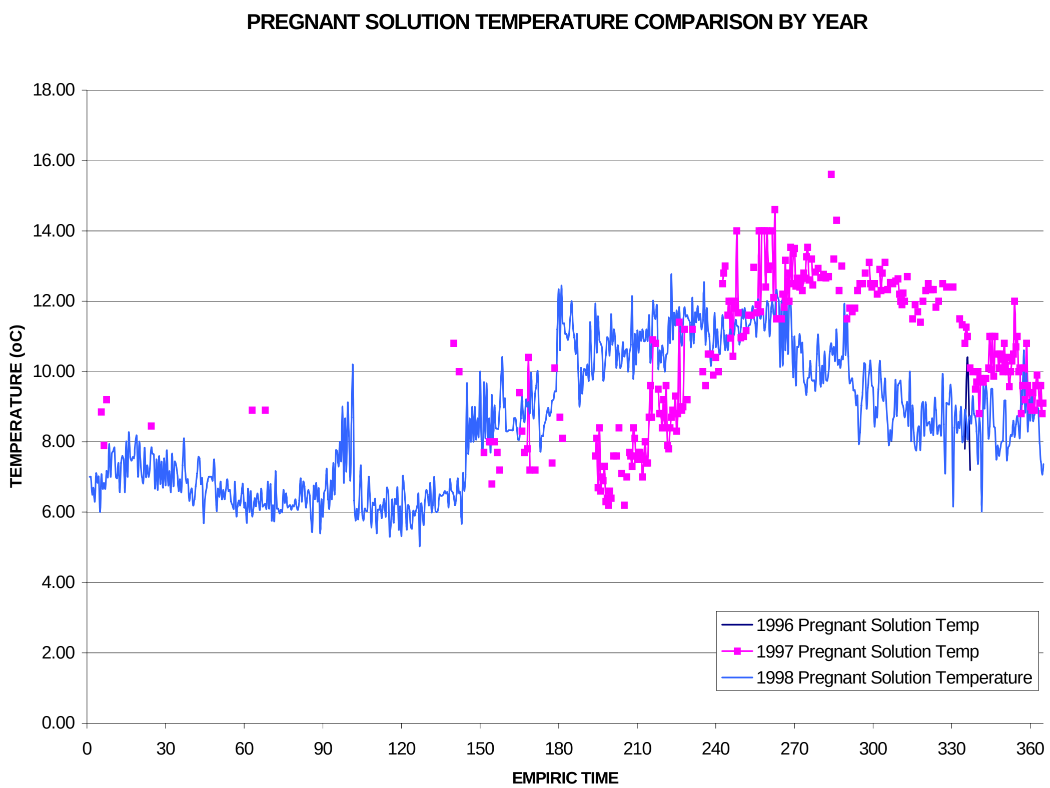
By way of an explanation, the height of the spent ore in Column 9 was approximately 1.3 meters and contained 40 kg. If the column rinsing test had been completed on a column double in size (2.6 meters, 80 kg.), the overall rinsing timeframe would not have doubled and the resulting tonnes of solution per tonne of ore (T/T) ratio would have been considerably less than the 2.62 reported. As rinse solution moves downward through the heap, acidity and contaminants will continue to be flushed and removed throughout the entire vertical extension of the heap. As long as the influent rinse solution is lower in concentration than the solute that is diffusing from the rock pores, and ample rinse volumes are provided, rinsing of contaminants and acidity is ongoing. This results in a tonne of rinse solution rinsing considerably more spent ore mass than is accounted for when using a T/T ratio directly obtained from the small columns. Because of this mechanism, using a T/T ratio from a small column and applying it directly to a large scale heap will result in over-prediction of the amount of solution required.

Our experience in rinsing over 50,000,000 tonnes of cyanide heaps on over 12 separate heaps is that T/T ratios determined directly from small columns consistently over-predict actual rinse times by 30% – 50%. For assessment and planning purposes, a heap rinsing period between the two methodologies is a reasonable approach. A rinse time of 4.5 years, as described in the previous report, is still a reasonable time estimate based on the currently available information. Re-evaluation of the estimated rinse times will be made after rinse tests are complete on the large scale column. At that time, the use of a T/T ratio would be useful as an alternative methodology based on the results of the large scale column. The optimum rinse approach will be further developed as a result of the large scale column program.

Year Round Rinsing

The timeframe calculated for heap rinsing is based on year round rinsing and solution application. Performance data already presented from the Brewery Creek Mine clearly demonstrates the ability to recirculate solution throughout the winter season under nearly identical climate conditions as Carmacks Copper. The thermal properties of the alkaline solution used at Brewery Creek are very similar to the fresh water and alkaline rinse solution that will be used for rinsing the Carmacks Copper heap. The only heat inputted into the Brewery Creek system was from the generators, again similar to the Carmacks Copper process flow sheet. Solution temperature profiles for Brewery Creek are shown in Figure 1.

Figure 1.



Large Scale Column Test Program

A large scale column program has been initiated to optimize the leaching phase of the process. This large scale column provides an opportunity to optimize the rinsing phase as well.

Column Description and Conditions

Two diameter 12” PVC columns of 20 ft height were installed in series and filled with 15 ft of ore each, for a representation of a 30 ft high heap. A duplicate set of two columns arranged similarly was also installed. The total ore charge to the columns was:

Column 1 A+B 984 Kg
Column 2 A+B 985 Kg

During agglomeration, 13 Kg/T elemental sulphur was added to the ore.

Leach solution was pumped at a rate of 10 $l/h/m^2$ to the top of column A, and was collected through an airtight drainage system into a 50 liter reservoir. From this reservoir, the solution was pumped onto the top of column B at a similar rate.

Air was injected into the bottom area of each A and B column at a rate of 0.15 $M^3/h/m^2$

Based on the previous small column test program as reported in the Alexco January 2006 report, additional rinsing tests will be complete on the current large scale column program. The following general procedure is recommended but is expected to be reviewed prior to the shutdown of the large scale column.

- Following completion of copper leaching, the feed solution will be shut off and the column allowed to freely drain until no remaining solution is draining from the column. The volume of the draindown solution should be measured to provide information on total column draindown necessary for optimization of the estimated heap draindown moisture percent.
- A sample of the heap draindown solution would be collected and analyzed for pH, conductivity, sulfate, acidity, alkalinity and 32 ICP metals (low detection limits, including selenium).
- Begin fresh water rinsing at an application rate similar to the leaching phase (0.20 lpm/m^2).
- At a minimum of twice per week, collect a sample of the column effluent and analyze for pH and conductivity. Measure the volume of column drainage collected.

- On a bi-weekly basis, collect a sample of the column effluent and analyze for pH, conductivity, sulfate, acidity, alkalinity and 32 ICP metals (low detection limits, including selenium).
- Continue fresh water addition until the pH of the column discharge increases to 5.0+ indicating that the majority of the acidity has been rinsed.
- Begin rinsing with a 5% alkaline solution of sodium carbonate. Rinse at the same application rate. Continue with sampling and monitoring schedule as highlighted above.
- Continue rinsing with alkaline solution until pH of column drainage reaches 8.0.
- Begin fresh water rinsing again using same monitoring schedule as highlighted above. This phase of fresh water rinsing is designed to determine the final pH that can be expected from the heap in the long-term.
- Once the column rinsing has been completed, the feed solution should be off and the column allowed to freely drain until no remaining solution is draining from the column. The volume of the draindown solution should be measured to provide additional information on total column draindown necessary for optimization of the estimated heap draindown moisture percent.

Mineralogical Assessment

Once the rinsing phase of the columns is complete, the column should be dismantled and sampled for additional mineralogical assessment and ABA testwork. If possible, samples of column residue should be collected at various elevations throughout the column during dismantling and preserved for additional sampling in the future. A composite sample of the column reside should be made and analyzed for paste pH and standards acid base accounting (ABA) parameters and metal leachate testing.