Comments on Homestake Mining Company's
***Progress Summary: Microfiltration, LTP Tracer Testing, TPP Injections Research, CAP, DRP, Site-Wide Water Balance Tool, and Rebound Evaluation*, 21 November 2013**

George Rice
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This is an evaluation of Homestake Mining Company's (HMC) *Progress Summary: Microfiltration, LTP Tracer Testing, TPP Injections Research, CAP, DRP, Site-Wide Water Balance Tool, and Rebound Evaluation* (Progress Summary)[1]. This evaluation was performed for the Bluewater Valley Downstream Alliance (BVDA).

The Progress Summary consists of four parts (enclosures). The Enclosure 1 briefly describes five studies and two documents. These are: 1) microfiltration pilot water treatment plant, 2) large tailings pile (LTP) tracer testing, 3) rebound evaluation of contaminants in the LTP, 4) testing of tripolyphosphate (TPP) to immobilize uranium, 5) sitewide water balance tool, 6) the 2013 Corrective Action Program, and 7) the Decommissioning and Reclamation Plan. The descriptions contained in this enclosure do not provide enough information to allow meaningful evaluations of the studies.[2]

The Progress Summary contains three additional enclosures: Enclosure 2, zeolite pilot study results; Enclosure 3, electric-coagulation pilot study results; and Enclosure 4, rebound evaluation summary. Comments on these enclosures are given below.

Enclosure 2: Zeolite Pilot Study Test and Results

Comment 2-1: High uranium concentrations

During the later portion of the test, the effluent uranium concentration was greater than 0.2 mg/L[3]. This exceeds the site standard for the alluvial aquifer (0.16 mg/L)[4]. HMC claims that the high uranium concentrations were caused by equipment malfunctions[5]. However, the enclosure does not contain any information to indicate that 1) HMC repaired the equipment, or 2) effluent uranium concentrations were acceptable after HMC repaired the equipment. Therefore, HMC has not demonstrated that it knows the cause of the high uranium concentrations, or that it understands how to prevent them in the future.[6] With respect to uranium, the pilot test appears to be a failure.

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[1] HMC, 2013c.
[2] However, the description of the TPP study states that monitoring will end 120 days after injection ends (HMC, 2013c, page 4). HMC has not shown that significant re-dissolution will not occur after 120 days. HMC should explain the basis for ending monitoring after 120 days.
[3] Enclosure 2, figure 2.
[4] HMC, 2013a, table 1.1-1.
[5] HMC, 2013c, pages 6 and 7.
[6] The treatment system did not reduce concentrations selenium, molybdenum, chloride, or nitrate; and it caused an increase in the concentrations of sulfate and TDS (enclosure 2, page 8). However, the increased concentrations of sulfate and TDS did not exceed the standard for the alluvial aquifer.

Comment 2-2: Quality of water used in test

During most of the test, the average uranium concentration of the influent water was 0.4 mg/L.[7] However, much of the contaminated groundwater at the HMC site contains uranium concentrations much higher than 0.4 mg/L[8]. HMC should explain how this pilot test can provide useful information concerning the treatment of uranium-contaminated groundwater at the HMC site.

Note: the electric-coagulation pilot study used influent water with an average uranium concentration of 3.02 mg/L (see below)[9].

Comment 2-3: Calculation errors

This enclosure contains calculation errors. For example, page 2 states:

> *Test water flow rates ranged from 140 gpm to 275 gpm.*
>
> *For the first four weeks of pilot testing, the process success fully treated 66,475,000 gallons of water for uranium removal.*

Assuming the highest flow rate and continuous operation of the plant:

> 275 gal/min x 1440 min/day x 28 days = 11,088,000 gallons, not 66,475,000 gallons.

Similar errors occur throughout the enclosure.

Enclosure 3: Electric-Coagulation Pilot Study Test and Results

Comment 3-1: High molybdenum and chloride concentrations

This treatment system did not reduce molybdenum concentrations to the required level. The average effluent concentration was 0.864 mg/L and the site standard for the alluvial aquifer is 0.10 mg/L[10]. The system also increased chloride concentrations from about 200 mg/L to about 500 mg/L. The site standard for chloride is 250 mg/L.[11]

HMC should explain 1) how the system will be fixed to achieve the required molybdenum and chloride concentrations, or 2) how the system can be used if it cannot reduce these concentrations to the required level. With respect to molybdenum and chloride, the pilot test appears to be a failure.

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[7] Enclosure 2, page 2.
[8] HMC, 2013b, figure 2.2-12.
[9] Enclosure 3, table 1.
[10] Enclosure 3, table 1.
[11] Enclosure 3, table 1.

Enclosure 4: Rebound Evaluation Summary Report

Comment 4-1: Large amounts of uranium and other metals remain in LTP after flushing

HMC has been injecting water into the LTP with water since 2000. The purpose of this injection is to flush uranium and other COCs[12] from the LTP, thereby reducing the length of time the LTP will be a source of groundwater contaminants. The rebound evaluation was conducted to determine what happens to contaminant concentrations after flushing ceases.[13]

The rebound evaluation shows that although flushing may remove uranium and other metals (e.g., molybdenum, selenium), large amounts of these contaminants remain in the LTP[14]. Table 1 shows the concentrations of mobile contaminants that remain in the tailings after flushing.

Table 1
Concentrations of Mobile Contaminants (dissolved and weakly adsorbed) Remaining in the LTP after Flushing[15]

Contaminant	Dissolved in tailings pore water (mg/kg)[16]	Weakly adsorbed to tailings solids (mg/kg)[17]	Total dissolved plus weakly adsorbed (mg/kg)
Molybdenum	16.83	6.77	23.6
Selenium	0.08	49.92	50
Uranium	3.63	37.33	40.96

The results of the rebound evaluation indicate that the LTP will remain a source of groundwater contaminants for the foreseeable future.

Comment 4-2: Target uranium concentration

HMC states that active flushing should cease once uranium concentrations are reduced to the target concentration of 2 mg/L[18]. No explanation of this value is given. HMC should explain why it chose 2 mg/L as the target concentration.

[12] COC: constituent of concern.
[13] Enclosure 4, page 1.
[14] Enclosure 4, table 4.
[15] Data for core #1, enclosure 1, table 4.
[16] HMC converted the original liquid (pore water) concentration (mg/L) to an equivalent solid concentration (mg/kg) by dividing liquid concentration by 3.4. The original liquid concentrations of molybdenum, selenium, and uranium were 57.22 mg/L, 0.28 mg/L, and 12.35 mg/L, respectively.
[17] Concentration of weakly adsorbed contaminant calculated by subtracting pore water concentration from extraction 1 concentration.
[18] Enclosure 4, page 12.

References

HMC, 2013a, *2012 Annual Monitoring Report/Performance Review for Homestake's Grants Project Pursuant to NRC License SUA-1471 and Discharge Plan DP-200*, March 2013.

HMC, 2013b, *Decommissioning and Reclamation Plan Update 2013, SUA-1471, Homestake Grants Reclamation Project, Cibola County, New Mexico, April 2013*.

HMC 2013c, *Progress Summary: Microfiltration, LTP Tracer Testing, TPP Injections Research, CAP, DRP, Site-Wide Water Balance Tool, and Rebound Evaluation,* 21 November 2013