Docket 040-08903

HOMESTAKE
Grants Project

Homestake Mining Company of California

Jesse R. Toepfer
Closure Manager

8 September 2016

ATTN: Dr. Robert Evans
Senior Health Physicist
U.S. NRC Region IV
1600 East Lamar Boulevard
Arlington, Texas 76011-4511

RE: Homestake's Corrective Action Plan for Addressing Water Treatment System Disruptions, Injectate Concentration Exceedances, and Radon Concerns

Dr. Evans,

With respect to the recent site audit and inspection conducted by the Nuclear Regulatory Commission (NRC) of the Homestake Mining Company of California (HMC) Grants Reclamation Project (GRP) from 23 to 25 August 2016, we acknowledge the unfortunate oversight that you and the NRC staff noted regarding our treated water quality effluent sample results. These results were taken from our point of compliance: sampling point two (SP2), which is downstream of the Reverse Osmosis (RO) plant, and is indicative of the water quality being returned to the environment.

As we discussed during the close-out session of the inspection, this letter contains our Specific Corrective Action Plan (SCAP) to address and correct the subject Water Treatment System (WTS) disruptions, injectate concentration exceedances, and radon concerns.

Please be advised that HMC takes this matter very seriously; accordingly, as of the date of this letter, HMC has already begun to implement the short-term and long-term actions discussed herein.

RECENT EFFORTS:

Since remediation activities first began in 1990, we have taken a proactive approach toward environmental stewardship, groundwater restoration, and our license obligations. To that end, in the past three years alone, HMC has increased its water treatment capacity approximately ***ten*** fold, having gone from the ability to treat approximately 270 gpm prior to 2014 to now having the ability to treat up to 2,700 gpm via one of two major new WTSs. We have taken great pride in our health and safety record, having expended more than 60,000 man-hours in 2015 alone without a single Lost Time Incident (LTI). The engineering, design, construction, and commissioning of the site's new RO and zeolite-based WTSs represents the combined efforts of more than 300 individuals and more than $30 million in capital outlays over a period of time spanning approximately 30 months.

With our commitment to remediation in mind, and noting HMC's long history of trying to do the right thing, we respectfully request NRC to exercise discretion and reconsider the classification of the subject findings.

BASIS FOR POTENTIAL NON-CITED NOV RELATING TO WATER QUALITY DISCHARGE:

The following discussion describes the circumstances leading to the request for the WT-SCAP (hereafter abbreviated as WT-SCAP). Figure 1 below illustrates the general water collection, treatment, and reinjection program at the GRP.

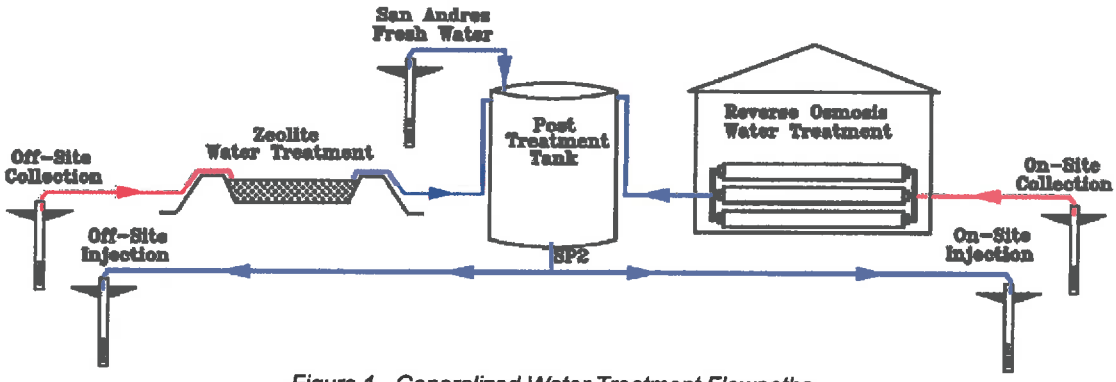

Figure 1. Generalized Water Treatment Flowpaths.

The SP2 sample is a monthly integrated water sample (small samples, each only a few milliliters in volume, are taken every hour and composited throughout the month) for effluent water after it leaves the Post Treatment Tank (PTT). The PTT is where treated and fresh water streams are combined prior to injection. Monitoring results for the SP2 sample location for 2015 were presented in Table 2.1-3 of the 2015 Annual Report and selected data from that tabulation are presented in Table 1 below. Note, in Table 1 below, only those sample results that exceeded the corresponding concentration standards for compliant water are included, and there are notes describing the operating conditions during the month when the exceedance(s) occurred.

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Table 1. Noted Exceedances from RO Compliance Sample Point 2 (SP2).

Sample Point	Sample Date	Uranium Concentration (mg/L)	Molybdenum Concentration (mg/L)	Operational Condition
SP2	1/13/2015	0.164	0.14	Existing RO units are operating while construction activities for the expanded RO capacity are ongoing. No zeolite treated water discharge to the ground-water injection system occurred.
SP2	5/27/2015		0.28	Construction and RO equipment installation activities are continuing. RO treatment was very limited with less than 26,000 gallons of RO product recorded for the month. Approximately 23.9 million gallons of San Andres water were supplied to ground-water injection. No zeolite treated water discharge to the ground-water injection system occurred.
SP2	9/17/2015	0.278	0.25	There was no recorded treated water produced by the RO with only fresh water used for injection during September. Approximately 30.5 million gallons of San Andres water were supplied to ground-water injection. The installation of the expanded RO treatment system is continuing. No zeolite treated water discharge to the ground-water injection system occurred.
SP2	9/17/2015	0.287	0.28	
SP2	10/6/2015		0.14	Limited operation of the RO unit occurred with slightly over three million gallons of RO product water recorded. Approximately 22.7 million gallons of San Andres water were supplied to ground-water injection. The installation of the expanded RO treatment system is continuing. No zeolite treated water discharge to the ground-water injection system occurred.
SP2	10/6/2015		0.14	

As indicated in the preceding tabulation, the uranium concentration slightly exceeded the compliant water standard of 0.16 mg/L in January of 2015, and also exceeded the compliant water standard in September of 2015. The molybdenum concentration exceeded the compliant water standard of 0.10 mg/L in February, May, September and October of 2015.

Two laboratory analytical results were reported in Table 2.1-3 and the preceding tabulation for both the September and October samples in 2015. The second result for each month is the analysis of a sample split that is routinely reserved but only tested in the event of an exceedance or otherwise questionable result. Hence, the two duplicate results for each month represent a single monthly SP2 sample.

The description of the operating condition during the four months when exceedances occurred reveals some of the treatment process changes and interruptions that resulted with the RO upgrades and expansion. As an example, only a very small quantity of treated water was produced by the RO in May of 2015 and the injection water consisted almost entirely of fresh water from the San Andres supply wells. Likewise, the RO plant was shut down for the month of September and a part of October 2015, with only fresh water from the San Andres wells supplied to the Post Treatment Tank (PTT).

Prior to the 300 gpm zeolite system being placed into actual service, it was pilot tested, with all effluent from the system being discharged into the Large Tailings Pile (LTP), and not to the PTT. Thus, although the 300 gpm zeolite treatment system was operating during part of 2015, no treated water was discharged to the PTT until early 2016. The construction of the 1,200 gpm zeolite system was not completed until mid-2016.

To summarize: The zeolite-based WTS was not in service in 2015. The RO plant was undergoing major upgrades, and it was only operated for a very limited time during May 2015; it was not in service during September 2015, and was operated only for a portion of October 2015. When the RO was not in service during 2015, the only source of water going to the PTT was from San Andres wells with measured uranium and molybdenum concentrations far below the site standards. The exceedances occurred during a time of

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significant upgrades and changes to the RO plant, which included changes in the delivery, routing and compositing of treated and fresh water, as well as changes to the zeolite WTS, which included new piping configurations and various attempts to optimize pH conditioning, and the regeneration process.

Fortunately, with the majority of the WTS upgrades completed and the expectation of more consistent RO operation, the consistency of the treated water quality is expected to improve. To that end, no exceedances of compliant water standards at SP2 have been recorded during 2016.

Further, the identification of causes or sources of treatment anomalies will be more straightforward as indicated in the following WT-SCAP. Going forward, the following procedures will be initiated if there is a detection of a Constituent of Concern (COC) above the concentration limit for compliant injection water at SP2. Additionally, the same procedures may be considered for use if there is an unexpected or anomalous result or trend in COC concentration at SP2, even if such observations do not exceed the limits for compliant water.

SPECIFIC CORRECTIVE ACTION PLAN: WATER QUALITY EFFLUENT

NRC has indicated they intend to pursue the oversight of the non-compliant water quality results as a potential non-cited Notice of Violation (NOV). While we respectfully request NRC to take our recent remediation efforts and upgrades into consideration as well as that the exceedances took place during the implementation of those upgrades, we nonetheless offer the following long-term and short-term corrective actions, which will be incorporated into the next revision of the site's Manual of Standard Practices.

All HMC staff and crew, as well as to any laboratory personnel that handle or process water samples for HMC—especially water samples for SP2, will be duly trained on the following procedures.

HMC will compare the monthly composited water quality results for SP2 (which are generally analyzed by an external laboratory), to the Site Standards (*i.e.,* the approved Groundwater Protection Standards (GWPS)). If an exceedance is noted with respect to the monthly composited water quality results for SP2, the following actions shall be carried out:

1. HMC will lead the process to confirm the exceedance.

   This process may include actions that are outlined later in this document as part of a water treatment system review Standard Operating Plan (SOP), such as:

   - Notification to the NRC project manager of the potential exceedance;
   - Reviewing and comparing sample analysis with historical results;
   - Retesting samples;

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- Submitting additional or duplicate samples;
- Testing samples with alternate or indicator methods;
- Inspecting treatment system equipment for defects, malfunctions or damage; and/or
- Suspending treatment operations for affected processes if damaged, malfunctioning or defective equipment is discovered or identified.

2. If an exceedance is confirmed, the following steps will be taken:
    a. HMC will document and record the incident, citing the date, time, and nature of the exceedance;
    b. HMC will investigate the configuration and conditions of the RO and Zeolite WTSs to validate anomalies or circumstances which may have caused or resulted in the exceedance;
    c. HMC will notify the NRC project manager within two weeks of confirmation of the exceedance or anomaly noted in the treatment system(s); and
    d. The NRC project manager will be informed as to the actions to be taken by HMC to address the exceedance or treatment system anomaly.
3. HMC will perform any necessary corrective actions indicated by the review process, which may include actions such as:
    - Repairing or replacing malfunctioning or poorly functioning equipment;
    - Adjusting feed or treatment rates;
    - Modifying the pretreatment, conditioning, and/or filtration procedures; and/or
    - Temporarily increasing sampling frequency to verify adequacy of treatment.

Table 2 below summarizes these procedures for the WT-SCAP.

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Table 2. Summary of Corrective Actions for WT-SCAP.

Water Treatment Specific Corrective Action Plan	
Identification of Anomaly	Will commence a thorogh review of any laboratory analysis indicating an exceedance of one or more GWPSs.
Confirm Exceedance	Will seek to confirm that the sample results are correct and representative of the injectate sampled at location SP2.
Document and Record	Record relevant information for the identified water treatment exceedance and/or water treatment system anomaly.
Notification of Occurrence	HMC will notify the NRC Project Manager of the occurrence of the exceedance or anomaly.
Notification of Confirmation	HMC will further notify the NRC Project Manager within two weeks of the confirmation of the exceedance or anomaly.
HMC Review and Assessment	HMC will review and assess the water treatment processes to identify the likely or potential cause(s) and possible remedy(-ies) for the exceedance and/or water treatment system anomaly.
Corrective Action	HMC will perform the necessary correction actions, including equipment repairs, replacements, and/or system modifications and adjustments.
Documentation	Depending on the nature of the exceedance and/or anomaly, HMC may produce a formal report, which would be available for review by NRC at the HMC site.

In addition to the WT-SCAP actions listed above to address a sample result that indicates an anomaly in the treatment process(es), HMC has identified the following long-term objectives to enhance the response to exceedances:

- Increase the internal monitoring of the WTSs;
- Analyze various plant conditions and configurations to optimize effluent water quality as measured from the SP2 compliance monitoring point;
- Automate system components with respect to influent and effluent water chemistry and flow rates, including monitoring and alert systems;
- Enhance the digital data collection capabilities for WTSs; and

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- Study and review options for indicator tests, instruments or procedures that would provide an early warning of changes in PTT water quality.

As a supplement to the WT-SCAP described above, the following discussion lists actions and procedures that will be considered for inclusion in an SOP that will serve as guidance for addressing the occurrence of an anomaly in the water treatment systems or exceedances observed in the resulting water quality analytical data.

SOP GUIDANCE: ADDRESSING WATER TREATMENT ANOMALIES

In the event a laboratory sample result for the monthly composited SP2 sample exceeds one or more of the applicable site GWPSs, the following actions will be considered in addressing the exceedance:

- The sample chemistry will be reviewed for consistency among measured parameters and with historical results, and if warranted, a rerun of the sample will be requested from the laboratory;

- A smaller "sub-sample" of water in the automatic sampler (which collects the integrated monthly sample for SP2) will be collected and stored once each week, such that each weekly sample represents only the water processed through the PTT during that preceding week, or since the last sample collection. Sufficient water will be collected to be able to composite the sample for analysis at the end of the month, as well as enough water to set aside so as to allow for follow-up analyses in the event of an exceedance. In the event of an exceedance, this would help to identify the specific week that the exceedance occurred:

    - A portion of each weekly sample will be analyzed using one of a variety of available indicator parameters or testing procedures, and The indicator analyses may include specific conductance, pH, and KPA measurements for uranium, etc.;

    - A portion of each weekly sample will be submitted to the laboratory for analysis of those constituents in exceedance of applicable standards, and if warranted all ground-water-related COCs listed in SUA-1471 Condition 35B;

- The operational records for the RO and zeolite treatment systems will be reviewed for malfunctions, disruptions or other changes during the weekly interval when the exceedance was identified to have occurred. If a possible cause or source of the exceedance is indicated by the operational review, the following actions will be considered by HMC:

    - Inspect any equipment that may have malfunctioned or may have been repaired or replaced during the weekly interval in question to confirm it is functioning properly;

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- If warranted, suspend treatment operations through the affected system until necessary corrective modifications are completed;
- Collect samples from intermediate points along the pre-treatment process stream to confirm the proper operation of filtration, conditioning, and acidification; and
- Collect any other internal samples necessary to troubleshoot the likely or potential source of the exceedance

- The information produced by the actions described in the WT-SCAP and the SOP above will be compiled and reviewed by HMC, and a report of the review may be produced for further review by NRC.

BASIS FOR POTENTIAL NON-CITED NOVS RELATING TO RADON CONCERNS

In order to respond to the potential non-cited uranium NOV regarding radon-222 (Rn-222) flux levels and methods to measure these levels, it is important to understand the changes to license SUA-1471 that underpin this requirement.

The basis for the potential non-cited NOV relates to [SUA-1471] License Condition (LC) 36 E, which requires a radon flux survey to verify compliance with the radon flux standard of 20 pCi per m^2 per second (20 pCi * m^{-2} * s^{-1}) for the Large Tailings Pile (LTP) and Small Tailings Pile (STP), on an annual basis, during the milestone period specified in LC 36A. This radon flux survey has been performed every year since 2003.

The first demonstration of compliance with radon flux standard occurred in December, 1996 in a request from HMC to extend reclamation milestones (ML13205A021). In this request, radon flux measurements on the LTP pile were provided for the following areas:

1. North, West, and South Side Slopes
   a. 40 measurements in October 1994
   b. Average flux of 3.9 pCi * m^{-2} * s^{-1}
2. Interim Cover
   a. 35 measurements in August, 1995
   b. Average flux of 42.1 pCi * m^{-2} * s^{-1}
3. Aprons and East Side Slope
   a. 24 measurements in July 1995
   b. Average flux of 2.1 pCi * m^{-2} * s^{-1}

Average Rn-222 flux for the entire LTP was 17 pCi * m^{-2} * s^{-1} using a straight average of 99 flux measurements. These measurements were collected using methods and

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frequencies consistent with EPA Method 115 as required by 10 CFR 40, Appendix A, Criterion 6(2).

NRC granted the reclamation milestone request in Amendment 25 to SUA-1471. No requirement to measure radon flux annually was introduced in this amendment, but consistent with Criterion 6(2) of 10 CFR 40, Appendix A and EPA method 115, it is clear in the request that the average radon flux calculation required consideration of the entire pile. There was no specific direction or guidance given by NRC to only consider certain areas of the pile when performing this calculation.

In 2003, HMC submitted another request to extend remediation milestones (ML033040196) for reasons similar to the 1996 request. In this request, additional radon flux data measured in 2003 from the interim cover was summarized, again demonstrating compliance with the radon standard, and was done using the same area averaging method that is still used today.

Using the data collected in 1994-1995 for the rock-covered portions of the LTP along with the measurements of the interim cover in 2003, the average radon flux in 2003 was 14 pCi * m^{-2} * s^{-1}. The area averaging technique in EPA Method 115 was used in this average since the number of canisters placed in 2003 (64) exceeded the number in 1995 and therefore using a straight averaging technique would bias the average to the measurement collected on the interim cover. A Technical Evaluation Report (TER) was issued by the NRC and provides justification for granting the license amendment request. As part of the TER, a new license amendment (LC 36 E) was recommended to be added to the license (this was done via license Amendment 26). This condition requires HMC to verify compliance with the radon flux standard for both the LTP and STP on an annual basis.

Since 2003, annual flux measurements have been performed on the large and small tailings piles and reported to the NRC. In cases where the radon flux exceeded the standard, the NRC was notified either by letter or by description in the radon flux report. (*e.g.,* see attached 2007 correspondence between HMC and NRC, and various Semi-Annual Monitoring Reports). Such occurrences were documented in 2004, 2006, 2011, and 2014. In each case the remedy was adding more compacted interim cover and subsequent re-measurement of those areas.

SPECIFIC CORRECTIVE ACTION PLAN: RADON FLUX

As understood by HMC, NRC's basis for the potential non-cited NOV is twofold. First, NRC will find that the radon flux as measured from the top of the LTP exceeds criterion 6a (2) in appendix A of 10 CFR 40. Second, NRC will find that that the calculations of radon flux are not consistent with EPA Method 115. HMC addresses both findings below.

In response to the first finding, HMC acknowledges that the radon flux average for the LTP was above the radon flux standard prior to mitigation. This is not the first occurrence, and previously the successful mitigation action by HMC has consistently been to add additional compacted interim cover in areas of elevated radon flux

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The short-term corrective action is again to add additional interim cover. In the 2nd quarter of 2016, HMC commissioned a gamma radiation survey of the LTP to identify elevated gamma radiation levels resulting from erosion of the existing interim cover. Prior to the NRC inspection, HMC planned and budgeted placing 15,000 cubic yards of clean soil material over elevated gamma radiation areas, consistent with the site's As Low As is Reasonably Achievable (ALARA) Policy. This activity will cover approximately 19 acres with 6 inches of additional interim cover, and as a favorable side effect, will likely result in lowering the average Rn-222 flux to levels below the standard. Additionally, HMC will place a layer of larger sized aggregate material over the additional interim cover to protect it from erosion.

The long-term corrective action is to lay in place the final radon barrier, which is designed to attenuate radon to levels below the standard for up to 1000 years.

In response to the second finding (*i.e.,* that the calculation of radon flux is not consistent with EPA Method 115), HMC respectfully disagrees.

The equation in Section 2.1.7 (b) of this method is precisely an area weighted average, and is what HMC uses in reporting average radon fluxes for both the LTP and STP. The number of canisters placed on the LTP (approximately 65) is more than the required number (35); this provides 100 measurements for the impoundment (64 historic measurements have been made on radon barrier in areas that can no longer be accessed (*i.e.,* the side slopes and aprons)).

Using a straight average of the annual measurements on the interim cover and the historic measurements on the completed side slopes would bias the average for the impoundment to the annual measurement results on the interim cover. HMC believes calculating the flux in this manner would be inappropriate.

The number of measurements on the STP pile (approximately 35) is likewise appropriate. Approximately 60 percent of the area is consumed by evaporation ponds, which consistent with EPA Method 115, emit zero radon flux. If this area were available for radon flux measurement, a minimum of 60 additional measurements could be made to represent the average for the pile. The result of such an analysis would not be conservative.

On behalf of Homestake, I hope this information is helpful and addresses the concerns raised during the recent inspection. Please feel free to contact me directly at 505.290.3067 if you have any questions or comments pertaining to this material.

Respectfully,

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Homestake Mining Company of California

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Enclosure (1)

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