UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EA-16-114

David Pierce
Closure Manager
Grants Reclamation Project
Homestake Mining Company of CA
P.O. Box 98/Highway 605
Grants, NM 87020

SUBJECT: HOMESTAKE MINING COMPANY OF CALIFORNIA, U. S. NUCLEAR REGULATORY COMMISSION AUDIT OF THE "ANALYSIS OF THE IMPACT OF EXCEEDANCES OF GROUND-WATER PROTECTION STANDARDS IN INJECTION WATER" SUBMITTED PURSUANT TO CONDITION 10 OF THE CONFIRMATORY ORDER EA-16-114, DOCKET 04008903, LICENSE SUA-1471

Dear Mr. Pierce:

By letter dated March 28, 2017,[1] the U.S. Nuclear Regulatory Commission (NRC) issued Confirmatory Order No. EA-16-114 (CO) to the Homestake Mining Company of California (HMC, the licensee) regarding violations that took place at the Grants Reclamation Project (Grants) site. The CO was issued as a result of Alternative Dispute Resolution mediation between HMC and the NRC.

Section V of the CO includes 16 Conditions which require licensee implementation. Condition 10 of the CO requires that the licensee "…use the methodology described in NUREG-1620 ([Agencywide Documents Access and Management System] ADAMS Accession No. ML032250190) to analyze the impact of exceedances documented in the NRC's October 4, 2016, letter to HMC." Condition 10 additionally requires HMC to complete the analysis within 120 days of issuance of the Confirmatory Order, to discuss the methodology, data, and analysis with the NRC no less than 30 days prior to its finalization, and to provide all the discussion material to the NRC at least 10 days prior to the discussion.

To comply with the Condition 10 of the CO, the licensee discussed their analysis with the NRC staff on June 26-27, 2017.[2] Subsequently, HMC submitted their analysis in a report entitled "Analysis of the Impact of Exceedances of Ground-Water Protection Standards in Injection Water", along with a cover letter, dated July 26, 2017.[3]

Condition 10 of the CO requires the NRC to perform an audit of the analysis, and provide in writing, the NRC audit results, including any recommended changes. The NRC completed its

[1] Agencywide Document Access and Management System (ADAMS) Package Accession No. ML17060A752.
[2] ADAMS Accession No. ML17352B067.
[3] ADAMS Package Accession No. ML17212A010.

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audit of HMC's July 2017 report and the results of the NRC's audit are contained in the enclosure.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions regarding this matter, please contact me at 301-415-7777, or via email at ron.linton@nrc.gov.

Sincerely,

Ron C. Linton, Project Manager
Uranium Recovery and Materials
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08903
License No.: SUA-1471

Enclosure:
NRC Staff Audit of the HMC
Impact of Exceedances

SUBJECT: HOMESTAKE MINING COMPANY OF CALIFORNIA, U. S. NUCLEAR REGULATORY COMMISSION AUDIT OF THE "ANALYSIS OF THE IMPACT OF EXCEEDANCES OF GROUND-WATER PROTECTION STANDARDS IN INJECTION WATER" SUBMITTED PURSUANT TO CONDITION 10 OF THE CONFIRMATORY ORDER EA-16-114, DOCKET 04008903, LICENSE SUA-1471 **DATE**

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RESULTS OF U.S. NUCLEAR REGULATORY COMMISSION STAFF AUDIT ANALYSIS OF THE IMPACT OF EXCEEDANCES OF GROUND-WATER PROTECTION STANDARDS IN INJECTION WATER

HOMESTAKE MINING COMPANY OF CALIFORNIA
GRANTS RECLAMATION PROJECT

CONFIRMATORY ORDER NO: EA-16-114
DOCKET NO: 040-08903
LICENSE NO: SUA-1471

1.0 INTRODUCTION

By letter dated March 28, 2017,[1] the U.S. Nuclear Regulatory Commission (NRC) issued Confirmatory Order No. EA-16-114 (CO) to the Homestake Mining Company of California (HMC, the licensee) regarding apparent violations that took place at the Grants Reclamation Project (Grants) site. The CO was issued following Alternative Dispute Resolution mediation between HMC and the NRC, which was the result of a records review and the issuance of five apparent violations documented in a letter dated October 4, 2016.[2] Section V of the CO includes 16 Conditions which require licensee implementation. As part of the CO, Condition 10 required an analysis of the impact of exceedance of Ground Water Protection Standards (GWPS), which was documented NRC's October 4, 2016, letter.

Confirmatory Order, Section V, No. 10 states:

> *HMC will use the methodology described in NUREG-1620 (ADAMS Accession No. ML032250190) to analyze the impact of exceedances documented in the NRC's October 4, 2016 letter to HMC. The analysis will be completed within 120 days of issuance of this Confirmatory Order. No less than 30 days prior to its finalization of the impact of exceedances analysis, HMC will discuss with NRC the methodology, data, and analysis. HMC will provide to NRC all discussion material at least 10 days prior to the discussion. The NRC will perform an audit of the analysis and provide in writing, the NRC audit results, including any recommended changes. HMC will incorporate NRC audit results in the actions described in Condition 5 of this section. In the event of a future non-compliance related to the GWPS, HMC will perform a similar assessment of the impacts of the non-compliance. HMC will report the incident to the NRC in accordance with License Condition 40 within 30 days of receipt of initial and confirmatory laboratory results.*

[1] Agencywide Document Access and Management System (ADAMS) Accession Package No. ML17060A752.
[2] ADAMS Accession No. ML16251A526.

Apparent Violation 1, from the October 4, 2016 letter states:

> *Title 10 of the Code of Federal Regulations (10 CFR) Part 40, Appendix A, Criterion 5D requires, in part, that the Licensee submit the proposed ground water Corrective Action Program (CAP) and supporting rationale for Commission approval prior to putting the program into operation. The currently approved ground water CAP is a requirement of Condition 35C of License Number SUA-1471, which, in part, requires the Licensee to implement the ground water CAP described in the September 15, 1989 [ML12222A088] submittal, as modified by the reverse osmosis system described in the January 15, 1998 [ML12291A910] submittal. The September 15, 1989 submittal only allows injection of fresh water, which is considered ground water collected from unimpacted deep aquifers to maintain a hydraulic barrier for plume control purposes. The January 15, 1998, submittal authorizes the injection of water treated by Reverse Osmosis (RO) at the RO plant or a combination of treated water and fresh water, as long as the effluent water from the RO plant contains concentrations of hazardous constituent below the Ground Water Protection Standards (GWPS) listed in Condition 35B of License Number SUA-1471.*
>
> *Contrary to the above, from 1995 to 2014, the licensee performed ground water corrective actions without prior U.S. Nuclear Regulatory Commission (NRC) approval and inconsistent with the NRC-approved ground water CAP, by means of collection and direct reinjection (i.e., the Reinjection Program) of ground water into the shallow alluvial aquifer, which was neither fresh water nor RO treated water, i.e., impacted water. Specifically, from 1995 to 1998, impacted water was injected into the alluvial aquifer through the use of the reinjection program, which was inconsistent with the approval to use only fresh water injections authorized in the September 15, 1989 submittal. Additionally, from 1998 through 2014, impacted water containing concentrations above the GWPS listed in Condition 35B of License Number SUA-1471 was injected into the alluvial aquifer through the use of the reinjection program, which was inconsistent with additional requirements in the January 15, 1998, submittal to modify the CAP to include the RO Plant.*

License Condition 35C states:

> *Implement the corrective action program described in the September 15, 1989 submittal, as modified by the reverse osmosis system described in the January 15, 1998 submittal, excluding all sampling and reporting requirements for Sample Point 1, with the objective of achieving the concentrations of all constituents listed in License Condition 35B. Composite samples from Sample Point 2 (SP2) will be taken monthly and analyzed for the constituents listed in License Condition 35B; the results of these analyses will be reported in the semi-annual and annual reports required by License Conditions 15 and 42.*

2.0 HMC ANALYSIS OF IMPACTS

Confirmatory Order Condition 10 requires HMC to complete an analysis of the impact of exceedances within 120 days of issuance of the CO, discuss the methodology, data, and analysis with the NRC no less than 30 days prior to its finalization, and to provide all discussion material to the NRC at least 10 days prior to the discussion. To comply with the Condition 10 of

the CO, the licensee discussed their analysis with the NRC staff on June 26-27, 2017.[3] By letter dated July 26, 2017[4], HMC submitted the *Analysis of the Impact of Exceedances of Ground-Water Protection Standards in Injection Water*, that addressed the exceedances documented in the NRC's October 4, 2016, letter outlining five apparent violations. The July 26, 2017, report focused on historical exceedances outlined in NRC's October 4, 2016, letter. In addition, by letter dated June 4, 2018[5], HMC submitted the *Analysis of the Impact of Exceedances of March and April 2018 Exceedance of Groundwater Protection Standards in Injection Water.* The HMC June 4, 2018, report focused on exceedances between July 2017 and June 2018. For both of these analyses, HMC adapted the methodology described in NUREG-1620 to evaluate the impact of exceedances of the ground-water protection standards in injection water.

HMC evaluated the impact of exceedances of the ground-water protection standards in injection water by analyzing the impact from both the longest period of exceedance and the largest magnitude of exceedance. Historically, the longest period of exceedance at SP2 extended from February of 2003 to January of 2004 and the largest magnitude of exceedance for both molybdenum (i.e., 0.72 mg/L) and uranium (i.e., 0.37 mg/L) occurred in November of 2004. For the November of 2004 exceedance, HMC estimated that 36 kg of molybdenum and 12 kg of uranium in excess of the GWPSs were injected into the Alluvial groundwater. HMC evaluated the impact of these periods of exceedance to residents and/or landowners based on the area of impact and expected increase in contaminant concentrations.

More recently, HMC determined that either an underperformance of the RO system or a treatment disruption resulted in the exceedance of GWPSs for molybdenum and/or uranium in the Alluvial aquifer, which are 0.1 mg/L and 0.16 mg/L, respectively, between July 26, 2017, and June 4, 2018. Between the July 26, 2017, and June 4, 2018, reports, HMC documented 36 monthly samples that exceeded the GWPSs for molybdenum. Uranium concentrations also exceeded the GWPSs for 5 out of those 36 months.

HMC provided several lines of evidence from both reports documenting a limited impact from the exceedances of the GWPSs in the injection water, including:

- Increases in molybdenum and uranium concentrations were calculated to be 0.04 mg/L and 0.009 mg/L, respectively.
- The additional molybdenum and uranium injection amounts are small relative to mass removal: 10,400 kg of molybdenum were removed from the groundwater during 2003 and an average monthly uranium mass removal from the groundwater of approximately 550 kg during 2004.
- Monitoring data do not show impacts attributable to the exceedances of GWPSs at SP2
- For the non-compliant water injected into the On-site, North Off-site, and South Off-site areas:
    - The On-site area is within the licensed boundary and there is no potential for exposure
    - The North Off-site area has no exposure points within 1,000 ft of any injection point and the concentration of injectate will be below site standards within a few hundred feet from the injection wells.
    - The South Off-site area has a municipal water supply and no landowners in this area derive their drinking water from the alluvial aquifer.

[3] ADAMS Accession No. ML17352B067.
[4] ADAMS Package Accession No. ML17212A010.
[5] ADAMS Accession No. ML18159A037.

3.0 NRC AUDIT RESULTS

Based on the NRC staff evaluation of HMC's analysis submitted on July 26, 2017, and June 4, 2018, NRC staff has determined that that the risk of exposure from the exceedances of GWPSs for the injection water is limited due to: (1) limited potential increases in molybdenum and uranium groundwater concentrations, as supported by HMC calculation and groundwater monitoring data, (2) dilution due to spreading of the injectate, and (3) limited access to groundwater due to HMC control, supply of potable water, and a well prohibition[6] in the Alluvial and Chinle Aquifers. Additionally, concentrations of molybdenum and uranium are expected to be within the GWPS within a few hundred feed beyond the point of injection. Although the injection of water in excess of the GWPS affects the restoration timeline, the excess molybdenum and uranium that was injected is small relative to the removal rates.

As documented in NRC Inspection Report 040-08903/2018-002 dated November 26, 2018[7], the licensee implemented a series of measures to mitigate exceedances of the GWPSs in injection water, including:

- Replacement of RO membranes
- Additional monitoring with increased frequency (relative to laboratory results which can take 30 days) to provide early indications on potential exceedances
    - Daily conductivity measurements
    - Weekly measurements using a kinetic phosphorescence analyzer to detect uranium
    - Monitoring of molybdenum concentrations with a Hach meter
- Review of preliminary laboratory results to more promptly identify any potential exceedances

The NRC staff agrees that the additional measures implemented as documented in the November 26, 2018, inspection report will help HMC lessen the chance of exceedances of injection water at SP2. Since the implementation of these measures, the injection water from SP2 has not exceeded the groundwater protection standards. NRC staff will continue to review groundwater monitoring results including those from SP2 during future NRC inspections.

4.0 RECOMMENDATIONS

The NRC staff does not have any recommendations related to its review of CO Condition 10 and HMC's analysis submitted on July 26, 2017, and June 4, 2018.

This audit satisfies the NRC staff's portion of Condition 10 of the CO.

As required by CO Condition 10, in the event of future non-compliance related to the GWPS, HMC will perform a similar assessment of the impacts of the non-compliance. HMC will report the incident to the NRC in accordance with License Condition 40 within 30 days of receipt of initial and confirmatory laboratory results. HMC completion and continued compliance with CO Condition 10 will be confirmed through future submittals from HMC and NRC onsite inspections.

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[6] ADAMS Accession No. ML19284C767.
[7] ADAMS Accession No. ML18303A199.