



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

June 18, 2020

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

**SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION ACCEPTANCE REVIEW AND  
REQUEST FOR SUPPLEMENTAL INFORMATION, HOMESTAKE MINING  
COMPANY OF CALIFORNIA, GROUNDWATER CORRECTIVE ACTION  
PROGRAM AND REQUEST FOR AMENDMENT TO LICENSE SUA-1471,  
DOCKET NO. 04008903, EA-16-114**

Dear Mr. Pierce:

On March 28, 2017, the U.S. Nuclear Regulatory Commission (NRC) issued Confirmatory Order<sup>1</sup> (CO) EA-16-114 to the Homestake Mining Company of California (HMC). In accordance with Condition 11 of the CO, HMC developed a Groundwater Corrective Action Program (GCAP) Report to update license SUA-1471, reflecting the intended groundwater corrective action operations and strategies at the Grants Reclamation Project (GRP) Grants, New Mexico.

In a letter dated December 18, 2019,<sup>2</sup> HMC submitted a license amendment request to the NRC as a license tie-down document for groundwater corrective action at the GRP and to replace the 1989 GCAP and the 1998 update to the GCAP specified in License Condition 35C. In a letter dated February 28, 2020,<sup>3</sup> HMC submitted its Environmental Report in support of the previously submitted license amendment request.

After receipt of the license amendment request and the supporting environmental report, the NRC staff performed an acceptance review of the application to determine if the application contained sufficient technical information to begin a detailed technical review. The NRC staff has determined that the application does not provide sufficient technical information to begin a detailed review and that supplemental information is needed. The information needed to continue our review is described in the enclosed request for supplemental information (RSI).

Responses to the enclosed RSI should be provided within 90 days from the date of this letter. If HMC is unable to meet this response date, please notify the NRC staff, within two weeks of receipt of this letter, of your new submittal date and the reasons for the delay. If the RSI responses do not provide sufficient information; the application may not be accepted for review.

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<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML17061A455

<sup>2</sup> ADAMS Package Accession No. ML19354B960

<sup>3</sup> ADAMS Accession No. ML20080M078

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," 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 document 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 review, please contact me at (301) 415-7777 or by e-mail to [Ron.Linton@nrc.gov](mailto: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 Materials Safety  
and Safeguards

Docket No. 040-08903

License No. SUA-1471

Enclosure:  
NRC Request for Supplemental Information

cc: via ListServ  
K. Vollbrecht (NMED)  
C. Burrus (OSE)  
M. Purcell (EPA)  
B. Tsosie (DOE)

**SUBJECT:** U.S. NUCLEAR REGULATORY COMMISSION ACCEPTANCE REVIEW AND REQUEST FOR SUPPLEMENTAL INFORMATION, HOMESTAKE MINING COMPANY OF CALIFORNIA, GROUNDWATER CORRECTIVE ACTION PROGRAM AND REQUEST FOR AMENDMENT TO LICENSE SUA-1471, DOCKET NO. 04008903, EA-16-114 **DATE: June 18, 2020**

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**ADAMS Accession No.: ML20142A195**

**\*Via e-mail**

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**REQUEST FOR SUPPLEMENTAL INFORMATION  
HOMESTAKE MINING COMPANY OF CALIFORNIA  
GROUNDWATER CORRECTIVE ACTION PROGRAM**

**Docket Number: 040-08903**

**License Number: SUA-1471**

**INTRODUCTION:**

Based on the Nuclear Regulatory Staff (NRC) staff's acceptance review, the Groundwater Corrective Action Program (GCAP) provides an update of the current groundwater correction actions from the earlier 1989 GCAP and 1998 amendment to the GCAP. However, projections of groundwater restoration still appear to be optimistic based on historical and recent operating experience and currently-available, site-characterization data. As summarized in Request for Supplemental Information (RSI) 8-4 below, there appears to be a series of assumptions that could result in a significant underestimation of the timeline for groundwater restoration. To evaluate the GCAP, the NRC staff will need the supplemental information described below. The NRC staff appreciates that there is significant uncertainty in projections of groundwater restoration based on the magnitude of the groundwater corrective action program at the Grants Reclamation Project (GRP) and the complexity of the site. However, assumptions regarding projections of groundwater restoration should be technically defensible and reasonably account for uncertainty and variability. This includes realistic assumptions based on the best available information. When information is limited, the use of reasonably conservative assumptions, sensitivity analyses, and/or alternative conceptual models should be used. These assumptions can be revised through ongoing monitoring and additional collection of data. For additional information regarding the technical defensibility of a GCAP, please see Section 4.4 "Ground-Water Corrective Action and Compliance Monitoring Plan" in NUREG-1620, Rev.1, "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978."

The NRC staff notes that the first number in the RSI corresponds to the chapter in the GCAP where the RSI originates.

**RSI 7-1**

Provide the following supporting documentation that was referenced in the application but was missing and is not otherwise available to NRC for its review:

- a) Frenzel, P.F. 1992. Simulation of ground-water flow in the San Andres-Glorieta aquifer in the Acoma embayment and eastern Zuni uplift, west-central New Mexico: U.S. Geological Survey Water-Resources Investigations Report 91-4099, 381 p;
- b) HDR 2016. Draft Remedial Investigation Report. Homestake Mining Company Superfund Site. June 21, 2016;
- c) Hydro-Engineering, LLC (HE). 2019. Memorandum – Drain Down Model Modifications and Predictions;
- d) For Appendix B, Attachment 2 "Tailings and Alluvial Water Quality Data" is missing;
- e) For Appendix B, Attachment 4 "Humidity Cell Testing Results" is missing; and
- f) For Appendix B, Attachment 5 "LTP [Large Tailings Pile] Static Column Testing Results" is missing.

Enclosure

### Discussion

The Homestake Mining Company of California (HMC) request and its attached addendum directly reference external materials that were used to develop the models which are the basis for evaluating the effectiveness of the corrective action program, confirming adequacy of the monitoring program and predicting future alternates to the corrective action program. However, the materials absent from the submittal and not readily available to the NRC staff would hinder the NRC staff's review of the accuracy and completeness of the modeling effort.

### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Criterion 7A of Appendix A to 10 CFR Part 40, states the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Guidance in NUREG-1620, Section 4.4.1, suggests that reviewers consider information specified in Criterion 1-8 of Appendix A to 10 CFR Part 40 relevant to the technical adequacy of the groundwater corrective action program. Furthermore, guidance in NUREG-1620, Section 4.4.2, suggests that a reactive transport model should be constructed if credit is taken for chemical processes that may mitigate the spread of contaminants as a plume migrates in addition to detailed groundwater flow and transport modeling, both of which HMC included in the submittal.

### **RSI 7-2**

Provide the laboratory data (cation exchange capacity, selective chemical extraction samples) used for the design of the models but not included with the application.

### Discussion

The laboratory data provides the bases for a variety of parameters used in the model. The data are often only summarized in the application which precludes staff's evaluation of the accuracy of the data.

### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Guidance in NUREG-1620, Section 4.4.1, suggests that reviewers consider information specified in Criterion 1-8 of Appendix A to 10 CFR Part 40 relevant to the technical adequacy of the groundwater corrective action program. Furthermore, guidance in NUREG-1620, Section 4.4.2, suggests that a reactive transport model should be constructed if credit is taken for chemical processes that may mitigate the spread of contaminants as a plume migrates in addition to detailed groundwater flow and transport modeling.

### **RSI 7-3**

Provide the elevation data for the WME wells used for the design of the models but not included with the application.

#### Discussion

The application documents subsurface water and strata for the WME borings which mostly were installed within the tailings pile. However, no elevation data were presented in the application to correlate the data to the underlying environmental media.

#### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Guidance in NUREG-1620, Section 4.4.1, suggests that reviewers consider information specified in Criterion 1-8 of Appendix A to 10 CFR Part 40 relevant to the technical adequacy of the groundwater corrective action program. Furthermore, guidance in NUREG-1620, Section 4.4.2, suggests that a reactive transport model should be constructed if credit is taken for chemical processes that may mitigate the spread of contaminants as a plume migrates in addition to detailed groundwater flow and transport modeling.

#### **RSI 7-4**

Provide the historical remedial system collection and injection rates used for the design of the models.

#### Discussion

The application does not succinctly incorporate the historic corrective actions undertaken by the licensee. This information is needed to evaluate the effectiveness of the corrective action program.

#### Basis

The acceptance criteria in NUREG-1620, Section 4.4.3(1), indicates that sufficient data are available to adequately define relevant parameters and to support models, assumptions, and boundary conditions necessary for developing detailed and site-scale models of the groundwater cleanup and the estimation of cleanup time. The information includes pumping, injection, and sampling wells (coordinates, depths, completion diagrams, flow rates (Section 4.4.3(1)(f)(ii)), and, pumping/injection rates and rate history for each well if pumping has been ongoing (Section 4.4.3(1)(f)(iii)).

#### **RSI 7-5**

Provide electronic versions for the numerical groundwater flow and fate and transport model predictive simulations.

#### Discussion

Electronic files for the flow and transport model calibration simulations were provided as part of the previous submittals. However, no electronic files of the predictive simulations were included with the prior submittals or the final submittal. This information is needed for staff to evaluate the licensee's prediction of cleanup time frames

### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Guidance in NUREG-1620, Section 4.4.1, suggests that reviewers consider information specified in Criterion 1-8 of Appendix A to 10 CFR Part 40 relevant to the technical adequacy of the groundwater corrective action program. Furthermore, guidance in NUREG-1620, Section 4.4.2, suggests that a reactive transport model should be constructed if credit is taken for chemical processes that may mitigate the spread of contaminants as a plume migrates in addition to detailed groundwater flow and transport modeling.

### **RSI 7-6**

Provide a table summarizing pertinent well data. The data should include; well name, coordinates, reference and ground elevations, completion interval and aquifer, depths to subsurface geologic contacts, installation date, and abandonment date.

### Discussion

The application includes data for selected monitoring wells. Given the complex history of operations, a proper evaluation of the corrective action performance and the models used to determine the cleanup timeframes should include pertinent data for all wells.

### Basis

The acceptance criteria in NUREG-1620, Section 4.4.3(1), indicates that sufficient data are available to adequately define relevant parameters and to support models, assumptions, and boundary conditions necessary for developing detailed and site-scale models of the groundwater cleanup and the estimation of cleanup time. The information includes pumping, injection, and sampling wells (coordinates, depths, completion diagrams, flow rates (Section 4.4.3(1)(f)(ii)), and, pumping/injection rates and rate history for each well if pumping has been ongoing (Section 4.4.3(1)(f)(iii)).

### **RSI 7-7**

Verify that the following information submitted as part of the application is true and accurate (e.g., final and not draft):

- a) Appendix B Second Interim Draft Geochemical Characterization of Tailings, Alluvial Solids, and Groundwater (HMC noted in Section 1.0 of the GCAP Appendix that a final report will be submitted in September of 2020).
- b) Previously submitted electronic groundwater flow and fate and transport model files.

### Discussion

The NRC staff noted a discrepancy between values used in the electronic model files submitted to NRC previously from those values listed in the report (e.g., on Figure 3-20, Layer 4 (Upper Chinle Aquifer), two values are depicted (red zone  $K_h=0.1$  ft/d;  $K_v=0.01$  ft/day; green zone  $K_h=10$  ft/d;  $K_v=1$  ft/day) but the corresponding zones in the previously submitted electronic model files are Zone 11 (=red on Figure 4)  $K_h=1$  ft/d;  $K_v=0.1$  ft/d and Zone 42 (=green on Figure 4)  $K_h=25$  ft/d;  $K_v=2.5$  ft/d).

**Basis**

10 CFR Part 40.9 requires that all information provided to the Commission be complete and accurate in all material respects.

**RSI 7-8:**

Provide a sensitivity analysis on the impact of an alternate conceptual model that includes low permeability layers in the Alluvial Aquifer on the restoration timeline.

**Discussion**

As discussed in Section 7.4.2.2.2 of the GCAP, a single effective porosity of 0.2 was assigned to the Alluvial Aquifer. However, the Alluvial Aquifer has been shown to contain significant heterogeneity with low-permeability interbedding layers.<sup>1</sup> Diffusion of relatively high concentrations of Contaminants of Concern (COCs) over a period of decades into these low permeability zones could significantly impact the groundwater restoration timeline as these COCs diffuse more gradually back into the higher permeability layers. The NRC staff appreciates that the spatial variability within the Alluvial Aquifer and the spatial extent of the modeling domain make it impracticable to represent these features explicitly within the flow and transport model. However, an abstracted or simplified model could be used to qualitatively evaluate the potential impact on restoration timelines due to these low permeability features.

**Basis**

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR Part 40, Appendix A, Criterion 9.

**RSI 7-9:**

Provide clarification and support for the assumed concentrations of uranium and molybdenum in the re-injection water or revise the modeling to be consistent with observed treatment effectiveness. If the actual concentrations of the re-injection water are higher than assumed in the GCAP, it could result in an unrealistic groundwater restoration timeline.

**Discussion**

In Section 7.4.2 of the GCAP, HMC stated: “[r]e-injection concentrations for the treated and/or fresh injection water associated with GRP site remedial activities were set equal to 0.01 milligrams/Liter (mg/L) for uranium and 0.003 mg/L for molybdenum.” While this discussion is for initial model setup (and calibration), the NRC staff assumes similar values were used in the predictive simulations.

Based on the re-injection concentrations reported in the 2017-2019 Annual Monitoring Reports for SP-2, the assumed values in the GCAP appear to be optimistic by a factor of two or more. The SP-2 concentrations have decreased for uranium and molybdenum from 2017 to 2019.

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<sup>1</sup> ADAMS Accession No. ML16351A351.



Also, the reported concentrations are from monthly sampling events and are not volume-weighted averages, which would be more reflective of actual re-injection concentrations. However, the GCAP does not provide a basis for assuming lower concentrations than what has been observed.

#### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR Part 40, Appendix A, Criterion 9.

#### **RSI 7-10:**

Provide a more robust sensitivity analysis for the fate and transport model parameters on the predictive simulations.

#### Discussion

In Section 7.6 of the GCAP as well as Section 6 of Appendix C, HMC provides a fate and transport model sensitivity analysis. The sensitivity analysis is insufficient, limited to only a lowering of the effective retardation factor for uranium. (Also, the discussions are based on changes to one parameter for the Freundlich Isotherm (i.e., Log Kr), which appears to be incorrectly reported in the text (by 3 orders of magnitude) as compared to the value used to calibrate the fate and transport model. HMC should correct the information in response to this RSI.) The analysis provided only general comments of the model sensitivity on the predicted impacts (i.e., plume will migrate further downgradient or the efficiency of the remedial system will be higher because of less retardation) rather than a discussion on the model sensitivity on matching the observed data or predicting future timeframes if more conservative values were used (e.g., the retardation factor was increased). Furthermore, given the lack of a true verification simulation, a sufficiently robust sensitivity analysis is needed for a model validation.

#### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Guidance in NUREG-1620, Section 4.4.1, suggests that reviewers consider information specified in Criterion 1-8 of Appendix A to 10 CFR Part 40 relevant to the technical adequacy of the groundwater corrective action program. Furthermore, guidance in NUREG-1620, Section 4.4.2, suggests that a reactive transport model should be constructed if credit is taken for chemical processes that may mitigate the spread of contaminants as a plume migrates in addition to detailed groundwater flow and transport modeling.

#### **RSI 8-1:**

Clarify if Permeable Reactive Barriers (PRBs) are needed for HMC to meet the Groundwater Protection Standards (GWPSs).

### Discussion

In Section 1.4 of the Environmental Report (ER), HMC stated:

*The proposed action, Alternative 3, will consist of continued groundwater collection, treatment, and injection within the alluvial and Chinle aquifers for approximately ten years, followed by monitored natural attenuation (MNA). MNA may be supplemented with passive treatment using permeable reactive barrier (PRB) technologies pending laboratory and field testing to determine its applicability to the GRP.*

HMC also stated in the ER that, “(t)he proposed action continues the current groundwater restoration activities and involves no additional surface disturbance.” This appears to be inconsistent with Alternative 3 as described in the GCAP and HMC’s associated groundwater modeling results.

In Section 8.3.2.3 of the GCAP for the proposed action, Alternative 3, HMC stated:

*After the extents of the dissolved plumes have essentially been reduced to the footprint of the LTP through operation of the groundwater containment and removal system for 10 years, operation would stop and installation of hydroxyapatite PRBs would be used to manage and treat groundwater impacted by the remaining COCs plume beneath the LTP and the declining COCs mass discharge from the LTP.*

Furthermore, modeling results shown in Figures 3-23 and 3-24 of Appendix E of the GCAP illustrate that uranium concentrations are projected to exceed the GWPS at the licensed boundary without PRBs. The NRC staff’s understanding is that the PRBs are projected to be necessary to mitigate the long-term seepage from the LTP such that the site meets the GWPS at the licensed boundary within the timeline for Alternative 3.

If PRBs may be needed, then the impact of the ground disturbance from additional well installation and the impact to the Alluvial and the Upper Chinle aquifers needs to be addressed in the ER (see RSI 8-2). Also, additional information is needed for the NRC staff to evaluate the effectiveness of the PRBs (see RSI-8-3).

### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR Part 40, Appendix A, Criterion 9.

### **RSI 8-2:**

If PRBs may be needed to meet the groundwater restoration timeline proposed in Alternative 3, provide the following additional information on the environmental impacts of:

- a) the installation of injection wells,
- b) injection of sodium phosphate and calcium citrate into the Alluvial and Upper Chinle Aquifers,
- c) the potential change in groundwater flow directions, and
- d) the potential for release of other COCs, such as arsenic displacement that was observed with the tripolyphosphate injections.<sup>2</sup>

#### Discussion

As discussed in RSI 8-1, it is not clear in the ER and GCAP whether HMC will need to install PRBs to meet the GWPSs at the licensed boundary in the projected timeline under Alternative 3. If PRBs are needed, then an assessment of the environmental impacts associated with the installation of PRBs in the Alluvial and Upper Chinle aquifers is needed. Furthermore, the installation of additional injection wells required by the PRB construction may require revisions to New Mexico Environment Department Discharge Permit 200.

#### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Additionally, this information is needed to assess compliance with 10 CFR 51.21.

#### **RSI 8-3:**

Provide the following additional information for NRC to evaluate the effectiveness of the PRBs:

- a) Provide information regarding the concentrations and quantities of COCs that are anticipated to be released from the LTP over time.
- b) Provide information regarding the assumed natural attenuation from the LTP to the proposed PRBs for each COC that could exceed the GWPS beneath the LTP.
- c) Provide information regarding the projected performance of the PRBs with respect to each COC that could exceed the GWPS (i.e., magnitude of reduction of COCs, longevity of COC sorption/precipitation, solubility/stability of hydroxyapatite under reasonably anticipated environmental conditions). This information should include hydroxyapatite PRB performance observed at other sites, comparison of tripolyphosphate PRB performance at the GRP with proposed hydroxyapatite PRB, potential for well fouling, variable PRB performance due to stratigraphic and structural variability (e.g., interbedding layers, fractures)
- d) Provide information regarding the potential for contaminated groundwater to bypass the PRBs due to a reduction in permeability within the PRBs.

#### Discussion

Additional information is needed to evaluate the performance of the proposed alternative, Alternative 3, which appears to include PRBs. In Section 8 of the GCAP, HMC stated, *[t]he feasibility of installing PRBs and the performance of the PRBs at the proposed locations across a vertical interval that includes the lower portion of the Alluvial Aquifer and the upper portion of the Upper Chinle unit would need to be verified through field and laboratory testing.* As described in RSI 8-1, it appears that PRBs are necessary for HMC to meet the GWPSs under Alternative 3. Accordingly, the GCAP should provide the information requested above for the NRC staff to evaluate the performance of the PRBs.

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<sup>2</sup> ADAMS Accession No. ML16351A351.

### Basis

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR Part 40, Appendix A, Criterion 9.

### **RSI 8-4**

Provide projections of cost estimates for restoration that are based on reasonable and defensible assumptions.

### Discussion

In Section 1.1 of the GCAP, HMC states:

*The purpose of this Groundwater CAP document is to satisfy condition 11 of the NRC [Nuclear Regulatory Commission] Confirmatory Order EA-16-114, provide NRC with the technical basis for approval of a license amendment application requesting revision to License Condition 35C so use of existing CAP infrastructure will be aligned with the scope of authorized groundwater corrective action, provide an update regarding the current site groundwater conditions, describe recent modifications to the groundwater restoration program, discuss the proposed future implementation of the CAP, and present predictions as to when groundwater restoration is expected to be completed based on updated groundwater flow and transport modeling.*

The NRC staff's acceptance review of the GCAP indicates that a series of assumptions appear to be optimistic based on operating experience and site characterization data. These assumptions relate to conceptual model development (see RSI 7-8), model parameterization (see RSI 7-9 & RSI 7-10), and groundwater treatment rates (see RSI 9-1). Both the groundwater restoration timeline and the required financial surety could be significantly underestimated due to these assumptions. For the NRC staff to have reasonable assurance, projections of groundwater restoration need to be based on reasonable and defensible assumptions.

### Basis

Section 8 of the GCAP discusses costs related to the alternatives analyzed. As described in 10 CFR Part 40, Appendix A, Criterion 9, the NRC staff requires assurance that sufficient funds will be available to carry out decommissioning activities. The amount of funds to be ensured by such surety arrangements must be based on Commission-approved cost estimates in a Commission-approved plan. That plan must contain a detailed cost estimate for decontamination, decommissioning, and reclamation, in an amount reflecting the cost of an independent contractor to perform the decontamination, decommissioning, and reclamation activities and an adequate contingency factor. As described further in 10 CFR Part 40, Appendix A, Criterion 9 (c): the licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and evaluates alternatives for mitigating these impacts.

**RSI 9-1:**

Provide realistic projections of flowrates for groundwater treatment systems. This information should include the following:

- a) If the capacity of the Reverse Osmosis (RO) and zeolite systems are not increased, provide realistic projections of groundwater treatment rates based on past operating experience.
- b) If the evaporative capacity is not increased, provide realistic projections of future performance based on evaporative capacity.

**Discussion**

In Section 9 of the GCAP, HMC discussed that the proposed GCAP projects that the COCs in the Alluvial and Chinle Aquifers will meet the GWPSs at the license boundary in approximately 10 years. One of HMC's assumptions with that timeline was that the RO system would operate at the current maximum capacity of 900 gallons per minute (gpm) for 10 years and that the zeolite treatment systems would operate at the current maximum rate of 1050 gpm for 6 years. HMC discussed that this is optimistic and represents a significant increase from the historic throughput averages. Table 6-6 of the GCAP shows that the maximum throughput for the RO system was 632 gpm in 2016 and 296 gpm in 2018 for the zeolite system. Unless HMC increases the capacity of the RO and zeolite systems, these projected treatment rates do not appear to be realistic.

With respect to evaporative capacity, the average annual evaporation rate reported in the Annual Monitoring Reports from 2016 through 2019 was 192 gpm. During this period, the RO and the zeolite systems averaged feed rates to the evaporation ponds of 98 and 32 gpm, respectively. The other components of HMC's major operational flows that feed into the evaporation ponds (i.e., precipitation, collection ponds, and the LTP) averaged, in total, approximately 67 gpm. In other words, from 2016-2019 the GRP operated essentially at capacity, which corresponded to RO and zeolite treatment rates of 505 and 248 gpm per year, respectively. NRC staff understands that the GRP has recently been operating under reduced evaporative capacity due the planned relining of Evaporation Pond 1. However, it appears that the maximum operating flow rates for the RO and zeolite systems, based on the evaporative capacity, are significantly less than the assumed operational rates in the GCAP for Alternative 3.

Without an increase in RO system, zeolite system, and evaporative capacities, groundwater treatment projections and therefore the groundwater restoration timeline are likely to be underestimated.

**Basis**

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR Part 40, Appendix A, Criterion 9.

## **RSI 9-2**

Provide additional information on specific metrics that can be used to evaluate the performance of the groundwater corrective actions.

### **Discussion**

In Section 9.5 of the GCAP, HMC provided general discussion on groundwater monitoring and operational monitoring. However, specific monitoring objectives to evaluate the performance of the groundwater corrective actions are not provided in the GCAP. Based on the uncertainty and potential optimism in several key assumptions, the NRC staff are concerned that the restoration timeline could be significantly underestimated. The establishment of performance metrics for key assumptions would provide additional confidence that the restoration timeline is reasonable and that adequate financial surety is maintained. Based on the NRC staff's preliminary review of the GCAP, these key assumptions include, but are not limited to: (1) RO and zeolite system groundwater treatment rates, (2) LTP seepage rates and concentrations, (3) impact of low-permeability layers on groundwater restoration, (4) uranium sorption, (5) performance of the PRBs. These key assumptions should be reported in annual monitoring reports comparing observations of groundwater corrective actions (e.g., groundwater treatment rates, LTP seepage rates and concentrations), updated assumptions (e.g., impact of low-permeability zones, uranium sorption, and performance of PRBs), and projected modeling results.

### **Basis**

Criterion 5D of Appendix A to 10 CFR Part 40 requires a proposed corrective action program with supporting rationale be approved by the Commission. Furthermore, Criterion 7A of Appendix A to 10 CFR Part 40, states that the purpose of a corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. This information is also needed to determine compliance with 10 CFR 40, Appendix A, Criterion 9.

## **RSI ER-1**

Provide additional/revised information in the Environmental Report, Section 2.1.1 regarding the no-action alternative using the definition in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," for the purpose of establishing a baseline for comparing alternatives.

### **Discussion**

The application currently states that the no-action alternative involves "cessation of all existing pumping of groundwater, ex-situ treatment of the pumped groundwater, cessation of all associated groundwater monitoring, and completion of decommissioning and surface reclamation of the remaining licensed facilities per the approved Decommissioning and Reclamation Plan." NUREG-1748 defines the no-action alternative as "a discussion of the results from a lack of action (i.e., status quo or the existing state)... the proposed action would not take place." It appears that the licensee has interpreted the no-action alternative as a cessation of all current activities, rather than maintaining status quo.

### **Basis**

This information is needed to determine compliance with 10 CFR 51.21.