



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

September 12, 2022

MEMORANDUM TO: R. Bill Von Till, Chief
Uranium Recovery and Materials
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety and Safeguards

FROM: Ron C. Linton, Project Manager *Ron C Linton* Signed by Linton, Ron
Uranium Recovery and Materials on 09/12/22
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety and Safeguards

SUBJECT: SUMMARY OF AUGUST 26, 2022, PUBLIC OBSERVATIONAL
MEETING TO DISCUSS THE HOMESTAKE MINING COMPANY OF
CALIFORNIA'S LARGE TAILINGS PILE EVAPOTRANSPIRATION
COVER DESIGN LICENSE AMENDMENT REQUEST

DATE OF MEETING: August 26, 2022

MEETING LOCATION: Virtual Microsoft Teams meeting

PURPOSE: The purpose of this meeting was for the U.S. Nuclear Regulatory Commission (NRC) staff to provide comments to the Homestake Mining Company of California (HMC) on the above referenced license amendment request and recent correspondence.

ATTENDEES: A list of attendees is provided in the enclosure to this meeting summary. Since this was a virtual meeting, publicly noticed on the NRC website for anyone to attend, not all attendees may have been identified in the enclosed list.

SUMMARY:

On August 26, 2022, a virtual public observational meeting was held between the NRC and the HMC regarding the Large Tailings Pile Evapotranspiration (ET) Cover License Amendment Request for the Grants Reclamation Project. The meeting notice was published on the NRC website on August 15, 2022, and is available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. [ML22227A096](#).

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The virtual public observational meeting began at 10:30 a.m., eastern time, with the NRC staff making opening remarks regarding the meeting background and purpose. As an observational meeting, members of the public are welcome to attend and observe the proceedings and ask questions to the NRC staff after NRC comments are provided to HMC.

On August 24, 2022, the NRC staff provided HMC with talking points for the public observational meeting (Enclosure 1). The NRC staff discussed the provided talking points in detail with HMC.

The NRC staff is concerned that there may be dispersive soils in the proposed borrow area for the ET cover and possibly the radon barrier. The NRC staff alerted HMC staff that dispersive soil should be avoided, if possible, and that further investigation and characterization of the borrow area(s) may be needed to further understand soil properties. The NRC staff discussed the proposed analog site and the recommended seed mix and noted several long-rooted species in the mix. The NRC staff noted that HMC has provided limited support for the performance objectives and assumed percolation rate of 0.01 to 0.02 in/year of the ET cover and the resulting risk significance. The inputs and results of the SEEP/W water balance model were discussed, including the lack of sensitivity analyses performed by varying input parameters or evaluating alternative scenarios. The NRC staff expressed its concern that the ET cover may affect the current design of the proposed radon barrier. Erosion resistance, potential for gully formation, and avoiding the need for long-term maintenance were discussed.

Following the NRC's comments to HMC and ongoing discussions, the NRC staff opened the meeting for questions and comments from the public. The NRC staff responded to several questions from the public that were in attendance.

The NRC staff provided closing remarks and the meeting was adjourned at 11:54 a.m.

In accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," of the NRC's "Agency Rules of Practice and Procedure," a copy of this memorandum will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC website at <https://www.nrc.gov/reading-rm/adams.html>.

Docket No.: 04008903
License No.: SUA-1471

Cc: Brad Bingham
Homestake ListServ

Enclosures:

1. NRC talking points
2. List of Attendees

**U.S Nuclear Regulatory Commission and Homestake Mining Company of California
Public Observational Meeting, Large Tailings Pile Evapotranspiration Cover
License Amendment Request, Grants Reclamation Project August 26, 2022
Talking Points**

Purpose:

Discuss Homestake Mining Company of California (HMC) Large Tailings Pile (LTP) Evapotranspiration (ET) cover License Amendment Request (LAR) and U.S Nuclear Regulatory Commission (NRC) acceptance review.

Topics:

- HMC may need to perform additional borrow source testing and analyses to more thoroughly characterize the soils that will be used to construct the ET cover. HMC did not evaluate soils for dispersive potential. Staff reviewed data provided by HMC and determined that most of the soil samples appear to be dispersive (see Table 1). Additional field testing may be necessary to better characterize the proposed soils.
- If HMC confirms that dispersive soils are present in the proposed borrow area, then additional laboratory testing for geotechnical, hydraulic and agronomic properties may need to be performed. This would also impact the ET cover modeling that is required to predict percolation of water as these properties are used as model inputs.

Discussion on Dispersive Soils:

The results of laboratory testing performed for geotechnical, hydraulic, and agronomic properties, are documented in LAR Appendices B1, B2, and C, respectively. Table 1 of the LAR summarizes these geotechnical and hydraulic laboratory results. Staff reviewed the results of the borrow soil agronomic laboratory testing (provided in Table 2 of Appendix C of the LAR). Testing results included pH, electrical conductivity, organic matter content, soil texture (U.S. Department of Agriculture (USDA)), as well as chemical analyses (NO₃-N, P, K, Zn, Fe, Mn, Cu, S, Ca, Mg, Na) and sodium adsorption ratio (SAR).

Using the concentrations of Ca, Mg, Na, and K provided in Table 2 of Appendix C, the staff calculated the percent Na to determine the soil dispersive potential using a relationship between total dissolved salts (TDS) (refer to Figure 1, U.S. Bureau of Reclamation (USBR); 1991¹). As shown in Table 1, many of the samples appear to be dispersive or fall within the intermediate range. Due to the highly erosive nature of dispersive soils, the staff determined that additional field testing is necessary to better characterize the proposed soils for the ET cover and radon barrier². Methods for determining dispersive soils include the crumb test (American Society for Testing and Materials (ASTM) D6572), pinhole test (D4647/D4647M), the double hydrometer test (ASTM D4221), and the analysis of pore water extraction (ASTM D4542). According to ASTM D6572, the crumb test should usually be performed in conjunction with the other tests since this test may not identify all dispersive clay soils.

¹ USBR (1991). *Characteristics and Problems of Dispersive Clay Soils*. Dated October.

² This also relates to the radon barrier since the proposed radon barrier soils will also be sourced from the North Borrow location. Furthermore, the side slopes of the LTP may also be impacted.

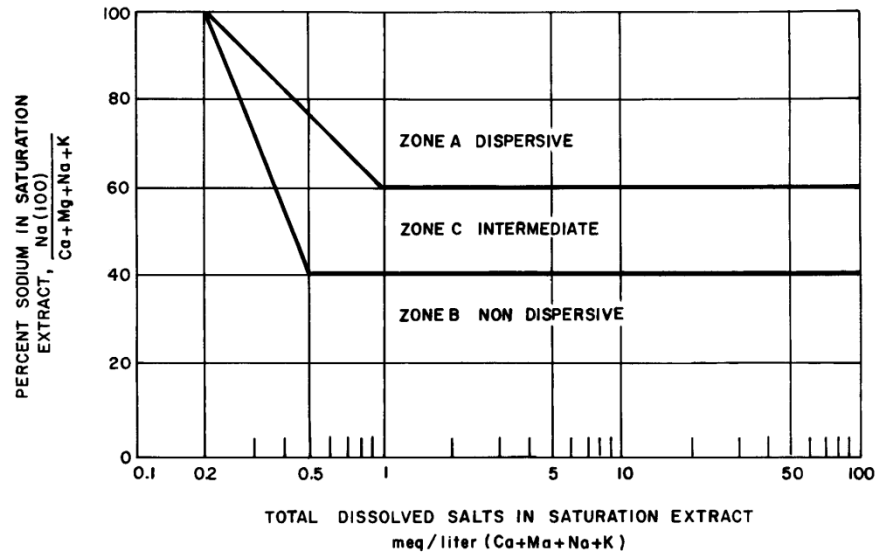


Figure 1. Dispersive Potential vs. TDS (Source: Figure 4 of USBR, 1991)

Sample	Depth (in)	Texture (USDA)	pH	Concentration(meq/L)						% Na	Dispersive Potential
				Ca	Mg	Na	K	SAR	TDS		
TP1-A	0-10	clay	8.66	0.8	0.1	8.0	0.0	11.9	8.9	89.9	Dispersive
TP1-B	10-60	clay	8.84	1.2	0.2	9.2	0.0	11.0	10.6	86.8	Dispersive
TP1-C	60-100	clay	9.11	0.6	0.1	7.2	0.0	12.2	7.9	91.1	Dispersive
TP2-A	0-9	clay	8.04	3.0	0.8	3.0	0.2	2.2	7.0	42.9	Intermediate
TP2-B	9-19	clay	7.91	7.0	2.7	8.2	1.8	3.7	19.7	41.6	Intermediate
TP2-C	19-96	clay	8.65	0.8	0.2	1.2	0.0	1.7	2.2	54.5	Intermediate
TP2-D	96-110	clay	8.57	1.1	0.3	2.4	0.0	2.9	3.8	63.2	Dispersive
TP3-A	0-6	clay loam	7.76	21.7	5.5	3.1	0.3	0.8	30.6	10.1	Non-Dispersive
TP3-B	6-48	clay loam	8.4	1.7	0.9	15.3	0.1	13.4	18.0	85.0	Dispersive
TP3-C	48-84	clay loam	9.56	1.3	2.9	22.8	0.1	15.7	27.1	84.1	Dispersive
TP3-D	84-132	clay loam	10.01	0.4	0.1	18.2	0.0	36.4	18.7	97.3	Dispersive
TP4-A	0-7	sandy clay loam	8.29	1.2	0.2	0.7	0.3	0.8	2.4	29.2	Non-Dispersive
TP4-B	7-14	sandy clay loam	8.23	1.4	0.3	0.5	0.1	0.5	2.3	21.7	Non-Dispersive
TP4-C	14-48	sandy clay loam	8.26	1.4	0.4	0.8	0.1	0.8	2.7	29.6	Non-Dispersive
TP4-D	48-84	sandy clay loam	8.86	0.4	0.2	5.2	0.0	9.5	5.8	89.7	Dispersive
TP5-A	0-6	clay	8.06	16.1	3.6	17.8	0.3	5.7	37.8	47.1	Intermediate
TP5-B	6-32	clay	8.2	8.6	2.0	26.6	0.1	11.6	37.3	71.3	Dispersive
TP5-C	32-72	clay	8.08	14.9	3.3	35.0	0.1	11.6	53.3	65.7	Dispersive

Table 1. Dispersive Soil Properties of the Test Pits (Data from Table 2 in LAR App. C).

- Additional borrow source testing may be needed to determine if there is enough material that is appropriate for construction of the ET cover. For example, the soil testing results reveal that several of the soil samples have very high pH values (mean > 8.53³) and high clay contents. Neither the LAR nor the construction specifications report specify clay content for the proposed ET cover soils. Both properties can restrict plant growth.
- Several other key properties needed to characterize an ET cover are also missing including CaCO₃ content⁴ and complete particle size distributions⁵ of the proposed soils.
- Identification of soils used to construct cover is unclear with respect to the consistency between narrative discussion and calculations. Although some suitability ranges for the agronomic properties are presented in Table 1 and Figure 1 of LAR Appendix C, the target soil properties for the ET cover are not clearly specified in the LAR. The specified target properties should include the following: soil pH; CaCO₃ content; nitrogen, potassium, and phosphorous content; electrical conductivity; salt content; cation exchange capacity; clay content; soil texture (USDA); particle size distributions and limits; porosity; Atterberg limits; bulk density.
- Critical ecological site information is missing. HMC proposes the Church Rock site as an analog site to determine the target ET cover vegetation. However, there is no information to support the selection of this analog (i.e., in terms of natural soils and vegetation). Furthermore, no assessment of the potential for bioinvasion has been made including the potential impacts on the cover integrity. Staff observed numerous animal burrows on the LTP during a site visit in February 2022.
- The ET cover modeling uses properties that are based on the original design, which utilizes a frost protection layer (instead of a water storage layer). This may produce erroneous results as these layers would have quite different properties from each other.
- Performance objectives of the ET cover, including percolation and monitoring are not clear. HMC provided limited support for the assumed percolation rate of 0.01 to 0.02 in/year and the resulting risk significance. The ET cover discussion should specify the design percolation rate (i.e., percolation from the base of the cover), the basis for the selection of this rate, and how the ET cover will be monitored in the short-term to ensure that it performs as designed.
- The potential rooting depths (i.e., maximum depths and density of root distribution) for the proposed vegetation may need to be evaluated with respect to the HMC site (including the implications for radon flux increases). The maximum rooting depths for the proposed vegetation (see Table 2) appear to exceed the depth to the tailings, which have a minimum depth of 5.6 ft as shown in Figure 3 of the LAR. For example, the roots of Fourwing Saltbush have been observed at a depth of over 30 ft.

³ Ideally should be in the 6.0 to 8.0 range

⁴ Should be <15 percent, by weight

⁵ Ideally limited to less than 15 percent gravel (i.e., particle size >2mm) and maximum particle size <2 inches

Homestake Recommended Seed Mix	
Common Name	Maximum Rooting Depth (ft)
Western Wheatgrass	5.41
Alkali Sacaton	-
Blue Grama	3.02
Galleta	-
Thickspike Wheatgrass	4.99
Indian Ricegrass	> 4.92
Sideouts Grama	6
Bottlebrush Squirreltail	2.46
Scarlet Globemallow	5.91
Palmer Penstemon	-
Rocky Mtn. Penstemon	-
Lewis Flax	-
Fourwing Saltbush	39.37
Wyoming Big Sagebrush	6
Sand Sage	10.99
Winterfat	30.18

Table 2. Proposed Vegetation for the HMC ET Cover

- While LAR Sections 4.1 provides the inputs and results of the SEEP/W water balance model, there is no discussion of any sensitivity analyses performed by varying input parameters or evaluating alternative scenarios. Specifically, the LAR should evaluate the performance of the ET cover in response to alternative scenarios (e.g., changes in vegetation cover and rooting depth, drought, and exceptionally wet years). The uncertainty (and resulting model sensitivity) associated with the various SEEP/W model input parameters should also be evaluated. For example, LAR Table 6 specifies the root depth was set at a depth of 3.25 feet, which extends 0.91 feet into the radon barrier. The impacts of using a shallower root depth should be assessed due to the highly compacted radon barrier (initially) limiting deeper root penetration. Other vegetation input parameters (e.g., leaf area index, vegetation cover) need further justification and are dependent upon HMCs basis for the selection of the Church Rock Mill site as an appropriate analog site.
- The Final Radon Barrier design for the large tailings pile (1995, Agencywide Documents Access and Management System Accession No. ML20085M655) based its radon flux calculation on an average long-term moisture content of 15.5 percent, with the understanding that material from the North Borrow area would be used for the radon barrier on the top slope. Staff understands that HMC does not plan to alter the radon barrier design for the top slope. With the change to an ET cover system, and the potential for roots to penetrate into the radon barrier given the relatively low amount of cover soil, it is not clear to the staff if the long-term moisture content assumption for the radon barrier on the top slope remains valid.

- Erosion resistance, potential for gully formation, and avoiding need for maintenance. In Appendix E of the LAR, the calculations for erosion control are based on a 2 percent slope with a length of approximately 736 feet. The narrative discussion should clarify placement of the rock/soil mixture. Additionally, the LAR does not address the potential for gully formation on the top slope. A rock/soil mixture may not be capable of avoiding gully formation in the cover soils, especially given the long slope lengths and the lack of rock-to-rock contact (if the soil and rock is mixed evenly throughout the 9-inch-thick layer).
- Input parameters for Wind Erosion Prediction System Calculations. The LAR states that specific inputs were selected based on the site location (Latitude: 35.24° N, Longitude: 107.86° W, and elevation of 6500 feet) and also that a sandy loam with 33 percent for the volume percent of the rock fragments was input into the model. However, none of the required model input parameters are listed.

LIST OF ATTENDEES:

AUGUST 26, 2022, PUBLIC OBSERVATIONAL MEETING WITH HOMESTAKE MINING COMPANY OF CALIFORNIA TO DISCUSS THE HMC LARGE TAILINGS PILE EVAPOTRANSPIRATION COVER DESIGN LICENSE AMENDMENT REQUEST AND THE FINAL RADON BARRIER

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Ron Linton	U.S. Nuclear Regulatory Commission (NRC)
Jane Marshall	NRC
George Alexander	NRC
Martha Poston-Brown	NRC
Dave McIntyre	NRC
Jean Trefethen	NRC
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Brittany Bolz	NRC
Doug Mandeville	NRC
Sarah Tabatabai	NRC
Adam Arguello	Homestake Mining Company of California (HMC)
JoAnne Martinez	HMC
Elizabeth Rudolf	HMC
Michael Wilter	HMC
Jesse Dillon	HMC
Brad Bingham	HMC
Melanie Davis	HMC
Kelly Greaser	HMC
Randy Whicker	HMC
Kristen Burt	HMC
Daniel Lattin	HMC
Jennifer Graham	U.S Department of Energy (DOE)
Jon Luellen	DOE
Susan Gordon	Public
Ann Maest	Public
Anonymous	Public
Thomas (no last name provided)	Public
Toby (no last name provided)	Public

Homestake Mining Company. Summary of Public Observational Meeting to discuss the Large Tailings Pile Evapotranspiration Cover License Amendment Request DATE September 12, 2022

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DATE	Sep 6, 2022	Sep 6, 2022	Sep 6, 2022	Sep 6, 2022
OFFICE	NMSS/DUWP /URMDB	NMSS/DUWP /URMDB		
NAME	RVon <i>RV</i>	RLinton <i>RL</i>		
DATE	Sep 12, 2022	Sep 12, 2022		

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