



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

September 25, 1997

Mr. Roy Cellan  
Homestake Mining Company  
P.O. Box 98  
Grants, New Mexico 87020

SUBJECT: FINAL RADON BARRIER DESIGN FOR THE SMALL TAILINGS PILE,  
AMENDMENT 27 TO SOURCE MATERIAL LICENSE SUA-1471

Dear Mr. Cellan:

The U. S. Nuclear Regulatory Commission staff has completed its review of the Homestake Mining Company (HMC) amendment request submitted in your letter dated August 6, 1996, which proposed a redesign of the final radon barrier for the small tailings pile at your Grants Mill Uranium mill and tailings site and various minor "housekeeping" license changes. The staff has determined that the redesign of the final radon barrier is acceptable, as explained in the enclosed Technical Evaluation Report (Enclosure 1).

Based on telephone discussions between yourself and Ken Hooks of the NRC, the various "housekeeping" license changes have been resolved as follows:

- \* License Condition (LC) 13 is deleted since it duplicates LC 10.
- \* LC 18 is deleted, since it is superceded by LC 37 which references the approved site reclamation plan.
- \* LC 21 is modified by replacing the word "mill" with "site", since the mill has been fully reclaimed.
- \* LC 23 has been modified by deleting specific references to "operational" and "nonoperational" procedures.
- \* LC 31 is deleted, since the groundwater monitoring requirements established for the "brine evaporation pond" are stated in LC 35, and reclamation requirements are stated in LC 37.
- \* LC 32A is deleted since the mill buildings have been fully reclaimed.
- \* LC 39 has been modified to remove the requirement to notify the NRC of changes to the evaporation pond design and filling of the pond, since the pond has been constructed and filled.

Pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Part 40, Source Material License SUA-1471 is hereby amended by modifying License Condition 37B as discussed in the enclosed TER and making the various "housekeeping" changes discussed above. All other conditions of this license shall remain the same. The license is being reissued to incorporate the above modification (Enclosure 2).

An environmental report is not required from HMC because the amendment does not meet the criteria of 10 CFR 51.60(b)(2), in that there will be no significant change in the types, or increases in the amounts, of effluents released. For the same reasons, an NRC environmental assessment is not required since this license amendment is categorically excluded under 10 CFR 51.22 (c)(11).

If you have any questions regarding this letter or the enclosures, please contact Ken Hooks, the NRC Project Manager for HMC, at (301) 415-7777.

Sincerely,

(Original signed by)

Joseph J. Holonich, Chief  
Uranium Recovery Branch  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 40-8903  
License No. SUA-1471  
Case Closed: L51439

Enclosures: As stated

cc: JVirgona, DOE Grand Junction  
MHanning, NMED Santa Fe

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## TECHNICAL EVALUATION REPORT

**DATE:** June 30, 1997

**DOCKET NO:** 40-8903                      **LICENSE NO.:** SUA-1471

**LICENSEE:** Homestake Mining Company

**FACILITY:** Grants Uranium Mill and Tailings Site

**PROJECT MANAGER:** Ken Hooks

**TECHNICAL REVIEWERS:** Dan Rom  
James Weldy, Center for Nuclear Waste  
Regulatory Analyses

### SUMMARY AND CONCLUSIONS:

By letter dated August 6, 1996, Homestake Mining Company of California (Homestake) requested an amendment to License Condition No. 37B of Source Material License SUA-1471 to reduce the radon barrier thickness for the small tailings pile at the Grants uranium mill and tailings site near Grants, New Mexico. The U.S. Nuclear Regulatory Commission staff has reviewed this request and concludes that the proposed redesigned cover meets the radon flux standard set forth in Criterion 6(1) of 10 CFR Part 40, Appendix A. The other requirements of criterion 6 have been considered in the review of the reclamation plan or will be considered in the staff review of the completion report.

### AMENDMENT REQUEST:

Homestake initially submitted an amendment request to reduce the cover thicknesses for the large and small tailings piles by a letter dated January 17, 1994. Pursuant to meetings and discussions with the NRC staff, Homestake revised the initial amendment request and submitted a June 16, 1995, request which addressed only the large tailings pile. This amendment request has already been approved by the NRC. The August 6, 1996, request which is the subject of this technical evaluation report (TER) addresses the small tailings pile. Considering the results from testing the properties of tailings materials and barrier soils, Homestake requested that the radon barrier thickness be reduced from 14 feet to variable thicknesses ranging from 24 to 71 inches.

### BACKGROUND:

The Homestake Grants Project mill site is located near Milan, New Mexico. The uranium ore was processed using an alkaline leach process. There are two tailings piles onsite designated as the "large tailings pile" and the "small tailings pile." The large tailings pile was used from 1958 to 1990 and contains 20.5 million tons of tailings. The large pile covers approximately 190 acres to a height of 85 to 100 ft. The small tailings pile was operated from 1958 to 1962 and contains 1.5 million tons of tailings. It covers approximately 40 acres to a height of 20 to 25 ft.

The Homestake reclamation plan was approved in July 1993. Some reclamation activities, including mill decommissioning and soil cleanup, have been completed. The radon cover has been placed on much of the large tailings pile and the cover top will be placed after primary consolidation has occurred. Portions of the small tailings pile have been covered, but the top is being used as an evaporation pond for the ground water corrective action program. Therefore, completion of barrier construction for the small tailings pile will not occur for several years.

### **TECHNICAL EVALUATION:**

This review focuses on the proposed radon barrier design for the small tailings pile. A design review was conducted in accordance with the NRC Final Standard Review Plan for the Review of a Remedial Action of Inactive Mill Tailings Sites (December 1993) and consisted of assessments of the Homestake amendment request and supporting documentation.

To meet Criterion 6(1) of 10 CFR Part 40, Appendix A, a soil radon barrier is typically placed over tailings impoundments to limit long-term radon flux to less than 20 pCi/m<sup>2</sup>s averaged over the entire tailings pile. The radon flux from the cell cover is dependent on the physical and radiological characteristics of the contaminated materials and the cover soils. These characteristics include radium content, dry density, specific gravity, porosity, long-term moisture content, thickness, emanation coefficient, and diffusion coefficient. In addition, external influences, such as freeze-thaw degradation, biointrusion, erosional stability, and slope stability, may also affect the radon attenuation and stability of covers. Using measured values or estimates of the above parameters and factors, computer codes are used to model the radon flux through the cover. The moisture content and diffusion coefficient are considered to be the critical parameters. Because radon has a relatively short half-life and decays to a solid particle, evaluations are typically performed on the upper 15 ft of material. Each of the radon flux computer code input values for the contaminated and cover materials is discussed in the following assessment.

#### **South Triangle Area of Small Tailings Pile**

The South Triangle area consists of a 7.0 ft layer of contaminated slimes which will be covered by a 4.0 ft layer of tailings sands. A minimum of 12.0 ft of windblown contaminated soil will cover the tailings. The radon barrier will consist of 6.0 in. of 100 percent maximum dry density (MDD) north borrow soil and 18.0 in. of 95 percent MDL north borrow soil. The surface area (including side slopes) of the South Triangle will be approximately 274,000 square ft.

#### **Contaminated Material Parameters**

The licensee has performed extensive sampling and testing to characterize the radium content, density, and moisture content of the tailings. To determine the average radium content and emanation coefficients of the tailings sands and slimes, data were taken from five borings. The mean radium activity concentration of the slimes was 732 pCi/g, and the mean emanation coefficient was 0.47. The mean radium activity concentration for the tailings sands was calculated to be 408 pCi/g, and the mean emanation coefficient was calculated to be 0.39. The values used for the radium activity concentration in the soil were acceptably derived, and the values used for the emanation coefficients are more conservative than the NRC default value of 0.35.

The measured physical parameters of the NRC-approved large tailings pile were used to model the tailings sands, because the ore and milling techniques were identical for the two piles. A density of 1.49 g/cm<sup>3</sup>, porosity of 0.44, long-term moisture content of 8 percent, and a diffusion coefficient of 0.03 cm<sup>2</sup>/sec were used to model the tailings sands and are acceptable. The physical parameters for the slimes were consistent with or more conservative than the values approved in the reclamation plan (Homestake Mining Company, 1993). A density of 1.19 g/cm<sup>3</sup> and porosity of 0.55 are values which were used in the reclamation plan and which have been supported by more recent site data. A more conservative moisture content of 13 percent was used, and the diffusion coefficient of 0.0317 was calculated using the NRC-approved empirical relationship in NUREG/CR-3533 (Nuclear Regulatory Commission, 1984).

All parameters for the windblown tailings used in the model including radium activity concentration, emanation coefficient, porosity, long-term moisture content, density, and diffusion coefficient were previously approved for the large tailings pile (Homestake Mining Company, 1995) and are considered acceptable. The windblown tailings layer will be compacted to 90 percent MDD as described in the reclamation plan (Homestake Mining Company, 1993).

The NRC staff concludes that contaminated material parameters are conservative or are justified based on the site-specific measurements.

#### Proposed Barrier

The proposed radon barrier will be constructed of compacted north borrow soil, as approved in the large tailings pile radon barrier redesign. The first 6 in. of the barrier will be compacted to 100 percent MDD. The remaining 18 in. will be compacted to 95 percent of the maximum density to protect the first 6 in. from freeze-thaw effects. In the calculations, this material was assumed to be degraded by freeze-thaw effects, consistent with assumptions for the large tailings pile, except that more conservative values for the porosity and long-term moisture content were used: a larger value of 0.475 was used for the porosity and a smaller value of 15.5 percent was used for the long-term moisture content. The radium activity, emanation coefficient, specific gravity, and mass density are consistent with the approved large tailings pile design and are considered acceptable.

The NRC staff concludes that radon barrier parameters are conservative or are justified based on the site-specific measurements.

#### **North and South Pond Areas**

The north and south pond areas consist of 5.0 and 9.0 ft of tailings sands, respectively. These sands will be covered by a 1.5 ft thick layer of contaminated debris and another layer of tailings sands that will be a maximum of 5.0 ft thick. This layer will then be covered by 5.0 ft of windblown tailings. The radon barrier will consist of 1.7 ft of north borrow soil compacted to 100 percent MDD and 1.5 ft of north borrow soil compacted to 95 percent MDD.

### Contaminated Material Properties

The physical properties of the bottom layer of tailings sands are the same as those for the South Triangle area and are acceptable. The debris layer consists of pipes, pumps, and pond residues. The radium concentration of the residues was determined from five samples that averaged 55 pCi/g. It was assumed that the entire layer of debris had a radium concentration of 55 pCi/g and an emanation coefficient of 0.35, which is the NRC default value. These values are considered acceptable. The derivations of the other physical parameters for this layer were not described. However, these parameters have a negligible effect on the radon flux from the surface because this layer is over 13 ft below the surface, so the parameters used are considered acceptable. The second layer of tailings sands has the same physical parameters as above, except that the porosity value used was 0.4 and the density value used was 1.60 g/cm<sup>3</sup>. The porosity value is equivalent to the NRC default value and is considered acceptable. The higher density value is more conservative than the previously used values, and is considered acceptable. The physical parameters of the windblown tailings are equivalent to those used for the South Triangle area and are considered acceptable.

The NRC staff concludes that contaminated material properties are conservative or are justified based on the site-specific measurements.

### Proposed Barrier

The proposed radon barrier will be constructed of compacted north borrow soil, as approved in the large tailings pile radon barrier redesign. The first 20.2 in. of the barrier will be compacted to 100 percent MDD. The remaining 18 in. will be compacted to 95 percent of the maximum density. This material will be assumed to be degraded by freeze-thaw effects, consistent with the assumptions for the large tailings pile, except that more conservative values for the porosity and long-term moisture content were used: a larger value of 0.475 was used for the porosity and a smaller value of 15.5 percent was used for the long-term moisture content. The radium activity, emanation coefficient, specific gravity, and mass density are consistent with the approved large tailings pile values and are considered acceptable.

The NRC staff concludes that radon barrier parameters are conservative or are justified based on the site-specific measurements.

### **Pond Area Out slopes**

The pond area out slopes will consist of a maximum of 10 ft of tailings sands which are currently covered by an 18 in. interim cover. The out slopes will be covered with 35 in. of north borrow soil compacted to 100 percent MDD and 18 in. of north borrow soil compacted to 95 percent MDD.

### Contaminated Material Properties

Homestake used the same parameters to describe the tailings sands that were used in the South Triangle area, with a maximum thickness of 10 ft. These are acceptable values to use for the tailings sands in this area.

Staff considers that contaminated material properties parameters are conservative or are justified based on the site-specific measurements.

#### Interim Cover

Homestake used the same physical parameters for the interim cover of the small tailings pile that were previously approved for the large tailings pile interim cover. The covers are both made of north borrow soil, so these parameters are acceptable. These values include a porosity of 0.32, a density of 1.80 g/cm<sup>3</sup>, a long-term moisture content of 8 percent, and a diffusion coefficient of 0.0129.

The NRC staff considers that the interim cover parameter values are conservative or are justified based on the site-specific measurements.

#### Proposed Barrier

The proposed radon barrier will be constructed of north borrow soil, as was approved for the large tailings pile radon barrier redesign. The first 35 in. of the barrier will be compacted to 100 percent MDD. The remaining 18 in. will be compacted to 95 percent of the maximum density. This material will be assumed to be degraded by freeze-thaw effects, consistent with the assumptions for the large tailings pile, except that more conservative values for the porosity and long-term moisture content were used: a larger value of 0.475 was used for the porosity, and a smaller value of 15.5 percent was used for the long-term moisture content. The radium activity, emanation coefficient, specific gravity, and mass density are consistent with the approved large tailings pile values and are considered acceptable.

The NRC staff concludes that radon barrier parameters are conservative or are justified based on the site-specific measurements.

#### Radon Attenuation Model

The licensee used the RAECOM computer code to calculate the long-term radon flux. The RAECOM code is an interactive FORTRAN program and is described in NUREG/CR-3533, Radon Attenuation Handbook for Uranium Tailings Cover Design. In 1989, the RAECOM code was modified by the NRC to eliminate cost-benefit optimization, and that code was named RADON. Both programs model radon flux using one dimensional, steady-state gas diffusion theory and are acceptable to determine compliance with regulations.

Table 1 summarizes the input soil parameters used by Homestake in their analyses. The South Triangle area, North and South Pond areas, and the pond area outcrops were modeled by Homestake for this license amendment. The radon flux from the South Triangle area was calculated to be 8.5 pCi/m<sup>2</sup>s. The radon flux from the pond outcrops area was calculated to be 20.0 pCi/m<sup>2</sup>s. The radon fluxes from the North and South Pond areas were calculated to be 20.0 pCi/m<sup>2</sup>s. However, the radon flux emanating from the debris layer of this area was calculated to be a large negative number (-19 pCi/m<sup>2</sup>s). This is not physically realistic, so the flux was recalculated by the NRC staff assuming that the upper layer of tailings sands was the bottom layer of contaminated material. The result of this calculation was a flux of 20.4 pCi/m<sup>2</sup>s for the North and South Pond areas.

Homestake calculated an areal averaged radon flux of 15.7 pCi/m<sup>2</sup>s. Using the higher flux for the North and South Pond areas, an areal averaged radon flux of 15.9 pCi/m<sup>2</sup>s was calculated by the NRC staff. These values are both less than the NRC limit of 20 pCi/m<sup>2</sup>s, so the radon barrier design is considered acceptable.

The licensee performed a series of flux measurements on the pile as it currently exists on the pond outcrops area and the South Triangle area and compared these measurements to the results of RAECOM modeling of the current pile to build confidence that the modeling accurately reflects the actual radon flux. The results of the measurements were similar to and slightly lower than the RAECOM modeling results. This builds confidence that the actual radon flux will not be greater than the flux predicted by the RAECOM code.

Staff considers that the results of the RAECOM modeling are conservative and demonstrate that the radon flux from the final pile will be less than 20 pCi/m<sup>2</sup>s, as required by 10 CFR Part 40, Appendix A, Criterion 6(1).

#### **RECOMMENDED LICENSE CHANGE:**

The staff recommends that a change be made to Source Material License SUA-1471, License Condition 37B to reflect the change in radon barrier thickness required for the small tailings pile. The following language is recommended for the revised license condition:

The radon barrier for the small tailings pile shall be constructed in accordance with material types, thicknesses, and placement criteria described in Homestake Mining Company's Final Radon Barrier Design for the Small Tailings Pile, transmitted to the NRC in August 1996.

Table 1. Summary of the RADON input parameters for the license amendment request

Radon Input Parameters						
Layer	Diffusion Coefficient (cm <sup>2</sup> /sec)	Emanation Coefficient	Density (g/cm <sup>3</sup> )	Porosity	Moisture Content (%)	Specific Gravity
Tailings sands	0.03	0.39	Upper layer of N. and S. Pond: 1.60	Upper layer of N. and S. Pond: 0.40	8	2.65
			All Other Areas: 1.49	All Other Areas: 0.44		
Windblown Tailings	0.0236	0.34	1.50	0.40	8	2.65
Interim Cover	0.0129	*	1.80	0.32	8	2.65
North Borrow soil (95% compaction)	0.01	*	1.51	0.44	15.5	2.70
North Borrow soil (100% compaction)	0.006	*	1.59	0.41	15.5	2.70
North Borrow soil (95%) (freeze-thaw degraded)	0.0138	*	1.42	0.475	15.5	2.70

\* Radium content not input as background level as emanation coefficient value not applicable.

#### ENVIRONMENTAL IMPACT EVALUATION:

An environmental report from Homestake is not required by 10 CFR 51.60(b)(2), since this amendment will not authorize or result in (i) a significant expansion of a site, (ii) a significant change in the types of effluents, (iii) a significant increase in the amount of effluents, (iv) a significant increase in individual or cumulative occupational radiation exposures, or (v) a significant increase in the potential for or consequences from radiological accidents. An NRC staff environmental assessment was not performed since this action is categorically excluded under 10 CFR 51.22(c)(11), as (i) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, (ii) there is no significant increase in individual or cumulative occupational radiation exposure, (iii) there is no significant construction impact, and (iv) there is no significant increase in the potential for or consequences from radiological accidents.

**REFERENCES:**

Homestake Mining Company, 1993. "Reclamation Plan, Revision October 1993." Prepared by AK GeoConsult, Inc. with Jenkins Environmental, Inc., NM: Homestake Mining Company of California, Grants Operation.

Homestake Mining Company, 1995. "Final Radon Barrier Design for the Large Tailings Pile." NM: Homestake Mining Company of California, Grants Operation.

Homestake Mining Company, 1996. "Final Radon Barrier Design for the Small Tailings Pile. Revision April 1996." Prepared by Environmental Restoration Group, Inc. and AK GeoConsult, Inc., Grants, NM: Homestake Mining Company of California, Grants Operation.

Nuclear Regulatory Commission, 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design." NUREG/CR-3533, Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission, 1993. "Final Standard Review Plan for the Review and Remedial Action of Inactive Mill Tailings Sites under Title I of the Uranium Mill Tailings Radiation Control Act, Revision 1." Washington, DC: Nuclear Regulatory Commission.

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purposes and at the places designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Parts. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee

1. Homestake Mining Company

3. License Number

SUA-1471, Amendment No. 27

2. P.O. Box 98  
Grants New Mexico 87020

4. Expiration Date

Until NRC determines site reclamation is adequate.

5. Docket or Reference No.

[Applicable Amendment: 12]  
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6. Byproduct, Source, and/or Special Nuclear Material

7. Chemical and/or Physical Form

8. Maximum Amount that Licensee May Possess at Any One Time Under This License

Uranium

Any

Unlimited

9. Authorized Place of Use: The licensee's uranium mill located in Cibola County, New Mexico, and the licensee's auxiliary ion exchange facility located in McKinley County, New Mexico. [Applicable Amendment: 12]

10. This license authorizes only the possession of residual uranium and byproduct material in the form of uranium waste tailings and other byproduct waste generated by the licensee's past milling operations in accordance with Tables 1 and 3 and the procedures submitted by letter dated September 2, 1993, as modified by letter dated March 7, 1996.

Anywhere the word "will" is used, it shall denote a requirement.

[Applicable Amendments: 1, 2, 12, 24]

11. DELETED by Amendment 21.

12. Periodic embankment inspections of the large and small tailings embankment shall be conducted by knowledgeable individuals who are familiar with the site and mining operations. An annual status report shall be included in the Semi-Annual Environmental Report for the second half of the year.

[Applicable Amendments: 2, 12, 14, 24]

13. DELETED by Amendment No. 27.

14. Any equipment, supplies or manpower that come in contact with tailing sand and/or slimes will be determined to be free of radioactive material by a personal scan and equipment decontamination. [Applicable Amendment: 21]

15. The results of all effluent and environmental monitoring required by this license

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shall be reported in accordance with 10 CFR 40, Section 40.65, with copies of the report sent to the NRC. Monitoring data shall be reported in the format shown in the attachment to SUA-1471 entitled, "Sample Format for Reporting Monitoring Data." All ground-water monitoring data shall be reported as described in License Condition No. 35. [Applicable Amendments: 5]

16. Before engaging in any activity not previously assessed by the NRC, the licensee shall prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not previously assessed or that is greater than that previously assessed, the licensee shall provide a written evaluation of such activities and obtain prior approval of the NRC in the form of a license amendment.
17. Prior to termination of this license, the licensee shall provide for transfer of title to byproduct material and land, including any interests therein (other than land owned by the United States or the State of New Mexico), which is used for the disposal of such byproduct material or is essential to ensure the long-term stability of such disposal site, to the United States or the State of New Mexico, at the State's option.
18. DELETED by Amendment No. 27.
19. DELETED by Amendment No. 17.
20. DELETED by Amendment No. 21.
21. The site Radiation Protection Administrator (RPA), who is responsible for conducting the site radiation safety program, shall possess the minimum qualifications as specified in Section 2.4.1 of Regulatory Guide 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be As Low As is Reasonably Achievable." [Applicable Amendment: 27]
22. The results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in the NRC regulations, all such documentation shall be maintained for a period of at least 5 years.
23. Standard procedures shall be established for all activities involving radioactive materials that are handled, processed, or stored. Procedures shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for environmental monitoring, bioassay analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the area to which it applies.

All written procedures shall be reviewed and approved in writing by the RPA before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the RPA

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shall perform a documented review of all existing procedures at least annually.

[Applicable Amendment: 27]

24. The licensee shall be required to use a Radiation Work Permit (RWP) for all work or nonroutine maintenance jobs where the potential for significant exposure to radioactive material exists and for which no standard written procedure already exists. The RWP shall be approved by the RPA or his designee, qualified by way of specialized radiation protection training, and shall at least describe the following:
- A. The scope of work to be performed.
  - B. Any precautions necessary to reduce exposure to uranium and its daughters.
  - C. The supplemental radiological monitoring and sampling necessary prior to, during, and following completion of the work.
25. DELETED by Amendment No. 21.
26. Mill tailings, other than small samples for purposes such as research or analysis, shall not be transferred from the site without specific prior approval of the NRC in the form of a license amendment. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
27. DELETED by Amendment No. 21.
28. The licensee shall maintain an NRC-approved financial surety arrangement consistent with 10 CFR 40, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, reclamation of tailings or waste disposal areas, ground-water restoration, and the long-term surveillance fee. Within 3 months of NRC approval of a revised reclamation plan, the licensee shall submit for NRC review and approval a proposed revision to the financial surety arrangement if estimated costs for the newly approved plan exceed the amount covered in the existing financial surety. The revised surety arrangement shall then be in effect within 3 months of written NRC approval.

Annual updates to the surety amount by 10 CFR Part 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least 3 months prior to the anniversary date, which is designated as June 30 of each year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of costs and the basis for the cost estimate. The attachment to the license entitled, "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates," outlines the minimum considerations used by the NRC in the review of site closure cost estimates.

The licensee's currently approved surety, a Parent Company Guarantee issued by Homestake Mining Company, shall be continuously maintained in an amount no less

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than \$24,000,000 for the purpose of complying with 10 CFR 40, Criteria 9 and 10, until a replacement is authorized by the NRC. The use of a parent company guarantee necessitates an evaluation of the corporate parent as part of the annual surety update. In addition to the cost information required above, the annual submittal must include updated documentation of the (1) letter from the chief financial officer of the parent company, (2) auditor's special report confirmation of chief financial officer's letter, (3) schedule reconciling amounts in chief financial officer's letter to amounts in financial statements, and (4) parent company guarantee if any changes are appropriate.

[Applicable Amendments: 9, 12, 23, 24, 26]

29. The licensee shall decommission the Homestake Uranium Mill in accordance with Section 2 of the reclamation plan dated January 1991; the licensee's August 28, 1991, response to comments 1-10 of the NRC's August 2, 1991, letter; and Technical Specifications B1 and B2 of the reclamation plan as revised on April 3, 1992. In addition, the licensee shall perform a soil cleanup verification gamma survey and soil sampling program as specified in the submittal of September 15, 1994, and as modified by the submittal of December 13, 1994. [Applicable Amendment: 20]

A. Deleted by Amendment No. 20.

B. Deleted by Amendment No. 20.

C. Deleted by Amendment No. 20.

D. The licensee shall use only soils obtained from borrow areas outside the restricted area which have not been impacted by site operations to cover the mill disposal area. The location of these borrow areas shall be documented.

E. The licensee shall implement a quality control (QC) program for the soil cleanup verification program which consists of recounting using offsite gamma spectroscopy equipment or chemical analysis by a vendor laboratory of at least 15 percent of all soil samples collected. In addition, a minimum of 5 percent of the QC samples shall be chemically analyzed. Results of the QC program shall be evaluated by the Radiation Protection Administrator and the evaluation documented at least monthly during the verification sampling program.

F. All decommissioning activities shall be documented. Within 90 days following the completion of mill demolition and disposal activities, the licensee shall submit to the NRC a report documenting the activities and providing summaries of all data generated as part of the radiation safety program for mill decommissioning. In addition, within 90 days following the completion of the soil cleanup and verification program, the licensee shall submit to the NRC a report documenting the cleanup activities and providing the results of all soil sampling and gamma surveys conducted to verify the adequacy of cleanup.

[Applicable Amendment: 15]

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30. DELETED by Amendment No. 21.

31. DELETED by Amendment No. 27.]

32. The licensee shall comply with the following:

A. DELETED by Amendment No. 27.

B. Analysis of urine samples shall utilize an LLD of at least 5 ug/l uranium.

C. A copy of the report documenting the annual ALARA audit shall be submitted to the NRC, review within 30 days of completion of the audit.

[Applicable Amendment: 2]

33. DELETED by Amendment No. 21.

34. DELETED by Amendment No. 4.

35. The licensee shall implement a compliance monitoring program containing the following:

A. Implement the monitoring program shown in Table 2 of the licensee's September 2, 1993 submittal and Table 3 of the licensee's January 9, 1995, submittal.

B. Comply with the following ground-water protection standards at brine evaporation pond point-of-compliance Wells D1 and BP, at the inactive tailings impoundment point-of-compliance Wells Y and X, and at the active tailings impoundment point-of-compliance Wells S4, S3, M5, and DQ with background being recognized in Well P:

chromium = 0.06 mg/l, molybdenum = 0.03 mg/l, selenium = 0.10 mg/l, vanadium = 0.02 mg/l, uranium = 0.04 mg/l, radium-226 and -228 = 5.0 pCi/l. and thorium-230 = 0.10 pCi/l.

C. Implement the corrective action program described in the September 15, 1989, submittal due to exceeding ground-water protection standards, with the objective of returning the concentrations of chromium, molybdenum, selenium, thorium-230, uranium, and vanadium to the concentration limits specified in 35(B) above.

D. Operate the lined evaporation pond and enhanced evaporation system as described in the June 8 and 28, 1990, submittals.

E. Submit a semiannual ground-water monitoring report in accordance with the reporting requirements of 10 CFR 40.65. Also, submit, by February 28 of each year, a performance review of the corrective action program that details the progress towards attaining ground-water protection standards.

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[Applicable Amendments: 3, 4, 5, 7, 8, 10, 11, 16, 21]

36. The licensee shall complete site reclamation in accordance with an approved reclamation plan. The ground-water corrective action plan shall be conducted as authorized by License Condition No. 35. All activities shall be completed in accordance with the following schedules.

A. To ensure timely compliance with target completion dates established in the Memorandum of Understanding with the Environmental Protection Agency (56 FR 55432, October 25, 1991), the licensee shall complete reclamation to control radon emissions as expeditiously as practicable, considering technological feasibility, in accordance with the following schedule:

(1) Windblow tailings retrieval and placement on the pile:

For the Large Impoundment - December 31, 1996.

For the Small Impoundment - May 31, 1997.

(2) Placement of the interim cover to decrease the potential for tailings dispersal and erosion:

For the Large Impoundment - December 31, 1996.

For the Small Impoundment - May 31, 1997.

(3) Placement of final radon barrier designed and constructed to limit radon emissions to an average flux of no more than 20 pCi/m<sup>2</sup>/s.

For the Large Impoundment which has no evaporation ponds - December 31, 2003.

For the Small Impoundment, tailings pile surface areas are essentially covered by evaporation ponds constructed as part of the ground-water corrective action program. Prior to December 31, 2012, the areas not covered by the evaporation ponds shall have final radon barrier in place. Final radon barrier placement over the entire pile shall be completed within 2 years of completion of ground-water corrective actions.

[Applicable Amendment: 25]

B. Reclamation, to ensure required longevity of the covered tailings and ground-water protection, shall be complete as expeditiously as is reasonably achievable, in accordance with the following target dates for completion:

(1) Placement of erosion protection as part of reclamation to comply with Criterion 6 of Appendix A of 10 CFR Part 40:

For the Large Impoundment - September 30, 2004.

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

License Number

SUA-1471, Amendment No. 2000

Docket or Reference Number

40-8903

For the Small Impoundment - September 30, 2013.

{Applicable Amendment: 25}

- (2) Projected completion of ground-water corrective actions to meet performance objectives specified in the ground-water corrective action plan - May 1, 2010.
- C. Any license amendment request to revise the completion dates specified in Section A must demonstrate that compliance was not technologically feasible (including inclement weather, litigation which compels delay to reclamation, or other factors beyond the control of the licensee).
- D. Any license amendment request to change the target dates in Section B above, must address added risk to the public health and safety and the environment, with due consideration to the economic costs involved and other factors justifying the request such as delays caused by inclement weather, regulatory delays, litigation, and other factors beyond the control of the licensee.

{Applicable Amendment: 13, 22}

- 37. The licensee shall reclaim the large and small tailings impoundments as stated in their October 29, 1993, submittal, including the following requirements.
  - A. The radon barrier for the large tailings pile shall be in accordance with material types, thicknesses and placement criteria described in Homestake Mining Company's *Final Radon Barrier Design for the Large Tailings Pile*, submitted June 16, 1995.
  - B. The radon barrier for the small tailings pile shall be constructed in accordance with material types, thicknesses, and placement criteria described in Homestake Mining Company's *Final Radon Barrier Design for the Small Tailings Pile*, transmitted to the NRC in August 1996 {Applicable Amendment: 27}.
  - C. The licensee shall submit a construction quality control program for NRC review and approval prior to placing any portion of the radon barrier that will ensure that the specification which limits the activity of the radon barrier material to 5 pCi/g above background is not exceeded.
  - D. The construction quality assurance and control program shall be as defined in the Staff Technical Position On Testing and Inspection (NRC, 1989). The acceptable correlation between ASTM D 2922 and ASTM D 1556 shall be as defined in the licensee's April 30, 1992, submittal.
  - E. The radon barrier shall not be placed on the top surface of the large tailings impoundment until the settlement has been demonstrated to be at least 90 percent of expected settlement, and the results of this determination have been reviewed and accepted by the NRC. The radon barrier

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may be placed on the large impoundment side slopes following final grading of the impoundment. Care shall be taken to preclude the possibility of ponding. Before the erosion protection is placed, it shall be verified that the radon barrier material meets the specifications.

- G. The adequacy of the erosion protection proposed for the side slopes of both the large and small impoundments shall be reevaluated considering any increases in impoundment heights due to the revised radon attenuation cover design.
- H. DELETED by Amendment No. 21.
- I. A completion report shall be provided within 6 months of the completion of construction. This report, including as-built drawings, shall verify that reclamation of the site has been performed according to the approved plan. The report shall also include summaries of results of the quality assurance and control testing to demonstrate that approved specifications were met.

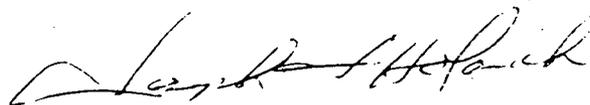
[Applicable Amendments: 14, 21, 22]

- 38. The licensee is authorized to use water collected as part of the site ground-water corrective action program for conditioning soils during placement of the interim cover or the radon barrier on the tailings impoundments. The licensee shall also analyze samples of the collection water being used for this purpose for radium-226 and 228 content semiannually. If sample results exceed 30 pCi/l combined radium, the licensee shall perform an evaluation of the potential impacts of using this water on the required design of the radon barrier and submit the evaluation for NRC review within 30 days of receipt of sample results. [Applicable Amendment: 18]
- 39. The licensee is authorized to construct and operate a lined evaporation pond, located between the existing evaporation pond (#1) and the existing brine ponds, in accordance with plans and commitments contained in submittals and correspondence from Homestake Mining Company dated July 26, 1994; August 16, 1994; August 29, 1994, and September 2, 1994; and September 15, 1994. Final reclamation shall consist of movement of liner and dike material to the small tailings impoundment. Underlying soils will be sampled for radium-226 content, and if above site standard of 5.5 pCi/gram, soils will be excavated and placed on the small impoundment. [Applicable Amendment: 19, 27]

FOR THE NUCLEAR REGULATORY COMMISSION

Date

Sept 25, 1997



Joseph J. Holonich, Chief  
Uranium Recovery Branch  
Division of Waste Management  
Office of Nuclear Material Safety