

SAFETY EVALUATION REPORT
FOR ISSUANCE OF
SOURCE MATERIAL LICENSE
EVEREST MINERALS CORPORATION
HIGHLAND URANIUM PROJECT
CONVERSE COUNTY, WYOMING
DOCKET NO. 40-8857
LICENSE NO. SUA-1511

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1.0 INTRODUCTION

In July 1984, Everest Minerals Corporation (EMC) applied for a new source material license. Several corporate decisions were made by the EMC staff which ultimately delayed the actual license issuance process until late 1985. However, by letter dated December 30, 1985, EMC submitted a complete license application. Concurrent with this request, the USNRC began environmental and safety review of the application materials.

1.1 Description of the Proposed Action

The proposed action is to secure a source material license for the commercial operation of an in situ leach uranium mine at the Highland Uranium project. Pending successful issuance of the license, EMC intends to solution mine approximately 120 acres of 3400 acres over which they control mineral access.

1.2 Background Information

Two in situ pilot mines have been operated at the Highland Uranium Project by Exxon Coal and Minerals Company. The first pilot, described in the Final Environmental Statement Related to Operation of Highland Uranium Solution Mining Project, November 1978, NUREG-0489, was operated from March 1, 1972 to November 7, 1974, and restored from 1974 through July 15, 1982. Because of the high chemical concentrations utilized in the lixiviant, restoration was unusually long and of marginal success. The second pilot, the R&D Expanded Pilot, operated from December 16, 1978, to September 30, 1981. This pilot demonstrated the technical feasibility of mining, the ability to control leach fluids within the mining zone, and the restorability of the affected ground water. An indepth discussion of the latter effort is included in the environmental assessment which accompanies this Safety Evaluation Report.

EMC's proposed project will utilize the existing infrastructure of the Highland facilities associated with Exxon's Operations. Within this complex, which formerly housed a uranium mill, a solution mining operation will be constructed and operated.

In situ mining is proposed for ore bodies distributed within a 3400 acre area with proposed wellfields covering approximately 120 acres, or 4 percent, of that total area.

1.3 Review Scope

This review will utilize the data collected during previous R&D in situ mining efforts at the site as well as appropriated data gathered from the operation of the Exxon Highland Uranium Mill.

Much of this data is directly applicable to the EMC proposal because they will be utilizing the equipment, buildings, and overall infrastructure remaining from the Exxon project.

This document will therefore detail the staff's review of in-plant radiological safety of the proposed commercial operation. The review will include a staff analysis of the license application as well as previous operational monitoring data for the facility.

2.0 AUTHORIZED ACTIVITIES

The pending review process and subsequent issuance of a source material license will authorize commercial operation of the Highland facility. Uranium will be extracted from the ore body by a sodium bicarbonate lixiviant at a rate of up to 3200 gallons per minute (gpm). The uranium rich solution will be extracted, concentrated, dried, and packaged on-site into a final U_3O_8 product.

2.1 Facility Description

EMC's proposed in situ project is located in the southern Powder River Basin of east central Wyoming, in central Converse County. The project is about 25 miles north of Douglas and 24 miles northeast of Glenrock. Access to the site is via Wyoming Highways 95 and 93 and the Highland Loop Road which are all paved to the EMC property.

Figure 1 shows the location of the project in eastern Wyoming, and Figure 2 is a detailed location map of the proposed facilities at the project site.

The research and development phase of the Highland facility occupied approximately 10 surface acres. As previously discussed, two R&D efforts were undertaken: the original R&D pilot and the expanded R&D pilot. Concurrent with the early stages of the site research and the testing in the patterns discussed above, data was being gathered on the minability and restoration character of the ore bearing zone. Additionally, operational data from components of the mill which will support the commercial in situ development were also being collected.

2.2 Operations

EMC proposes to proceed with commercial in situ mining operations with the first phase of the commercial scale operation producing approximately 500,000 pounds U_3O_8 per year; this production rate is planned to expand to 1,000,000 pounds U_3O_8 per year after 4 years. During commercial operation, injection wells, recovery wells, and

monitor wells will be installed in the ore zones. The wellfield size will be determined by the flows and concentrations achievable, as demonstrated from the in situ pilot operation and the local hydrologic data. In the first wellfield area, the recovered fluids will flow to a header house via buried pipelines, and will then be piped to the main process facility (MPF) which will be housed in the existing mill building. Within the MPF, the recovered water will be circulated through ion exchange (IX) columns where the uranium in solution will be removed and loaded on the IX resin. Following the loading, the IX resin will be stripped of the uranium. The stripped, or barren, water will be fortified with carbon dioxide, piped back to the wellfield via a return pipeline, and fortified with gaseous oxygen prior to reinjection into the ore zone. This procedure will continue until the mining area is depleted of uranium.

The IX columns and elution equipment are to be located inside the MPF. After loading of the IX resin, the resin will be eluted (stripped). The pregnant eluate containing the uranium will then be thickened, washed, dried, and packaged in preparation for market. All process steps will be conducted on site.

The general process circuit configuration is shown in Figure 3. The configuration of this process circuit has been reviewed by the USNRC staff, and it represents a typical circuit for this type of operation. To assure that the process circuit is not changed without adequate health and safety considerations, the licensee will be required by license condition to submit all proposed circuit changes to the USNRC for review and approval.

The main process facility is designed for a 3200 gpm throughput capacity with a nominal yellowcake production capacity of 1,000,000 pounds U_3O_8 per year. The estimated project schedule projects 500,000 pounds U_3O_8 per year in years 1 and 2; 750,000 pounds U_3O_8 per year in years 3 and 4; and 1,000,000 pounds U_3O_8 per year in subsequent years. To maintain 1,000,000 pounds U_3O_8 per year throughput, additional wellfield areas on adjacent lands controlled by EMC are anticipated to be added to the permit area. To assure that these areas have similar mining characteristics as the adjacent areas of the licensee will be required to submit an appropriate license amendment for review and approval. An indepth discussion of the mining characteristics associated with the ore zone is contained in the accompanying Environmental Assessment.

3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

3.1 Organization

A partial organization chart of EMC depicting the relationships of the organizational components responsible for operations, environmental protection, and radiation safety at the Highland site is shown in Figure 4. The licensee will be required by license condition to maintain this corporate structure. Should the licensee seek to alter the organizational structure, an appropriate license amendment will be required.

The Corporate Vice President/Production Manager (VP/PM) has the executive authority and ultimate responsibility for all activities at the Highland Uranium Project.

The Corporate Environmental Manager reports to the Corporate VP/PM and is responsible for overall coordination of licensing, permitting, environmental protection, and monitoring programs. He advises all other Corporate functions on environmental protection, radiation safety, and regulatory compliance matters.

The Corporate Chief Engineer reports to the Corporate VP/PM and has overall responsibility for engineering and technical support for the Highland Uranium Project.

The Corporate Radiation Safety Officer (RSO) reports to the Corporate Environmental Manager and is responsible for establishing and implementing effective environmental, radiation safety, and license compliance programs. Further, until EMC commences uranium production operations at the Highland Uranium Project, the Corporate RSO will function as, and assume the responsibilities of the Highland site RSO.

The Highland Uranium Project Mine Manager reports to the Corporate VP/PM and is directly responsible for all Highland site activities, including wellfield and process facilities operations, industrial and radiation safety, and environmental protection.

The Highland Site RSO reports to the Highland Mine Manager and is directly responsible for administering established environmental protection and radiation safety programs for the Highland site. The Highland Site RSO directs the activities of the Highland site environmental/radiation safety staff who conduct radiological surveys, collect environmental samples and data for radiation safety programs, perform laboratory analyses and calculations of employee radiation exposures, conduct radiation safety training, and maintain respective records. Each member of the staff, including the RSO,

has authority to suspend any operation of work activity that poses potential radiation and/or environmental hazards until appropriate resolution of the situation has been achieved.

3.2 Radiation Safety Staff and Responsibilities

The Highland Site RSO has direct responsibility for the implementation of all radiation and safety protection procedures, equipment and controls, including emergency procedures. As previously discussed, the RSO is responsible for the collection and interpretation of employee exposure related monitoring data and the proper recording and reporting of such. The RSO will conduct routine training programs for the supervisors and employees with regard to the proper application of radiation protection, nuclear safety, and environmental control procedures. Peer reviews will be supplied by the Corporate RSO.

The Corporate RSO is responsible for the development, administration, and enforcement of all radiation protection programs at the Highland site. The Corporate RSO will develop and administer corporate radiation protection and nuclear safety programs to ensure that (1) employees are afforded the optimum practical protection against related hazards, (2) exposure of employees to radiation and radioactive materials is as low as reasonable achievable, and (3) all regulatory requirements are met.

3.3 Minimum Technical Qualifications for Radiation Safety Staff

EMC has proposed the following minimal qualifications and experience for personnel that will be assigned the responsibility of developing, conducting, and administering the Highland site radiation safety program:

Highland Mine Manager

The position of Mine Manager requires a Bachelors degree in science or engineering or equivalent work experience of 5 years supervisory experience. Work experience should include industrial process/production experience and industrial process/production management.

Corporate Radiation Safety Officer

The Corporate RSO will have a bachelor's degree in the physical or biological sciences, mathematics, or engineering from an accredited college or university, and a minimum of 3 years of experience in applied radiation protection work.

Highland Site Radiation Safety Officer

The Highland Site RSO will have a bachelor's degree in the physical or biological sciences, mathematics, or engineering from an accredited college or university, or an equivalent combination of professional education and experience. A year of experience in applied radiation protection work is considered equivalent to 2 years of professional education.

The Highland Site RSO is the individual that carries full responsibility of the day-to-day radiation safety aspects of the operation. Due to this responsibility, the USNRC will require by license condition that this individual receive a minimum of 2 weeks of formal radiation safety or health physics training on an annual basis. Prior to hiring of this individual, the staff will require by license condition that the individual's experience, education, and specialized training be submitted to the USNRC for review and approval.

3.4 Administrative and Operating Procedures

All principal work assignments will be conducted in accordance with written operating procedures. Supervisory and management personnel will routinely observe their employees at work and thus will be able to ensure adherence to the written procedures. All new operating procedures which may affect radiation safety will be reviewed by the radiation safety staff. Review and approval of operating procedures by the RSO will be done at least annually to ensure that radiation exposures are maintained as low as is reasonable achievable.

A copy of the updated written procedures will be required by license condition to be kept in the areas of the production facility where they are used. The licensee will be further required by license condition to have all operational and nonoperational activities reviewed and approved in writing by the RSO and the Corporate Radiation Protection Officer prior to implementation.

Nonroutine work or maintenance activities which may result in personnel exposure to radioactive materials will be carried out in accordance with special work procedures. These procedures will involve contacting the environmental/radiation protection staff prior to the start of work. A member of the Highland environmental/radiation protection staff will survey the area for radiation and/or contamination levels, as appropriate, and conduct a discussion of precautions to be taken during the activity to keep personnel exposures as low as is reasonably achievable. Job supervisors will direct the work in such a manner as to minimize exposure to radiation or airborne radioactive materials. Air

samples will be taken as necessary to evaluate the exposures of all involved personnel. Additionally, techniques such as the use of respirators will be used to reduce exposures.

To assure that nonroutine work or maintenance activities are properly documented, the licensee will be required by license condition to complete a special work procedure (Radiation Work Permit) form prior to conducting the task. Furthermore, the review of the work environment and radiation levels will be required by license condition to be conducted by the RSO or a trained and qualified designate.

3.5 Audits and Inspections

3.5.1 Inspections and Monthly Audit

The Highland Site RSO or designated health physics technician will conduct a daily walk-through inspection of all work and storage areas of the MPF to ensure proper implementation of good radiation safety procedures. Additionally, the Highland Site RSO will conduct weekly inspections of all work and storage areas; his findings pertaining to compliance with license requirements and radiation safety practices will be documented.

A monthly compliance report will be prepared by the Highland Site RSO; these reports will be submitted to the Mine Manager and the Corporate RSO. The Corporate RSO will review and evaluate these reports and consult with the Highland Site RSO as appropriate. The reports, along with any additional evaluation, will be forwarded to the Corporate VP/PM, the Corporate Chief Engineer, and the Corporate Environmental Manager for their review and assessment. Additionally, the licensee will be required by license condition to include a summary of all inspection and audit results in the annual ALARA audit.

3.5.2 ALARA Audit

An annual ALARA audit of the plant operations will be conducted under the direction of the Corporate RSO. The licensee has committed to performing an annual ALARA audit which addresses the topics discussed in Section 2.3.3 of Regulatory Guide 8.31. This will include the following:

- ° employee exposure records (external and time-weighted calculations),

- ° bioassay results,
- ° inspection log entries and summary reports of daily, weekly, and monthly inspections,
- ° documented training program activities,
- ° radiation safety meeting reports,
- ° radiological survey and sampling data,
- ° reports on overexposure of workers submitted to NRC, Mine Safety and Health Administration (MSHA), or State of Wyoming, and
- ° operating procedures that were reviewed during this time period.

The report on the annual radiation protection and ALARA audit should specifically discuss the following:

- ° trends in personnel exposures for identifiable categories of workers and types of operational activities,
- ° whether equipment for exposure control is being properly used, maintained, and inspected, and
- ° recommendations on ways to further reduce personnel exposures from uranium and its daughters.

The licensee will be required by license condition to submit a copy of the annual ALARA audit to the USNRC for staff review. The submittal to the NRC will allow for staff review of the licensee's ALARA audit program and make an independent decision on the adequacy of the program.

3.6 Radiation Safety Training

All site employees at the Highland plant will be administered a training program on radioactive material handling and radiological safety. This training will be administered in keeping with standard radiological protection guidelines as detailed in Section 2.5 of Regulatory Guide 8.31. Because the licensee has committed to this program, the training will consist of the following:

- Fundamentals of Health Protection
- Personal Hygiene at Uranium Mills
- Facility Provided Protection
- Health Protection Measurements
- Radiation Protection Regulations
- Mill Emergency Procedures

Additionally, the licensee will be required by license condition to document all training and maintain records on file of the content and results of the training.

4.0 RADIATION SAFETY CONTROLS AND MONITORING

4.1 Ventilation and Effluent Control

At the Highland site, there are two major radioactive effluents: radon gas from the production solutions and uranium particulates from the drying and packaging area as well as the dryer stack. Radon gas will be released primarily in the recovery tanks and associated process equipment. To cope with this situation, all tanks will be covered and individually vented to the atmosphere.

The atmospheric venting is designed to minimize personnel exposures. In addition to the specific venting, the plant building is equipped with five general area exhaust fans. These fans are 36-inch diameter vents with a combined flow rate of 64,000 cfm. Due to the heat load that these units would draw during winter months, they will only be utilized if the individual venting fails to reduce radon to acceptable levels.

In addition to the individual vents and general area exhaust fans, two separate ventilation and exhaust systems are located in the yellow cake drying and packaging area. As a consequence of their negative pressure design, they will also draw air from the process building and therefore aid in ventilation of the process building.

The packaging area ventilation/scrubber system collects and cleans air fumes and particulates in these areas. Subsequently, the exhaust is discharged to the atmosphere through a 6-inch diameter stack with a flow rate of 600 cfm.

A second and independent duct system services the yellowcake dryer area. Exhausts from this system are discharged to the atmosphere through an 18.5-inch diameter stack which extends above the process building roof. Design intake of the scrubber is 3,300 cfm with an efficiency in excess of 99 percent. The licensee will be required by license condition to have the scrubber in operation during all times when product drying is taking place. Furthermore, the

observations of the scrubber controls or an audible alarm will be required to assure that the scrubber is functioning as designed.

4.2 In-Plant Monitoring Data

Previous in-plant monitoring for particulates and radon gas indicate that the ventilation systems are very efficient in removing these radionuclides from the process building. Because the previous monitoring is based upon milling of uranium ore and not the proposed solution extraction techniques, the data is not entirely applicable to the proposed action.

To determine the levels of radon and uranium that are present within the process building and associated ancillary facilities, EMC proposes to sample the air in five locations: the elution area, dryer room, drumming area, precipitant and clarification area, and the satellite facilities.

The elution area and satellite facilities will have radon daughters measured at floor level and on the upper catwalk equidistant from the vessels. The dryer room and drumming area will have continuous sampling of uranium during operation. This sampling will utilize a low volume pump, the results of which will be used in determining employee exposures.

Because the concentration of uranium particulates and radon can only be predicted from previous operational data, the staff will require by license condition that EMC sample at the previously discussed locations on a weekly frequency to characterize the typical concentrations with the facility. Furthermore, the licensee will be required to submit this data to the USNRC for review within 30 days of its collection. Staff review of this data will indicate if additional areas will need to be sampled.

4.3 Personnel Monitoring Data

The calculation of internal exposure to radon or its daughters and uranium will be based on a time-weighted exposure (TWE) calculation incorporating a consideration of both occupancy time and average airborne concentration. Occupancy factors will be determined from actual time card data rather than based upon a time study approach. Occupancy times will also additively consider exposures from nonroutine or clean up operations that are covered by radiation work permits. The licensee will also be required by license condition to perform and document within 1 week of the end of each regulatory period, occupational exposure calculations.

Average airborne concentrations of radon or its daughters and uranium will be determined based upon monthly air samples. An exception to this is within the drying and packaging area where employees will log in and out. Due to this, actual airborne radionuclide concentrations will be utilized for these time periods spent by employees in these areas.

Occupancy factors and airborne concentrations will be determined on employee exposure. The exposure calculation will be based upon MPC hours. All exposure calculations will be maintained in the employee's personnel files and reviewed on a quarterly basis to assure that no employee exceeds the regulatory limit of 520 MPC-hours in a calendar quarter. As previously discussed, a weekly exposure determination will be required to assure that the 40-hour control limit for soluble uranium has not been exceeded.

Should exposures exceed applicable regulatory limits, EMC will be required by license condition to conduct an investigation into the possible causes. Additionally, necessary corrective actions will be required by EMC to assure that future exposures are as low as reasonably achievable. Furthermore, the licensee will be required by license condition to maintain all survey and monitoring data as well as reports on audits and operations for a minimal period of 5 years. This will allow the licensee to review operational records and determine if the plant data shows any radionuclide concentration trends.

EMC provided minimum details on the manner in which worker exposures due to inhalation and ingestion of airborne radon or its daughters and radioactive particulates of uranium would be determined. The regulations within 10 CFR 20.103(a)(1) and (2) require the control and assessment of exposure to radon and its daughters on a calendar year basis; whereas, the soluble form of uranium (yellowcake) must be evaluated and controlled on the basis of a 40-hour work week. The staff will require by license condition that 90 days prior to operation of the facility, a complete set of procedures for determining internal exposure be submitted to the USNRC for review and approval.

4.4 External Radiation Control Program

4.4.1 External Radiation Surveys

During previous commercial scale operations at the Highland facility, area thermoluminescent dosimeters (TLDs) were used to determine the need for personnel monitoring throughout the plant. Several dosimeters were placed in the processes and warehouse areas.

As previously discussed, this mill monitoring data has little or no application to the EMC proposal. Therefore, the licensee will be required by license condition to propose TLD monitoring locations based upon final facility renovation.

4.4.2 Exposure to External Radiation

Limited external exposure records are available for the previous operation of the Highland site; however, as previously discussed, they have little or no application to the renovated facility which will be utilized. Therefore, the TLD monitoring sites, as proposed in the previous section, will be evaluated by the staff.

The TLD data as well as the results of a gamma survey throughout the monitored buildings will be evaluated to identify any areas accessible to personnel where the gamma exposure rates meet the definition of a "radiation area" as stated in 10 CFR 20.202(b)(2). If such an area is identified, EMC will appropriately post it.

4.5 Internal Radiation Control Program

4.5.1 Airborne Radioactivity Surveys

EMC's proposed in-plant air monitoring program consists of monthly sampling for radon or its daughters and uranium. However, as previously discussed, the staff considers this frequency to be inadequate and will, therefore, require by license condition that the licensee sample weekly to characterize the air at the sample locations.

The process building is vented to the atmosphere to control potential buildup of radon concentrations. Data acquired during operations indicate that previous milling particulates within the process building are extremely low. The potential does, however, exist for significant uranium particulate concentrations to exist in the drying and packaging area. To help control this, air is drawn through the drying and packaging area and, therefore, maintains a lowered air pressure in this area. To ensure that this negative pressure is maintained and that the scrubbing system is functioning, the staff will require by license condition that the system be equipped with an audible alarm that will sense a drop in airflow rate or other malfunction, or that the system have its operation checked and documented every four (4) hours.

4.5.2 Exposure to Internal Radiation

Radiation exposures at the various worker stations are primarily a function of the time spent at the station and the concentration of uranium and radon or its daughters. As previously discussed, the licensee has provided venting of the facility to limit the amount of radionuclides contained in the facility as well as limit the amount of radionuclides contained in the various enclosed areas. EMC proposes to sample airborne uranium in the dryer room, drumming area, and the precipitation and clarification area monthly. The staff considers the proposed areas to represent those locations in the process building where uranium particulates could be present. However, as previously discussed, EMC will be required by license condition to perform air sampling on a weekly frequency.

EMC plans to utilize a special work permit for all nonroutine work and maintenance tasks. They will consider the exposure determinations associated with these requests as an additional employee exposure. Due to this, each special work permit will be required by license condition to have a calculation of the radionuclides present in the work environment air.

4.5.3 Respiratory Protection Program

No respiratory protection program has been proposed by EMC. However, they have proposed in their application to dry and package yellowcake on site. Therefore, the staff will require by license condition that 3 months prior to commercial operation of the facility, the licensee submit for review and approval a respiratory protection program. Furthermore, the licensee shall be prohibited from utilizing the drying and packaging components of the facility until an appropriate respiratory protection program is reviewed and approved by the USNRC.

4.6 Bioassay

A. Urinalysis

The purpose of the bioassay program is to confirm the effectiveness of the radiation protection programs and to verify the results of the calculated exposures. EMC has proposed to collect urine samples from all personnel. These employees would then have an initial uranium action level of 15 micrograms per liter. The staff has determined that the

routine urinalysis program is insufficient to adequately verify calculated exposures. The staff will, therefore, require by license condition all employees have a baseline urine sample taken prior to their initial assignment at the site. Furthermore, monthly samples will be required of all employees routinely entering the process area. Sampling of all employees working in the process area will assure that adequate data exists to determine if a potential overexposure has been caused.

The staff will further require by license condition that urine samples be analyzed by vendors capable of detecting 5 micrograms of natural uranium per liter. Similarly, blanks and spikes will be required to be submitted with each group of urine samples as a quality control measure.

B. In Vivo Analysis

EMC has not proposed to perform in vivo counting. A staff review indicates that it is not in conformance with Regulatory Guide 8.22. The staff will, therefore, require by license condition that EMC's bioassay program involve in vivo counting of all personnel who routinely work in the mill process area upon initial assignment to the facility and at least every 2 years thereafter.

4.7 Contamination Control

4.7.1 Personnel Contamination

EMC will require all employees leaving the yellowcake production areas to change clothing and shower or monitor themselves for alpha contamination. Failure to meet the maximum radiation level of 1000 dpm/100 cm² requires the employees to decontaminate and resurvey themselves. The staff has determined that the personnel contamination program should include surveying of all people leaving the process building and the yellowcake area and documented alpha contamination spot checks on a quarterly frequency. The staff will, therefore, require this procedure by license condition.

4.7.2 Surface Contamination

EMC has proposed to survey designated eating areas, change rooms, and office areas for contamination monthly. Detection of alpha activity significantly above background will be an indication that increased cleanup effort is

warranted. A contamination level of 10 dpm/cm² will be used as a guideline for restricting use of areas for eating purposes unless it is determined that the contamination is fixed. For fixed activity, the guideline will be an average value of 50 dpm/cm² and a maximum level of 150 dpm/cm². Detection of contamination in such areas exceeding these levels will result in decontamination of respective areas.

The staff has determined that this program is inadequate to assure that areas are adequately sampled for contamination. The staff will, therefore, require by license condition that if removable alpha contamination exceeds 1000 dpm/100 cm², the area will be decontaminated. Furthermore, there is no commitment to survey the production areas. The staff will, therefore, require by license condition that the licensee daily inspect the drying and packaging area for yellowcake and that all other production areas be monitored monthly.

The staff will also require the licensee to propose 60 days prior to operation of the facility a designated eating area.

4.7.3 Disposal of Contaminated Equipment

The licensee has not proposed a procedure to survey equipment leaving the site. The staff will, therefore, require by license condition that all equipment leaving the facility shall be surveyed in accordance with applicable procedures. Additionally, the licensee shall be required by license condition, to dispose of all contaminated materials in an approved disposal site.

4.8 Quality Assurance and Calibration

The EMC application contained a minimum discussion on a quality assurance (QA) program for all sampling and analyses performed as part of the radiation safety program. Therefore, the staff will require by license condition that a QA program equivalent to all of the recommended elements, as specified in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent stream and the Environment," be submitted to the NRC for review and approval.

EMC has committed that all radiation monitoring, sampling, and detection equipment shall be recalibrated on a regularly scheduled basis. The staff has determined, and will require by license

condition, that the equipment be recalibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use.

5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL

The EMC process facility and solution disposal system are located over a several-acre area and are, in several instances, surrounded by individual fences which are posted in accordance with 10 CFR 20.203(e). Signs reading "CAUTION - RADIOACTIVE MATERIALS" are maintained along the fence and are visible to individuals as they approach the fence. EMC has committed to maintaining adequate posting for the site.

Security for the site is provided by personnel working at the facility. Considering the remote location of the site and the private access road leading to it, such security measures are adequate. EMC will control access to the site by way of a locked gate at the main access road. Visitors will be required to contact EMC personnel to open the gate for site entry.

The staff concludes that the above markings and access control are adequate. A more complete discussion of the restricted area is contained in the accompanying Environmental Assessment. A license condition will be issued which exempts the licensee from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "ANY AREA WITHIN THE FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

6.0 EMERGENCY PROCEDURES AND PREVENTATIVE MEASURES

EMC has established emergency procedures for natural disasters, significant equipment or facility damage, uncontrolled plant shut downs, yellowcake spills, loss or theft of yellowcake or sealed sources, employee overexposure, and unauthorized discharges of radioactive materials. The procedures to be followed specify appropriate individuals to contact and health and decontamination procedures as well as area clean up methods.

Accidents involving the uncontrolled discharge of waste solutions would be extremely remote. As required by license condition, the licensee will perform a daily inspection of the solution disposal system. The licensee will also be required by license condition to immediately notify the USNRC by telephone of any failure of the solution disposal system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure.

7.0 EVAPORATION POND EVALUATION

EMC has proposed two different methods for disposal of process water: deep well injection and land spreading. A complete discussion of these methods is contained in the accompanying Environmental Assessment. Therefore, these facilities will not be discussed here.

8.0 DECOMMISSIONING AND RECLAMATION

EMC will be required by license condition to decommission and reclaim the site to appropriate radiation protection standards. Additionally, the well fields will be required to be abandoned in accordance with the State of Wyoming standards. Additional site reclamation and aquifer restoration information is contained in the accompanying Environmental Assessment.

9.0 SURETY REQUIREMENTS

The staff will require by license condition that the applicant submit to the NRC a copy of a surety bond, or other acceptable financial instrument, for reclamation and decommissioning costs of the facility. The bond amount shall be calculated based on hiring a contractor to perform the work. The bond shall be renewed annually in order to allow readjustment of the bond total value due to changing conditions, inflation, and other similar considerations.

10.0 CONCLUSION INCLUDING SAFETY LICENSE CONDITIONS

Upon completion of the safety review of EMC's application for source material license, the staff has concluded that the operation of the Highland site, in accordance with the following license conditions, will be protective of health and safety and fulfills the requirements of 10 CFR Part 20. The staff, therefore, recommends that EMC be issued a source material license subject to the following conditions:

1. Any significant changes in the process circuit as illustrated and described in Figure 3.2 of the renewal application shall require approval by the USNRC in the form of a license amendment.
2. Release of equipment or packages from the restricted area shall be in accordance with Attachment No. 1, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials," dated September 1984.
3. The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the facility, provided that all entrances to the facility are conspicuously posted

in accordance with Section 20.203(e)(2) and with the words, "Any area within this facility may contain radioactive material."

4. The results of sampling, analyses, surveys and monitoring, and calibration of equipment and 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 USNRC regulations, all such documentation shall be maintained for a period of at least five (5) years.
5. Standard operating procedures (SOPs) shall be established for all operational process activities involving radioactive materials that are handled, processed, or stored. Standard operating procedures for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for nonoperational activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the process area to which it applies.
6. All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the RSO and the Corporate RSO before implementation and whenever a change in a procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the Corporate RSO shall perform a documented review of all existing operating procedures at least annually.
7. 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 operating procedure exists. All RWPs shall be accompanied by a breathing zone air sample or an applicable area air sample. The RWP shall be issued by the Highland Site RSO or his designate, qualified by way of specialized radiation protection training, and shall at least describe the following:
 - A. The scope of the 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
 - D. In addition, the RSO's review of all nonroutine activities shall be documented.

8. The licensee shall maintain effluent control systems as specified in Section 4.4.3 of the licensee's application with the following additions:
 - A. Operations shall be immediately suspended in the dry/pack area of the facility if any of the emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.
 - B. The licensee shall, during all periods of yellowcake drying operations, assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. This shall be accomplished by either (1) performing and documenting checks of water flow and air pressure differential approximately every four (4) hours during operation, or (2) installing instrumentation which will signal an audible alarm if either water flow or air pressure differential fall below the manufacturer's recommended levels. If an audible alarm is used, its operation shall be checked and documented daily.
 - C. Air pressure differential gauges for other emission control equipment shall be read and the readings documented once per shift during operations.
9. Occupational exposure calculations shall be performed and documented within 1 week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Routine radon daughter and particulate samples shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Nonroutine samples shall be analyzed and the results reviewed by the RSO within two (2) working days after sample collection.
10. The licensee shall submit a detailed decommissioning plan to the USNRC at least twelve (12) months prior to planned final shutdown of mining operations.
11. The licensee shall perform and document a daily visual inspection of the waste solution disposal system. Should the inspection indicate that a discharge has taken place, the USNRC, Uranium Recovery Field Office, shall be notified by telephone within 48 hours.

A written report shall be filed with the USNRC, Uranium Recovery Field Office, within 30 days of first notifying the USNRC that a discharge occurred. This report shall include analytical data and describe the mitigative actions and the results of that action.

12. The licensee shall maintain an area within the restricted area boundary for storage of contaminated materials prior to their disposal. All contaminated wastes and evaporation pond residues shall be disposed at a licensed radioactive waste disposal site.
13. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criterion 9, adequate to cover the estimated costs, if accomplished by a third party, for completion of the NRC-approved site closure plan including; above ground decommissioning and decontamination, the cost of offsite disposal of radioactive solid process or evaporation pond residues, and ground-water restoration as warranted. Within three (3) months of NRC approval of a revised closure plan and cost estimate, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved site closure plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within three (3) months of written NRC approval. Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criterion 9, shall be provided to the NRC at least three (3) months prior to the anniversary of the effective date of the existing surety instrument. If the NRC has not approved a proposed revision 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing arrangement, prior to expiration, for 1 year.

Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The licensee shall also provide the NRC with copies of surety related correspondence submitted to the State, a copy of the State's surety review and the final approved surety arrangement. The licensee must also ensure that the surety, where authorized to be held by the State, expressly identifies the NRC related portion of the surety and covers the above ground decommissioning and decontamination, the cost of offsite disposal, soil and water sample analyses and ground-water restoration associated with the site. The basis for the cost estimate is the NRC approved site closure plan or the NRC approved revisions to the plan.

Prior to actual operation, Everest Minerals Corporation shall submit a surety instrument acceptable to the State of Wyoming and the NRC for an amount not less than \$2,233,000, in favor of the State of Wyoming, and shall be continuously maintained for the purpose of complying with 10 CFR 40, Appendix A, Criterion 9, until a

replacement is authorized by both the State and the NRC. The NRC's site closure estimate represents \$2,233,000 of this surety arrangement.

Attachment No. 3 "outlines the minimum considerations used by the NRC in the review of site closure estimates."
Reclamation/decommissioning plans and annual updates should follow this outline.

14. In addition to the inspection and audit program described in Section 4.7 of the application, the RSO or his designate shall document a daily walkthrough of the facility to determine if radiation control practices are being implemented.
15. The licensee shall submit to the USNRC, Uranium Recovery Field Office, a copy of the ALARA report as specified in Section 4.7 of the application within two (2) months of the end of the reporting period. The report shall also include a summary of the daily walkthrough inspections.
16. The licensee shall submit to the USNRC, Uranium Recovery Field Office, particulate and radon sampling locations as well as designated eating areas at least two (2) months prior to beginning uranium recovery. The locations, as a minimum, shall include the drying and packaging area and all worker occupied stations associated with the uranium recovery process. Radon daughters shall be sampled weekly, and particulates shall be sampled weekly in the dry/pack area and monthly in the process areas.
17. If any worker reaches or exceeds 25 percent of the maximum permissible exposure limits as specified in 10 CFR Part 20, based upon a calculated TWE for the week or the calendar quarter, dependent on the solubility of the material, the RSO shall initiate an investigation of the employee's work record and exposure history to identify the source of the exposure.

Necessary corrective measures shall be taken to ensure that future exposures are as low as is reasonably achievable. Records shall be maintained of these investigations and results furnished to the USNRC, Uranium Recovery Field Office, in the semiannual 10 CFR 40.65 report.

18. In addition to the bioassay program discussed in Section 4.7.5 of the application, the licensee shall comply with the following:
 - A. Anytime an action level of 15 ug/l uranium for urinalysis or 9 nCi of natural uranium for in vivo measurement is reached or exceeded, the licensee shall document the corrective actions

which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation shall be submitted to the USNRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR 40.65.

- B. Anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis or 16 nCi uranium for an in vivo measurement is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within thirty (30) days of exceeding the action level.
 - C. All in vivo measurements shall be performed in accordance with the recommendations contained in Revision 1 of Regulatory Guide 8.22.
19. If employees do not shower prior to leaving the main process facility, they shall monitor themselves with an alpha survey instrument prior to exiting. Should the results of monitoring exceed an action level of 1000 dpm/100 cm², employees shall decontaminate themselves to less than the action level. If decontamination cannot be accomplished, the employee shall report the incident to the RSO for investigation. Additionally, the RSO shall perform and document unannounced quarterly spot checks of employees leaving the process area.
 20. All radiation monitoring, sampling, and detection equipment shall be recalibrated after each repair and as recommended by the manufacturer or at least semiannually. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use.
 21. Any changes to the organizational chart as illustrated in Figure 4.1 of the application shall require approval by the USNRC in the form of a license amendment.
 22. The licensee shall submit for USNRC review and approval, three (3) months prior to lixiviant injection, a written procedure for determining employee exposures.
 23. The licensee shall, two (2) months prior to lixiviant injection, propose a surface contamination program which includes inspection frequency and utilizes an action level of 1000 dpm/100 cm² removable alpha. The licensee shall also prohibit eating in all but designated eating areas.

Please note that additional license conditions can be found in the Environmental Assessment for Everest Minerals Corporation.



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Approved by:



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