UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
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DENVER, COLORADO 80225

DEC 12 1989

URFO:GRK
Docket No. 40-8943
040089431125

MEMORANDUM FOR: Docket File No. 40-8943

FROM: Gary R. Konwinski
Project Manager

SUBJECT: SAFETY EVALUATION REPORT (SER) FOR FERRET EXPLORATION COMPANY OF NEBRASKA, CROW BUTTE PROJECT

Attached is the Safety Evaluation Report (SER) prepared in support of the issuance of a commercial source material license for Ferret Exploration Company, Crow Butte Project. Several safety related license conditions have been attached to the SER. With the inclusion of these license conditions and those contained in the accompanying Environmental Assessment (EA), commercial operation of the site will pose no significant impacts.

Gary R. Konwinski
Project Manager

Approved by:
Ramon E. Hall
Director

Attachment:
Crow Butte Project Safety Evaluation Report

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SAFETY EVALUATION REPORT

FOR ISSUANCE OF

SOURCE MATERIAL LICENSE

FERRET EXPLORATION COMPANY OF NEBRASKA, INC.

CROW BUTTE PROJECT

DAWES COUNTY, NEBRASKA

DOCKET NO. 40-8943

LICENSE NO. SUA-1534

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1.0 INTRODUCTION

By their application dated October 7, 1987, and letter dated June 7, 1989, Ferret Exploration Company of Nebraska, Inc. (FEN) applied for a new source material license. Several delays have been experienced due to deficiencies in the application. The following is a safety review of the application materials.

1.1 Description of Proposed Action

The proposed action is to issue a source material license for the commercial operation of an in-situ leach uranium mine in Dawes County, Nebraska. Pending issuance of the license, FEN intends to solution mine approximately 500 acres of 2560 acres over which they control mineral access.

1.2 Background Information

In January 1985, Wyoming Fuel Company (WFC) was issued Source Material License SUA-1441 to construct and operate a research and development (R&D) in-situ leach uranium mine and recovery plant in Dawes County, Nebraska, known as the Crow Butte Project. FEN acquired a major interest from WFC in June 1986, and currently is the operator of the Crow Butte Project. Mining was conducted in two well fields (WF-1 and WF-2) at the R&D site, from July 1986 to the present in WF-1 and from June 1986 to February 1987 in WF-2. Restoration was carried out in WF-2 from February 1987 to April 1988. WF-2 is currently restored.

Uranium will be recovered by in-situ leaching from the Basal Chadron Sandstone at a depth which varies from 400 feet to 800 feet over the permit area. The overall width of the mineralized area varies from 1000 feet to 5000 feet.

1.3 Review Scope

This document details the staff's review of in-plant radiological safety of the licensee's proposed commercial operation. The review will include a staff analysis of the license application as well as previous operational 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 Crow Butte Project. Uranium will be extracted from the orebody by introduction of a sodium bicarbonate lixiviant at an average rate of 2500 gallons per minute (gpm). The uranium-rich solution will be extracted and concentrated at the onsite process facility into a final U_3O_8 slurry product. The activities also include an optional onsite dryer and packaging facility.

2.1 Facility Description

The Crow Butte Project site is located in west-central Dawes County, Nebraska, just north and west of the Pine Ridge Area. Figure 1.0-1 shows the general location of the proposed project site. The Crow Butte Project site is about 5.25 miles southeast of the city of Crawford via Squaw Creek Road. State Highway 71 provides access to the project area from points north and south of Crawford. U.S. Highway 20 provides access to Crawford and the project area from points east and west.

Facilities planned for the commercial activities at the Crow Butte Project include a 20,000 square foot process building, several well fields, solar evaporation ponds, access roads and support facilities.

The operation of the commercial facility will result in two sources of liquid waste. These sources are (1) process waste water which includes filter backwash, well-field bleed, eluate bleed and water treatment brine, and (2) restoration waste which will be primarily brine from the reverse osmosis unit used for water treatment. Solar evaporation ponds will be used to store and evaporate the liquid wastes. At the conclusion of the project, the contaminated sediments from the solar evaporation ponds and any solid radioactive waste will be disposed of at a licensed radioactive waste disposal site.

2.2 Operations

FEN proposes to proceed with commercial in-situ mining operations with an estimated production rate of 1,000,000 pounds of U_3O_8 per year. The first 2 years of operation are estimated to be about half the estimated production rate. During the initial phase of commercial operation, injection, recovery, and monitor wells will be installed in the ore zones. Piping will be from the plant building to the well-field building and from the well-field building to the individual well. The recovered fluids will flow from the well field through the pipeline to the process building. Either high density polyethylene or PVC pipe will be used for underground service. All underground piping will be leak tested prior to use.

The ion exchange (IX) columns and elution equipment will be located in the process building. After loading, the IX resin will be eluted. The pregnant eluate containing the uranium will be thickened and the solids discharged will be sent to the dryer before shipping as a solid or sent to storage for shipment as a slurry to a licensed milling or converting facility.

The general process circuit configuration is shown in Figure 3.1-1. The configuration of this process circuit has been reviewed by the USNRC staff, and it represents a typical circuit for this type of uranium recovery 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 any proposed circuit change to the configuration shown in Figure 3.1-1, to the NRC for review and approval.

The main process facility will operate at an average 2500 gpm throughput, not including restoration flow, and expects to recover about 1,000,000 pounds of U_3O_8 per year. The estimated project schedule projects a flow rate of approximately 1250 gpm for the first 2 years, which is increased to 2500 gpm for the remainder of the project. In order to maintain approximately 1,000,000 pounds U_3O_8 per year throughput, several well fields will be developed in the 2560 acre permit area. To assure that health and safety concerns are considered during any expansion, the licensee will be required to submit for NRC review and approval, any changes to the permit area described in the license application dated October 7, 1987.

In order to assure adequate security and safe storage, the licensee's proposed facilities are designed for approximately 454,545 kilograms of U_3O_8 storage. Accordingly, the licensee will be authorized by license condition a maximum possession at one time of 454,545 kilograms of U_3O_8.

3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

3.1 Organization

A partial organization chart of FEN depicting the relationships of the organizational components responsible for operations, environmental protection and radiation safety at the Crow Butte site is shown in Figure 5.1-1. 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. A brief description of the organization follows.

The President of FEN has overall responsibility for the radiation, environmental and safety activities of the Crow Butte commercial facility. The Vice President of FEN is responsible for all Crow Butte commercial production facilities, reporting directly to the President. He is directly responsible for the radiation safety programs and nonradiological programs at the production facility. The Vice President, FEN, supervises the Project Administrator, the Plant Superintendent and the Corporate Radiation Safety Officer, and sees that these programs are conducted in a manner consistent with the regulatory requirements. The Vice President, FEN, will be responsible for all regulatory agency contacts.

The Crow Butte Plant Superintendent is responsible for all uranium production activity at the site. He is responsible for implementing any safety and/or monitoring programs associated with operations, including yellowcake handling procedures, and is authorized to immediately implement any action to correct or prevent radiation safety hazards.

The Crow Butte Project Administrator is responsible for the implementation of radiological programs, nonradiological environmental programs, public relations and exploration activities. He is responsible for licensing development, licensing modifications and license compliance.

The Corporate Radiation Safety Officer (CRSO) is responsible for the development, administration and enforcement of all radiation safety programs. The CRSO is authorized to conduct inspections and to immediately order any change necessary to preclude or eliminate radiation safety hazards and/or maintain regulatory compliance. The CRSO reports directly to the Vice President, FEN.

The Health Physics Technician (HPT) will be responsible for the implementation of all onsite environmental and safety programs, including emergency procedures. The HPT will report to the Crow Butte Project Administrator and will also be responsible to the Corporate Radiation Safety Officer for technical guidance. He will personally inspect facilities to verify compliance with all applicable requirements in the areas of radiological health and safety, as well as industrial health and safety. The HPT will work closely with all supervisory personnel to ensure established programs are maintained. The HPT will be responsible for collection and interpretation of employee exposure-related monitoring date, including data from industrial safety and radiological safety. The HPT will make recommendations, as necessary to improve any and all safety related controls, and has the authority to stop unsafe or hazardous operations.

3.2 Radiation Safety Staff and Responsibilities

The Crow Butte site HPT has direct responsibility for the implementation of all radiation and safety protection procedures, equipment and controls, including emergency procedures. As previously discussed, the HPT is responsible for the collection and interpretation of employee exposure related monitoring data and its proper recording and reporting of such. The HPT will implement routine training programs for the supervisors and employees with regard to the proper application of radiation protection, nuclear safety and environmental control procedures. Assistance and reviews will be supplied by the CRSO.

The CRSO is responsible for the development, administration and enforcement of all radiation protection programs at the Crow Butte site. The CRSO 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 reasonably achievable, and (3) all regulatory requirements are met.

3.3 Minimum Technical Qualifications for Radiation Safety Staff

FEN has proposed the following minimal qualifications and experience for the CRSO and Crow Butte HPTs.

The minimum qualifications of the CRSO are as follows:

Education: A bachelors degree in physical science or engineering from an accredited college or university, or an equivalent

combination of relevant experience and training in uranium recovery radiation protection.

General Experience: One year supervisory experience and one year in a uranium recovery facility or related experience.

Health Physics Experience: One year of work experience in applied health physics, radiation protection, industrial hygiene or similar work.

Specialized Training: At least 4 weeks of formalized courses in health physics and radiation protection.

Specialized Knowledge: A thorough knowledge of the proper application and use of all the health physics equipment used at the mine, the procedures for radiological sampling and monitoring, and methods of exposure calculation.

The minimum qualifications for the Health Physics Technician are as follows:

Education: An associates degree in the physical sciences, engineering or a health-related field. Alternately, a high school diploma plus 2 years of relevant work experience in applied radiation protection.

General Experience: One year of work experience in a uranium recovery facility or related industry involving radiation protection.

Health Physics Experience: One year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene or industrial safety.

Specialized Training: At least 4 weeks of formal specialized training in radiation health protection.

Specialized Knowledge: Knowledge of the proper operation of health physics instruments used for monitoring and surveying at the mine and personnel dosimetry requirements.

The Crow Butte site HPT is the individual that carries full responsibility of the day-to-day radiation safety aspects of the operation. Due to this responsibility, the NRC will require by license condition that this individual receive formal radiation safety or health physics training at least every 2 years. Prior to commencement of operations, the staff will require by license condition that the CRSO and HPT experience, education and specialized training be submitted to the NRC for review and approval. Additionally, due to the complexity and potential safety and health hazards associated with the drying and packaging operations, the licensee will be required by license condition to ensure that an individual meeting

the minimum qualifications of the CRSO is physically present at the Crow Butte site during drying and packaging operations.

3.4 Administrative and Operation 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. The licensee will be required by license condition to ensure that all new operating procedures which may affect radiation safety are reviewed and concurred in by the radiation safety staff. Review and approval of operating procedures by the CRSO will be done at least annually to ensure that radiation exposures are maintained as low as is reasonably 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 CRSO prior to implementation.

Nonroutine work or maintenance activities which may result in personnel exposure to radioactive materials will be carried out in accordance with a radiation work permit (RWP). Due to the potential health and safety hazards associated with nonroutine operations, the licensee will be required by license condition to use a RWP for all nonroutine work not covered by an existing procedure where the potential for exposure to radioactive materials exist 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 Crow Butte site HPT or designate, qualified by way of specialized radiation protection training, except when the work to be performed is in the drying and packaging areas. Work in these areas will require that the RWP be issued by the CRSO or designate, qualified by way of specialized radiation protection training equivalent to the CRSO. The RWP 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; and

In addition, the CRSO's quarterly review of all nonroutine activities shall be documented.

3.5 Audits and Inspections

3.5.1 Inspections and Monthly Audit

The Crow Butte HPT will conduct a daily walkthrough inspection of all work and storage areas of the commercial facility to ensure proper implementation of good radiation safety procedures. Additionally, the Crow Butte HPT will conduct weekly and monthly inspections of all work and storage areas. Monthly inspections will include review of all monitoring and exposure data. To ensure adequate documentation of the findings and corrective actions, the licensee will be required by license condition to maintain documentation of all daily and weekly inspections. The CRSO will conduct quarterly onsite inspections.

A monthly compliance report will be prepared by the Crow Butte HPT and submitted to the Crow Butte Plant Superintendent. The Plant Superintendent will review and evaluate these reports and consult with the Crow Butte HPT as appropriate. The Plant Superintendent will initiate a "Monthly Summary Inspection Report" to be forwarded to the Vice President. The licensee will be required by license condition to include a summary of all inspection and audit results in the annual ALARA audit report.

3.5.2 ALARA Audit

An annual ALARA audit of the plant operations will be conducted under the direction of the CRSO. 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. The ALARA team members will be selected by the Project Administrator. The ALARA audit will be submitted annually to the FEN Vice President, and 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 Nebraska, 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 NRC for staff review. This submittal will allow for staff review of the licensee's ALARA audit program and allow for an independent decision on the adequacy of the program.

3.6 Radiation Safety Training

The licensee has committed in the application that all site employees at the Crow Butte Project will be provided radiation safety training consistent with the training guidelines detailed in Section 2.5 of Regulatory Guide 8.31.

4.0 RADIATION SAFETY CONTROLS AND MONITORING

4.1 Ventilation and Effluent Control

At the Crow Butte site, there are two major radioactive gaseous effluents: radon gas from the production solutions and uranium particulates from the drying and packaging areas, 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 to minimize personnel exposures. In addition to the specific venting, the plant building is equipped with general area exhaust fans.

4.2 In-Plant Monitoring Data

The in-plant radiation and airborne radioactivity monitoring program for the Crow Butte facility is discussed briefly in Section 5.7.3 of the application. Periodic air samples in specified work areas will be collected and analyzed for various radionuclides. Personnel exposure to external radiation will be measured by individual dosimeters. The employee's exposure to airborne radioactivity will be determined from the individual occupancy records and the measured airborne concentrations.

FEN did not specify locations for in-plant monitoring, but proposes to submit the locations at least sixty (60) days prior to operations for review and NRC approval.

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 or may be based upon a time study approach. Occupancy times will also additively consider exposures from nonroutine or cleanup operations that are covered by radiation work permits. Average airborne concentrations of radon or its daughters and uranium will be determined based upon monthly air samples. The licensee will be required by license condition to perform and document occupational exposure calculations within 1 week of the end of each monitoring period.

Individual external radiation exposure monitoring will be accomplished by gamma surveys and personnel dosimeters. Gamma surveys and area monitoring results will be used in conjunction with the individual occupancy times to assist in estimating employee exposures, identification of radiation areas and in calculating occupancy times. Personnel dosimeters will be issued for individual monitoring in accordance with 10 CFR 20.101.

4.4 External Radiation Control Program

4.4.1 Occupational Exposure

The proposed methods for monitoring external radiation exposure include personnel dosimeters to be exchanged quarterly. Employee monitoring will be conducted in accordance with 10 CFR 20.101.

4.4.2 External Radiation Surveys

Gamma surveys will be conducted at work stations on a monthly basis. Area dosimeters will be placed throughout the plant to determine the need for personnel monitoring.

4.5 Internal Radiation Control Program

Radiation exposures at the various worker stations are primarily functions of the time spent at the station and the concentration of radioactive material. As previously discussed, the licensee has provided venting of the facility as well as the use of a vacuum dryer to significantly reduce the concentration of airborne radioactivity. A vacuum dryer has the advantage that the product is isolated from the operator as well as the environment through the utilization of a negative pressure chamber that is not connected with a heat source. Additionally, general air sampling

and breathing zone samples will be taken during operations in the dryer room and packaging area to estimate possible internal radiation exposure.

4.6 Bioassay

FEN proposes the following frequency for the bioassay program:

Dry/Pack operators and Dry/Pack Maintenance personnel - every 30 days.
Operators and other personnel in general work areas - quarterly.
Office workers - annual.
Preemployment - all site personnel.

The FEN proposal provides a higher bioassay frequency for the personnel with a possibility of exposure and lesser frequency for personnel with minimal possibility of exposure. The operators in the general work area will be subjected to minimal airborne uranium since all uranium in these areas will be in solution or slurry form. Site office workers will not be routinely subjected to any uranium compounds.

FEN did not propose action levels or reporting requirements or for bioassay measurements. Therefore, the staff will require by license condition that in addition to the bioassay program discussed in Section 5.7.5 and letter dated June 7, 1989, FEN comply with the following:

Any time an action level of 15 ug/l for urinalysis 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 NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR 40.65. Any time an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis 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.

4.7 Contamination Control

4.7.1 Personnel Contamination

FEN will require all employees leaving the restricted areas to monitor themselves for alpha contamination. Failure to meet the minimum radiation level of 1000 dpm/100 cm^2 requires the employee 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 that documented alpha contamination spot checks be performed by the CRSO on a quarterly frequency. The staff will, therefore, require this procedure by license condition.

4.7.2 Surface Contamination

FEN has proposed to conduct weekly surveys and routine monthly smear wipes in designated eating areas, change rooms and office areas to determine these contamination levels. Detection of alpha activity significantly above background will be an indication that increased cleanup effort is necessary. FEN's proposed action levels and cleanup procedures are consistent with current NRC regulations and guidances with the exception of smear tests in lunch rooms and general office areas. FEN proposes to conduct alpha survey of these areas and if an area is suspected of contamination, a smear test will be conducted. However, due to the high potential for internal ingestion in these areas, the staff will require by license condition that FEN conduct weekly smear tests of all eating and general office areas.

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 FEN quality assurance and instrument calibration program, described in Section 5.7.9 of the license application, proposes procedures and policies for the effluent and radiological monitoring programs. The quality assurance program is based on guidance provided in Regulatory Guide 4.15. FEN proposes semiannual calibration of all radiation and effluent monitoring equipment. The licensee did not, however, indicate a more frequent calibration interval if recommended by the manufacturer, and following any repairs. The licensee also did not indicate that records of radiation detection and environmental monitoring equipment would be maintained. The staff will require by license condition that radiation detection instruments, portable air sampling equipment and fixed continuous air samplers shall be calibrated after each repair and at least semiannually, or at the manufacturer's suggested interval, whichever is more frequent. All radiation detection instruments shall be checked for proper operation using a radiation check source prior to each day's use. Flow rates on fixed continuous air samplers shall be checked each time the sampler head is changed. Documentation of all instrument calibration, operational checks and repairs shall be maintained by the licensee.

5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL

Security for the site is provided by personnel working at the facility. FEN will control access to the restricted area by way of gates and/or doors. Access to the restricted area will be limited to authorized personnel only.

All visitors will be required to register at the office and will not be permitted inside the plant area without authorization from designated supervisory personnel.

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

FEN has established emergency procedures for natural disasters, significant equipment or facility damage, uncontrolled plant shutdowns, 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 cleanup 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 NRC 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

FEN's Crow Butte operations will result in two primary sources of liquid waste. They are eluant bleed and production bleed. These waste streams are routed to water treatment or the evaporation ponds. A complete discussion of these methods is contained in the accompanying Environmental Assessment.

8.0 DECOMMISSIONING AND RECLAMATION

FEN 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 Nebraska standards. Additional site reclamation and aquifer restoration information is contained in the accompanying Environmental Assessment.

9.0 SURETY REQUIREMENTS

The staff will require, as a 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 FEN's application for source material license, the staff has concluded that the operation of the Crow Butte Project 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 FEN be issued a source material license subject to the following safety related conditions:

1. Authorized place of use shall be the licensee's Crow Butte facilities in Dawes County, Nebraska.

2. The licensee is hereby authorized to possess byproduct material in the form of uranium byproduct waste generated by the licensee's operations authorized by this license.

3. For use in accordance with statements, representations and conditions contained in the licensee's application dated October 7, 1987, and submittals dated December 14, 1987, and March 28, 1988.

4. The plant throughput shall not exceed a flow rate of 2500 gallons per minute.

5. The licensee shall not possess more than 454,545 kilograms of barreled U_3O_8 at one time.

6. The Crow Butte production rate shall not exceed 1,000,000 pounds of U_3O_8 per year.

7. Any significant changes in the process circuit as illustrated and described in Figure 3.1-1 of the application dated October 7, 1987, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.

8. Release of equipment or packages from the restricted area shall be in accordance with the attachment to this license entitled, "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.

9. The licensee is hereby exempted from the requirements of Section 20.203(c)(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(3)(2) and with the words, "ANY AREA WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

10. The licensee shall be required to ensure that the Corporate Radiation Safety Officer (CRSO) or an individual meeting the minimum education and experience requirements of the CRSO be physically present at the Crow Butte facility when dryer and packaging operations are being conducted. The documentation of the individual's training and experience shall be maintained onsite by the licensee. Additionally, the radiation safety

technician shall have four (4) months experience with the CRSO during installation and operation of the vacuum dryer and a course in respiratory protection, prior to assuming the role of RSO.

11. 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 NRC regulations, all such documentation shall be maintained for a period of at least five (5) years.

12. 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. A current, approved copy of each written procedure shall be kept in the process area to which it applies.

All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the Corporate Radiation Safety Officer (CRSO) before implementation and whenever a change in a procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the CRSO shall perform a documented review of all existing operating procedures at least annually.

13. 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 Crow Butte site Health Physics Technician (HPT) or his designate, qualified by way of specialized radiation protection training, except when the work to be performed is in the drying and packaging areas. The RWP for these areas shall be issued by the CRSO or his designate, qualified by way of specialized radiation protection training equivalent to the CRSO, 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.

In addition, the CRSO's quarterly review of all nonroutine activities shall be documented.

14. The licensee shall maintain effluent control systems as specified in Section 4 of the licensee's application dated October 7, 1987 with the following additions:

A. Operations shall be immediately suspended in the drying or packaging areas of the facility if any of the emission control equipment for these areas is not operating within specifications for design performance.

B. The licensee shall, during all periods of yellowcake drying operations, assure that the rotary vacuum dryer is operating within the manufacturer's recommended ranges necessary to achieve design performance. This shall be accomplished by either (1) performing and documenting checks of water flow, air pressure differential and vacuum, approximately every four (4) hours during operations, or (2) installing instrumentation which will signal an audible alarm if either water flow, air pressure differential or vacuum 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, vacuum gauges or other emission control equipment shall be read and the readings documented once per shift during operations.

15. 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 CRSO within two (2) working days after sample collection.

16. The licensee shall submit a detailed decommissioning plan to the NRC, Uranium Recovery Field Office for review and approval at least twelve (12) months prior to planned final shutdown of mining operations.

17. 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 NRC, Uranium Recovery Field Office, shall be notified by telephone within 48 hours. A written report shall be filed with the NRC, Uranium Recovery Field Office, within 30 days of first notifying the NRC that a discharge occurred. This report shall include analytical data, describe the mitigative actions and the results of that action.

18. 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.

19. 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, soil and water analyses 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 approve 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 Part 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 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. When the NRC authorizes the surety instrument to be held by the State of Nebraska, 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 on an annual basis. The licensee must also ensure that the surety, where authorized to be held by the State of Nebraska, 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 NRC-approved revisions to the plan.

Within 90 days of issuance of this license, Ferret Exploration Company of Nebraska, Inc. (FEN), shall submit a surety instrument acceptable to the State of Nebraska and the NRC, Uranium Recovery Field Office, for an amount not less than $4 877,550. This surety shall be written in favor of the State or the NRC for the purpose of complying with 10 CFR Part 40, Appendix A, Criterion 9, until a replacement is authorized by both the State and the NRC. FEN shall maintain the existing approved surety until a replacement is authorized by the NRC. Annual updates and reclamation/decommissioning plan cost estimates should follow the outline in the attachment to this license entitled, "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates." For the purposes of NRC's annual review, FEN's anniversary date is designated as (to be determined at license issuance) of each successive year. The annual

update should be received by the NRC 90 days prior to the anniversary date.

20. In addition to the inspection and audit program described in Section 5.3 of the application, dated October 7, 1987, the Health Physics Technician (HPT) or designate shall document a daily walkthrough of the facility to determine if radiation control practices are being implemented.

21. The licensee shall submit to the NRC, Uranium Recovery Field Office, a copy of the ALARA report as specified in Section 4.7 of the application dated October 7, 1987, within two (2) months of the end of the reporting period. The report shall also include a summary of the daily walkthrough inspections.

22. The licensee shall submit to the NRC, 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 operations. 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 areas and monthly in the process areas.

23. In addition to the bioassay program discussed in Section 5.7.5 of the application, dated October 7, 1987, the licensee shall comply with the following:

A. Anytime an action level of 15 ug/l uranium for urinalysis 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 NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR Part 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.

24. Employees shall monitor themselves with an alpha survey instrument prior to exiting the restricted area. Should the results of monitoring exceed an action level of 1000 dpm/100 cm^2, employees shall decontaminate themselves to less than the action level. If decontamination cannot be accomplished, the employee shall report the incident to the CRSO for

investigation. Additionally, the CRSO shall perform and document unannounced quarterly spot checks of employees leaving the process area.

25. Notwithstanding the representation in Section 5.7.6 of the licensee's application, dated October 7, 1987, the licensee shall conduct weekly alpha contamination surveys for removable and nonremovable contamination of lunch rooms, change rooms, shower rooms, and offices.

26. All radiation and environmental monitoring, sampling and detection equipment shall 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 day's use.

27. Any changes to the organizational chart as illustrated in Figure 5.1-1 of the application dated October 7, 1987, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.

28. The licensee shall submit for NRC, Uranium Recovery Field Office review and approval, three (3) months prior to lixiviant injection, a written procedure for determining employee exposures.

29. 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 cm^2 removable alpha. The licensee shall also prohibit eating in all but designated eating areas.

30. Any changes to the permit area described in the license application dated October 7, 1987, shall require approval by the NRC, Uranium Recovery Filed Office, in the form of a license amendment.

31. At least ninety (90) days prior to operations the licensee shall submit to NRC, Uranium Recovery Field Office, the training and education documents for the Corporate Radiation Safety Officer and the on-site Health Physics Technician.

Please note that additional license conditions can be found in the Environmental Assessment for Ferret Exploration Company of Nebraska, Inc.

Gary R. Konwinski
Project Manager

Approved by:
Ramon E. Hall
Director

8943/112S/VRS/89/05/25/SER

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