FORM NRC-2
(7-77)
10 CFR 40

Approved by GAO
R0203

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. (Check one)
- [X] (a) New license
- [ ] (b) Amendment to License No. _____
- [ ] (c) Renewal of License No. _____
- [ ] (d) Previous License No. _____

2. NAME OF APPLICANT
Ferret Exploration Company of Nebraska, Inc.

3. PRINCIPAL BUSINESS ADDRESS
Suite 400, 1800 Glenarm Place
Denver, Colorado 80202

4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED
Approximately 4 miles southeast of Crawford, Nebraska; Processing facility and evaporation ponds will be located in Section 19, T 31 N, R 51 W, Dawes County, Nebraska.

5. NAME OF PERSON TO BE CONTACTED CONCERNING THIS APPLICATION
Steve Collings/Vice President

6. TELEPHONE NO. OF INDIVIDUAL NAMED IN ITEM 5
(303) 294-0427

7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED

Ferret Exploration Company of Nebraska, Inc. (FEN) will operate a commercial scale uranium in-situ leach facility to produce U_3O_8 which will be sold for use as a reactor fuel.

8. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE

(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (*Including % U or Th.*)	(d) MAXIMUM AMOUNT AT ANY ONE TIME *(kilograms)*
NATURAL URANIUM	U_3O_8	Solution - 0 to 50 grams/liter Slurry - 1 to 50% U; Dried product - 50% to 80% U	454,545 Kg
URANIUM DEPLETED IN THE U-235 ISOTOPE			
THORIUM (ISOTOPE)			

(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME *(kilograms)*
454,545 Kg

9. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES.

See Section 3.0, Facilities in the ER for process description.
See Section 5.0, Operations in the ER for the potential radiation hazards of the process.

10. LIST THE NAMES AND ATTACH A RESUME OF THE TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE OF APPLICANT'S SUPERVISORY PERSONNEL AND THE PERSON RESPONSIBLE FOR THE RADIATION SAFETY PROGRAM (OR OF APPLICANT IF AN INDIVIDUAL).

Minimum qualification for supervisory personnel and the Radiation Safety Officer (RSO) are given in Section 5.0 of the ER.

11. DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9; INCLUDE: (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate. The description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument).

A description of the radiation detection equipment is given in Section 5.7 of the ER, Radiation Safety Controls and Monitoring.

(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE, INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier).

The methods, frequency and standards used in calibration of instruments are described in Section 5.7 of the ER, Radiation Safety Controls and Monitoring.

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11(c). VENTILATION EQUIPMENT WHICH WILL BE USED IN OPERATIONS WHICH PRODUCE DUST, FUMES, MISTS, OR GASES, INCLUDING PLAN VIEW SHOWING TYPE AND LOCATION OF HOOD AND FILTERS. MINIMUM VELOCITIES MAINTAINED AT HOOD OPENINGS AND PROCEDURES FOR TESTING SUCH EQUIPMENT.

No specific ventilation equipment is required other than plant venting of radon gas which is addressed in Section 4.0, Effluent Control Systems, and Section 5.7, Radiation Safety Controls and Monitoring.

12. DESCRIBE PROPOSED PROCEDURES TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE AND PROPERTY AND RELATE THESE PROCEDURES TO THE OPERATIONS LISTED IN ITEM 9; INCLUDE: (a) SAFETY FEATURES AND PROCEDURES TO AVOID NONNUCLEAR ACCIDENTS, SUCH AS FIRE, EXPLOSION, ETC., IN SOURCE MATERIAL STORAGE AND PROCESSING AREAS.

A description of Ferret Exploration of Nebraska's safety programs for nonradiological effects is described in Section 5.0, Operations; Effects of nonradiological accidents is presented in Section 7.5, Effects of Accidents.

(b) EMERGENCY PROCEDURES IN THE EVENT OF ACCIDENTS WHICH MIGHT INVOLVE SOURCE MATERIAL.

Emergency procedures involving source material are described in Section 7.5, Effects of Accidents.

(c) DETAILED DESCRIPTION OF RADIATION SURVEY PROGRAM AND PROCEDURES.

Section 5.7, Radiation Safety Controls and Monitoring provides a detailed description of the radiation survey program and procedures.

13. WASTE PRODUCTS: *If none will be generated, state "None" opposite (a), below. If waste products will be generated, check here* ☒ *and explain on a supplemental sheet:*

(a) Quantity and type of radioactive waste that will be generated.

(b) Detailed procedures for waste disposal. See attached Environmental Report.

14. IF PRODUCTS FOR DISTRIBUTION TO THE GENERAL PUBLIC UNDER AN EXEMPTION CONTAINED IN 10 CFR 40 ARE TO BE MANUFACTURED, USE A SUPPLEMENTAL SHEET TO FURNISH A DETAILED DESCRIPTION OF THE PRODUCT, INCLUDING:

(a) PERCENT SOURCE MATERIAL IN THE PRODUCT AND ITS LOCATION IN THE PRODUCT.

(b) PHYSICAL DESCRIPTION OF THE PRODUCT INCLUDING CHARACTERISTICS, IF ANY, THAT WILL PREVENT INHALATION OR INGESTION OF SOURCE MATERIAL THAT MIGHT BE SEPARATED FROM THE PRODUCT.

(c) BETA AND BETA PLUS GAMMA RADIATION LEVELS (*Specify instrument used, date of calibration and calibration technique used*) AT THE SURFACE OF THE PRODUCT AND AT 12 INCHES.

(d) METHOD OF ASSURING THAT SOURCE MATERIAL CANNOT BE DISASSOCIATED FROM THE MANUFACTURED PRODUCT.

CERTIFICATE

(This item must be completed by applicant)

15. ***The applicant, and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 40, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.***

FERRET EXPLORATION COMPANY OF NEBRASKA, INC.

BY: ORIGINAL SIGNED BY
STEVE COLLINGS
(Signature)

Dated October 7, 1987

Steve Collings
(Print or type name)

Vice President
(Title of certifying official authorized to act on behalf of the applicant)

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

88-0017

INTRODUCTION

Ferret Exploration Company of Nebraska Inc. (FEN) is pleased to submit this application for a Source and By-product Material License to the U.S. Nuclear Regulatory Commission for their consideration. This application is for a commercial in-situ uranium mining facility in Dawes County, Nebraska.

Much of the information in this aplication was collected and submitted to the agencies in the R&D application which was submitted in February of 1983. It was noted at that time that the R&D application contained much of the data necessary for a commercial application. The data submitted in 1983 were updated in the preparation of this application. FEN would like to acknowledge the contributors to the R&D application preparation.

FEN acknowledges Resource Technologies Group, Inc. (RTG) of Lakewood, Colorado for providing the overall project management in the preparation of this application, for their work in the hydrologic test and evaluation area, and the facilities area. FEN would also like to acknowledge Greystone Development Consultants Inc. of Englewood, Colorado for their updating of the Ecological Section, the Socioeconomic Sections, the Population Distribution Section and the Meteorology Section; the Nebraska State Historical Society of Lincoln, Nebraska for their updating of the Regional Historic, Archeological, Architectural, Scenic and Natural Landmarks Section; Radiant Energy Management of Golden, Colorado for their evaluation of the radiological effects; Enecotech of Denver, Colorado for their assistance in the meteorological area and the computer modeling of the radiological effects; and the staff of FEN for the preparation of the Geology Section and for their assistance in the collection of operational data, restoration data, and baseline data.

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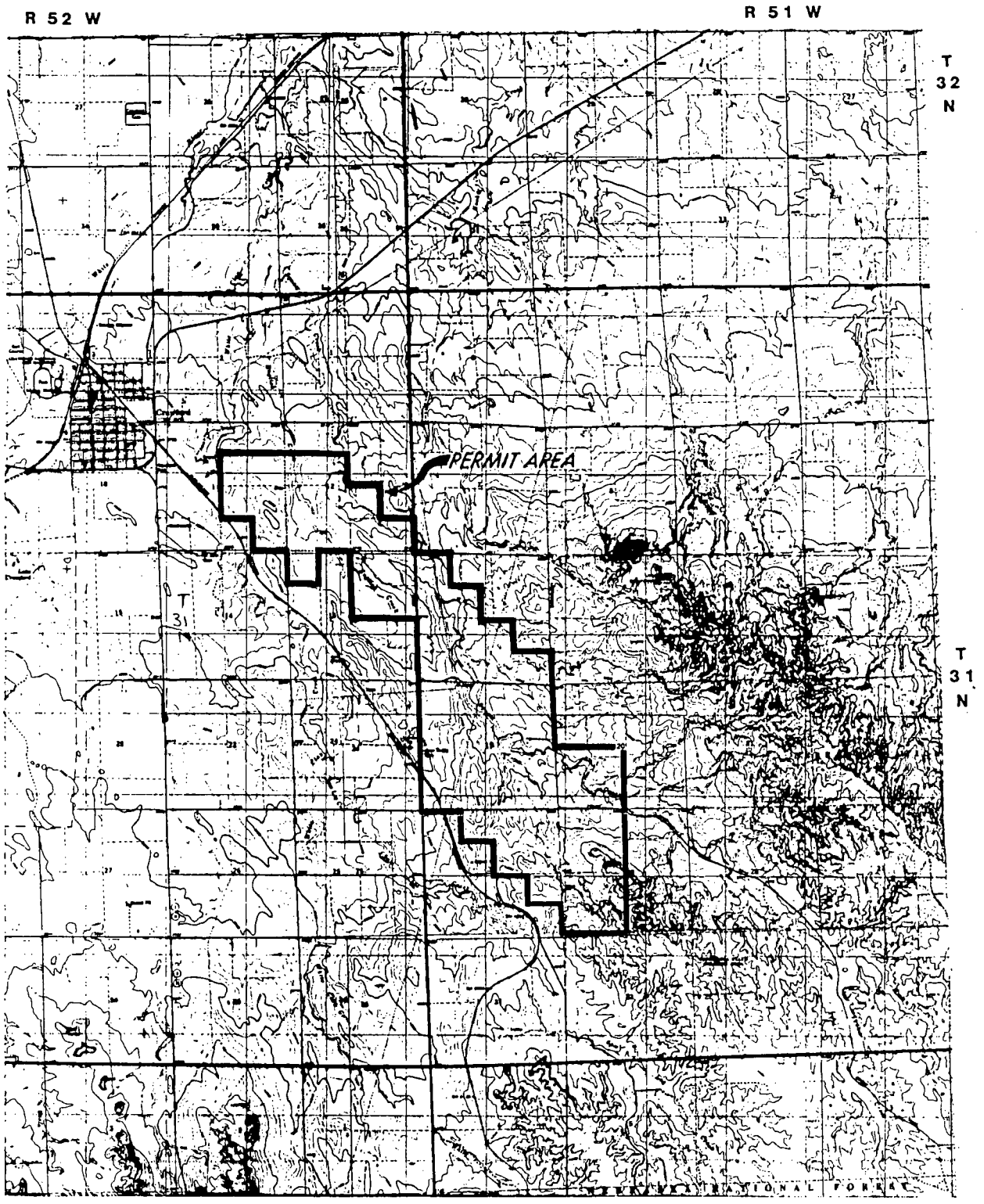
Figure 2.1-1 shows the general location of the facility and Figure 2.1-2 shows the Project Site. (See Section 2.0)

The land within the Project Site has been leased by FEN.

FEN is presently operating a R & D Facility in the N/2 SE/4 of Section 19, T 31 N, R 51 W. Operations at the R & D Facility were initiated in July 1986. Mining was conducted in two wellfields (WF-1 and WF-2) at the R & D Site from July 1986 to the present in WF-1, and Restoration was carried out in WF-2 from February 1987 to the present. WF-2 is currently in Restoration stabilization which is expected to be completed in early 1988.

Uranium will be recovered by in situ leaching from the Basal Chadron Sanstone 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. The ore body ranges in grade from less than 0.05 to greater than 0.5% U_3O_8, with an average grade estimated at 0.26% equivalent U_3O_8 and 0.31% chemical U_3O_8.



- PERMIT AREA

1.0(2) 07/29/87

REV. DATE	FERRET OF NEBRASKA, INC.	
	CROW BUTTE PROJECT Dawes County, Nebraska	
	PERMIT AREA	
	PREPARED BY: F.E.N.	
	DWN. BY: JC	DATE: 7/31/87 FIGURE: 1.0-1

The in-situ leaching process consists of an oxidation step and a dissolution step. Gaseous oxygen or hydrogen peroxide will be used to oxidize the uranium, and sodium bicarbonate will be used for dissolution. The sodium bicarbonate lixiviant will be used at a concentration ranging from less than 0.5 to 5.0 grams per liter and oxidant concentration will range from 0.01 to 1.5 g/l.

In this report sodium bicarbonate ($NaHCO_3$) will be used as a generic term to describe sodium combined with any form of carbon dioxide. These forms include carbonate ion (CO_3), bicarbonate ion (HCO_3) and dissolved carbon dioxide (CO_2 aqueous). The distribution of these forms of carbon dioxide is determined by the pH.

The uranium bearing solution resulting from the leaching of uranium underground will be recovered and the uranium extracted in a process plant. The plant process will use the following steps:

a. Loading of uranium complexes onto an ion exchange resin;

b. Reconstitution of the solution by addition of sodium bicarbonate and oxygen;

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FEN proposes to ultimately operate the uranium extraction process at an average flow of 2500 gallons per minute (gpm) not including restoration flow and expects to recover 1,000,000 lbs. of U_3O_8 per year. The first two years of operation may be at approximately 1250 gpm and then flow will be increased to 2500 gpm.

Construction of the Commercial Facility is planned for 1988 and time of construction is estimated at 9-12 months. Facilities will include a

nominal 20,000 square foot process building, wellfield, solar evaporation ponds, access roads and support facilities.

Start-up is planned for the 3rd Quarter of 1989. It is estimated that sufficient recoverable reserves are available for at least ten (10) years to over twenty-five (25) years.

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, wellfield bleed, eluent 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 solids from the solar evaporation ponds and any solid radioactive waste will be disposed of at a licensed radioactive waste disposal site.

Aquifer Restoration will be carried out at the Crow Butte site concurrent with mining. The Restoration process will be similar to the process used to restore Wellfield #2 at the Crow Butte R & D. The Restoration process consisted of the following steps:

1. Withdrawal of solutions from the wellfield which will recall any solutions that may have migrated outside of the wellfield perimeter during mining. This water may be transferred to a new wellfield during commercial operations.

2. Withdrawal of water from the wellfield followed by treatment of the water using reverse osmosis and reinjection of the purified water. The brine produced by the reverse osmosis unit will be sent to the solar evaporation ponds.

3. If necessary, a reductant such as hydrogen sulfide or sodium sulfide will be injected into the wellfield to reduce the concentration of trace elements.

The FEN Restoration program is designed to return the water quality of the affected zone to the quality level specified by NDEC which is a quality of use consistent with the "uses for which the resource was suitable" prior to the activity.

At the completion of the mine life and after groundwater restoration has been completed, all injection and recovery wells will be plugged and the site decommissioned. Decommissioning will include plant disassembly and disposal, pond reclamation and land reclamation of all disturbed areas.

FEN will maintain a surety bond for the benefit of the USNRC and/or the State of Nebraska throughout the life of the project. The surety bond will be based on the costs for groundwater restoration, plant decommissioning and surface reclamation.

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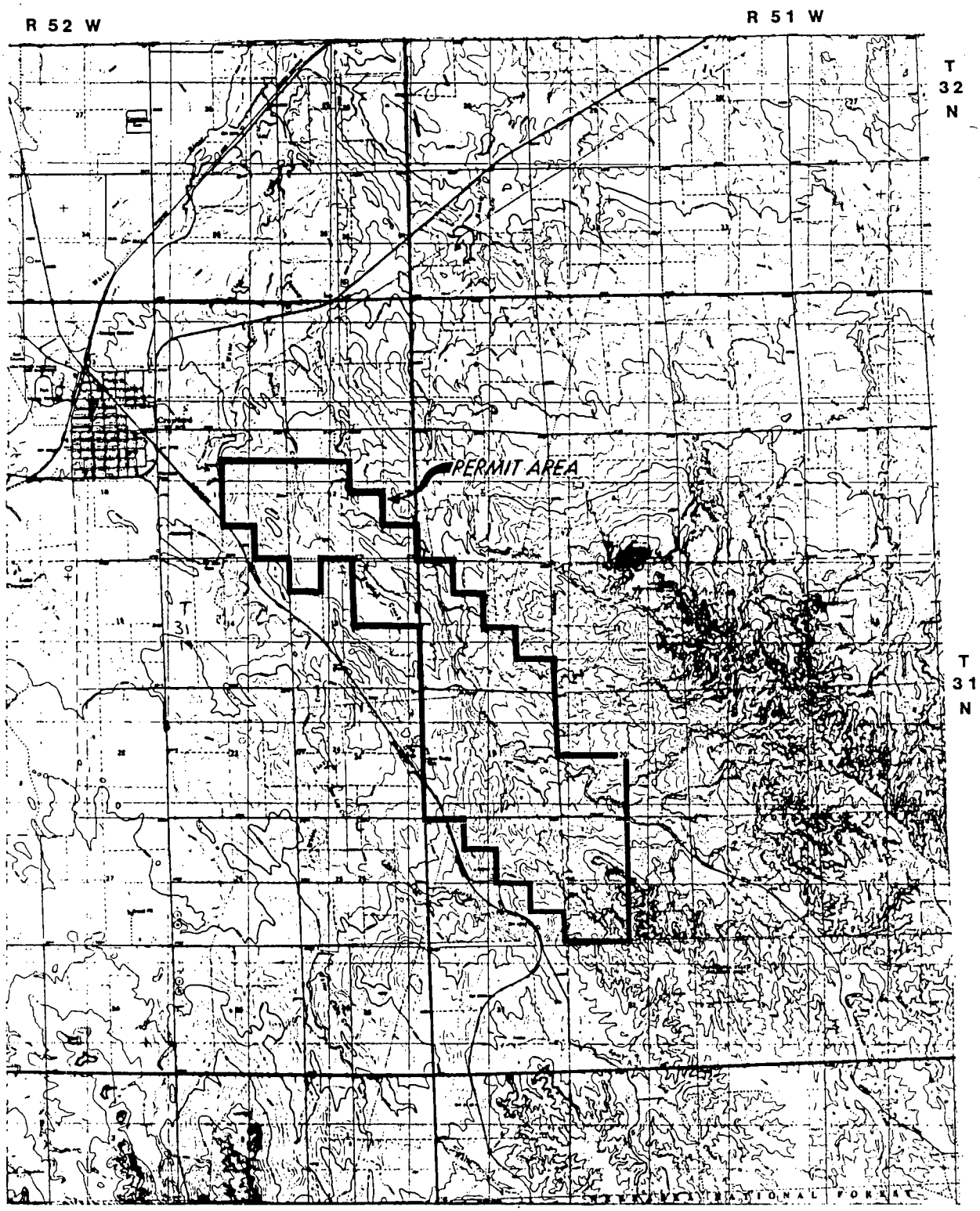

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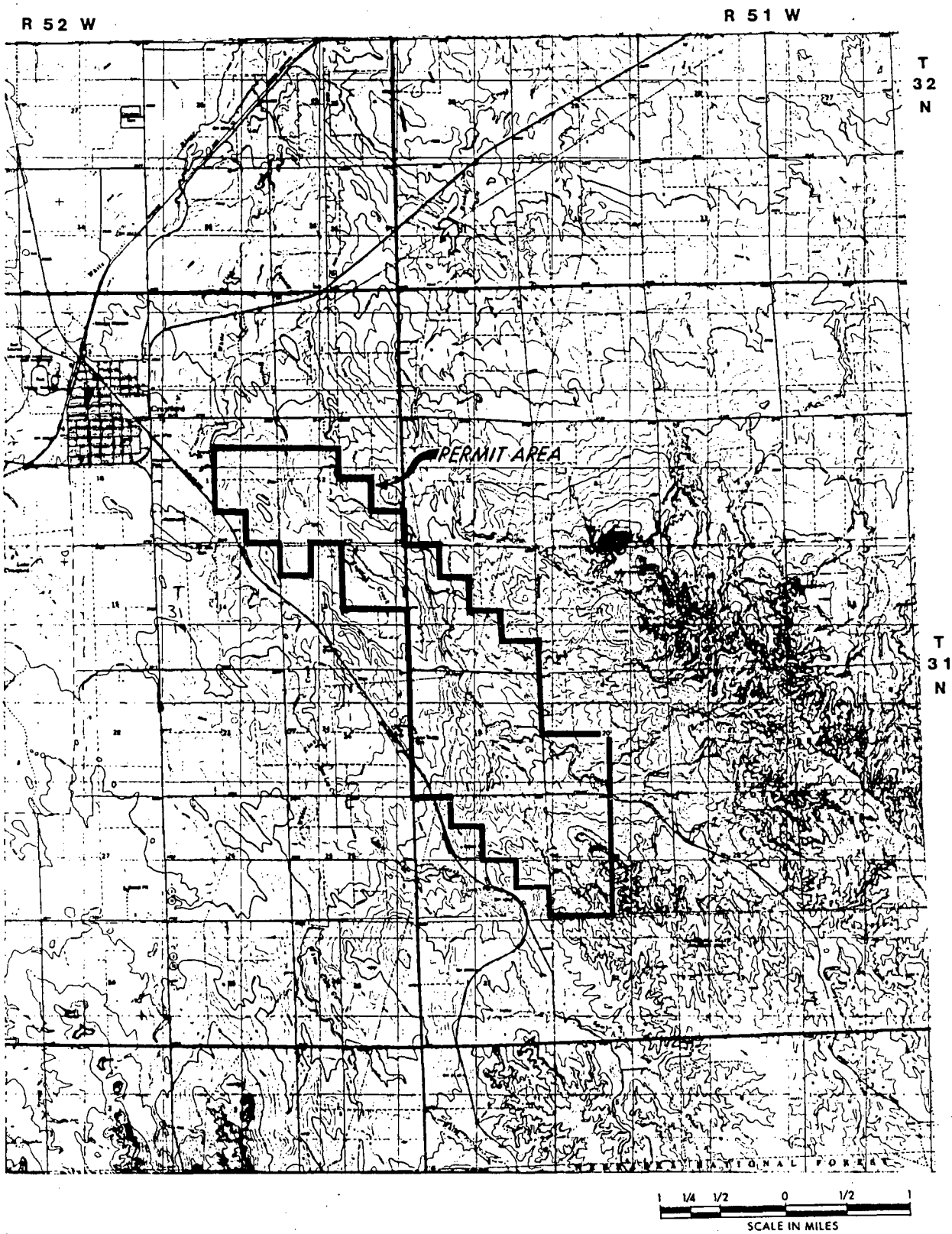

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