

**DEPARTMENT OF ENVIRONMENTAL QUALITY
AUTHORIZATION FOR UNDERGROUND INJECTION AND MINERAL
PRODUCTION WELLS**

Pursuant to the Nebraska Environmental Protection Act, Neb. Rev. Stat. Sections 81-1501 to 81-1532 (Reissue 1999 and Cum. Supp. 2006), the rules and regulations pursuant thereto, including Nebraska Administrative Code Title 122, as amended, and in reliance on statements and representations made by the permittee, a permit is hereby issued to:

CROW BUTTE RESOURCES, INC.

141 Union Boulevard, Suite 330
Lakewood, Colorado 80228
Phone: (720) 879-5140
FAX: (720) 917-0188

authorizing the construction, operation, monitoring, maintenance, plugging, abandonment, closure, and restoration of Class III underground injection and mineral production wells for the conduct of its uranium mining operation located in Dawes County, Nebraska. The Class III underground injection and mineral production wells shall be limited to the basal sandstone portion of the Chadron Formation using wells arranged in injection well patterns. The location of the facility is the areas legally described as:

Dawes County, Nebraska	
Township 31 North, Range 52 West,	Township 31 North, Range 51 West
<p style="text-align: center;">Section 11</p> <p>S½NE¼, (80 acres) N½SE¼, (80 acres) SE¼SE¼ (40 acres)</p>	<p style="text-align: center;">Section 18</p> <p>SW¼, (160 acres) S½NW¼, (80 acres) NW¼NW¼, (40 acres) S½SE¼, (80 acres) NW¼SE¼ (40 acres)</p>
<p style="text-align: center;">Section 12</p> <p>SW¼, (160 acres) S½NW¼, (80 acres) NW¼SE¼, (40 acres) S½SE¼: (80 acres)</p>	<p style="text-align: center;">Section 19</p> <p>All (640 acres)</p>
<p style="text-align: center;">Section 13</p> <p>E½, (320 acres) E½NW¼, (80 acres) NE¼SW¼, (40 acres) NW¼NW¼, (40 acres)</p>	<p style="text-align: center;">Section 20</p> <p>SW¼ (160 acres)</p>
<p style="text-align: center;">Section 24</p> <p>NE¼NE¼ (40 acres)</p>	<p style="text-align: center;">Section 30</p> <p>NE¼, (160 acres) NE¼SE¼, (40 acres) NE¼NW¼ (40 acres)</p>
	<p style="text-align: center;">Section 29</p> <p>W½, (320 acres)</p>

These wells shall be located in a portion of the approximately 2840 acre Nebraska Department of Environmental Quality permit area boundary. The location of these wells shall be limited to the area shown on Figure 1 (the permit boundary) and shall not extend beyond that area. The permit also includes the area required for all monitor wells.

All mining, stabilization, restoration, and reclamation activities will be conducted in accordance with the monitoring requirements and other conditions set forth in parts hereof.

Financial Surety amounts for the commercial operation have been established to account for costs associated with the operation and decommissioning of the existing ponds, buildings, equipment, and well fields.

This permit became effective on April 23, 1990 and is hereby modified on the date shown below. This permit shall remain effective through the life of the facility, unless it is revoked and reissued, or terminated. The Director shall review the permit at least once every five years to determine whether it should be modified, revoked and reissued, terminated, or a minor modification made.

Signed this _____ day of _____

Michael J. Linder
Director

Part I. SPECIFIC PERMIT CONDITIONS**A. General Description of Permitted Activity**

1. This permit is for a mining operation located in Dawes County, Nebraska as shown on page 1 of 23 of permit NE0122611.
2. This permit is for an in-situ uranium mine comprised of approximately 2840 acres consisting of contiguous injection well patterns within the permit boundary. The production zone is the basal sandstone unit of the Chadron Formation. The top of this unit of the Chadron Formation ranges from an approximate depth of 800 feet at the southern permit boundary to 250 feet at the northern permit boundary. Elevations range from approximately 3040 feet to 3570 feet above mean sea level. Excess water withdrawal (lixiviant bleed) will provide control of leachate movement. Monitor wells will provide horizontal and vertical surveillance of ground water quality thereby demonstrating confinement. The mining consists of injection of a sodium carbonate/ bicarbonate solution along with an oxidant (oxygen or hydrogen peroxide) to the uranium-bearing formation through a pattern of injection wells. The uranium is solubilized by the lixiviant and this solution is pumped from the recovery wells to the processing plant where the uranium is extracted by ion exchange. The lixiviant is then reconstituted with leaching agents and recycled to the well field for reinjection. Ion exchange will be used in the processing plant and the yellow cake will be shipped from the facility.

B. Notice of Intent to Operate

Prior to operation of each mine unit or any part thereof the permittee must submit a notice of completion of construction to the Director with the following information:

1. A scaled map indicating the location of all monitoring, production, injection wells and known archeological sites.
2. A well completion report for all injection/production well(s).
3. A statement that each Class III well or group of wells utilizing a positive displacement pump shall be equipped with both high and low pressure safety switches which will shut down the pump in case of pressure increase over the authorized pressure or sudden pressure loss.
4. A well completion report for all monitor well(s).
5. The baseline sampling data used to determine the Upper Control Limits (UCLs) and the designation of these limits.
6. The baseline sampling data used to determine the restoration values and the permittee's recommendation for wells to be designated as restoration wells in that mine unit.

7. The results of testing which demonstrates the mechanical integrity for all wells by:
- a. Setting a packer immediately above the completion interval and a packer or well head at ground surface. The space between the two will then be pressurized to at least 125% of maximum operating pressure specified in Part II, A, 1 of this permit. The pressure must be held for a period of 20 minutes maintaining 90% of the original pressure to pass the test.
- OR**
- b. The use of the casing cementing pressure/single point resistivity method of MIT for Class III uranium wells in conjunction with another approved mechanical integrity testing method.
- In addition to either a or b the permittee shall also provide:
- c. A precalculated amount of cement/bentonite grout or bentonite grout to fill the annular space of the well along with well records demonstrating the presence of adequate grouting material to prevent fluid migration.
- AND**
- d. Any other data gathered for the injection and production wells.
8. In addition the permittee shall have available on site for review upon request any other pertinent information which they have compiled, such as:
- a. All available geological and geophysical logging and testing on the well(s).
 - b. The results of the formation testing program.
 - c. Compatibility of injected materials with fluids in the injection zone and the minerals in both the injection zone and the confining zone.

Or so much of said information as the director may require in consultation with the permittee. The Notice of Intent to Operate for each mine unit or partial mine unit shall be submitted at least thirty days prior to any injection. Within thirty days from the receipt of the Notice of Intent to Operate the Director shall give written approval or state such steps necessary to receive approval.

C. Liquid Waste Streams Resulting from the Permitted Activity

- 1. **Lixiviant Bleed** - excess fluid pumped from the well field to control lixiviant movement.
- 2. **Precipitation circuit bleed** - excess from ion exchange, elution, and precipitation.
- 3. **Filter backwash** - water used to remove solids from filters.
- 4. **Waste treatment brine - reverse osmosis or other conventional waste water treatment processing wastes.**
- 5. **Laboratory waste** - waste from routine chemical laboratory procedures and processes.

6. **Process building sump waste** - waste generated by general clean up of facilities, pump leakage, or wash down.

7. **Well development water** - water generated during the development of wells screened within the Chadron Formation.

D. Disposal of Waste

1. All of the liquid waste streams shall be collected and retained in the lined evaporation ponds, or disposed of in a permitted deep disposal well as approved by the Department. Well development water will be captured in water trucks specifically labeled for such purpose, and equipped with signage indicating that these trucks may only discharge their contents to the lined evaporation ponds. This permit does not authorize any wastewater discharge to the land surface or surface water of the State of Nebraska. Land application or surface discharges of wastewater must be regulated through a separate permit.
2. Radioactive solids will be disposed of as per NRC License SUA-1534.
3. Nonradioactive solids - solid and semisolid wastes will be disposed of at a licensed landfill site in accordance with Neb. Rev. Stat. 81-1516 (Reissue 1994).

E. Development Drilling and Abandonment of Uncased Holes

This permit allows development drilling within the permit area for the purpose of determining new mine unit locations. The permittee shall notify the Department at least ten (10) days prior to any development drilling within the permit area.

1. Upon completion of a development hole, the hole shall be plugged with an approved abandonment mud in a manner which will prohibit the movement of fluids out of the injection zone or between underground sources of drinking water. The product sheet must state the product is an abandonment mud (mud). The mud shall be mixed through a hopper and meet the following criteria:
 - a. A viscosity of at least 20 seconds/qt. above the Total Depth (T.D.) viscosity to exceed 60 seconds/qt. (using a Marsh funnel), and
 - b. A mud density of at least 8.7 lbs/gal.

The mud shall be circulated through the hole until it is returning to surface. If the formation pressure is such that the density of the mud is not sufficient to hold the plug in place, A weighting agent added to the Plug Gel or a Portland cement slurry shall be used.
2. An approved hole plug shall be placed six feet below the land surface followed by cement which has been mixed with water to within two feet of the land surface. The top two feet of the hole shall be filled with dirt into which a hole marker, showing section, township, and range shall be placed.
3. The topsoil will be removed and stockpiled separately from the rest of the pit material. Upon completion of the hole the pit will be filled and the dirt mounded to allow for subsidence. The pit will then be leveled, topsoil replaced and the entire site reseeded with an approved seed mixture.
4. A hole abandonment report shall be included with the quarterly report. It shall include the T.D. viscosity (seconds/qt.), the abandonment viscosity (second/qt.), the mud density (lbs/gal.), and the amount and kind of approved abandonment product used to plug each hole.

Part II. INJECTION LIMITATIONS MONITORING REQUIREMENTS AND DETERMINATION OF RESTORATION**A. Injection Limitations****1. Injection Well Limitations**

Commencing on the date of approval of the Notice of Intent to Operate and lasting through the permit expiration date the permittee is authorized to inject sodium carbonate/bicarbonate and an oxidant or a restoration reductant to the wells designated as injection wells. (See Notice of Intent to Operate.) Such injection shall be limited as specified in Tables 2.1 and 2.2:

TABLE 2.1: INJECTION WELL REQUIREMENTS

CHARACTERISTICS	LIMITATIONS	MONITORING REQUIREMENTS	
	Maximum Limits	Measurement Frequency	Sample Type
Well Head Pressure	100 PSIG	Once/day	Manifold Gauge
Flow Rate	See Table 2.2	Once/day	24 Hr. Average
Injection Fluid			
Chloride	• 5000 mg/l	Once/day	24 Hr. Composite
Sulfate	• 5000 mg/l	Once/day	24 Hr. Composite
Sodium	• 6000 mg/l	Once/day	24 Hr. Composite
Alkalinity	• 4100 mg/l	Once/day	24 Hr. Composite
pH	6.0 to 10.5 S.U.	Once/day	Grab
Bleed Rate	None	Once/day	Totalizer Meter

TABLE 2.2: MINING REQUIREMENTS

TOTAL MINE INJECTION RATES (Cumulative for all mine units)		
Production Flow (maximum)	Restoration Flow	Total Flow (maximum)
9,660 gpm	Total Flow – Production Flow	11,000 gpm*

*The total injection rate at the facility shall be calculated using a 24-hr daily average collected from flow meters for each well.

Sample(s) taken in compliance with the injection requirements specified in Tables 2.1 and 2.2 shall be taken at the following location(s):

- a. Injection pressure; from a gauge on manifold.
- b. Injection totalizer; from flow meter downstream of filters after chemicals are added but before oxidant addition.
- c. Injection fluid; downstream from filter after chemicals are added but before oxidant addition.

2. Mine Unit Limitations

The permittee shall have no more than five mine units in the mining stage at any given time.

The permittee shall not have more than five mine units in restoration (excluding those units in stabilization) at any given time.

The permittee shall not have more than three mine units constructed in advance of the active mining.

3. Archaeological and Historical Limitations

The permittee shall not conduct mining activities or cause other modifications within a 100 foot radius of the five archaeological or architectural sites that could qualify for the national register without written approval from the Nebraska State Historical Society. This written approval must be supplied to the Department thirty days prior to any development or construction activity within the area. The permittee is responsible for any additional field investigations, which may be required for Historical Society approval. These five sites are listed and described in Subsection 4.8 of

Crow Butte Uranium Project
Application and Supporting Environmental
Report for State of Nebraska
Underground Injection Control Program
Commercial Permit
November 1987

as: 25DW112, 25DW114, 25DW192, 25DW194, and 25DW00-25

4. Pump Test Limitations

The permittee shall not construct any mine units outside the area of influence of the pump tests shown in Figure 2 of this permit. If mine units are required outside this area the permittee must conduct another pump test to demonstrate continued confinement and hydrologic conditions. The data from this test shall be submitted to the Department and receive approval prior to any construction.

B. Monitoring Requirements**1. Monitoring Wells**

During the period beginning with initiation of injection in the Mine Unit and lasting through restoration and stabilization of a mine unit, the permittee shall monitor all wells designated as monitor wells as specified in Table 2.3. In addition, all shallow monitoring wells designed to monitor water quality in the Brule Aquifer will, at a minimum, be analyzed annually for uranium and radium-226 to the lowest detection limit available.

TABLE 2.3: MONITORING WELL REQUIREMENTS

MONITORING REQUIREMENTS				
Upper Control Limit*				
Monitoring Characteristics	Sampling Frequency	Single Parameter**	Multiple Parameter**	Sample Type
Chloride	Biweekly	mg/l	mg/l	Grab
Conductivity	Biweekly	umhos/cm	umhos/cm	Grab
Alkalinity (as CaCO ₃)	Biweekly	mg/l	mg/l	Grab
Water Level	Biweekly	Reported to the nearest 0.1 foot from land surface.		
Barometric Pressure	Biweekly			

* If a single parameter Upper Control Limit (UCL) is exceeded or if two or more multiple parameter UCLs are exceeded for a particular well, the permittee shall collect a verification sample within 24 hours from the time the first analysis is available. If the second sample does not indicate exceeded UCLs, a third sample shall be taken within 48 hours of the time the first sample was taken.

If the second or third samples indicate an exceeded UCL, the well in question shall be placed on excursion status and monitored on a weekly basis. The permittee shall notify the Department by telephone within 24 hours from the time the confirmation sample was taken. The permittee shall mail to the Department the laboratory data from all the samples and a plan of corrective action. This data shall be postmarked within five days from the time the confirmation sample was taken. In the event neither the second nor third samples indicate exceeded UCLs then the well shall be returned to its regular sampling frequency.

At such time as three consecutive one-week samples are below the exceeded UCL, the excursion status shall be removed from the well. Weekly sampling shall continue for an additional three weeks. If the UCL is not exceeded then biweekly sampling shall resume. Should an excursion occur, a formal report shall be submitted with the quarterly report containing all lab data and the results of the corrective actions taken. If corrective actions have not been effective within 90 days of the excursion confirmation, the injection of fluid shall be terminated in the affected area. Resumption of injection shall require a written approval by the Director.

**Upon receipt of pertinent data and prior to operation, the UCLs for the monitor wells shall be calculated using one of the following methods:

- Determine the maximum recorded value from preoperational sampling and multiply the value by 1.20 to calculate the multiple parameter value.
- For those monitor wells where the baseline average of the indicator parameter is 50 mg/l or less, the multiple parameter UCL shall be calculated as equal to 20 percent above the maximum concentration measured for the parameter, baseline average for the parameter plus 5 standard deviations, or baseline average plus 15 mg/l.
- Multiply the multiple parameter value by 1.20 to calculate the single parameter value.

These values will be rounded off to the nearest unit.

Sample(s) taken in compliance with the monitoring requirements specified above shall be taken at the well head or at a location approved by the Director.

2. Evaporation Ponds

Upon initial pond operation and until approval of the Director to cease, the permittee shall monitor the evaporation pond leak detection systems and the evaporation pond freeboards as specified in Table 2.4:

TABLE 2.4: EVAPORATION POND REQUIREMENTS

MONITORING CHARACTERISTICS	SAMPLING FREQUENCY
Fluid Level	Weekly*
Freeboard	Weekly

**Upon determination of elevated fluid levels or other conditions indicative of a leak into the underdrain system, the permittee shall notify the Department immediately and conduct monitoring in accordance with the NRC License SUA-1534 until occurrences causing the leaks into the underdrain system have been corrected, and the results from required monitoring or sample analyses substantiate the corrective actions. Such information shall be reported to the Department. If corrective actions require the pumping of the contents of one evaporation pond into another, the minimum freeboard levels are waived until such time as the corrective actions have succeeded, and the evaporation pond can be placed back into service.*

Measurements taken in compliance with the monitoring requirements specified in Table 2.4 shall be taken from the detection system and at the pond.

With the exception of specific monitoring requirements in this permit, all monitoring of the ponds and the detection systems shall be in accordance with the NRC License SUA - 1534.

Upon initial pond operation and until approval of the Director to cease the permittee shall monitor the evaporation pond monitor well(s) as specified in Table 2.5:

TABLE 2.5: EVAPORATION POND MONITORING WELL REQUIREMENTS

MONITORING CHARACTERISTICS	SAMPLING FREQUENCY	SAMPLE TYPE
Conductivity umhos/cm	Quarterly	Grab
Chloride mg/l	Quarterly	Grab
Alkalinity (as CaCO ₃) mg/l	Quarterly	Grab
Sodium mg/l	Quarterly	Grab
Sulfate mg/l	Quarterly	Grab

Sample(s) taken in compliance with the monitoring requirements specified in Table 2.5 shall be taken at the well head.

C. Restoration Determination

Upon construction of a new mine unit the permittee shall designate and sample one baseline restoration well per four acres within the mine unit for all the parameters listed in the restoration table (Table 2.6). All the premining sampling of the baseline restoration wells must be at least 300 ft. from any active mine unit (not to include the R&D well field).

1. Designation of Restoration Wells

Within each mine unit a minimum of one injection or production well per acre shall be designated as a restoration well. There shall be a minimum of ten restoration wells per mine unit. The production well of each standard injection well pattern shall be designated as the restoration well. If there is more than one standard injection well pattern per acre, the production or injection well which is centrally located shall be designated as the restoration well. Any monitor well which has an excursion will automatically become an additional restoration well. The designation of the baseline restoration wells must be included with the Notice of Intent to Operate for the mine unit. The designation of the remaining restoration wells shall be included in the restoration plan submitted for that mine unit.

2. Establishment of Restoration Parameters

- a.** Those parameters which have numerical ground water standards established in Title 118 or other established documents must be restored to the standard value unless the standard is exceeded by the mean of the preoperational sampling values (baseline mean). The restoration value for parameters whose baseline mean exceeds the standard shall be equal to the mine unit mean plus two standard deviations (see Table 2.6).
- b.** If no standard exists for a parameter listed on the restoration table (Table 2.6), a wellfield average of the preoperational sampling data shall be assigned. Normal statistical procedures will be used to obtain this average. All three values obtained from Part II, C. shall be averaged to obtain the assigned restoration value (see Table 2.6).
- c.** Prior to any mining in the mine unit the permittee must submit these values to the Department for approval. The restoration values for each mine unit will be based on current Title 118 numerical standards and wellfield averages at the time the notice of intent is submitted to the Director. All data to verify the selection of these wells shall be submitted.

TABLE 2.6: RESTORATION TABLE (1/3/2007)

CURRENT TITLE 118 NUMERICAL STANDARDS		PARAMETERS SET ON WELLFIELD AVERAGES		OTHER PARAMETERS	
Parameter	Standard	Parameter	Parameter	Value	
Arsenic (As)	0.05 mg/l	Calcium (Ca)**	Ammonia (NH ⁴ as N)	10.0 mg/l	
Barium (Ba)	2.0 mg/l	Total Carbonate*	Molybdenum (Mo)	1.0 mg/l	
Cadmium (Ca)	0.005 mg/l	Potassium (K)**	Nickel (Ni)	0.15 mg/l	
Chloride (Cl)	250 mg/l	Magnesium (Mg)**	Vanadium (V)	0.2 mg/l	
Copper (Cu)	1.3 mg/l	Sodium (Na)**			
Fluoride (F)	4.0 mg/l	Total Dissolved Solids (TDS)***			
Iron (Fe)	0.3 mg/l				
Mercury (Hg)	0.002 mg/l				
Manganese (Mn)	0.05 mg/l				
Nitrate as N (NO ³)	10.0 mg/l				
Lead (Pb)	0.015 mg/l				
Radium (Ra)	5.0 pCi/l				
Selenium (Se)	0.05 mg/l				
Uranium (U)	0.030 mg/l				
Sulfate (SO ⁴)	250.0 mg/l				
Zinc (Zn)	5.0 mg/l				
pH	6.5 – 8.5 S.U.				

All parameters listed as parameters with numerical ground water standards (Title 118 or other sources) are subject to change based on the procedure outlined in Part II, C, 2 of this permit.

** Total carbonate shall not exceed 50% of the total dissolved solids value.*

*** One order of magnitude above baseline mean shall be used as a restoration value for some parameters due to the ability of some major ions to vary one order of magnitude depending on pH.*

**** The restoration value for Total Dissolved Solids shall be the baseline mean plus one standard deviation.*

3. Restoration Procedure

At the cessation of mining in each mine unit the permittee shall notify the Department in writing, and shall proceed to establish the post-mining water quality for all the parameters listed on the restoration table (Table 2.6) of this permit for the designated restoration wells. The permittee may accomplish this by collecting a sample of the lixiviant injected into the mine unit to be representative of the post mining water quality. These samples may be split between a lab of the permittee's choice and a lab of the Department's choice.

The permittee shall submit in writing a restoration plan including a stabilization period of at least six months for that mine unit, and after Department approval

shall commence restoration. Prior to approval of the restoration plan, the Department may require the installation of additional wells to evaluate the success of the restoration efforts. When the permittee determines that restoration is complete they shall sample and complete an analysis of all designated restoration wells for all the parameters listed in the restoration table. These samples must be split between a lab of the permittee's choice and a lab of the Department's choice. Results of these samples shall be submitted to the Department.

4. Restoration Determination and Stabilization

a. Restoration Parameters Achieved

If the restoration procedure has returned the wellfield average of the restoration parameters to concentrations at or below the parameters approved by the Department, the permittee shall notify the Department that they are initiating stabilization. This notification shall include data supporting the fact that the restoration parameters have been achieved. The Director shall respond in writing by either accepting or denying the initiation of stabilization. If at any time during stabilization the Director deems it necessary, he or she may extend the stabilization period by notifying the permittee in writing. During stabilization, the permittee will monitor all designated restoration wells on a monthly basis for all the parameters listed on the restoration table. At the end of the stabilization period, the permittee shall submit this data and may request that the wellfield be considered restored if the restoration parameters have been achieved and there is an absence of significant increasing trends for any of the restoration parameters. The Director shall, in writing, extend the stabilization or, require further restoration, or accept the restoration of the mine unit.

b. Restoration Parameters Not Achieved

If the restoration parameters established in the Notice of Intent are not met or if there are significant increasing trends for any of the restoration parameters after application of best available technology, the permittee shall provide for the Department's approval a written justification for alternate values.

This justification shall include all available water quality data for the mine unit in question, a narrative discussing the restoration techniques including demonstration of best available technology, and a justification of the need to alter the parameter(s). The adoption of an alternate value shall not in and of itself indicate a failure to successfully restore the mine unit.

In determining whether the restoration table (Table 2.6) should be altered the Department shall consider the following:

- (1)** Uses for which the ground water was suitable at baseline quality levels;
- (2)** actual existing use of the ground water in the area prior to and during the mining;

- (3) potential for future use of the ground water at baseline quality and at proposed restoration parameters;
- (4) the effort made by the permittee to restore the ground water to the restoration parameters;
- (5) the availability of existing technology to restore the ground water to the restoration parameters; and
- (6) the potential harmful effects of levels of particular parameters.

If the Department determines that:

- (a) Reasonable efforts have been made giving consideration to (1) through (6) above; and
- (b) the formation water present in the aquifer would be suitable for any use for which it was reasonably suited to prior to mining; or
- (c) further restoration efforts would consume energy, water, or other natural resources of the State without providing a corresponding benefit to the State,

the Department may adopt the alternate value(s) and inform the permittee in writing.

If the Department determines, with cause, that alternate values are not justified, then written denial of alternate values shall be sent to the permittee. The permittee shall then submit a second restoration plan detailing further restoration and after approval, shall commence restoration.

When the permittee determines that subsequent restoration is complete the permittee shall sample and complete an analysis of all designated restoration wells for all the parameters listed in the restoration table. These samples shall be split between a lab of the permittee's choice and a lab of the Department's choice. Results of these samples shall be submitted to the Department. Restoration determination shall begin again as outlined in Part II. C.

PART III. WELL CONSTRUCTION, SPACING, SAMPLING AND REPORTING
A. Well Construction Requirements

All wells shall be constructed in accordance with Section 10.2 of:

Crow Butte Uranium Project
Application and Supporting Environmental
Report for State of Nebraska
Underground Injection Control Program
Commercial Permit
November 1987

or subsequent approved submittals.

1. General Requirements

- a. Wells which are completed using bentonite grout as a sealing material must utilize a cement basket at or near the base of the casing to help support the column of grout. The casing shall extend as close to the bottom of the hole as possible before emplacement of the bentonite grout. In addition, placement of the bentonite grout must be accomplished through the use of a tremie pipe.
- b. Any Injection/Production well which is completed or intended to be completed by underreaming the casing must use cement or cement/bentonite grout as a sealing material.
- c. Each well must be shown to be functionally operational prior to its use.
- d. All wells constructed are subject to the mechanical integrity requirements contained in sections I and IX of this permit. In addition to these requirements, any well which has had a rig workover performed on it must pass a mechanical integrity test prior to being placed back into service. Workovers performed with a pulling unit are exempt from this requirement.

2. Cement/Grout Specifications

- a. All cement will be ASTM Type I, II or API Class B or G and meet the following criteria:
 - i. A density of no less than 11.5 lbs/gal.
- b. A bentonite grout shall be mixed as close to possible to a concentration of 1.5 lb. bentonite per gallon of water (1 qt. polymer per 100 gallons of water may need to be premixed to prevent the clays from hydrating prematurely) and meet the following criteria:
 - i. A density of no less than 9.2 lbs/gal.

B. Spacing Requirements**1. Production Zone Monitoring Wells**

Production zone monitor wells shall be screened through the entire aquifer thickness with a screen-to-blank ratio of at least 1.

Production zone monitor wells shall be spaced no greater than 300 feet from a mine unit and no greater than 400 feet between the wells and located so as to detect excursions.

2. Shallow Monitoring Wells

Shallow monitor wells shall be screened through the entire sand unit. The permittee shall notify the Department at least five days prior to well construction.

The Notice of Intent to Operate shall include well completion reports for these wells. Approval of the initial well construction shall be given with the Notice of Intent to Operate. All wells must be shown to be functionally operational prior to initiation of the mining.

Shallow monitor wells shall be completed in the first continuous and water-bearing sandstone unit overlying the production zone. These wells shall be equally distributed throughout the mine unit, with one well for every four acres included in the mine unit.

C. Monitor Well Sampling Procedures**1. Mine Unit**

- a. Measure water level.
- b. Pump or airlift to evacuate at least one casing volume and allow pH and conductivity to stabilize prior to sampling;
- c. Sample filtering, preservation, and hold times shall be in accordance with the U.S. Environmental Protection Agency's Approved Methods for Sampling and Sample Preservation of Water and Wastewater.

2. Evaporation Pond Monitoring Wells

- a. Measure water level.
- b. Pump, airlift or bail to evacuate at least one casing volume and allow pH and conductivity to stabilize prior to sampling.
- c. Sample filtering, preservation, and hold times shall be in accordance with the U.S. Environmental Protection Agency's Approved Methods for Sampling and Sample Preservation of Water and Wastewater.

D. Preoperational Sampling of Newly Constructed Wells**1. Restoration Wells**

A minimum of one baseline restoration well per four acres will be sampled for all the parameters listed on the restoration table (Table 2.6). All premining sampling must be done at least 300 feet from any active mine unit. Each well must be sampled a minimum of three times in a manner and at a depth representative of the aquifer to be affected by mining fluids in that area of the mine unit. If there are anomalous sample analyses within a mine unit the Department may require additional sampling prior to any mining in that particular mine unit.

2. Monitor Wells

All monitor wells shall be sampled once for all the parameters listed on the restoration table (Table 2.6) and twice for all parameters listed in Table 2.3. All premining sampling events will be conducted at least 2 weeks apart. All premining sampling of production monitoring wells must be done at least 300 feet from any active mine unit. If there is a significant variability between samples the Department may require additional sampling prior to any mining in that particular mine unit.

E. Reporting Requirements

1. Reporting shall be done quarterly unless otherwise specified. Reporting periods shall be January-March, April-June, July-September, and October-December.

Deleted:

2. Reporting of monitoring results gathered during reporting periods shall be summarized and reported to the Department no later than the 28th day of the month following the end of the reporting period. Copies of the results shall be kept on site for inspection by the Department.

3. Quarterly reporting must be submitted on or before April 28, July 28, October 28, and January 28.

Signed copies of these reports shall be submitted to the Department at the following address:

Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, NE 68509

PART IV. PLUGGING AND ABANDONMENT OF CASED HOLES**A. General**

1. The proposed plugging and abandonment plan shall be submitted to the Department for approval. The Director will review any revised, updated, or additional plugging and abandonment plans.
2. Plugging and abandonment shall be done in accordance with Title 122 Chapter 35. Prior to abandonment the permittee shall notify the Director seven days before commencing plugging and abandonment.
3. Prior to abandonment, all wells shall be plugged with cement or other approved plugging material in a manner which will prohibit the movement of fluids out of the injection zone into or between underground sources of drinking water.

B. Cement/Grout Specifications

1. All cement will be ASTM Type I, II or API Class B or G.
2. All Bentonite products will have specifications outlined in the approved plugging and abandonment plan.

C. Surface Reclamation

The permittee shall reclaim all disturbed land surfaces to conserve the soil and water resources in the affected areas. The Natural Resources Conservation Service shall be consulted for technical assistance in reclaiming the land surface including appropriate seed mixtures. Topsoil from the ponds and building areas shall be removed, stockpiled, and seeded during the operation, and reapplied to the contoured surface. Reclamation plans including the seed mixture will be submitted to the Department for approval at least 60 days prior to commencement of reclamation. Pond reclamation and decommissioning/decontamination shall be in accordance with NRC License SUA - 1534.

PART V. OTHER PERMITS AND LICENSES

The permittee shall have all other permits and licenses as required by the Department and other state, federal, or local agencies.

PART VI. CORRECTIVE ACTION**A. Lixiviant Movement**

1. Increasing the overrecovery rate,
2. Reordering the wellfield,
3. Cease injection of lixiviant or whatever action is necessary to recall the lixiviant.

B. Shallow Aquifers

Anytime a shallow aquifer may be affected by a mining solution release, the permittee must submit a corrective plan of action to the Department for approval. This plan should follow the steps outlined in NDEQ Title 118 – Ground Water Quality Standards and Use Classification, Appendix A.

C. Surface Water

Anytime surface water is affected by a mining solution release, the permittee must submit a corrective plan of action to the Department for approval.

PART VII. PERMIT DEFINITIONS**A. Permit Area**

The area as shown in Figure 1.

B. Mine Unit

The area identified as a mine unit at the time of submittal of the Notice of Intent to Operate as approved by the Department.

C. Application

The document entitled, Crow Butte Uranium Project, Dawes County, Nebraska, certified November 9, 1987, meets the conditions of Chapter 11, Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells.

D. Zone of Endangering Influence

That zone described in Title 122, Chapter 14, Part 001.02.

E. Area of Review

That area as shown in Figure 4.2-1 of the application as identified in Part VII. C..

PART VIII. FINANCIAL STATEMENT

Evidence of financial responsibility in the form of a letter of credit or other form satisfactory to the Department in accordance with Chapter 13, Title 122, Rules and Regulations for Underground Injection and Mineral Production Wells, shall be provided to the Department in an amount which is equal to or greater than the total costs indicated in the Surety Cost Estimate document submitted by the permittee. The permittee shall provide an annual update of the surety estimate as required, along with an audit statement from an independent professional auditing firm. The Department shall review the financial responsibility and surety estimates annually, and may apply all appropriate tools to ensure its adequacy, including submission to the Department's internal accounting personnel, or submission to the office of the State Auditor.

PART IX. STANDARD PERMIT CONDITIONS**A. Monitoring and Records**

All monitoring requirements shall be in accordance with those stated in Title 122, Chapter 20.

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of all the volume and nature of the monitored discharge or injection. All samples shall be taken at the monitoring points specified in this permit unless otherwise specified. Monitoring points shall not be changed without notification to and the approval of the Department.

2. Mechanical Integrity

The permittee shall demonstrate mechanical integrity at least once every five years during the life of the well(s) as required herein and in Title 122, Chapters 18 and 20. The Department shall be notified at least five days prior to any mechanical integrity testing.

3. Test Procedures

Test procedures for the analysis of pollutants which are required to be monitored by this permit, unless otherwise specified by the Director, shall conform to the latest edition of the following references:

Standard Methods for the Examination of Water and Wastewaters, 18th Edition, 1992, American Public Health Association. New York, NY 10019

A.S.T.M. Standards, Part 11, American Society for Testing and Materials, Philadelphia, PA 19103

Methods for Chemical Analysis of Water and Wastes, March 1979, Environmental Protection Agency Water Quality Office, Analytical Quality Control Laboratory NERC, Cincinnati, Ohio 45268

4. Additional Monitoring by the Permittee

If the permittee monitors any parameter more frequently than required using approved testing procedures or procedures specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Mining Monitoring Report. Such increased frequency shall also be indicated.

5. Averaging of Measurements

Calculations for all limitations which require averaging shall utilize an arithmetic mean unless otherwise specified by the Director in this permit.

6. Retention of Records

The permittee shall retain all records in accordance with Title 122, Chapter 20.

B. Plugging and Abandonment

Plugging and abandonment shall be done in accordance with Title 122, Chapter 35. Prior to abandonment the permittee shall notify the Department seven days before commencing plugging and abandonment activities. Plugging shall conform to the following standards:

1. A plugging and abandonment plan shall be submitted to the Department for approval.
2. Prior to abandonment of boreholes and wells, the boreholes and wells shall be plugged with cement or other approved plugging material in a manner which will prohibit the movement of fluids out of the injection zone into or between underground sources of drinking water.

C. Financial Responsibility

The permittee shall secure and maintain in full force and effect at all times a performance bond or other form of financial security in a form acceptable to the Director. This bond or financial security will provide for proper plugging and abandonment of the permitted wells, restoration of the aquifer, and surface reclamation. This permit shall become invalid if the permittee does not maintain a performance bond or other form of financial security acceptable to the Director in the appropriate amount.

D. Reporting Requirements

1. Evaporation Pond Operation

A minimum of five feet of freeboard shall be maintained in the commercial evaporation ponds during normal operations. A minimum of three feet of freeboard shall be maintained in the R & D ponds during normal operations. The permittee shall immediately notify the Department when the freeboard decreases to less than the specifications.

Should any abrupt change in the water depth occur or a leak be detected in the evaporation pond liner, the Department will be immediately notified. The pond fluids will be evacuated as soon as practicable to another location approved by the Director, and the pond seal repaired. A determination of the extent of any subsurface contamination shall be made and a report submitted to the Director within 30 days after the leak is detected. The report shall also contain the permittee's plan for corrective action.

All other reporting requirements shall be in accordance with Title 122, Chapter 21.

2. Signatory Requirements

All signatory requirements shall be in accordance with Title 122, Chapter 15.

3. Modification, Revocation, and Reissuance of Permit

Administer as required by Title 122, Chapter 30.

4. Permit Transfer

Administer as required by Title 122, Chapter 29.

5. Confidential Information

Address as required by Title 122, Chapter 28.

E. General Conditions**1. Compliance**

Administer as required by Title 122, Chapter 36. It shall not be a defense for a permittee in an administrative enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

2. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or correct any adverse impact to the environment resulting from noncompliance with this permit, including accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliance.

3. Property Rights

The issuance of this permit does not convey any property right of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of a person's rights, nor any infringement of federal, state or local laws or regulations.

4. Severability

Administer as required by Title 122, Chapter 36.

5. Right of Entry

Inspection and Right of Entry shall be in accordance with Title 122, Chapter 27.

6. Maintenance

The permittee shall at all times properly install, operate and maintain all facilities and systems of treatment and control (and related appurtenances) to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance.

7. Permit Changes

This permit may be modified, revoked and reissued, or terminated for cause by the Department (Title 122, Chapters 30 and 31) or upon filing of a request by the permittee. The permittee shall furnish to the Director any information which the

Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit. Such information may also be requested by the Director to determine compliance with the permit. Upon request by the Director, the permittee shall also furnish copies of records required to be kept by the permit.

F. General Definitions

All definitions except those listed below shall be those in Title 122, Chapter 1.

Abandonment Mud – A product made specifically for the abandonment of boreholes of wells.

Bentonite Grout - A slurry mixture comprised primarily of water and Bentonite (Montmorillonite) which is emplaced into the void space of boreholes, or annular space of wells, or internal volume of cased wells for purposes of consolidation and elimination of permeability.

Bimonthly - Once every other month.

Biweekly - Once every other week.

Cement - A slurry mixture comprised primarily of water and Portland Cement which is emplaced into the void space of boreholes, or annular space of wells, or internal volume of cased wells for purposes of consolidation and elimination of permeability.

Cement/Bentonite Grout - A combination of Cement and Bentonite to make a grout.

Composite Sample - A combination of individual samples obtained at regular intervals over a period of time. Examples include the volume of an individual sample proportional to a flow rate during a sample period (flow composite), or a constant volume sample collected at equal time intervals during a composite period (time composite).

Discharge - When used without qualification, means a discharge of a pollutant(s).

Excursion - The presence of an exceeded upper control limit contained in this permit.

Freeboard - The vertical distance between the normal operational level of the surface of a liquid and the top of the side walls in a conduit, lagoon cell, tank, or evaporation pond.

Lixiviant - Leach solution injected into the ore body which is used to oxidize, complex, and solubilize the uranium ore.

Mining Monitoring Report - The forms approved by the Director and used to report the monitoring results by the permittee.

Waters of the State - All waters within the jurisdiction of this state including streams, lakes, ponds, impounding reservoirs, marshes, wetlands, water courses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within, or bordering upon the state.