



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-8064**

June 17, 2002

Mr. Michael L. Griffin  
Manager of Environmental and  
Regulatory Affairs  
Crow Butte Resources, Inc.  
86 Crow Butte Road  
Post Office Box 169  
Crawford, NE 69339-0169

SUBJECT: NRC INSPECTION REPORT 040-08943/02-01

Dear Mr. Griffin:

This refers to the routine inspection conducted on May 21-23, 2002, at your in-situ uranium processing facility near Crawford, Nebraska. This inspection consisted of a review of site status, site operations, radiation protection, radioactive waste management, and environmental monitoring. The inspection determined that, overall, you have operated the uranium production facility in a safe and effective manner. The inspection findings were presented to you and other members of your staff at the conclusion of the onsite inspection. The enclosed report presents the results of that inspection.

No violations were identified during the inspection; therefore, no response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Mr. Louis C. Carson II at (817) 860-8221 or the undersigned at (817) 860-8186.

Sincerely,

*/RA/*

Charles L. Cain, Chief  
Nuclear Materials Licensing Branch

Docket No.: 40-8943  
License No.: SUA-1534

Enclosure:  
NRC Inspection Report 040-08943/02-01

Crow Butte Resources, Inc.

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U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No. 040-08943  
License No. SUA-1534  
Report No. 40-8943/02-01  
Licensee: Crow Butte Resources, Inc.  
Facility: Crow Butte Project  
Location: Crawford, Dawes County, Nebraska  
Dates: May 21-23, 2002  
Inspector: Louis C. Carson II, Health Physicist  
Nuclear Materials Licensing Branch  
Approved By: Charles L. Cain, Chief  
Nuclear Materials Licensing Branch  
Attachment: Supplemental Information

## **EXECUTIVE SUMMARY**

### **Crow Butte Project NRC Inspection Report 040-08943/02-01**

This inspection included a review of site status, management organization and controls, in-situ leach operations, radiation protection, radioactive waste management, and environmental monitoring. Overall, the licensee was operating the facility in a safe and effective manner.

#### **Management Organization and Controls**

- The licensee continued to maintain a staff organization at the site that complied with the license. The radiation protection staff was filled with qualified individuals (Section 2).
- The licensee had correctly implemented the requirements of the performance-based license (Section 2).

#### **In-Situ Leach Operations**

- Site activities were conducted in accordance with applicable license and regulatory requirements (Section 3).
- Site operating parameters were within the respective license limits, and no health or safety hazard was identified (Section 3).
- Yellowcake dryer maintenance and operations were being performed appropriately (Section 3).

#### **Radiation Protection**

- The licensee implemented a radiation protection program that met requirements established in 10 CFR Part 20 and the license (Section 4).
- Surveys and personnel monitoring were being performed as required. Bioassay sample results did not exceed the prescribed action levels (Section 4).
- During the interval of time covered by this inspection report, occupational exposures were well below the dose limits specified in 10 CFR Part 20 (Section 4).

#### **Radioactive Waste Management/Environmental Monitoring**

- The licensee collected and reported environmental and effluent monitoring results as stipulated in the license. Sample results reviewed during the inspection did not exceed applicable NRC regulatory limits (Section 5).
- The licensee conducted operations in such a manner that doses to the nearest resident were below the NRC's annual limit. There was no evidence that site operations had an adverse impact on the environment (Section 5).

- The groundwater monitoring program was technically adequate and in compliance with the license and the NRC regulations. (Section 5).
- Mechanical integrity testing of wells was bring performed in an acceptable manner (Section 5).

## Report Details

### **1 Site Status**

Crow Butte Resource's in-situ uranium mine was in full operation during the inspection with mining activities in Mine Units 4-7, restoration activities ongoing in Mine Units 2-3, and reclamation activities in Mine Unit 1. The licensee was ready to begin wellfield recirculation in Mine Unit 2 in preparation for the stabilization stage.

Mine Unit 7 was placed into active service during July 1999. The licensee recently placed Wellfield Houses 31 and 34 into service within Mine Unit 7. Mine Units 8 and 9 were under development during this inspection. The licensee anticipated that Mine Unit 8 would be in operation in August 2002.

The licensee continues the production of yellowcake material in the central processing facility. Uranium-bearing leach solution was being pumped from the wellfields to the process facility. Ion exchange columns were used to recover uranium from the leach solution. The end product of the in-situ leach process was normally dried in a dryer maintained under negative pressure. The yellowcake is packaged into 55-gallon drums for shipment offsite.

### **2 Management Organization and Controls (88005)**

#### **2.1 Inspection Scope**

The organization structure was reviewed to ensure that the licensee had established and maintained an effective organization with defined responsibilities, functions, and controls in place to ensure compliance with NRC requirements.

#### **2.2 Observations and Findings**

##### **a. Organization and Staff**

The organization structure requirements are provided in License Condition 9.3, which references the NRC-approved license application. Staff assignments and reporting responsibilities are outlined in License Condition 9.12 and Section 5 of the license application. At the time of the inspection, 59 individuals were employed by Crow Butte Resources at the site, including 12 contract workers for well drilling.

During calendar year (CY) 2002, the corporate organization structure was revised. The Plant Manager reports to the Manager of Operations. The Manager of Environmental and Regulatory Affairs reports to the Senior Vice-President. The corporate radiation safety officer (CRSO) reports to the Manager of Environmental and Regulatory Affairs. Overall, the licensee's site organization structure was consistent with those in place during previous inspections. The licensee had provided an appropriate level of oversight for the current level of plant operations.

License Condition 9.13 delineates the responsibilities and qualifications for the CRSO. All qualifications and required refresher training were completed as specified in the license and as prescribed in the May 1983 Regulatory Guide (RG) 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be As Low As is Reasonably Achievable." The CRSO is required to complete 40 hours of radiation safety training every two years. The licensee's CRSO had completed the biennial training requirement on May 17, 2002.

b. Performance-Based License Review

The NRC issued Crow Butte Resources a performance-based license (PBL) in March 1998. License Condition 9.4 states that the licensee may, under certain conditions, and without prior NRC approval, make changes in the facility or processes, make changes to procedures, or conduct tests and experiments not presented in the license application. The licensee's implementation of the PBL provisions was reviewed to ensure that any changes made by the licensee under the provision of License Condition 9.4 did not negatively impact the licensing basis of the site. Since the previous inspection, the licensee conducted eight safety and environmental review panel (SERP) reviews addressing the following subject areas:

- Review of spill events for CY 2000 and 2001,
- Organization Change Evaluation,
- Review and approval of Wellfield Headerhouses 27, 32, and 33
- Approval of new Upper Control Limits (UCLs) for Mine Units 5, 6, and 7.

The inspector reviewed the SERP evaluation reports and determined that the licensee's conclusions were technically and administratively adequate. Changes made to licensed activities that resulted from the SERP recommendations had not negatively impacted the licensing basis of the site.

2.3 Conclusions

The licensee continued to maintain a staff organization at the site that complied with the license. The radiation protection staff was filled with qualified individuals. The licensee correctly implemented the requirements of the PBL.

**3 In-Situ Leach Facilities (89001)**

3.1 Inspection Scope

The objective of this portion of the inspection was to verify that the licensee had conducted site activities in accordance with applicable regulations and conditions of the license. Additionally, the scope of the inspection was to ensure that operational controls were adequate to protect the health and safety of workers and members of the public.



### 3.2 Observations and Findings

#### a. Site Tour

Site tours were performed by the inspector to verify that licensed activities were being conducted in accordance with applicable regulations and specific license conditions. The inspector toured site buildings, wellfields, waste storage areas, and processing equipment facilities. The inspector examined fences and gates and noted that they were in good condition. Site fences were also properly posted in accordance with License Condition 9.11. The facility and related processing equipment appeared in good condition and operated properly. No equipment misalignments that could have resulted in loss of uranium bearing materials and in potential contamination were identified. Process flow, level, or pressure parameters were not found outside of their required ranges. Yellowcake product contamination was not observed on the floor or in the general area of the central processing plant.

License Condition 10.5 specifies that the annual throughput for the licensed operation shall not exceed a flow rate of 5,000 gallons per minute (gpm), not including restoration flow. During CY 2001, the average production flowrate was estimated by the licensee as 4,345 gpm. At the time of the site tour, the production injection flowrates were noted to be less than 4,500 gpm as indicated on the control room computer. License Condition 10.5 further states that processing plant operations shall not exceed 2 million pounds. The inspector determined that CY 2001 yellowcake production was below the 2 million pound limit.

License Condition 11.1 requires that during wellfield operations, injection pressures shall not exceed the integrity test pressure of 100 pounds per square inch gauge (psig) at the injection well heads. According to the licensee, the injection pressures have varied from 40 to 95 psig depending on the wellfield header house elevation. The inspector noted that the well injection fluid pressure gauge reading in the pipe exiting the central processing facility was less than 90 psig. The NRC inspector also confirmed that the licensee was obtaining and recording process flows and pressures in accordance with License Condition 11.1.

#### b. Evaporation Ponds

License Condition 10.6 states that the research & development ponds shall have at least 0.9 meters (3 feet) of freeboard, and the commercial evaporation ponds shall have at least 1.5 meters (5 feet) of freeboard. License Condition 10.6 also requires the licensee to keep a sufficient reserve capacity in each pond to enable the transfer of contents from one pond to the other ponds. The inspector conducted a visual inspection of the ponds, and it was determined that the freeboard limits and reserve capacity were in compliance with the license requirements.

License Condition 11.4 requires the licensee to perform and document pond inspections. The inspector reviewed the licensee's pond inspection records for CY 2001 and for CY 2002. The inspector determined that the licensee appeared to have been adequately inspecting the ponds on a daily and weekly basis.

c. Yellowcake Dryer Operations

The licensee dried yellowcake product using a vacuum chamber dryer. The yellowcake dryer is required by the NRC to be operated and maintained in accordance with the requirements listed in License Condition 10.8. License Condition 10.8 requires that the yellowcake dryer be maintained at a negative pressure during system operation. The licensee's standard operating procedure (SOP) P-19, "Yellowcake Dryer Operation and Maintenance," was stated by the licensee to be used by the operations staff when operating the dryer.

On May 10, 2002, the yellowcake dryer experienced an abnormal event when the dryer sealing system failed. This situation resulted in a partial loss of dryer vacuum. Immediate corrective actions were taken to seal the yellowcake dryer room. The room was posted as an airborne radioactivity area as required by the operating procedure. However, the operators delayed shutting off the dryer heat when the negative pressure had been significantly reduced. The inspector reviewed the licensee's investigation report. It was determined that the licensee's procedure and License Condition 10.8 were not clear on the timing of placing the dryer in cooldown. The operators waited for the yellowcake slurry that was loaded in the dryer to dry before going to the cooldown mode. Yellowcake that is partially dry sets up like paste which would have to be manually scrapped out of the dryer before operations could resume. The inspector concluded that the operators decision to delay the dryer cooldown mode averted a significant radioactive material cleanup operation.

The inspector reviewed air sample data from this event to ascertain the extent that an airborne radioactivity areas existed in the near the yellowcake dryer. The licensee collected bioassay samples from the workers who were near the dryer room during the event and measured airborne release of yellowcake. Results of the air samples taken in one location of the dryer room revealed that the maximum airborne uranium concentration was 45 percent of the derived air concentration (DAC) for natural uranium. The DAC is defined in 10 CFR Part 20, Appendix B, Table 1, "Occupational Values". The bioassay results from the three operators measured less than 5 µg/l.

The dryer sealing system repair was completed via radiation work permit (RWP) 02-17 on May 13, 2002. The inspector determined that the licensee's response to this abnormal event was adequate.

3.3 Conclusions

Plant process parameters were within the licensed limits, site fences were in good condition, and perimeter postings were appropriate. Radiation areas were properly posted. Yellowcake dryer maintenance and operations were being performed appropriately. Site activities were conducted in accordance with applicable license and regulatory requirements.

#### **4 Radiation Protection (83822)**

##### **4.1 Inspection Scope**

The scope of this part of the inspection was to determine if the licensee's radiation protection program was in compliance with the requirements established in the license and 10 CFR Part 20 regulations.

##### **4.2 Observations and Findings**

###### **a. Annual Program Review**

License Condition 12.6 specifies that an "annual as low as is reasonably achievable" (ALARA) audit of the radiation safety program shall be performed in accordance with Regulatory Guide 8.31 and Section 5.3 of the license application. The CY 2001 annual ALARA audit was completed on March 28, 2002. The current ALARA review was found to be thorough and comprehensive.

###### **b. Occupational Exposure Monitoring**

The licensee's exposure monitoring program was reviewed to ensure that no worker exceeded the occupational dose limits specified in 10 CFR 20.1201. The program consisted of the issuance of optically stimulated luminescent (OSL) dosimeters to site workers and collection of air particulate samples for natural uranium and radon daughters. The licensee had monitored a total of 41 individuals during CY 2001 using OSLs. The licensee's records indicated that the highest external exposure for CY 2001 was 428 millirems with an overall employee average of 165 millirems. The inspector reviewed the licensee's dosimetry records and concluded that no individual exceeded the NRC's annual occupational dose limits.

The licensee performed air sampling for uranium on a monthly basis. The average sample result for CY 2001 was less than 1 percent of the DAC value for natural uranium. Air samples were also obtained during yellowcake packaging operations. These sample results occasionally exceeded the action level; however, respirators were used during these operations. During CY 2001, the calculated dose to the individual with the highest uranium intake was 53 millirems, and the calculated dose to the average worker was 23 millirems.

Radon daughter sampling was conducted monthly unless the action level established by the licensee was exceeded, then the sampling frequency was weekly. The average concentration in CY 2001 was 0.199 working levels (WL), or 249 millirems. During CY 2001, the individual with the highest radon daughter exposure was 0.416 WLs or 520 millirems.

The licensee used the OSL monitoring of external exposures, the radon daughter and natural uranium results from air sampling for determining the total effective dose

equivalent (TEDE) for workers. In CY 2001, the highest TEDE was determined to be 987 millirems. The average worker TEDE was 271 millirems which was well below the NRC's annual TEDE dose limit of 5 rems listed in 10 CFR 20.1201. So far in CY 2002, the highest TEDE for an individual was 262 millirems.

c. Bioassays

The urine bioassay program was reviewed to determine compliance with License Conditions 9.3 and 10.12. Action levels were defined by the licensee in accordance with Table 1 of Regulatory Guide 8.22, "Bioassay at Uranium Mills." Evaluations were required when bioassay results exceeded any action level. Bioassay samples were analyzed by a vendor laboratory. Sample shipments included blank and spiked samples for quality assurance. Process operators and laboratory personnel were sampled on a monthly basis, while personnel involved in dryer operations were sampled weekly. During year CY 2001, no worker samples had exceeded the lowest action level of 15 µg/l. So far in CY 2002, no sample had exceeded the action level of 15 µg/l.

d. Contamination Control Program Review

The contamination control program requirements are provided in Table 5.7-18, "Radiological Monitoring Program Summary," of the NRC-approved license renewal application as well as License Conditions 9.8 and 10.11. The contamination control program included surface contamination surveys, skin and personnel clothing surveys, and equipment release surveys. Table 5.7-18 requires that eating areas, change rooms, and office areas be surveyed for alpha contamination on a weekly basis.

The licensee had surveyed the restricted and unrestricted areas using hand-held instruments for detection of total alpha contamination (fixed and removable). Also, in the unrestricted areas, smear tests for removable alpha contamination were performed monthly. All CY 2001 and CY 2002 sample results were noted to be below the licensee's action limits.

License Condition 10.11 requires that employees must monitor themselves with an alpha survey instrument prior to exiting the restricted area. Should the results of monitoring exceed the action level, employees must decontaminate themselves to less than the action level. Also, the licensee must perform unannounced quarterly spot checks of employees exiting the controlled areas. The licensee's records of these spot checks were reviewed for CYs 2001 and 2002. The licensee found isolated occasions during CY 2001 when individuals failed a spot check. The radiation safety staff had reinforced the instructions on frisking requirements and techniques.

In accordance with License Condition 9.8, the release of equipment or packages from the restricted area must be in accordance with the NRC guidance document entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials." The inspector reviewed 65 survey records for CY 2002. The licensee's records indicated that no items were released with contamination in excess of the fixed surface and removable contamination limits that are specified in the NRC guidance document.

e. Radiation Work Permits

License Condition 10.9 states that where the potential for exposure to radioactive materials exists, and for which no SOP exists, a radiation work permit (RWP) shall be required. Since the last inspection 48 RWPs had been issued. The licensee issued 47 RWPs during CY 2001 and 19 RWPs in CY 2002, so far. Licensee worker dose assessment and calculations were part of the RWPs. Selected RWPs were reviewed, and the documents were determined to meet the intent of the license.

f. NRC Radiation Surveys

During the site tours, the inspector measured ambient radiation levels using an NRC microRoentgen meter (Serial Number 33542, calibration due date December 10, 2002). Radiation survey results taken were consistent with the results from previous inspections. Areas surveyed included the central processing facility, the reverse osmosis building, yellowcake dryer room, yellowcake drum storage area, and several wellfield houses. Except for the areas identified by the licensee in central processing facility, no other radiation areas, as defined by 10 CFR 20.1003, were identified.

g. Instrument Calibrations

License Condition 10.13 requires that all radiation, environmental monitoring, sampling, and detection equipment be calibrated after repair and as recommended by the manufacturer or at least annually. The inspector reviewed calibration records for radiation detection instruments used in CYs 2001 and 2002. The licensee maintained calibrated equipment available for use. Records indicated that all instruments were routinely calibrated against known standards and were checked daily for proper operation. During the site tour, the inspector observed that each radiation detection instrument in the plant was calibrated and daily operational checks were conducted.

4.3 Conclusions

The licensee implemented a radiation protection program that met the requirements established in 10 CFR Part 20 and the license. Surveys and personnel monitoring were being performed as required. Bioassay sample results did not exceed the prescribed action levels. Occupational exposures were well below the 10 CFR Part 20 limits.

**5 Environmental Monitoring (88045)  
Radioactive Waste Management (88035)**

5.1 Inspection Scope

The environmental and groundwater monitoring programs were reviewed to assess the effectiveness of the licensee's programs and to evaluate the impact, if any, of site activities on the local environment.

## 5.2 Observations and Findings

### a. Environmental Monitoring

License Condition 11.3 requires that the licensee establish and conduct an effluent and environmental monitoring program in accordance with a letter submitted to the NRC dated March 18, 1999. License Condition 12.1 requires that the effluent and environmental monitoring results be reported to the NRC in accordance with the provisions of 10 CFR 40.65. The inspector reviewed the licensee's semi-annual effluent and environmental reports dated August 15, 2001, for the first half of CY 2001, and February 28, 2002, for the second half of CY 2001. The inspector also reviewed the original laboratory data used in the development of these reports. The inspector noted that the semi-annual reports were submitted to the NRC in a timely manner, and all the relevant data were provided.

### b. Environmental Air Sampling

During CYs 2001 and 2002, the licensee had performed environmental air particulate, radon, surface water, sediment, well water, and ambient radiation monitoring. The licensee utilized seven sample stations including one background (control) and three nearest resident stations. Air particulate sampling had been performed at each station when the yellowcake dryer was in use. The filters were composited on a quarterly basis and analyzed for natural uranium, radium-226, and lead-210 concentrations. All air particulate sample results were less than 4.0 percent of the applicable limits specified in 10 CFR Part 20, Appendix B, effluent concentrations limits (ECL).

Radon-222 was monitored at the seven sample stations with track-etch canisters which were exchanged on a semi-annual basis. The highest radon sample results obtained were at the fence line monitoring station AM- 5 and background station AM-6 during the second half of CY 2001. These sample results were 17 percent of the applicable ECL (with daughters removed).

### c. Environmental Exposure Rates

Environmental thermoluminescent dosimeters (ETLDs) were located at the sample stations to monitor the ambient gamma exposures. The ETLDs were exchanged on a quarterly basis. During CY 2001, the highest annual exposure was measured at fence line monitoring Station 8. This exposure was 3.0 millirems, with background subtracted.

### d. Public Dose Assessment

The inspector evaluated the public dose to ensure that site operations did not result in a total effective dose equivalent to individual members of the public in excess of 100 millirems per year, the annual limit specified in 10 CFR 20.1301. The evaluation included environmental monitoring data for CY 2001 and data at the background station and three nearest resident stations. Based on the highest dose measured for CY 2001, the dose to the public was well below the NRC's annual limit.

e. Groundwater Monitoring Program

(1) Mechanical Well Integrity Tests

License Condition 10.2 requires that mechanical well integrity tests (MITs) be conducted on all production and injection wells before they are placed into service and periodically thereafter. An objective of the MIT for injection and production wells is to ascertain that the joints that connect each segment of well casing do not leak lixiviant [injection fluid] or contaminants [radium, uranium, chloride, or selenium] into native groundwater supplies. Such leaks are also referred to as well excursions.

The inspector examined field records for the MITs to confirm that tests had been performed in accordance with the established SOP P-23, "Mechanical Integrity Test." A well casing test was required to hold 90 percent of the pressure test of 125 pounds per square inch gauge (psig). Any well that could not maintain a pressure of at least 112 psig for 20 minutes was "considered unacceptable" and was required to be repaired, retested, plugged, or abandoned. The licensee had tested 555 wells in CY 2001 and 343 so far in CY 2002. The inspector verified that MITs had been performed as prescribed by the license before a new well was placed into service and every five years thereafter. The inspector reviewed records of 380 MITs that were performed in various mine units and wellfields in CYs 2001 and 2002. Of those MIT results reviewed, no well test had been recorded as failed or considered unacceptable. However, several wells had been taken out of service and declared as abandoned. The inspector reviewed the well abandonment records. The inspector reviewed records that indicated that the MITs had been conducted at the required pressure of 125 psig. MIT pressures had been held for the prescribed time. Overall, the inspector found that the licensee's MIT records reflected that all well tests had passed.

The inspector observed personnel checking out the MIT rig before performing an MIT on a well, and the inspector observed the conduct of an MIT. The inspector determined the MITs were performed in an acceptable manner to assure well integrity and in accordance with SOP P-23 and License Condition 10.2.

(2) Groundwater Upper Control Limits and Tracking Data

License Condition 11.2 requires the licensee to sample all perimeter and upper aquifer monitor wells on a frequency of no more than 14 days apart. License Condition 11.2 specifies excursion criteria and references corrective action procedures for excursions. License Condition 12.2 requires the licensee to notify the NRC in the event of an excursion.

The inspector examined CYs 2001 and 2002 water quality sampling records for perimeter monitoring wells in Mine Unit 2. Additionally, the inspector observed a technician collect and analyze groundwater samples from well CM-5. The technician showed the inspector how the licensee maintained all routine groundwater monitoring data schedules on a database. The technicians also kept a well sampling list and logbook in the field with them. The inspector noted

that the technician collected, analyzed, and marked each sample in accordance with the following SOPs:

- E-3 Field Measurement of Specific Conductance
- E-4 Field pH Measurement
- E-5 Routine Groundwater Monitoring

Some sample results had exceeded the prescribed upper control limits (UCLs) for specific conductivity, chloride, and alkalinity during the quarterly sampling periods in CY 2001 and so far in CY 2002. The licensee had reported each exceedence as required by License Conditions 11.2 and 12.2.

(3) Groundwater Restoration

The licensee stated that they were ready to begin wellfield recirculation in Mine Unit 2 in preparation for the stabilization stage. The inspector reviewed groundwater sampling data from Mine Unit 2 to ascertain if the licensee was ready to move into the stabilization stage. The inspector reviewed the following licensee documents:

- "Restoration Plan-Mine Unit 2," dated December 5, 1995
- "NRC License Renewal Application," dated July 2, 2001, Table 6.1-2: "Baseline and Restoration Values for Mine Unit 2"
- "Crow Butte Monthly Restoration Reports of Mine Unit 2," groundwater sample results from November 1998 through March 2002

There are four steps that have to be completed during the restoration stage (groundwater transfer, sweep, treatment, and wellfield recirculation) before entering the stabilization stage. Based on four chemical parameters that the licensee monitored for routinely (uranium, vanadium, pH, and conductivity), they were ready to begin the recirculation step of all the wells in Mine Unit 2. However, the inspector noted that each well sampled during the stabilization period had to meet the UCL for 27 chemical parameters before Mine Unit 2 restoration would be complete. Additionally, the inspector noted that the licensee analyzed the wells for conductivity instead of total dissolved solids (TDS). A licensee representative explained that they do not analyze each sample for each of the 27 parameters until the stabilization stage because of the cost, and that conductivity values will be converted to TDS during the stabilization stage. Consequently, the uranium, vanadium, pH, and conductivity analyses were the key cost effective indicators that the licensee used to determine that a mine unit was ready for the stabilization stage.



The inspector found that Mine Unit 2 sample results for vanadium were consistently higher than the restoration standard (0.2 milligrams/liter) in most of the Mine Unit 2 wells. Licensee representatives stated that they could further reduce the vanadium concentration during the recirculation step using reverse osmosis and ion exchange methods. As for the other indicators, certain wells had elevated values (hot spots) that would be lowered during the volumetric blending effect of the recirculation step. Based on the inspector's review of the Mine Unit 2 data, it seemed that the license was ready to proceed with the wellfield recirculation step and eventual stabilization stage.

Following the review of the groundwater sampling records and observing the licensee implement the sampling procedures, the inspector concluded that the groundwater monitoring program was technically adequate and in compliance with the license and the NRC regulations.

### 5.3 Conclusions

The licensee had collected and reported environmental and effluent samples that were required by the license. Groundwater sample results that exceeded the applicable NRC regulatory limits were reported as required. Doses to the nearest resident were below the NRC 's annual limit. The groundwater monitoring and MIT programs were technically adequate and in compliance with the license and the NRC regulations. There was no evidence that site operations had an adverse impact on the environment.

## 6 **Exit Meeting Summary**

The inspector presented the inspection results to representatives of the licensee at the conclusion of the inspection on May 23, 2002. Licensee representatives acknowledged the findings as presented. The licensee did not identify anything reviewed by the inspector as proprietary.

## SUPPLEMENTAL INFORMATION

### PARTIAL LIST OF PERSONS CONTACTED

#### Licensee

M. Griffin, Manager of Environmental/Regulatory Affairs  
R. Grantham, Radiation Safety Officer  
S. Magnuson, Vice President, Manager of Operations  
C. Miller, Plant Superintendent

#### Nebraska Department of Environmental Quality

D. Miesbach, Underground Injection Control Program Coordinator

### ITEMS OPENED, CLOSED AND DISCUSSED

#### Opened

None

#### Closed

None

#### Discussed

None

### LIST OF ACRONYMS USED

ALARA	as low as is reasonably achievable
CFR	Code of Federal Regulations
CY	calendar year
DAC	derived air concentration
ECL	effluent concentrations limit
ETLD	environmental thermoluminescent dosimeter
gpm	gallons per minute
MIT	mechanical integrity test
OSL	optically stimulated luminescent
PBL	performance-based license
PDR	Public Document Room
psig	pounds per square inch gauge
RWP	radiation work permits
SERP	Safety and Environmental Review Panel
SOP	standard operating procedure
TDS	total dissolved solids
TEDE	total effective dose equivalent
UCL	upper control limit
WL	working level