UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

October 20, 2005

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

SUBJECT: NRC INSPECTION REPORT 040-08943/05-001

Dear Mr. Griffin:

On September 22, 2005, the Nuclear Regulatory Commission (NRC) completed an inspection of 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 2.390 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 Ms. Judith Walker at (817) 860-8299 or the undersigned at (817) 860-8197.

Sincerely,

***/RA/***

Jack E. Whitten, Chief
Nuclear Materials Licensing Branch

Docket No.: 040-08943
License No.: SUA-1534

Enclosure:
NRC Inspection Report
040-08943/05-001

cc w/enclosure:
Mr. Jim Stokey, Mine Manager
Crow Butte Resources, Inc.
86 Crow Butte Road
Post Office Box 169
Crawford, Nebraska 69339-0169

Public Document Room
Upper Niobrara-White Natural Resources District
805 East Third
Chadron, Nebraska 69337

Nebraska Department of Environmental Control
Box 94877 Statehouse Station
301 Centennial Mall South
Lincoln, Nebraska 68509

Mr. Pat Mackin, Assistant Director
Systems Engineering & Integration
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road
San Antonio, Texas 78238-5166

Nebraska Radiation Control Program Director

bcc w/enclosure (via ADAMS distrib):
LDWert
RANelson
SJCohen
PXMicalack
JEWhitten
JLWalker
KEGardin
NMLB
RIV Nuclear Materials File - 5th Floor

ADAMS: **X** Yes Initials: jlw3
**X** Publicly Available **X** Non-Sensitive

DOCUMENT NAME: s:\dnms\!nmlb\jlw3\50894301.wpd r:_dnms\

| RIV:DNMS:NMLB | C:NMLB | NMSS |
|---|---|---|
| JLWalker | JEWhitten | Scohen ***(Via e-mail)*** |
| ***/RA/*** | ***/RA/*** | ***/RA/ J. L. Walker for*** |
| 10/18/05 | 10/20/05 | 10/20/05 |

OFFICIAL RECORD COPY T=Telephone E=E-mail F=Fax

**ENCLOSURE**

U. S. NUCLEAR REGULATORY COMMISSION
REGION IV

| | |
|---|---|
| Docket No. | 040-08943 |
| License No. | SUA-1534 |
| Report No. | 040-08943/05-001 |
| Licensee: | Crow Butte Resources, Inc. |
| Facility: | Crow Butte Project |
| Location: | Crawford, Dawes County, Nebraska |
| Dates: | September 20-22, 2005 |
| Inspectors: | Judith Walker, Health Physicist<br>Nuclear Materials Licensing Branch<br>Division of Nuclear Materials Safety |
| | Stephen Cohen, Hydrogeologist<br>Uranium Processing Section, Fuel Cycle Facilities Branch<br>Division of Fuel Cycle Safety and Safeguards, NMSS |
| Accompanied by: | Paul Micalack, Hydrogeologist<br>Uranium Processing Section, Fuel Cycle Facilities Branch<br>Division of Fuel Cycle Safety and Safeguards, NMSS |
| Approved By: | Jack E. Whitten, Chief<br>Nuclear Materials Licensing Branch |
| Attachment: | Supplemental Information |

## EXECUTIVE SUMMARY

Crow Butte Project
NRC Inspection Report 040-08943/05-001

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 inspectors determined that the licensee had continued to maintain a staff organization at the site that complied with the license. The inspectors noted that the radiation protection staff was staffed with qualified individuals (Section 2).

- The inspectors concluded that the licensee had correctly implemented the requirements of the performance-based license (Section 2).

In-Situ Leach Operations

- Site operations were conducted by the licensee in accordance with applicable license and regulatory requirements (Section 3).

- The inspectors observed that site operating parameters were within the respective license limits, and no health or safety hazards were identified (Section 3).

- The inspectors determined that the yellowcake dryer maintenance and operations were being performed appropriately by the licensee (Section 3).

Radiation Protection

- The licensee had 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 by the license and regulations. Bioassay samples exceeding the prescribed action levels were investigated and corrective actions were considered and performed (Section 4).

- During the interval of time covered by this inspection report, occupational exposures were observed by the inspectors to be well below the dose limits specified in 10 CFR Part 20 (Section 4).

Radioactive Waste Management/Environmental Monitoring

- The inspectors noted that the licensee had collected and reported environmental and effluent monitoring results as stipulated in the license. Sample results reviewed by the inspectors during the inspection did not exceed applicable NRC regulatory limits (Section 5).

- The inspectors determined that the licensee had conducted operations in such a way that doses to the nearest resident were below the NRC's annual limit. The inspectors observed no evidence that site operations had any adverse impacts on the environment (Section 5).

## Report Details

### 1 Site Status

Crow Butte Resource's (CBR's) in-situ uranium mine was in full operation during the inspection. At the time of the inspection, the licensee was actively mining in Mine Units 5-9. Groundwater restoration activities were underway in Mine Units 2-4. The inspectors noted that groundwater reclamation activities in Mine Unit 1 were completed by the license. Surface reclamation of Mine Unit 1 began in 2003 and further work is pending completion of a wellfield reclamation plan. Mine Unit 10 was the latest mine unit under development.

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

### 2 Management Organization and Controls (88005)

2.1 Inspection Scope

The licensee's organizational structure was reviewed by the inspectors. This review concluded that the licensee had established and maintained an effective organization with specifically defined responsibilities, functions, and controls. The licensee had established and maintained an organization in place that was adequate to ensure compliance with NRC licensing and regulatory requirements.

2.2 Observations and Findings

a. Organization and Staff

The organizational structure requirements are outlined in License Condition 9.3 which references the NRC-approved license application. The licensee's staff assignments and reporting responsibilities are outlined in License Condition 9.12 and Section 5 of the license application. At the time of this inspection, 51 individuals were employed by Crow Butte at the site, including 18 contractors.

On February 23, 2004, CBR's corporate organizational structure and chain of command was revised. The current structure states that the mine manager currently reports to the senior vice president, operations. The manager of health, safety, and environmental affairs reports to the mine manager. The radiation safety officer (RSO) currently reports to the manager health, safety and environmental affairs.

Overall, the inspectors determined the licensee's site organizational structure to be consistent with those in place during previous inspections. The inspectors concluded that the licensee had provided an appropriate level of oversight for the current level of plant operations.

b. Performance-Based License Review

The NRC issued CBR a performance-based license (PBL) in March 1998. License Condition 9.4 of the PBL requires, in part, 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 by the inspectors to ensure that any changes made by the licensee were under the provisions of License Condition 9.4. Also, that any changes made under the PBL did not negatively impact the licensing basis of the site. The inspectors noted that the licensee had conducted six safety and environmental review panel (SERP) reviews in calendar year (CY) 2004 and one so far in CY 2005. The SERP reviews primarily consisted of review and approvals for new wellhouses installed on-site.

The inspectors reviewed the SERP evaluation reports and determined that the licensee's conclusions were technically and administratively adequate. Also, the inspectors concluded that 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 has continued to maintain a staff organization at the site that complied with the license. The inspectors determined that the radiation protection group was staffed with qualified individuals. The inspectors also concluded that the licensee had 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 this 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 inspectors to verify that licensed activities were being conducted in accordance with applicable regulations and specific license conditions. The inspectors toured site buildings, wellfields, waste storage areas, and processing equipment facilities. The inspectors 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 inspectors observed that the facility and related processing equipment appeared to be in good condition and operating properly. No equipment misalignments that could have resulted in loss of uranium bearing materials and potential contamination were identified by the inspectors during the inspection. Process flow, level, or pressure parameters were observed within their required ranges. The inspectors observed no yellowcake contamination on the floor or in the general area of the central processing plant.

License Condition 10.5 specifies, in part, 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. At the time of the site tour, the production injection flowrates were noted to be less than 4,400 gpm as observed by the inspectors on the control room computer. License Condition 10.5 further requires that processing plant operations shall not exceed 2-million pounds. The inspectors determined that in CY 2004, yellowcake production was below the 2-million pound limit.

License Condition 11.1 requires, in part, 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. Based on information provided by the licensee, the inspectors determined that the injection pressures had varied from 40 to 95 psig depending on the wellfield header house elevation, but had not exceeded the 100 psig limit.

b. Evaporation Ponds

License Condition 11.4 requires, in part, that the licensee perform and document pond inspections. The inspectors reviewed the licensee's daily and weekly pond inspection records for CY 2004 and to the date of this inspection in CY 2005. The licensee also performed an annual inspection of the evaporation pond in CY 2004. The inspectors determined that the licensee had adequately inspected the ponds as required.

During the inspection, the inspectors toured Evaporation Pond No. 3 with the licensee's staff and observed staff conduct level and conductance measurements, inspected the pond for abnormal conditions, and completed pond inspection records. The inspectors concluded that the license conditions and standard operating procedures were followed.

c. Yellowcake Dryer Operations

The licensee dried yellowcake slurry by using a vacuum chamber dryer. The NRC license required that the yellowcake dryer be operated and maintained in accordance with the requirements listed in License Condition 10.8. License Condition 10.8 requires, in part, 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 used by the operations staff when operating the dryer. During the inspection, the licensee demonstrated the yellowcake dryer alarm functions from the control room computer and in the plant. The inspectors concluded that the negative pressure system for the yellowcake dryer was fully operational. The inspectors observed the following during yellowcake drying and unloading operations: posting of the dryer room as an Airborne Radioactivity Area, operators using respiratory equipment and air samplers.

d. Management of Spills

License Condition 12.2 requires, in part, that until license termination, the licensee shall maintain documentation on all spills of source or 11e.(2) byproduct materials. Also, the licensee is required to notify the NRC of any spill that may have a radiological impact on the environment per 10 CFR 40.60. The licensee maintained spill records for all solution releases. Records indicated that the licensee experienced 15 spills during CY 2004 and 9 to date in CY 2005.

The licensee has elected to no longer review spills by the SERP process, the licensee is now utilizing fault tree analysis to evaluate spills and ascertain whether any trends existed. The inspectors reviewed the licensee's site procedure guidance and spill records and did not identify any mis-classified incidents or spills that had occurred and that had not been correctly reported to the NRC.

3.3 Conclusions

The inspectors observed during the site tour that licensed plant process parameters were within established limits, site fences were in good condition, and perimeter postings were appropriate. The licensee had posted radiation areas properly. Yellowcake dryer maintenance and process operations had been performed appropriately. The inspectors noted that site activities conducted during the inspection 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 9.12 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 2004 annual ALARA audit was completed on March 24, 2005. The inspectors concluded that the licensee's annual program review was thorough and summarized the relevant areas of radiation protection.

b. Occupational Exposure Monitoring

The licensee's dose monitoring program was reviewed by the inspectors to ensure that no worker exceeded the occupational dose limits specified in 10 CFR 20.1201. The program consisted of the licensee issuing optically stimulated luminescent (OSL) dosimeters to site workers and the collection of air particulate samples for natural uranium and radon daughters. The licensee's records indicated that the highest external dose for CY 2004, was 276 millirems with an overall employee average of 121 millirems. The inspectors reviewed the licensee's dosimetry records and concluded that no individual exceeded the NRC's annual occupational dose limits.

The licensee had performed air sampling for uranium on a monthly basis. Air samples were also obtained by the licensee during yellowcake packaging operations. The licensee's average sample results for CY 2004, was less than 1 percent of the derived air concentration value for natural uranium.

Radon daughter sampling was conducted monthly by the licensee, unless the action level established by the licensee had been exceeded, then the sampling frequency became weekly. The average concentration noted by the inspectors in CY 2004, was 0.197 working levels months (WLM), or 5 percent of the annual regulatory limit of 4 WLM. During CY 2004, the individual with the highest radon daughter exposure was 0.312 WLMs or 8 percent of the regulatory limit.

To determine the total effective dose equivalent (TEDE) for workers, the licensee used: (1) OSL monitoring for external doses, and (2) radon daughter and natural uranium results from air sampling. In CY 2004, the highest TEDE was determined by the licensee to be 679 millirems, and the average worker TEDE was 388 millirems. Worker doses for CY 2005 was determined by the inspectors to be well below the NRC's annual TEDE dose limit of 5 rems listed in 10 CFR 20.1201. The inspectors also reviewed records to the date of this inspection in CY 2005, for external and internal doses which indicated that workers doses were within regulatory limits.

c. Bioassays

The urine bioassay program was reviewed by the inspectors to determine compliance with License Conditions 9.12 and 11.8. Action levels for CBR were defined using Table 1 of Regulatory Guide 8.22, "Bioassay at Uranium Mills."

To the date of this inspection in CY 2005, the licensee's bioassay records indicated that no individual exceeded the action level of 15 micrograms per liter (µg/l). However, a review of the licensee's bioassay records for CY 2004, indicated that two worker samples had exceeded the lowest action level of 15 (µg/l). License Condition 11.8 states, in part, that any time a worker's urine specimen exceeds 15 µg/l, the annual ALARA audit will indicate the corrective actions considered or performed. The RSO performed an bioassay investigation of both incidences where the action level was exceeded. The ALARA report documented the corrective actions performed by the licensee.

In February of 2004, one individual had a bioassay result of 96 µg/L. A second sample was collected 24 hours later and results were less than the detection limit of 5 µg/L. The licensee concluded that the result of the elevated bioassay may have been due to sample bottle contamination, since the followup analysis was negative and according to calculations, measurable uranium would have been remained in the individual if the individual was exposed to uranium. The licensee pursed the option that bottle contamination may have come from storage of the bioassay containers and caps in the site laboratory where yellowcake samples are routinely analyzed. The licensee to correct this contamination problem has since placed the sample bottles in an administrative office for storage.

In November of 2004, one individual had a bioassay result of 17 µg/L. A second bioassay sample was collected 24 hours later and results were less than the detection limit of 5 µg/L. The licensee performed a planned task observation of the individual loading yellowcake slurry into the dryer. Transferring yellowcake slurry and loading the dryer are tasks that the licensee performs under a special radiation work permit (SRWP) and the protective clothing requirements for the task clearly state coveralls and gloves at all times. The individual performing this task recalled wearing a shop coat instead of coveralls, which may have allowed for contamination to contact some portion of the individuals clothing. The licensee has since updated the SRWP to add the use of face shields as required equipment where yellowcake slurry is transferred or handled. The RSO also reiterated the proper us of equipment to employees performing this task.

d. Contamination Control Program Review

The licensee's 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 9.12. The licensee's 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 by the licensee for alpha contamination on a weekly basis.

The records reviewed by the inspectors indicated that 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 by the licensee on a monthly frequency.

The inspectors reviewed records of contamination sample for results to the date of this inspection in CY 2005. The inspector reviewed records compiled by the licensee and noted survey results below the licensee's action limits. During this inspection, the inspectors determined that the technician's survey techniques observed and results recorded were adequate.

License Condition 9.12 requires, in part, that employees must monitor themselves with an alpha survey instrument prior to exiting the restricted area. Also, if the results of monitoring exceed the action level, employees must decontaminate themselves to less than the action level. The licensee must also perform unannounced quarterly spot checks of employees exiting the controlled areas. The licensee's records of these spot checks of employees exiting the controlled areas were reviewed to the date of this inspection in CY 2005 and were found adequate. The inspectors confirmed that survey meters had been properly calibrated, daily checked for operability, and were fully functional at the time of this inspection. Monitoring records reviewed by the inspectors indicated that no individual had left the site with contamination above the licensee's action level.

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 inspectors reviewed records of surveys conducted by the licensee to the date of this inspection in CY 2005. The licensee's records indicated that no items had been released from the site with contamination in excess of the fixed surface and removable contamination limits specified in the NRC guidance document.

The inspectors reviewed the licensee's methods for releasing shipments that contained radioactive material (e.g., dry yellowcake in drums, wet yellowcake in slurry, and 11e.(2) byproduct waste). Shipping records and manifest reviewed by the inspectors indicated that the licensee had conducted contamination surveys on each container before it was released from the controlled area and transported from the facility. The licensee shipped 28 yellowcake shipments in drums to the date of this inspection in CY 2005 and one 11e.(2) byproduct shipment.

The licensee, based on records reviewed by the inspectors, had ensured external radiation contamination on each container was not in excess of Department of Transportation (DOT) limits specified in 49 CFR 173.428. The DOT's external radiation contamination limit for loose beta-gamma contamination on each container is 22 disintegrations per minute per centimeter squared ($dpm/cm^2$). The inspectors reviewed container release survey records since the last inspection and determined that the licensee was meeting DOT's established contamination limit. The inspectors concluded that the licensee had released radioactive material shipments in accordance with applicable license conditions, NRC regulations, and DOT requirements.

e. Respiratory Protection

The respiratory program was reviewed during the inspection. There were 12 site employees fully qualified to wear respirators. These individuals included yellowcake packaging operators, plant operators and safety personnel. Annual respirator refresher training was performed in December of 2004. Contract workers received respirator training when required based of their assigned work duties.

Table 5.7-20 of the license renewal application, requires the licensee to perform surveys for alpha contamination on all respirators after cleaning and before packaging for reuse. The inspectors noted that all survey results were less than 20 dpm/100 $cm^2$ with an action level of 100 dpm/100 $cm^2$. All records review by the inspectors indicated that the licensee's respirator cleaning activities were effective in removing loose or fixed contamination.

f. Instrument Calibrations

License Condition 9.12 requires, in part, that all radiation, environmental monitoring, sampling, and detection equipment be calibrated after repair, as recommended by the manufacturer, or at least annually. The inspectors reviewed calibration records for CY 2004, to the date of this inspection in CY 2005, for radiation detection instruments used on-site. The records reviewed by the inspectors indicated that the licensee had maintained calibrated equipment available for use. Records also indicated that all instruments were routinely calibrated against known standards and were checked daily for proper operation. During the site tour, the inspectors observed that each radiation detection instrument in use had been calibrated and daily operational checks had been conducted.

4.3 Conclusions

The inspectors concluded that the licensee had implemented a radiation protection program that met the requirements established in 10 CFR Part 20 and the license. Surveys and personnel monitoring activities conducted by the licensee were being performed as required. Bioassay samples exceeding the prescribed action levels were investigated and corrective actions were considered and performed. Occupational exposures were observed by the inspectors to be 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 by the inspectors 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, in part, 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, in part, that the effluent and environmental monitoring results be reported to the NRC in accordance with the provisions of 10 CFR 40.65. The inspectors reviewed the licensee's semi-annual effluent and environmental reports dated February 18, 2005, for the second half of CY 2004, and its report dated August 19, 2005, for the first half of CY 2005. The inspectors noted that the licensee had submitted semi-annual reports to the NRC in a timely manner and the licensee had provided all relevant data.

b. Environmental Air Sampling

The licensee performed environmental sampling for air particulates, radon, surface water, sediment, well water, and ambient radiation monitoring. The licensee had utilized seven environmental air sampling stations including one background (control) and the three nearest resident stations. Air particulate sampling had been performed at all stations when the yellowcake dryer was in operation. The filters from each of the environmental air sampling sites were then composited by the licensee on a quarterly basis and analyzed for natural uranium, radium-226, and lead-210 concentrations. All air particulate sample results for CY 2004, and those of the first half of CY 2005, were observed by the inspectors to be less than 7.5 and 4.0 percent respectively, of the applicable limits specified in 10 CFR Part 20, Appendix B, effluent concentrations limits (ECL).

Radon-222 was monitored by the licensee at the seven sample stations using track-etch canisters exchanged on a semi-annual basis. The highest radon sample results reported by the licensee's environmental dosimetry vendor was determined by the inspector to be at fenceline monitoring station AM-5. During the second half of CY 2004 and the first half of CY 2005, these sample results were recorded by the vendor as 6 and 7 percent respectively, of the applicable ECL (with daughters removed).

c. Environmental Exposure Rates

Environmental thermoluminescent dosimeters (ETLDs) were also located at the seven sample stations for monitoring ambient gamma exposures. The ETLDs were exchanged on a quarterly basis. In CY 2004, the highest annual exposure measured by the licensee was at a nearest residence monitoring Station AM-1. The licensee recorded this exposure as 12.0 millirems and for the first half of CY 2005, the licensee recorded the highest exposure as 15.0 millirems at monitoring station AM-6, which is the control station.

d. Public Dose Assessment

The inspectors evaluated the potential public dose to ensure that the licensee's site operations did not result in a total effective dose to individual members of the public in excess of 100 millirems per year, the annual limit specified in 10 CFR 20.1301. The public dose assessment evaluation provided by the licensee included environmental monitoring data from the background sampling station and two nearest resident stations. Based on the highest dose measured for CY 2004, and to the date of this inspection in CY 2005, the dose to the public was determined by the inspectors to be well below the NRC's annual limit.

e. Groundwater Monitoring Program

License Condition 11.2 requires, in part, that the licensee sample all perimeter and upper aquifer monitor wells on a frequency of no more than 14 days apart (postponement requires documentation). License Condition11.2 also specifies excursion criteria; and references corrective action procedures for excursions. License Condition 12.2 requires, in part, that the licensee notify the NRC in the event of an excursion. The licensees Procedure E-5, "Routine Monitor Well Sampling," was reviewed for consistency with the PBL. Following the review of the sampling records by the inspectors and after observing licensee staff implement the sampling procedures, the inspectors concluded that the groundwater sampling program was technically adequate and in compliance with the license condition and the licensee's procedures.

The inspectors reviewed private well and surface water sampling reports, well sampling standard operating procedures, semi-annual ground-water reports, well sampling records, and ground-water analytical data. Ground-water and surface water sampling was implemented in accordance with the monitoring program submitted by letter dated March 18, 1999, and in accordance with license condition 11.3. Ground-water sampling programs implemented by the licensee including biweekly monitoring well sampling for active mine units, weekly well sampling of excursions, and lower-frequency well sampling in mine units under restoration.

The inspectors reviewed Section 3 - Water Monitoring Program of the SOPs. This review indicated that the licensee's available well sampling documents lacked sufficient information for inspectors to readily determine compliance with the SOPs. One item noted by the inspectors is that the licensee has multiple well sampling procedures; however, well sampling documents do not indicate specifically which procedure is being followed for each well. The licensee should include water level data after purging, number of well volumes purged (in addition to actual volume purged), historical field parameter readings, if applicable, and the actual method used for purging.

The licensee also presents an alternate purging method in the SOPs, which states that one well volume may be purged and one set of field parameter readings (i.e., ph, temperature, conductivity) may be collected before collecting the sample.

This procedure has two problems; first, purging one well volume is acceptable, so long as drawdown is minimal, and second, collecting one set of field parameters does not establish the representativeness of the sample. The licensee, in accordance with its SOPs, must collect water level measurements before and after purging to show that drawdown was minimized and collect three sets of field parameters that meet the stabilization criteria presented in the SOPs.

In summary, licensee staff appeared to be following written procedures when collecting ground-water samples; however, the inspectors identified some discrepancies in the procedures and well sampling documentation. Those items of concern are as follows:

- The alternate purge method of pumping on purge volume and collecting one set of field parameters does not appear to be technically justified.
- Well sampling forms do not provide sufficient information to determine which sampling technique is being utilized for any given well.
- Low-volume purging is only applicable when well drawdown is minimal. The licensee does not appear to be collecting the water table data necessary to confirm that drawdown is minimal during well purging.

Revision of the licensee's SOPs for ground-water sampling concerning low volume well purging techniques and sampling documentation was identified by the inspectors as an Inspector Followup Item (IFI) 040-08943/0005-01.

5.3 Conclusions

The inspectors determined that the licensee had collected and reported environmental and effluent samples required by the license. Dose estimates to the nearest resident were determined by the inspectors to be below the NRC's annual limits. There was no evidence presented by the licensee that site operations had an adverse impact on the environment.

## 6 Exit Meeting Summary

The inspectors presented the inspection results to representatives of the licensee at the conclusion of the inspection on September 22, 2005. The licensee's representatives acknowledged the findings as presented. The licensee did not identify any documents or processes reviewed by the inspectors as proprietary information.

## ATTACHMENT

## SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Griffin, Manager of Environmental/Regulatory Affairs
R. Grantham, Radiation Safety Officer
J. Cash, Plant Superintendent
J. Stokey, Mine Manager

Nebraska Department of Environmental Quality

D. Carlson, Underground Injection Control Program

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

| | |
|---|---|
| 040-08943/0005-01 | Revision of the licensee's SOPs for groundwater sampling concerning low volume well purging techniques and sampling documentation. |

Closed
None

Discussed
None

LIST OF ACRONYMS USED

| | |
|---|---|
| ALARA | as low as is reasonably achievable |
| CFR | Code of Federal Regulations |
| CPF | central processing facility |
| CY | calendar year |
| DOT | Department of Transportation |
| $dpm/cm^2$ | disintegrations per minute per square centimeter squared |
| ECL | effluent concentrations limit |
| ETLD | environmental thermoluminescent dosimeter |
| gpm | gallons per minute |
| MIT | well mechanical integrity tests |
| OSL | optically stimulated luminescent |
| PBL | performance-based license |
| PDR | Public Document Room |
| psig | pounds per square inch gauge |

| | |
|---|---|
| RSO | radiation safety officer |
| SERP | safety and environmental review panel |
| SOP | standard operating procedure |
| SRWP | special radiation work permit |
| TEDE | total effective dose equivalent |
| WLM | working level month |