



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION IV
1600 E LAMAR BLVD
ARLINGTON, TX 76011-4511

July 18, 2014

Mr. Larry L. Teahon, Manager,
Crow Butte Resources, Inc.
86 Crow Butte Road
Post Office Box 169
Crawford, NE 69339-0169

SUBJECT: NRC INSPECTION REPORT 040-08943/14-001

Dear Mr. Teahon:

This refers to the announced, routine inspection conducted on June 3-5, 2014, at the Crow Butte Resources facility in Crawford, Nebraska. The inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and the conditions of your license. Within these areas, the inspection consisted of selected examinations of procedures and representative records, observations of activities, and interviews with personnel. The inspection findings were discussed with you at the exit briefing conducted at the conclusion of the onsite inspection.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, should you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Ms. Linda M. Gersey, Health Physicist, at 817-200-1299, or the undersigned at 817-200-1191.

Sincerely,

/RA/

Ray L. Kellar, P.E., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Docket: 040-08943
License: SUA-1534

Enclosure:

NRC Inspection Report 040-08943/14-001

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket: 040-08943

License: SUA-1534

Report: 040-08943/14-001

Licensee: Crow Butte Resources, Inc.

Facility: Crow Butte Facility

Location: Dawes County, Nebraska

Dates: June 3-5, 2014

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Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

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Approved by: Ray L. Kellar, P.E., Chief
Repository and Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Attachment: Supplemental Inspection Information

Enclosure

EXECUTIVE SUMMARY

Crow Butte Resources, Inc.
NRC Inspection Report 040-08943/14-001

This inspection included a review of site status, management organization and controls, site tours, radiation protection, environmental protection, effluent controls, transportation, radioactive waste management activities, and emergency preparedness. The licensee was conducting operations in accordance with regulatory and license requirements.

Management Organization and Controls

- The organizational structure and staffing levels maintained by the licensee during the inspection period met the requirements specified in the license and were sufficient for the work in progress. (Section 1.2a)
- The licensee's Safety and Environmental Review Panel evaluations reviewed by the inspectors were conducted in accordance with requirements of the performance-based license, with one exception. (Section 1.2b)
- The licensee was conducting audits and inspections as required by regulatory requirements and the license. (Section 1.2c)
- The licensee had provided the appropriate reports to comply with the additional protocol requirements. (Section 1.2d)

In-Situ Leach Facilities

- Site operations were being conducted in accordance with applicable license conditions and regulatory requirements. (Section 2.2a)
- One violation was closed related to the exceedence of the dose limit in any one hour in an unrestricted area. (Section 2.2b)
- The licensee had submitted an updated financial assurance package for NRC review. (Section 2.2c)

Radiation Protection

- The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. (Section 3.2)
- The annual doses to employees were below occupational dose limits. (Section 3.2a)
- Training, instrumentation, radiological surveys, radiation work permits, and respiratory protection met license and regulatory requirements. (Section 3.2)

Effluent Control and Environmental Protection and Maintaining Effluents from Materials Facilities As Low As Reasonably Achievable

- The licensee conducted environmental monitoring in accordance with license requirements. (Section 4.2a)
- The annual dose to members of the public was below regulatory limits. (Section 4.2b)
- Mechanical integrity testing of wells was being conducted in accordance with approved procedures. (Section 4.2c)

Inspection of Transportation Activities and Radioactive Waste Management

- The licensee was conducting solid and liquid waste disposal operations in accordance with license and regulatory requirements. (Section 5.2)
- The licensee was conducting yellowcake and solid byproduct waste shipments in accordance with U.S. Department of Transportation and NRC requirements. (Section 5.2a)
- The licensee had identified and fixed a pond liner leak. (Section 5.2c)

Emergency Preparedness

- The licensee was implementing an Emergency Response Program that is consistent with its license conditions and operating procedures. (Section 6.2)

Report Details

Site Status

The Crow Butte Resources, Inc. facility started commercial operations in April 1991. At the time of the inspection, the licensee continued to recover uranium through in-situ recovery operations. Uranium processing and drying operations were in progress at the Central Processing Plant (CPP). Restoration of groundwater in mined wellfield units continued to be performed via reverse osmosis in the Restoration Building. The current operational status of the Mine Units (MUs) is as follows:

- Groundwater in MU-1 has been restored and wells and wellhouses were decommissioned
- Mine Units 2, 3, 4, 5, and 6 were undergoing groundwater restoration
- Mine Units 7, 8, 9, 10, and 11 were in production

License Condition (LC) 10.5 limits the plant throughput to a maximum of 9,000 gallons per minute (gpm), excluding restoration flow. Facility records indicate that the average operating flow observed within the period that occurred since the previous inspection (June 2013), was 6,840 gpm. The amount of CPP process waste effluent diverted to the facility commercial ponds did not significantly change over the past year.

Two ion-exchange (IX) columns and two 250 gpm reverse osmosis (RO) units were installed in the Restoration Building during 2012 for additional MU restoration capacity. Both of the IX units and one RO unit have been online since the last half of 2012 and the other RO unit was placed online within the second calendar quarter of 2014. Additionally, the licensee added monitoring wells within MUs 8 and 10, and connected additional production and injection wells in MU-11 to an existing well house located in MU-9. The licensee has not activated the second yellowcake dryer due to current production needs.

Since the License Amendment Application for the addition of the Marsland Satellite is currently under review, the inspectors took the opportunity to visit the proposed location of the Marsland Satellite during the inspection. The inspectors also observed the licensee run two computer ground water models that are referenced in the Marsland License Amendment Application (i.e., the computer model used to demonstrate the ground water hydraulic effects of nearby agricultural wells and the model used to demonstrate the licensee's ability to maintain an inward hydraulic gradient at a MU during a power outage). The inspectors observed the complete setup of the two computer models, all model assumptions, and all input data.

1 Management Organization and Controls (88005)

1.1 Inspection Scope

Ensure that the licensee had established an organization to administer the technical programs and to perform internal reviews, self-assessments, and audits.

1.2 Observations and Findings

a. Organizational Structure

The licensee's corporate organizational structure is illustrated in Figure 5.1-1 of the license application. At the time of the inspection, the licensee had 50 full time employees at the facility. The licensee has one Radiation Safety Officer (RSO) and one full-time health physics technician (HPT). The licensee continues to train another HPT who was formerly a plant operator for the licensee. The licensee also employed contractors for all drilling operations and other work, as needed. The inspectors determined that the licensee had sufficient staff to implement the radiation protection, groundwater monitoring, and environmental programs at its current operating level.

The licensee notified the inspection team that Cameco Resources (Power Resources' parent company) will be closing its current headquarters office in Cheyenne, Wyoming office and consolidating with its Casper, Wyoming office. The Casper office will be the new headquarters location. The Cheyenne office is expected to close September 30, 2014.

b. Safety and Environmental Review Panel

License Condition 9.4 of the performance-based license requires, in part, that the licensee establish a Safety and Environmental Review Panel (SERP) to evaluate if program changes require an NRC license amendment prior to implementation. The inspectors reviewed the following seven SERP evaluations that were performed by the licensee since the previous inspection. The inspectors concluded that the licensee had implemented the SERP determination in accordance with the performance-based license conditions, with one exception, as noted below.

1. SERP 13-04, dated July 15, 2013, approved newly established restricted areas outside the CPP and the Restoration Building.

In response to a violation of NRC requirements identified during the 2013 inspection (refer to the July 3, 2013, Inspection Report and Notice of Violation, ML13184A360), the licensee evaluated areas on the site with the potential to exceed 2 millirem (0.02 millisievert) in any one hour for compliance with 10 CFR 20.1301(a)(2). As a result of this evaluation, restricted areas were established outside the Restoration Building and the yellowcake storage area adjacent to the CPP. In addition, the licensee instituted new monthly gamma dose rate surveys outside of the CPP, the Restoration Building, the outside of all header houses (HHs), and the outside of all booster stations.

During this inspection, the inspectors visited these newly established restricted areas and verified that the licensee was controlling these areas in accordance with their license requirements.

2. SERP 13-05, dated August 23, 2013, approved the technical qualifications of a HPT.

The licensee held a SERP to evaluate the education, training, and work experience of an employee against the recommendations for the qualifications of

an HPT in NRC Regulatory Guide (RG) 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as Is Reasonably Achievable," in accordance with LC 9.12. The licensee provided educational transcripts for the employee and highlighted specific math and science courses, along with additional training and experience.

The inspectors reviewed the education, training, and experience submitted for the SERP for the HPT. After comparing the qualifications submitted by the licensee to both of the recommended qualifications for HPT in RG 8.31 (refer to Section 2.4.2 of RG 8.31), the inspectors concluded that the qualifications submitted for the HPT were not consistent with either of the recommendations for HPT qualifications in RG 8.31. The inspectors noted that, although the individual had a degree, that degree was not in the physical sciences, engineering, or a health-related field. Therefore, the inspectors did not agree with the results of the licensee's SERP 13-05.

In LC 9.12, the licensee commits to following the recommendations in RG 8.31. Regulatory Guide 8.31 states that the RSO and radiation safety staff is responsible for performing all routine and special radiation surveys. The inspectors reviewed records for radiation surveys performed by the licensee, including surveys associated with the release of potentially contaminated equipment for unrestricted use performed by the employee qualified by the licensee under SERP 13-05. As discussed in Section 3 below, the inspectors do not consider the release of potentially contaminated equipment for unrestricted use by this unqualified HPT as a significant health risk. After discussing the qualifications of this employee with the licensee, the licensee decided to rescind the HPT qualification of the employee and to not allow the employee to release any more potentially contaminated equipment for unrestricted use. The inspectors determined that the failure to have a qualified HPT perform surveys of potentially contaminated equipment for unrestricted use was a minor performance deficiency that was not subject to enforcement action in accordance with the NRC's Enforcement Policy.

3. SERP 13-06, dated August 28, 2013, approved the addition of monitoring wells CM 10-32, CM 10-33, and CM 10-34 in MU-10. In approving HH-57 in MU-10, these three new monitoring wells were added to the list of baseline restoration monitoring wells resulting in the recalculation of the restoration values for MU-10.
4. SERP 14-01, dated January 24, 2014, approved the addition of monitoring wells CM8-26, CM8-27, CM8-28, SM8-30, and SM8-31 in MU-8. In approving HH-35A7 in MU-8, wells P-6111, CM8-23, CM8-24, and CM8-25 were added to the list of baseline restoration monitoring wells resulting in the recalculation of the restoration values for MU-8.
5. SERP 14-02, dated April 2, 2014, approved HH-47A/65 to operate five new production and five new injection wells in MU-11. Header House- 47A is physically located in MU-9 and was previously approved for operation. These ten new MU wells in MU-11 are to be connected to the HH-47A and thus, the HH has a dual identification number 47A/65

6. SERP 14-03, dated April 22, 2014, further approved HH-47A/65 to operate three new production and eight new injection wells in MU-11.
7. SERP 14-04, dated April 22, 2014, approved the replacement of perimeter monitoring well CM11-13 in MU-11. Well CM11-13 was damaged beyond repair and the well was abandoned and replaced with CM 11-13A, which is located 35 feet south of CM11-13. The well damage resulted from trying to retrieve the lower packer stick in the well during a mechanical integrity test (MIT). As a precaution, the licensee plugged the damaged well with bentonite while in the presence of an inspector. The licensee plans to complete the proper plugging of Well CM11-13 during August 2014.

c. Audits and Inspections

The inspectors reviewed the audits and inspections being generated by the licensee in accordance with LC 9.12, which includes a requirement to follow the guidance in RG 8.31. The licensee was conducting and documenting a daily walk-through of all work and storage areas of the facility to ensure good radiation practices were being followed. The RSO, HPTs, or trained plant operator performed the daily walk-through. The RSO, or an HPT, when the RSO was not available, was performing a weekly inspection of all facility areas to observe general radiation control practices and review required changes in procedures and equipment. Also, the RSO was generating a monthly report that summarized the results of the daily and weekly inspections and monitoring and radiation exposure data. The inspectors concluded that inspections were generally being conducted and recorded in accordance with LC 9.12 and RG 8.31.

The licensee had hired contractors to perform the annual audit of the radiation safety program as required by 10 CFR 20.1101(c). The inspectors reviewed the 2012 and 2013 annual audits. The audits included a review of occupational exposures, radiation survey results, documented training activities, and compliance with license and regulatory requirements. The reports highlighted a decrease in maximum individual and collective occupational exposure in recent years. The inspectors found that the audits met the requirements of 10 CFR 20.1101(c).

d. Additional Protocol Verification

The inspectors verified that the licensee had provided the NRC with appropriate documentation to comply with 10 CFR 75.11 which relates to the Agreement Between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the US. The licensee had provided the four necessary forms that provide contact information, the capacity of yellowcake production, the actual annual yellowcake production, and the quantity of yellowcake on hand. The licensee discussed how they determined these numbers, and the inspectors found the reports to be accurate, complete, and consistent for the reports submitted on January 9, 2014, for calendar year (CY) 2013.

1.3 Conclusions

The organizational structure and staffing levels maintained by the licensee during the inspection period met the requirements specified in the license and were sufficient for the work in progress. The licensee's Safety and Environmental Review Panel evaluations

reviewed by the inspectors were conducted in accordance with requirements of the performance-based license, with one exception. The licensee was conducting audits and inspections as required by the regulatory requirements and the license. The licensee had provided the appropriate reports to comply with the additional protocol reporting requirements.

2 In-Situ Leach Facilities (89001)

2.1 Inspection Scope

Determine if in-situ recovery activities were being conducted by the licensee in accordance with the NRC's regulatory requirements and the license.

2.2 Observations and Findings

a. Operations and Restoration

At the time of this inspection, uranium recovery operations were being performed at MUs 7, 8, 9, 10, and 11. Facility records indicate that MUs 2, 3, 4, 5, and 6 were in restoration. Mine Units 2 and 3 were within the restoration monitoring phase that demonstrates stability of restored ground water quality and MUs 4 thru 6 were within restoration phases where ground water quality is being actively restored through ground water extraction and injection. During the inspection, the licensee provided an update on the status of restoration MUs 2 and 3. The ground water quality data for these two MUs showed significant improvements in restoration performance within the Basal Chadron aquifer during 2009 and 2010 stemming from the changes to the licensee's methods of ground water extraction and injection. During this period, there were substantial declines of target ground water analytes (e.g., alkalinity, total dissolved solids, sodium, sulfate, arsenic, uranium, vanadium, and radium-226).

Facility records indicate that the average and highest operating flow observed over the past year was 6,840 gpm and 7,103 gpm, respectively. Consistent with LC 10.5, the inspectors observed that the highest recorded flow rate is below the maximum plant throughput of 9,000 gpm.

The inspectors spot-checked facility records to verify that the bleed at MU-11 is sufficiently maintaining an inward hydraulic gradient. The inspectors observed average daily bleed data for the period from June 1, 2013 to May 22, 2014, and hydrographs (i.e., time-series graphs of monthly ground water level measurements) for perimeter monitoring wells CM11-07, CM11-16, CM11-18, and CM11-19 for the period from November 2010 to May 2014. These records indicated that an inward hydraulic gradient had been maintained at the MU.

License Condition 10.6 requires, in part, that the licensee shall assure that the negative pressure for the drying heating chamber is maintained and documented. The inspectors reviewed the computer records which continually record the air pressure differential during drying operations. The inspectors found the dryer vacuum system was operating as required by the license.

In response to a pressurized yellowcake drum incident that occurred at another licensee's facility, the licensee had made changes to its yellowcake packaging and loading procedure. One change implemented was to measure the yellowcake product with a temperature probe to ensure that the product temperature is below 110 degrees Fahrenheit. In addition, the licensee increased the cooling time for yellowcake drums from 12 to 24 hours prior to securing the drum lid. The inspectors verified that these activities were still being conducted in accordance with their internal procedures.

The licensee's installation of a second dryer located adjacent to the first dryer is approximately 90 percent completed. The licensee stated that the remainder of work on the second dryer will be postponed until the capacity is needed. After the dryer is operational, the NRC plans to conduct an inspection to ensure all license and regulatory requirements are being implemented. The current license permits the licensee to put the new dryer into operation when they determine it is operational.

License Condition 9.9 requires, in part, that any new construction area not previously assessed by the NRC shall have a cultural inventory completed by the licensee prior to construction. The licensee stated that no new areas were under construction that required a cultural resource inventory.

b. Site Tours

Site tours were conducted to observe in-situ recovery operations in progress. Areas toured included the CPP, Restoration Building, selected wellfields, selected HHs, deep disposal wells and the evaporation ponds. The inspectors observed a MIT conducted in Well P-1628, the sampling of ground water monitoring well CM 11-3, environmental sampling of stream location E-5, Impoundment I-4, and Well 63, as well as on-site laboratory analysis of a sample suite. The inspectors observed the condition of plant equipment, fences, postings, and gates. Plant operating parameters (flow, pressure) were compared to licensed limits. The pressurized downflow ion-exchange columns and resin trap downstream of the ion-exchange columns in the CPP appeared to be functioning as designed. New HHs installed since the previous inspection were constructed with a concrete containment under the floor.

The inspectors noted that all entrance areas to the facility were posted with the words, "Any Area Within This Facility May Contain Radioactive Material", as required by LC 9.11. Additionally, it was noted that the temporary storage of byproduct waste materials is located in restricted areas as required by LC 10.14.

During the site tours, the inspectors performed independent radiological surveys using two NRC-issued survey meters; a Ludlum Model 19 microRoentgen survey meter (NRC 015540, calibrated using radium-226, calibration due date of 02/04/2015), and a Ludlum Model 2401-EC2 survey meter (NRC 20779G, calibration due date of 12/28/2014). The average background reading was approximately 15 microRoentgen per hour ($\mu\text{R/hr}$) in the unrestricted areas. The inspectors measured 3000 $\mu\text{R/hr}$ at the boundary of the radiation area posting to the demister in the plant. Inspectors observed that a lead shield was wrapped around the demister. The inspectors did not measure any areas greater than 5000 $\mu\text{R/hr}$ which the licensee had not previously identified and posted as radiation areas. The inspectors determined that the licensee identified and posted radiation areas as required in 10 CFR 20.1902.

During the previous inspection, one violation (VIO 040-08943/1301-01) was identified by the inspectors related to exceedence of doses in unrestricted areas. The inspectors determined that the dose in an unrestricted area adjacent to the Restoration Building, which is located in a controlled area, was 0.04 milliSievert (4 millirem) per hour, for over one consecutive hour. On the inside of the Restoration Building near this area was the location of new RO units which caused the elevated radiation levels. This is a violation of 20.1301(a)(2), which states, in part, that the dose in any unrestricted area from external sources does not exceed 0.02 milliSievert (2 millirem) in any one hour. The licensee responded immediately when the inspector identified the violation by placing a fenced around the area near the Restoration Building that exceeded the dose limit. The inspectors determined that no member of the public was present in this area at any time while the dose limit was exceeded. The licensee responded to this violation in letter dated August 23, 2013, (ADAMS Accession number ML13235A335). The licensee committed to evaluating all licensed areas to ensure the dose limits had not been exceeded. As a result, an additional area was fenced off near the yellowcake storage area adjacent to the CPP. In addition, the licensee instituted new monthly gamma dose rate surveys outside of the CPP, the Restoration Building, the outside of all HHS, and the outside of all booster stations. The inspectors verified that the corrective actions were being conducted. Future inspections will ensure appropriate radiation surveys are being conducted to identify any areas exceeding the dose limits to members of the public. This violation is considered closed.

c. Financial Assurance

In accordance with LC 9.5, the licensee submitted its annual financial assurance update for the Crow Butte facility on September 30, 2013. This update has been accepted by the NRC staff and is currently in final stages of the review process.

2.3 Conclusions

Site operations were being conducted in accordance with applicable license conditions and regulatory requirements. One violation was closed related to the exceedence of the dose limit in any one hour in an unrestricted area. The licensee had submitted an updated financial assurance package for NRC review.

3 Radiation Protection (83822)

3.1 Inspection Scope

Determine if the licensee's radiation protection program was in compliance with the license and 10 CFR Part 20 requirements.

3.2 Observations and Findings

a. Occupational Exposures

The inspectors reviewed the licensee's dose assessment for CY 2013 and the first quarter of 2014. Approximately 54 employees and contractors were monitored for external exposures using thermoluminescent dosimeters that were exchanged on a quarterly basis. Occupationally monitored employees included CPP operators, Restoration Plant operators, health physics staff, laboratory staff, and wellfield

operators. The highest deep dose equivalent for CY 2013 was a Restoration Plant operator that received 262 millirem (2.62 millisievert). For the first quarter of 2014, the highest deep dose equivalent was 49 millirem (0.49 millisievert) for a CPP operator who is also a dryer operator.

The licensee conducted air sampling, in part, for assessment of internal exposures. The inspectors reviewed the licensee's radon-222 air sampling records and the uranium particulate and worker breathing zone sample results for January 2013 through April 2014. The highest exposure for radon daughters for an employee for CY 2013 was 0.116 working level months. This maximum exposure is below the annual regulatory limit of 4 working level months. The highest exposure for radon daughters for an employee from January 2014 through April 2014 was 0.0139 working level months.

The highest employee airborne uranium exposure for CY 2013 was 1.56×10^{-2} microcuries (μCi). This maximum exposure is below the annual regulatory limit of 1.0 μCi . The highest employee airborne uranium exposure from January 2014 through April 2014 was 2.14×10^{-3} μCi . The inspectors also confirmed that the licensee had conducted air sampling at the required intervals.

The occupational exposure records indicated that the average and highest total effective dose equivalent for CY 2013 were 153 millirem (1.53 millisievert) and 446 millirem (4.46 millisievert), respectively. There were no total effective dose equivalent measurements to personnel exceeding the regulatory limit of 5000 millirem (50 millisievert) per year. Pursuant to 10 CFR 20.1208, there were no occupational exposures of a declared pregnant woman since the previous inspection.

The licensee also monitors for soluble uranium intake in compliance with 10 CFR 20.1201(e). The highest soluble intake of uranium for CY 2013 was received by a dryer operator and was calculated to be 0.963 milligrams of uranium in one week. The highest soluble intake of uranium from January 2014 through June 2014 was received by a dryer operator and was calculated to be 0.623 milligrams of uranium in one week. All employees received less than the regulatory limit of 10 milligrams uranium per week.

Urine bioassays are taken to ensure that the respiratory protection program and engineering controls for airborne uranium are being utilized appropriately. The licensee submits bioassays to an outside analytical laboratory for analysis on a monthly basis for the yellowcake dryer operators and quarterly for CPP operators and others in the bioassay program. The inspectors reviewed the bioassay program to verify compliance with LCs 11.8 and 11.9. Since the previous inspection in June 2012, no bioassay results exceeded the action level of 15 micrograms uranium per liter of urine. The inspectors also verified that bioassay QA/QC procedures were completed in accordance with LC 9.12.

b. Training

The inspectors reviewed the licensee's radiation safety training procedures and radiation training documentation in accordance with LC 9.12, which includes a requirement to follow the guidance in RG 8.31. The radiation safety training procedures, training course material for new employees, annual refresher training course material, and written exams were found to meet the requirements of the license and regulatory requirements. Annual refresher training for 2013 and 2014

was conducted April 17-19 and April 23-25 respectively. Records show that approximately 70 employees and contractors completed annual refresher training in 2014. Employees performing duties related to the U.S. Department of Transportation (DOT) hazardous materials shipping had current training within the past three years, in accordance with 49 CFR 172.702. All annual and refresher radiation safety training activities and records were in accordance with the requirements of the license.

c. Instrumentation

The inspectors reviewed several different types of survey instruments and requested the licensee to describe their use. For breathing zone air samples, the licensee uses the SKC AirChek^{XR} lapel air sampler. These units are calibrated each morning and then before each use. For loose surface alpha contamination surveys, the licensee uses an Eberline SAC-R5 detector (photomultiplier tube) with a Model 2000 scaler. This unit's calibration date was checked against the licensee's calibration records and was found to be currently calibrated. The licensee also uses a Ludlum Model 4310-1 detector with a Ludlum Model 2929 dual scaler for loose surface alpha contamination surveys. For monthly airborne uranium samples, the licensee uses a ThermoEberline Model RAS-1 Portable Particulate Air Sampler.

The survey instruments examined by the inspectors were found to be in calibration and were being used appropriately by the licensee's staff. In addition, the inspectors found the licensee's calibration procedures consistent with Volume IV, Section 10 of its Health Physics Manual (Radiological Laboratory Programs).

d. Radiation Protection Surveys

The inspectors reviewed selected records for CY 2013 for in-plant radiological surveys (which includes radiation exposure surveys, fixed and loose surface contamination for unrestricted and restricted areas, and in-plant air uranium and radon progeny), and material release surveys. For alpha contamination area surveys in unrestricted areas, the licensee requires removable alpha samples (i.e., smears) for total alpha contamination levels greater than 250 disintegrations per minute per 100 squared centimeters (dpm/100cm²).

The inspectors reviewed the monthly radon daughter concentrations in the plant. For CY 2013, the highest plant average radon daughter concentration was 0.012 working levels. For this same time period, the highest plant maximum radon daughter concentration was 0.031 working levels. The inspectors also reviewed the monthly area airborne uranium samples. For CY 2013, the highest plant average uranium concentration was 2.77×10^{-11} microcuries per millimeter ($\mu\text{Ci/ml}$). For this same time period, the highest plant maximum uranium concentration was 1.41×10^{-9} $\mu\text{Ci/ml}$. The inspectors reviewed the survey results and found them to meet the requirements of the license.

The inspectors also reviewed the licensee's program for releasing items for unrestricted use (i.e., "free release"). For releasing items for unrestricted use, the licensee uses an action level of 750 dpm/100cm² total alpha contamination. At this action level, or higher, the licensee verifies removable alpha contamination levels (i.e., smears). The inspectors found the licensee's program for releasing items for unrestricted use to be

consistent with RG 8.30.

The inspectors reviewed the release of potentially contaminated equipment for unrestricted use by the unqualified HPT, discussed in Section 1.2.b.2 above. The inspectors noted that the length of the employee's relevant work experience was consistent with both options 1 and 2 of the recommendations for an HPT in RG 8.31, and the education and training of the employee partially fulfilled the recommendations for an HPT in RG 8.31. In addition, after reviewing the licensee's records, the inspectors determined that the potentially contaminated equipment released for unrestricted use by this employee all measured less than 750 dpm/100cm² total (fixed plus removable) alpha contamination and less than 50 dpm/100cm² removable alpha contamination. The inspectors found no reason to conclude that surveys performed by the unqualified HPT were performed incorrectly. The inspectors determined that the failure to have a qualified HPT perform surveys of potentially contaminated equipment for unrestricted use was a minor performance deficiency that was not subject to enforcement action in accordance with the NRC's Enforcement Policy.

e. Radiation Work Permits

Since the previous inspection, the licensee had issued 12 radiation work permits (RWPs). The RWPs were related to inspecting demisters for the precipitation tanks, cleaning out the yellowcake overflow tank, and cleaning out the sediments in Commercial Evaporation Pond #4. The inspectors noted that the RWPs included the appropriate personal protective equipment, respiratory protection, and air monitoring. These RWPs were reviewed in conjunction with the licensee's internal procedures and license commitments and were found to have met these requirements.

f. Respiratory Protection

The inspectors examined respiratory protection equipment and reviewed the licensee's procedures for respiratory protection. All respirators used at the facility are National Institute for Occupational Safety and Health certified and the respirators examined by the inspectors appeared in like-new condition. The licensee's respiratory protection procedures included fit-testing of respirators for employees, inspection and storage of respirators, and annual audits of the respiratory protection program. The inspectors found the licensee's respiratory protection program to be in accordance with the license application and regulatory requirements.

3.3 Conclusions

The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. The annual doses to employees were below occupational dose limits. Training, instrumentation, radiological surveys, radiation work permits, and respiratory protection met license and regulatory requirements.

4 Effluent Control and Environmental Protection and Maintaining Effluents from Materials Facilities ALARA (88045, 87102)

4.1 Inspection Scope

Determine if the environmental and effluent monitoring programs were effective to monitor the impacts of site activities on the local environment.

4.2 Observations and Findings

a. Environmental Monitoring

The effluent and environmental monitoring program requirements are specified in LC 11.3 and the approved license application, and the reporting requirements are specified in LC 12.1. The two Semiannual Radiological Effluent and Environmental Monitoring Reports (semiannual reports) dated August 26, 2013 and February 28, 2014 were reviewed during the inspection. The semiannual reports were submitted to the NRC in a timely manner and provided relevant data for the facility. The environmental monitoring program consisted of air particulate, radon, surface water, sediment, and ambient gamma exposure rate sampling as required by LC 11.3.

The licensee has seven monitoring stations at various locations around the licensed property, including one background station. The inspectors observed Air Monitoring Stations AM-2 (nearest downwind residence), AM-4 (permit boundary) and AM-5 (near an uninhabited residence, but located on the licensee's property). The inspectors also observed air station AM-25 (located near the CPP), which was used to collect additional data regarding public dose. The inspectors discussed the procedure for sample collection at air monitoring stations with an HPT and found the procedure and the knowledge of the HPT regarding the procedure to be adequate.

The seven monitoring stations were used to measure natural uranium, radium-226, and lead-210 concentrations in air. Uranium, radium-226, and lead-210 are analyzed on a quarterly basis and radon-222 is analyzed on a semiannual basis. The sample results reported by the licensee for natural uranium, radium-226, and lead-210 indicated that no members of the public exceeded regulatory limits. The sample results for radon-222 was less than the effluent concentration approved in the license application. The licensee measured ambient gamma radiation levels at the seven sample stations using dosimeters that were exchanged quarterly. The annual ambient gamma radiation levels ranged from 29 - 45 millirem (0.29 - 0.45 milliSievert) and were comparable to a background level of 36 millirem (0.36 milliSievert).

Surface water was collected quarterly from streams and water impoundments in the wellfield areas. The licensee collected water samples from five streams (unless they were dry) and three impoundments since the previous inspection. The samples were analyzed for natural uranium and radium-226 concentrations. The sample results were less than the annual effluent concentration limits specified in 10 CFR Part 20 for water. The inspectors observed samplings at Stream E-5, Impoundment I-4, and Well 63 and verified that the samplings were performed in accordance with procedures outlined in their respective procedures within the facility's operating manual.

Stream sediment samples were also collected annually from three locations in Squaw Creek, two locations on English Creek, and three impoundments on English Creek consistent with the water sample locations. The samples were analyzed for natural

uranium, radium-226, and lead-210 concentrations. No specific limit has been established for sediment samples, but the data is used by the licensee for trending purposes.

The semiannual reports also contained water supply well data. Water supply wells located within 1 kilometer of the wellfields were sampled quarterly. A total of 20 wells and a drinking water well were sampled. Results presented in the semiannual reports are consistent with previously collected data.

b. Doses to Members of the Public

Due to the violation of NRC requirements identified during the 2013 inspection (refer to the July 3, 2013 Inspection Report and Notice of Violation, ML13184A360), the licensee was not able to demonstrate compliance with 10 CFR 20.1301 (dose limits for individual members of the public) using the method described in 10 CFR 20.1302(b)(2). Instead, the licensee demonstrated compliance with 10 CFR 20.1301 by calculating the dose to the maximally exposed member of the public in accordance with 10 CFR 20.1302(b)(1). The licensee identified the nearest downwind resident, represented by Air Monitoring Station #2 (refer to Appendix F of the February 28, 2014, Semiannual Radiological Effluent and Environmental Monitoring Report, ML14071A019) as the maximally exposed member of the public. Using measured air particulate and radon concentrations at Air Monitoring Station #2, in addition to measured gamma radiation levels, the licensee calculated a maximum yearly (for the year 2013) dose at Air Monitoring Station #2 (nearest downwind resident) to be 5.06 millirem (0.05 milliSievert). This maximum dose for a member of the public is under the 100 millirem (0.1 milliSievert) per year dose limit specified by 10 CFR 20.1301.

The inspectors also evaluated the licensee's compliance with 10 CFR 20.1101(d), constraint on air emissions. This dose excludes radon-222 and its daughters. Using the nearest downwind resident, represented by Air Monitoring Station #2, the licensee calculated the maximum dose (for the year 2013) to be 0.12 millirem (0.0012 milliSievert), excluding radon-222 and its daughters. This maximum dose for a member of the public is under the 10 millirem (0.1 milliSievert) per year dose constraint specified by 10 CFR 20.1101(d).

c. Wellfield and Excursion Monitoring

License Condition 11.2 specifies, in part, the monitoring well sampling requirements and the criteria for placing a well on excursion status. The licensee's groundwater sampling program requirements include biweekly monitoring of well sampling in active MUs, weekly sampling of wells in excursion status, and lower-frequency well sampling in MUs under restoration. The inspectors reviewed groundwater sampling records from June 2013 to June 2014, to determine whether the licensee was collecting samples at the required frequency and whether excursions were properly identified. The inspectors selected monitoring data at random and examined the reports to confirm the licensee's automated excursion reporting system was functioning properly. Data from known excursions was also reviewed to ensure that the monitoring frequency had been increased according to LC 11.2 requirements. The inspectors concluded that the licensee was implementing the groundwater monitoring program in accordance with the license.

The inspectors reviewed the spill records for the past 12 months. According to the licensee's records, four spills occurred resulting in a total of 375 gallons of unrecovered fluids. Of the total unrecovered volume, 359 gallons of production fluid was released. None of these spills were reportable to the NRC.

The inspectors reviewed recent MIT documentation to determine whether test results were being appropriately reported and that tests were being performed in accordance with license commitments. The inspectors observed a MIT at Well P-1628 and verified that the test was performed in accordance with test procedures outlined in Standard Operating Procedure P-23 of the facility's operating manual. The inspectors determined that the licensee was performing and documenting the MITs in accordance with the license commitments.

The inspectors observed recent monitoring well sampling to determine whether sampling is being performed in accordance with the license commitments. The inspectors observed a sampling of Well CM 11-3 and verified that the sampling was performed in accordance with procedures outlined in the Monitoring Well Sampling procedure of the facility's operating manual.

The inspectors observed on-site laboratory analysis of monitoring well ground water samples to determine whether the analyses were being performed in accordance with licensee procedures. The inspectors observed the analytical analysis of a sample suite and verified that the analyses were performed in accordance with test procedures outlined in Standard Operating Procedure CBO-QMP-10-009 of the facility's Laboratory Manual.

4.3 Conclusions

The licensee conducted environmental monitoring in accordance with license requirements. The annual dose to members of the public was below regulatory limits. Mechanical integrity testing of wells was being conducted in accordance with approved procedures.

5 Inspection of Transportation Activities and Radioactive Waste Management (86740, 88035)

5.1 Inspection Scope

Determine whether transportation and radioactive waste disposal activities were being conducted in compliance with license requirements.

5.2 Observations and Findings

a. Inspection of Transportation Activities

The licensee ships 11e.(2) waste and full yellowcake barrels on a routine basis which fall under the DOT hazardous material shipping regulations. The inspectors observed yellowcake barrels being prepared for shipment by the HPT and determined that the appropriate procedures were being used to meet regulatory requirements. The licensee ships yellowcake product to Canada for processing. Since January 2013, the licensee had made a total of 24 yellowcake shipments. The inspectors reviewed a selected

sample of shipping records and found them to be complete and in accordance with DOT and NRC regulations.

b. Solid Byproduct Waste

License Condition 9.7 requires, in part, that the licensee possess a waste disposal agreement to dispose of 11e(2) byproduct material at an offsite location. The inspectors reviewed the waste disposal agreement dated June 4, 2010, and found it to be valid through June 30, 2015. Material sent for disposal consisted of 11e(2) contaminated equipment, such as filters, pipes, pumps, and soil. Since January 2013, the licensee had made 7 shipments of waste to a licensed facility.

License condition 10.14 states, in part, that the licensee shall store 11e.(2) byproduct material in a restricted area. The inspectors observed that the licensee had two restricted areas for the storage bins.

c. Wastewater Disposal

Consistent with LC 10.7, the licensee has been disposing of plant and wellfield operation wastewater using deep disposal well (DDW) injection and evaporation ponds. The licensee currently has two DDWs. The licensee provided the inspectors with the waste disposal rates recorded over the past year for each of the two operating DDWs. The actual capacities reported by the licensee for the two wells was 35 gpm under an injection pressure of 307 pounds per square inch (psi) and 229 gpm under an injection pressure driven by static pressure without the use of pumps. The total capacity of two wells was approximately 264 gpm. The average injection rates over the past year were 35 gpm and 191 gpm for the two DDWs.

The inspectors observed the two deep disposal wells to assess the manner in which they were being operated as well as their condition. The DDWs injection pressures were satisfactory monitored and controlled. The DDWs housing was observed to be framed with heavy iron beams that were bolted to the housing concrete foundation. Locks were found to be secure and spill containment was present.

The inspectors observed the three Commercial Evaporation Ponds (Ponds 1, 3, and 4) and the two research and development (R & D) ponds (East and West Ponds) to assess the condition of the pond liners, condition of the side slopes, and the manner in which the ponds were being operated. The R & D ponds and the Commercial Evaporation Ponds receive well development water and CPP process waste effluent, respectively. Although the licensee is authorized to construct a total of five ponds, Commercial Evaporation Ponds 2 and 5 were never constructed. The inspectors observed that the licensee was maintaining the proper amount of freeboard on the respective ponds in accordance with LC 10.6.

License Condition 11.4 and Section 5.8.8.3 of the approved license application specify, in part, that the licensee must perform and document inspections of its onsite evaporation ponds. The inspectors reviewed recent pond inspection documentation to determine whether inspection results were being appropriately reported and that inspections were being performed properly. The inspectors observed a weekly pond inspection and verified that the inspection was performed in accordance with inspection

procedures outlined in Crow Butte Project Environmental Manual Volume VI, Chapter 8, dated August 27, 2009.

On May 7, 2014, water level readings from all six underdrains at Commercial Evaporation Pond #1 indicated a potential pond liner leak (i.e., underdrain measurements in all underdrains were very near the pond level). Facility records indicated that water samples from the six underdrains were analytical analyzed for chloride, alkalinity, conductivity, sodium, and sulfate on May 8, 2014. These laboratory results for the underdrains were observed to be similar to the pond contents, which demonstrated a potential leak of the primary pond liner. Upon confirmation of the liner leak, the water level in Commercial Evaporation Pond #1 was lowered by transferring the contents to Commercial Evaporation Pond #3. On May 8, 2014 after the initiation of the water transfer, a failed patch was identified and temporarily repaired. On May 20, 2014, a second tear in the failed patch was identified below the water line. After additional water was transferred to Commercial Pond #4, permanent repairs to both tears were conducted on May 23, 2014. Laboratory analysis of ground water samples from three pond monitor wells for the indicator analytes did not indicate leakage from the secondary liner.. The inspectors noted that the licensee's actions and reporting of the pond leak were consistent with requirements under LC 11.4.

5.3 Conclusions

The licensee was conducting solid and liquid waste disposal operations in accordance with license and regulatory requirements. The licensee was conducting yellowcake and solid byproduct waste shipments in accordance with U.S. Department of Transportation and NRC requirements. The licensee had identified and fixed a pond liner leak.

6 Emergency Preparedness (88050)

6.1 Inspection Scope

Determine if Emergency Response activities were conducted in accordance with the licensee's operating procedures.

6.2 Observations and Findings

The inspectors verified that the licensee's emergency preparedness activities are conducted in accordance with Volume VIII of the licensee's Procedure Manual. Since the last inspection, five sections of the Procedure Manual have been modified: Chapter 1- Hydrochloric Acid; Chapter 2- Medical Emergencies; Chapter 10 - Emergency Reporting; Chapter 12 - Propane; and Appendix B - Instructions to Driver. The inspectors confirmed that changes to the procedures meet emergency plan requirements, licensing commitments, and NRC requirements and do not decrease the overall effectiveness of the emergency preparedness program.

The inspectors discussed emergency preparedness with the licensee including their emergency procedures and the use of spill kits. The licensee indicated that the truck used for yellowcake shipments contains a spill kit, which can be used to mitigate the radiological consequences of a yellowcake spill. The licensee conducts an emergency exercise every two years, and did not have an emergency exercise since the last inspection. The licensee is expected to hold their next emergency drill, involving a

transportation incident with spilled yellowcake, later this year. The local fire department is expected to participate in the exercise. Based on this review it was determined that the licensee has been implementing an Emergency Response program that is consistent with its license conditions and operating procedures.

6.3 Conclusions

The licensee was implementing an Emergency Response Program that is consistent with its license conditions and operating procedures.

7 Exit Meeting Summary

The inspectors presented the inspection results to the licensee's representatives at the conclusion of the onsite inspection on June 5, 2014. Representatives of the licensee acknowledged the findings as presented. During the inspection, the licensee did not identify any information reviewed by the inspectors as proprietary.

SUPPLEMENTAL INFORMATION

Partial List of Persons Contacted

Licensee

R. Grantham, Radiation Safety Officer
D. Pavlick, General Manager
L. Teahon, Manager, Health Safety and Environmental Affairs

Items Opened, Closed, and Discussed

Open

None

Closed

040-08943/1301-01 VIO Failure to keep unrestricted areas less than 0.02 milliSievert
(2 millirem) in any one hour

Discussed

None

Inspection Procedures Used

IP 88005	Management Organization and Controls
IP 89001	In-Situ Leach Facilities
IP 83822	Radiation Protection
IP 88045	Effluent Control and Environmental Protection
IP 87102	Maintaining Effluents from Materials Facilities ALARA
IP 86740	Inspection of Transportation Activities
IP 88035	Radioactive Waste Management
IP 88050	Emergency Preparedness

List of Acronyms Used

ADAMS	Agencywide Documents Access and Management System
CY	calendar year
CFR	Code of Federal Regulations
CPP	Central Processing Plant
DOT	Department of Transportation
DDW	deep disposal well
dpm/100cm ²	disintegrations per minute per 100 squared centimeters
HH	header house
HPT	health physics technician
IP	inspection procedure
IX	ion exchange
LC	license condition
MIT	mechanical integrity test
MU	mine unit
NRC	U.S. Nuclear Regulatory Commission
psi	pounds per square inch
R&D	research and development
RG	NRC Regulatory Guide
RO	reverse osmosis
gpm	gallons per minute
RSO	Radiation Safety Officer
RWPs	Radiation Work Permits
SERP	Safety and Environmental Review Panel
μCi	microcurie
μCi/mL	microcurie per milliliter
μR/hr	microRoentgen per hour
VIO	violation