



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

December 15, 2022

Tate Hagman, Restoration Manager
Crow Butte Resources, Inc.
86 Crow Butte Road
Post Office Box 169
Crawford, NE 69339-0169

SUBJECT: CROW BUTTE RESOURCES, INC. NRC INSPECTION REPORT 040-08943/2022-001 AND NOTICE OF VIOLATION

Dear Mr. Hagman:

This letter refers to the team U.S. Nuclear Regulatory Commission (NRC) inspection conducted on August 2-4, 2022, at your Crow Butte Project near Crawford, Nebraska. This inspection examined activities conducted under your license as they relate to public health and safety, the common defense and security, and to confirm compliance with the Commission's rules and regulations and the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

The inspection findings were discussed with you and other members of your staff at the conclusion of the onsite inspection on August 4, 2022. A final exit briefing was held with Doug Pavlick, General Manager, and other members of your staff on November 9, 2022. The NRC also informed you of the proposed unresolved item, as described below, on December 15, 2022, after completion of an internal NRC review of the inspection findings. The enclosed report presents the results of this inspection.

Based on the results of this inspection, the NRC has determined that two Severity Level IV violations of NRC requirements occurred. These violations were evaluated in accordance with the NRC Enforcement Policy. The current Enforcement Policy is included on the NRC's Web site at (<https://www.nrc.gov/about-nrc/regulatory/enforcement.html>). The violations involve your failure to submit a license-required report to the NRC in a timely manner and failure to revise or generate a new safety and environmental review panel evaluation to reflect changes in facility operations in accordance with license requirements. The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the subject inspection report. The violations are being cited in the Notice because they were identified by the NRC.

In addition, the NRC identified an unresolved item regarding your methodology for processing equivalent feed as compared to the guidance provided in NRC Regulatory Issue Summary 2012-06, "NRC Policy Regarding Submittal of Amendments for Processing of Equivalent Feed at Licensed Uranium Recovery Facilities," dated April 16, 2012. The NRC will continue to review

this open item, and you will be advised by separate correspondence of the results of our deliberation on this matter. Because this item remains under NRC review, you are not required to respond to this matter at this time. Please be advised that the number and characterization of the issues described in the report may change as a result of further NRC review.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the Notice. The NRC review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements. Additionally, the NRC will use your response to the Notice, in part, to continue its review of the unresolved item.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response 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 matter, please contact Dr. Robert Evans, Senior Health Physicist, at (817) 200-1234, or the undersigned at (817) 200-1249.

Sincerely,



Signed by Warnick, Gregory
on 12/15/22

Gregory G. Warnick, Chief
Decommissioning, ISFSI, and Operating
Reactor Branch
Division of Radiological Safety and Security

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

Enclosures:

1. Notice of Violation
2. NRC Inspection Report 040-08943/2022-001

cc:

Becki Harisis, Nebraska DHHS
Bryan Miller, Nebraska DHHS

CROW BUTTE RESOURCES, INC. NRC INSPECTION REPORT 040-08943/2022-001 AND NOTICE OF VIOLATION DATED DECEMBER 15, 2022

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CROW BUTTE RESOURCES, INC. NRC INSPECTION REPORT 040-08943/2022-001 AND NOTICE OF VIOLATION

ADAMS ACCESSION NUMBER: **ML22341A205**

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| OFFICE | DRSS:DIOR | DRSS:DIOR | NMSS:DUWP | BC:DIOR |
| NAME | RJEvans | LMGersey | TLancaster | GGWarnick |
| SIGNATURE | RJE | LMG | TXL | GGW |
| DATE | 12/08/2022 | 12/07/2022 | 12/07/2022 | 12/15/2022 |

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NOTICE OF VIOLATION

Crow Butte Resources, Inc.
Crawford, Nebraska

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

During an NRC inspection conducted on August 2-4, 2022, two violations of U.S. Nuclear Regulatory Commission (NRC) requirements were identified. In accordance with the NRC Enforcement Policy, the violations are listed below:

- A. License Condition 11.2.2 of NRC Materials License SUA-1534, Amendment 5, states, in part, that if an overlying aquifer monitoring well in Mine Unit 6 or Mine Unit 8 is placed on excursion status per License Condition 11.1.5, the natural uranium data from wells on excursion status in the overlying aquifer in Mine Units 6 or 8 shall be provided to the NRC within 60 days of the excursion confirmation in the written report specified in License Condition 11.1.5.

Contrary to the above, as of August 4, 2022, the natural uranium data for two overlying aquifer monitoring wells on excursion status in Mine Units 6 and 8 were not provided to the NRC within 60 days of excursion confirmation in a written report for the following two monitoring wells:

- Monitoring well SM6-28 which was on excursion status from the time of NRC's previous facility inspection in August 2019 to January 7, 2020, and from May 30, 2020, to June 17, 2020
- Monitoring well SM8-25 which was on excursion status from May 21, 2020, to June 17, 2020

This is a Severity Level IV violation (NRC Enforcement Policy Section 6.3)

- B. NRC Materials License SUA-1534, License Condition 9.4 states, in part, that the licensee may, without obtaining a license amendment pursuant to Title 10 to the *Code of Federal Regulations* (10 CFR) 40.44, and subject to conditions specified in License Condition 9.4(B), make changes in the facility and procedures as described in the license application. License Condition 9.4(D) further states that the licensee's determinations shall be made by a Safety and Environmental Review Panel (SERP).

Contrary to the above, as of August 2, 2022, the licensee made changes in the facility and procedures as described in the application without conducting a SERP determination. Specifically, the licensee failed to revise SERP 12-10 entitled, "Approval to Conduct a Pilot Test to Receive and Extract Uranium from Uranium Loaded Resin from a Small Community Water System," dated November 1, 2012, or generate a new SERP determination, to assess the operational methodology being used to process uranium-loaded resins, produced by municipal water treatment facilities, as equivalent feed. In other words, at the time of the inspection, the licensee was processing uranium-loaded resins produced by municipal water treatments systems differently from the process that was reviewed and approved in SERP 12-10.

This is a Severity Level IV violation (NRC Enforcement Policy Section 6.3).

Pursuant to the provisions of 10 CFR 2.201, Crow Butte Resources, Inc. is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional

Administrator, Region IV, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violations or, if contested, the basis for disputing the violation or severity level; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken; and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued requiring information as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Your response will be made available electronically for public inspection in the NRC Public Document Room or in 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, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days of receipt.

Dated this 15th day of December 2022

**U.S. NUCLEAR REGULATORY COMMISSION
REGION IV**

Docket No. 040-08943

License No. SUA-1534

Report No. 040-08943/2022-001

Licensee: Crow Butte Resources, Inc.

Location: Crow Butte Project
Dawes County, Nebraska

Dates: August 2-4, 2022

Inspectors: Robert J. Evans, PhD, CHP, PE, Senior Health Physicist
Decommissioning, ISFSI, and Operating Reactor Branch
Division of Radiological Safety and Security

Linda M. Gersey, Health Physicist
Decommissioning, ISFSI, and Operating Reactor Branch
Division of Radiological Safety and Security

Thomas Lancaster, Hydrogeologist
Uranium Recovery and Materials Decommissioning Branch
Division of Decommissioning, Uranium Recovery, and
Waste Programs
Office of Nuclear Materials Safety and Safeguards

Accompanied by: Stephen Poy, Mechanical Engineer
State Agreement and Liaison Programs Branch
Division of Materials Safety, Security, State, and Tribal Programs
Office of Nuclear Materials Safety and Safeguards

Approved by: Gregory G. Warnick, Chief
Decommissioning, ISFSI, and Operating Reactor Branch
Division of Radiological Safety and Security

Attachment: Supplemental Inspection Information

EXECUTIVE SUMMARY

Crow Butte Resources, Inc.
NRC Inspection Report 040-08943/2022-001

The U.S. Nuclear Regulatory Commission (NRC) performed a routine, announced health and safety inspection from August 2-4, 2022, at the Crow Butte Project near Crawford, Nebraska. The inspection included a review of records, interviews with site personnel, and tours of the site. The inspectors concluded that the licensee conducted decommissioning activities in accordance with regulatory and license requirements with two exceptions as described below.

Groundwater and Water Management

- The licensee conducted uranium recovery operations and maintained an inward hydraulic gradient in the mine units as required by the license. The licensee conducted dryer operations annually since the previous inspection, and a walk through of the dryer procedures with the operator indicated that the appropriate regulatory and license commitments were followed. Routine site inspections were conducted and documented by the licensee in accordance with license conditions. (Section 1.2)

Radiation Protection

- The licensee implemented a radiation protection program that met the requirements of Title 10 to the *Code of Federal Regulations* (10 CFR) Part 20 and the license. The licensee's radiation protection program was commensurate with the risks involved based on existing licensee activities. (Section 2.2)

Radioactive Waste Management and Transportation

- The evaporation ponds were being maintained in accordance with procedures and license requirements. A pond liner leak was identified, reported, and repaired by the licensee. Wastewater and deep disposal well activities were conducted in accordance with site procedures. Radioactive wastes were stored with an emphasis on security. Radioactive material was transported in accordance with regulatory requirements. (Section 3.2)

Effluent Control and Environmental Protection

- The licensee conducted effluent and environmental monitoring and reported the results to the NRC in semi-annual reports in accordance with license requirements. Per the licensee's records, site operations had a negligible effect on public doses. The licensee monitored and recorded well and manifold pressures and flows, and the licensee continued to monitor for excursions. A violation was identified related to the licensee's failure to submit a license-required report to the NRC. The licensee continued to implement a well casing mechanical integrity test program in accordance with license requirements. Test failures were reported to the NRC as required by the license. (Section 4.2)

Emergency Preparedness and Fire Protection

- The licensee established and implemented programs for emergency responses, fires, and radiological spills. No radiological event or spill occurred since the previous inspection that was required to be reported to the NRC. (Section 5.2)

Management Organization and Controls

- The licensee's organizational structure met license requirements, and the licensee had sufficient staff for the work in progress. The inspectors reviewed one Safety and Environmental Review Panel evaluation completed since the last inspection, and the inspectors confirmed that the licensee conducted and documented the evaluation in accordance with license requirements. The inspectors identified one violation related to the licensee's failure to update a Safety and Environmental Review Panel evaluation to reflect a change in operations. An unresolved item was identified regarding the licensee's current methodology for processing equivalent feed material as compared to existing NRC guidance. This unresolved item remains under NRC review. Annual program reviews were conducted in accordance with regulatory requirements. The licensee implemented the Additional Protocol requirements in accordance with regulatory requirements. (Section 6.2)

Report Details

Site Status

Crow Butte Resources (the licensee) started commercial operations in 1991. The facility is an in-situ recovery site that extracted uranium from sandstone aquifers at depths ranging from 400 to 800 feet below ground surface. In April 2018, the licensee reduced operations and entered the care and maintenance mode of operations. Since the previous inspection, conducted in July-August 2019 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML19219B387), the licensee continued to be in the care and maintenance mode.

At the time of the inspection, site activities included maintaining wellfield flows with reverse osmosis, ion exchanger, and dryer operations as needed. The licensee was not processing uranium or conducting yellowcake drying operations at the time of the inspection. The licensee's staff indicated that it had not commenced with construction activities at the Marsland Expansion Area; therefore, this location was not inspected.

1 Groundwater and Water Management at Uranium Recovery and 11e.(2) Byproduct Material Facilities (NRC Inspection Procedure [IP] 89020)

1.1 Inspection Scope

The objectives of this inspection procedure were to determine if groundwater and water management activities were protective of workers, members of the public, and the environment and to determine if these activities complied with license and regulatory requirements.

1.2 Observations and Findings

a. Uranium Recovery Operations

As of April 2018, the licensee ceased injection of lixiviant into the mine units for production purposes. The inspectors confirmed with the licensee that the water being injected into the mine units for restoration purposes did not include the NRC-approved lixiviant constituents specified in License Condition 10.1.1.

Of the 11 mine units (MUs) constructed at the site, one mine unit (MU-1) has been restored and its related wells and header houses have been decommissioned. Mine units MU-2 through MU-8 were in various stages of restoration. Mine units MU-2 and MU-4 began stability monitoring during the first quarter of 2022. Mine units MU-3 and MU-5 continued to be on stability monitoring since the previous inspection. Mine units MU-6, MU-7, and MU-8 were in active cleanup. Mine units MU-9, MU-10, and MU-11 were in bleed-only recirculation mode to maintain an inward hydraulic gradient.

The inspectors spot-checked facility records to verify that the bleed at MU-10 was sufficient to maintain an inward hydraulic gradient. The inspectors observed average daily bleed data for the period from November 2021 to June 2022, and hydrographs (i.e., time-series graphs of monthly ground water level measurements) for perimeter monitoring wells CM10-11, CM10-15, CM10-21, and CM10-26 for the period from November 1, 2021, to July 25, 2022. These records indicated that an overall inward

hydraulic gradient had been maintained at the MU in accordance with License Condition 10.1.6.

b. Dryer Operations

Since the previous inspection in 2019, the licensee operated the yellowcake dryer once per year to process uranium recovered from the restoration of mine units. The inspectors walked through the licensee's procedure CBR-SOP-019, "Yellowcake Dryer Operation and Maintenance," revision 24, dated March 15, 2017, with an operator. The procedure provided sufficient guidance on the dryer emission controls and guidance to ensure negative pressure was continually maintained during drying operations, as required by License Condition 10.2.1.

The inspectors noted that procedure CBR-SOP-019 contained sufficient instructions to prevent over-pressurization of a newly filled drum by requiring a minimum of 24 hours delay between filling and sealing the lid. The licensee documented several steps from the drying procedure in the operations logbook, which is kept in the control room. The inspectors reviewed the operations logbook for the previous four annual drumming operations and concluded that the appropriate information was being recorded by the operators.

The licensee had a total of thirty-nine 55-gallon drums of yellowcake in storage at the time of the inspection, totaling approximately 24,648 pounds. The inspectors noted that the licensee complied with License Condition 10.2.3, which states that annual yellowcake production shall not exceed 2 million pounds. The licensee stated that they anticipate having enough yellowcake drums for shipment to a conversion facility within the next year.

c. Routine Site Inspections

The inspectors reviewed routine inspections performed by the licensee since the previous inspection. As required by License Conditions 9.2 and 9.7, the licensee conducted and documented a daily walk-through of all work and storage areas of the facility to ensure that good radiation practices were being followed.

In accordance with License Condition 9.7, site procedures allowed trained and qualified operators to perform daily walkthroughs on days when the radiation safety staff was not available, such as weekends and holidays. The radiation safety officer (RSO) or health physics technician reviewed the walk-through documentation upon return to the facility. The inspectors randomly reviewed several daily walk-through records conducted since the previous inspection and found them in compliance with license requirements.

The inspectors accompanied a wellfield operator conducting the daily wellfield inspection and observed the operator's use of the "wellfield inspection sheet." License Condition 10.1.12 requires selected flow and pressure parameters to be monitored and recorded daily. The wellfield operator demonstrated how the injection and production pressures for each well in header houses were monitored and documented on the inspection sheet. The wellfield operator also described the verification of the requirement for injection pressures to be maintained less than 100 pounds per square inch at the injection well heads. In addition, wellfield operators are required to ensure that the heater and fan are operational in each header house. The inspectors determined that

the daily wellfield inspection was being conducted and documented in accordance with License Condition 10.1.12.

1.3 Conclusions

The licensee conducted uranium recovery operations and maintained an inward hydraulic gradient in the mine units as required by the license. The licensee conducted dryer operations annually since the previous inspection, and a walk through of the dryer procedures with the operator indicated that the appropriate regulatory and license commitments were followed. Routine site inspections were conducted and documented by the licensee in accordance with license conditions.

2 **Radiation Protection at Uranium Recovery and 11e.(2) Byproduct Material Facilities (IP 89030)**

2.1 Inspection Scope

The objectives of the inspection procedure were to ensure that the licensee effectively managed radiation protection to minimize the potential for exposures to workers and the public and ensure that these activities complied with license and regulatory requirements.

a. Occupational Exposures

The inspectors reviewed the licensee's occupational exposure records for calendar year 2019 through the first quarter of 2022. Occupationally monitored employees included plant and wellfield operators, safety and environmental staff including health physics, laboratory, and maintenance employees. Employees were monitored for external exposure using optically stimulated luminescence dosimeters which were exchanged on a quarterly basis. These results were reported as deep dose equivalent exposures. The highest external exposures assigned to an individual for each calendar year were as follows: (1) 55 millirem for 2019; (2) 56 millirem for 2020, (3) 57 millirem for 2021; and (4) 21 millirem for the first quarter of 2022. These external exposures were below the NRC's annual limit of 5,000 millirem as specified in Title 10 to the *Code of Federal Regulations* (10 CFR) 20.1201(a).

The licensee conducted particulate and radon-222 air sampling, in part, for assessment of internal exposures. The inspectors reviewed the licensee's sampling results for 2019-2022. The inspectors confirmed the licensee had conducted sampling at the required intervals. The appropriate exposures were calculated and recorded for each employee.

The inspectors reviewed the licensee's bioassay sampling results since the previous inspection. Bioassay samples were collected monthly. Except for the planned spiked samples required by the radiation protection plan, no bioassay sample results were above the lower limit of detection for uranium or the 15 micrograms per liter action level for investigation.

Internal dose or committed effective dose equivalent (CEDE) doses were assigned based on radon monitoring, uranium particulate monitoring, and bioassay results. The average CEDE assigned to employees for 2019-2022 ranged from 46 -117 millirem,

while the maximum CEDE assigned to employees ranged from 69-163 millirem. All sample results were less than regulatory limits.

b. Radiation Work Permits and Respiratory Protection

Nine radiation work permits were issued in 2019-2022. The inspectors reviewed selected radiation work permits and concluded that the permits provided sufficient controls for radiological hazards for the work to be performed.

The licensee maintained a respiratory protection program in case of need. All individuals who might wear respiratory protection were currently medically qualified for respirator use and had current respiratory fit test records on file. Respiratory protection refresher training was provided annually in 2019-2021. Respiratory protection refresher training for 2022 was planned for December 2022. Respirator inspections and surveys were conducted monthly in accordance with radiation protection program procedures.

c. Radiation Protection Surveys

The inspectors reviewed the licensee's routine contamination and gamma radiation surveys conducted since the previous inspection. The licensee conducted weekly removeable contamination surveys in designated clean areas of the facility, such as lunchrooms and office areas. Monthly gamma radiation surveys were conducted in the central processing plant, wellfields, and deep disposal wells (DDWs). Contamination spot checks were conducted on trash containers and respirators. No significant contamination problems were identified based on this records review.

Quarterly spot checks for contamination were conducted on employees, vehicles, and equipment in the wellfield. Free release surveys were reviewed and determined to be performed in accordance with License Conditions 9.6 and 11.1.9, Regulatory Guide 8.30, "Health Physics Surveys in Uranium Recovery Facilities," revision 1, and Regulatory Guide 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities will be As Low As Reasonably Achievable," revision 1. The inspectors verified that surveys were being conducted and documented as required. No contamination issues were identified during this review.

d. Radiation Safety Instrumentation

The inspectors reviewed the licensee's operability, calibration, and maintenance records for survey instruments. Selected instruments reviewed were determined to be in calibration. The licensee used an offsite vendor to perform annual calibrations of radiation safety instrumentation. The inspectors observed survey meters in use by licensee personnel when exiting restricted areas. The survey meters examined by the inspectors were in calibration and were used appropriately by the licensee's employees.

e. Training

The inspectors reviewed the licensee's training program. Employees were provided with initial hazard communications and radiation protection training and with annual refresher training. Employees preparing shipping paperwork had current U.S. Department of Transportation function-specific training. Other employees were provided with Department of Transportation training commensurate with their job responsibilities. The

annual refresher training also included job hazard analysis, confined space entry, fire protection, and emergency response training. All licensee staff completed annual refresher training in April 2020, July 2021, and May 2022. The inspectors determined that the licensee's training programs met license and regulatory requirements.

f. Independent Radiological Surveys

During tours of the central processing plant and reverse osmosis building, the inspectors conducted independent radiological surveys using a Ludlum Model 19 microRoentgen meter calibrated to radium-226 (serial number 36543, calibration due date of 8/19/22). With a background of about 10 microRoentgen per hour ($\mu\text{R/hr}$), the exposure rates within the central processing plant ranged from under 100 $\mu\text{R/hr}$ up to 2,000 $\mu\text{R/hr}$. The exposure rates within the reverse osmosis building ranged from about background to 2,200 $\mu\text{R/hr}$. In both buildings, the areas with the highest exposure rates were the reverse osmosis skid membranes.

During tours of the wellfields and header houses, the inspectors conducted independent radiological surveys using a RadEye G survey meter (serial number 30932, calibration due date of 11/12/22). The wellfields measured the same as the outdoor background levels of approximately 10 $\mu\text{R/hr}$. Readings inside the header houses ranged between 50-79 $\mu\text{R/hr}$. Some header houses were posted as "Caution-Radiation Area" due to having filters which have the potential to exceed 2,000 μR in any one hour. The inspectors did not measure any header house during the site tour that exceeded 2,000 μR in any one hour.

2.3 Conclusions

The licensee implemented a radiation protection program that met the requirements of 10 CFR Part 20 and the license. The licensee's radiation protection program was commensurate with the risks involved based on existing licensee activities.

3 Radioactive Waste Management and Transportation at Uranium Recovery and 11e.(2) Byproduct Material Facilities (IP 89035)

3.1 Inspection Scope

The objectives of this inspection procedure were to ensure that the licensee effectively managed radioactive wastes and safely transported radioactive material, and to ensure that these programs complied with license and regulatory requirements.

3.2 Observations and Findings

a. Review of Evaporation Ponds

The licensee maintains three commercial and two research and development ponds. All ponds have leak detection systems. The pond inspection program consisted of daily, weekly, monthly, and quarterly inspections, in addition to an annual technical evaluation. The pond inspection program was outlined in procedure CBR-EMP-002, "Evaporation Pond Monitoring," revision 9, dated April 23, 2020. The inspectors observed an operator performing and documenting the daily and weekly pond inspections in accordance with the procedure. The daily inspections included measuring water level freeboard and

verifying pond embankments were maintained. Weekly inspections included verifying the perimeter fences and pond liners were in good condition, verifying there were no exposed sediments that may become airborne, and measuring the water levels in the leak detection systems. The operator completed the inspection procedure and documented the results appropriately. The inspectors determined that the licensee had procedures in place for pond inspections that met the requirements specified in License Conditions 10.2.5 and 11.2.1.

b. Verification of Liner Leaks

On December 14, 2021, water level readings and underdrain sample analytical data from the north middle underdrain of Commercial Evaporation Pond #1 indicated a potential pond liner leak. When the laboratory results were obtained, the licensee contacted the NRC by phone and provided notification of the potential liner leak as required by License Conditions 11.1.6 and 11.2.1. A written report dated January 12, 2022 (ML22025A180), was provided to the NRC with analytical data, monitoring results, mitigative actions, and the results of those actions required by License Conditions 11.1.6 and 11.2.1.

Upon confirmation of the potential liner leak, the licensee lowered the water level of Commercial Evaporation Pond #1 by transferring the contents to Commercial Evaporation Pond #4. The liner was inspected, and a faulty patch was identified and repaired on January 4, 2022. After the faulty patch was repaired, the licensee added water to Commercial Evaporation Pond #1.

On February 16, 2022, water level readings and underdrain sample analytical data from the north middle underdrain of Commercial Evaporation Pond #1 again indicated a potential pond liner leak. The licensee again lowered the water level of the pond by transferring the contents to Commercial Evaporation Pond #3 for further inspection and repair. On March 3, 2022, a second faulty liner patch was identified and repaired (ML22076A190). Water was again added to the pond to verify the corrective action was effective. The inspectors noted that the licensee's actions and reporting of the pond leak were consistent with requirements under License Condition 11.4.

c. Wastewater Disposal Activities

License Condition 10.2.6 provides the requirements for management of liquid effluents from process buildings and other process waste streams. At the time of the inspection, the licensee was returning the liquid effluents to the process circuit, transferring the liquid effluent to the evaporation ponds, and/or disposing of the liquid effluents via DDWs. The licensee was not disposing of liquid wastes via land application.

The inspectors observed the operation of the two DDWs and compared the licensee's management of the wells to procedure CBR-SOP-022, revision 19, "Deep Disposal Well Operation and Control." The inspectors also toured the central processing plant, control room, and two DDW header houses and confirmed that the licensee operated the equipment in accordance with procedural requirements. Pressures, flow rates, and tank levels were found to be in accordance with procedure limits, and routine tests were being conducted in accordance with procedure requirements.

d. Radioactive Waste Storage

The inspectors observed that all 11e.(2) waste storage bins were staged within the restricted area with surrounding fences and locked entries. The inspectors performed an ambient gamma survey of the containers and confirmed that the areas were appropriately posted and controlled in accordance with regulatory and license requirements.

e. Transportation of Radioactive Material

Since the previous inspection, the licensee routinely shipped three types of radioactive material. These included intermodal containers of 11e.(2) solid waste to a licensed disposal site, minimally contaminated stripped resins returned to a customer, and 11e.(2) samples to a licensed laboratory for analysis. The 11e.(2) samples, consisting mostly of restoration monitoring well samples, were sent to a laboratory which possessed a specific license that authorized possession of 11e.(2) material. No yellowcake shipments had occurred since the previous inspection. The inspectors reviewed a representative sample of shipping papers to ensure compliance with the U.S. Department of Transportation regulations and did not identify any items of concern.

The inspectors verified that the licensee had a valid solid 11e.(2) waste disposal agreement in place, as required by License Condition 9.9. The disposal agreement was effective through December 31, 2030. The licensee made 11 solid 11e.(2) waste shipments for disposal since the previous inspection.

3.3 Conclusions

The evaporation ponds were being maintained in accordance with procedures and license requirements. A pond liner leak was identified, reported, and repaired by the licensee. Wastewater and deep disposal well activities were conducted in accordance with site procedures. Radioactive wastes were stored with an emphasis on security. Radioactive material was transported in accordance with regulatory requirements.

4 Effluent Control and Environmental Protection at Uranium Recovery and 11e.(2) Byproduct Material Facilities (IP 89045)

4.1 Inspection Scope

The objectives of this inspection procedure were to ensure that the licensee effectively controlled, monitored, and quantified releases of radioactive materials in liquid, gaseous, and particulate forms to the environment and to ensure that these programs complied with license and regulatory requirements.

4.2 Observations and Findings

a. Environmental and Effluent Monitoring

License Condition 11.2.3 requires the licensee to implement an effluent and environmental monitoring program, and License Condition 11.1.1.D requires the licensee to submit the results in semi-annual reports. The inspectors reviewed the licensee's reports and related data for calendar years 2019-2021 (ML19248C357, ML19289A496,

ML20057D422, ML20248H492, ML21105A740, ML21251A489, ML21272A297, and ML22053A184). Since the 2019 inspection, the licensee continued to implement the effluent and environmental programs.

The effluent monitoring program consisted of measurement or calculation of air particulates, radon, and radon progeny releases from the plant, header houses, and wellfields. The licensee conducted yellowcake drying operations using a vacuum dryer which limited the release of uranium air particulates from the central processing plant. The results of these samples or calculations were presented in the semi-annual reports.

The licensee's environmental monitoring program included air particulate, radon, surface water, private well water monitoring, as well as measurement of ambient gamma exposure rates. The inspectors reviewed the semiannual reports and data for 2019-2021 and confirmed that the licensee continued to collect the required data and report the results to the NRC. The inspectors noted that the licensee placed six radon track etch detectors at the nearest resident and background sample stations to monitor for the variability in data relative to using only one detector at each location.

Surface water and water supply well samples were collected quarterly from streams, water impoundments, and supply wells as specified by the license. The licensee collected surface water samples from five locations (unless they were dry) and three impoundments. The inspectors reviewed the analysis and sample frequency of recorded data and found the samples were analyzed quarterly for uranium and radium in accordance with License Condition 11.2.3.

Stream sediment samples were collected annually from three locations in Squaw Creek, two locations on English Creek and three impoundments on English Creek, consistent with the water sampling locations. The samples were analyzed for natural uranium, radium-226, lead-210, and thorium-230 concentrations. No specific limit had been established for sediment samples; the data was used by the licensee for trending purposes.

The licensee calculated the doses to the public based on the results of the effluent and environmental monitoring programs and reported the results to the NRC in the annual radiation protection program review reports specified in License Condition 11.1.2. The inspectors reviewed the public dose assessments for 2019 and 2020 during the inspection (ML20345A251 and ML21252A072); the results for 2021 were not available at the time of the inspection. The results were less than one millirem per year using an occupancy factor of 0.75 and indoor equilibrium factor of 0.5. These calculated doses were well below the regulatory limit of 100 millirem per year.

The inspectors observe the RSO conducting weekly filter changeouts at the background and nearest resident sample stations. The sample stations were used to sample air particulates and measure ambient radon and radiation levels. The RSO conducted the filter-changeouts in accordance with the instructions provided in procedure CBR-EMP-004, revision 4, "Air Monitoring," and common industry practices. The air samplers were found to be in good working order, and the sampling stations appeared to be well designed and effectively maintained.

b. Wellfield and Excursion Monitoring

License Condition 10.1.12 provides instructions for routine monitoring and recording of flow rates of injection and recovery wells as well as manifold pressures. The inspectors reviewed the licensee's implementation of this license condition. Based on site tours and records review, the inspectors determined that the flow rates were recorded, and injection pressures did not exceed 100 pounds per square inch at the injection well heads as specified by the license.

License Condition 11.1.5 specifies the excursion monitoring requirements and the criteria for placing a groundwater monitoring well on excursion status. The inspectors reviewed groundwater sampling records issued since the previous NRC inspection and determined that the licensee collected samples at the required frequency and properly identified excursions. Data from two known excursions were reviewed, and the inspectors determined that the monitoring frequency had been increased according to the license requirements. The inspectors concluded that the licensee implemented the excursion monitoring program in accordance with License Condition 11.1.5 requirements.

License Condition 11.1.5 states, in part, that all designated perimeter and upper aquifer monitor wells shall be sampled and tested no more than 14 days apart, with a few exceptions. The inspectors observed the licensee's sampling of two shallow monitoring wells SM-10-7 and SM-10-8. The sampler conducted the sampling using the instructions provided in procedure CBR-EMP-003, "Water Monitoring," revision 8. The results of sampling were compared to the upper control limits established for this well. The inspectors noted that the sampler effectively purged the two wells and collected sufficient volume of samples for testing.

The inspectors also reviewed the onsite laboratory's management and analysis of samples. The laboratory staff had developed a methodology for managing data and timely review of the data.

The inspectors reviewed the licensee's compliance with License Condition 11.2.2 requirements. This license condition requires the licensee, in part, to report data to the NRC in certain non-routine circumstances. In accordance with License Condition 11.2.2, the inspectors determined that natural uranium data for overlying aquifer monitoring wells on excursion status in Mine Units 6 and 8 was being maintained at the facility. However, the inspectors found that natural uranium data for two overlying aquifer monitoring wells on excursion status in Mine Units 6 and 8 was not provided to the NRC within 60 days of excursion confirmation. These monitoring wells are identified as SM6-28 and SM8-25 and were on excursion status as follows:

- Monitoring well SM6-28 was on excursion status from the time of NRC's previous facility inspection (July 2019) to January 7, 2020, and from May 30, 2020, to June 17, 2020
- Monitoring well SM8-25 was on excursion status from May 21, 2020, to June 17, 2020

The licensee's failure to provide the natural uranium data from wells on excursion status to the NRC within 60 days of excursion confirmation was identified as a violation of License Condition 11.2.2 requirements (VIO 040-08943/2022-01-01).

c. Mechanical Integrity Testing

License Condition 10.1.4 requires the licensee to implement a well casing mechanical integrity test (MIT) program. The program requires, in part, that the licensee retest each well at least once every five years of use. The inspectors reviewed the licensee's implementation of its well casing MIT program and observed the licensee's staff conducting an MIT.

The inspectors observed the test of well 1896. This well was slightly over 600-feet deep. The test was conducted in accordance with procedure CBR-SOP-023, "Mechanical Integrity Test (MIT)," revision 14. The well passed the test using the criteria provided in License Condition 10.1.4. The test performer documented the result of the test on a form that was approved for use by the State of Nebraska. After completion of the test, the inspectors provided possible procedure enhancements to the licensee for consideration.

Well casing test failures are reportable to the NRC per License Condition 11.1.6. Since January 2020, the licensee conducted about 2900 MITs. Out of approximately 2900 tests, only four casings failed the test, and the failures were reported to the NRC accordingly (ML20042C900, ML20070H641, ML20276A109, and ML22206A109).

4.3 Conclusions

The licensee conducted effluent and environmental monitoring and reported the results to the NRC in semi-annual reports in accordance with license requirements. Per the licensee's records, site operations had a negligible effect on public doses. The licensee monitored and recorded well and manifold pressures and flows, and the licensee continued to monitor for excursions. A violation was identified related to the licensee's failure to submit a license-required report to the NRC. The licensee continued to implement a well casing mechanical integrity test program in accordance with license requirements. Test failures were reported to the NRC as required by the license.

5 Emergency Preparedness and Fire Protection at Uranium Recovery and 11e.(2) Byproduct Material Facilities (IP 89050)

5.1 Inspection Scope

The objectives of this inspection procedure were to determine if the licensee's emergency preparedness and fire protection programs were being maintained in a state of operational readiness and to determine if these programs complied with license and regulatory requirements.

5.2 Observations and Findings

a. Emergency Preparedness and Fire Protection

License Condition 10.1.2 states, in part, that the licensee shall establish emergency procedures for potential accident and unusual occurrences including significant equipment or facility damage, pipe breaks or spills, loss or theft of yellowcake or sealed sources, significant fires, and natural disasters. The inspectors confirmed that the licensee maintained an Emergency Manual and response procedures for emergencies

including medical, contaminated injury, fire, explosion, chemical releases, natural disasters, security threats, radiological releases and spills, transportation accidents, evacuations, and reporting requirements.

Fire response instructions include general instructions, fires in the plant structures, range fires, and gas or electrical supply failures resulting in fires. Radiological emergency response instructions included yellowcake drum failures, and fires or explosions involving yellowcake material. The procedures also discussed theft of radioactive materials during shipments and thefts above weight thresholds.

The licensee developed lesson plans for emergency response and fire protection training. The training was provided to all employees as part of annual refresher training. The training included a written test.

b. Response to Spills

License Condition 11.1.6 requires the licensee to maintain documentation of unplanned releases of source or byproduct material and process chemicals. In addition, the licensee is required to have written procedures for evaluating the consequences of the spill or event against the NRC's reporting criteria as provide in 10 CFR Parts 20 and 40. The inspectors reviewed the licensee's implementation of its programs for responding to spills and events.

The licensee established procedure CBR-EPRP-007, "Radiological and Spill Emergencies," revision 9, for responding to radiological spills and emergency events. The procedure also referred to two forms used by the licensee to document spills and associated threshold for reporting spills. The procedure included instructions for collection of soil or spilled water samples as needed.

Since the last inspection in July 2019, the licensee experienced and documented nine spills. Based on the licensee's analyses and sample results, the inspectors confirmed that none of the spills were reportable to the NRC in accordance with the criteria provided in regulations and site procedures.

5.3 Conclusions

The licensee established and implemented programs for emergency responses, fires, and radiological spills. No radiological event or spill occurred since the previous inspection that was required to be reported to the NRC.

6 Management Organization and Controls at Uranium Recovery and 11e.(2) Byproduct Material Facilities (IP 89005)

6.1 Inspection Scope

The objectives of this inspection procedure were to ensure that the licensee effectively managed facility organization, changes, independent review committees, internal reviews and audits, routine site inspections, facility procedures, Additional Protocol reports and to ensure that the licensee's management organization and controls complied with license and regulatory requirements.

6.2 Observations and Findings

a. Organizational Structure

At the time of the inspection, the licensee had 16 full time employees at the facility, a reduction from 19 full time employees since the NRC's previous inspection in July 2019. The organizational structure also reflected the reassignment of personnel to address attrition. For example, the former SHEQ Coordinator left this position on November 2021, and the responsibilities for that vacant position shifted to the restoration manager. The inspectors determined that the movement of duties and responsibilities associated with attrition did not have a negative impact on essential functions such as operations and radiation protection.

The licensee had a written safety policy and standard operating procedures that addressed operational activities involving radioactive and non-radioactive materials associated with licensed activities, radiation protection, environmental surveillance, and emergency response in accordance with the requirements of License Condition 10.1.2. The licensee conducted audits and inspections and completed the necessary submissions in accordance with regulatory and license requirements.

The inspectors determined that the licensee had sufficient staff to implement the radiation protection, groundwater monitoring, and environmental programs at its current operating level. Interviews with managers and staff at the Crow Butte Project indicated a strong commitment to safety existed at all levels of the organization. The organizational structure and staffing levels maintained by the licensee were found to meet the requirements specified in the license and were adequate for the work in progress.

b. Safety and Environmental Reviews

License Condition 9.4 of the performance-based license requires that the licensee establish a Safety and Environmental Review Panel (SERP) process to evaluate whether program changes, tests, or experiments require an NRC license amendment prior to implantation. One new SERP was initiated since the previous inspection. SERP 19-01, dated December 5, 2019, evaluated a change to the quality assurance program related to calibration of radioactive sources. The licensee had been sending their radiation calibration sources, used to determine instrument operating parameters, to the manufacturer for decay correction verification. The manufacturer no longer offers this service. The licensee determined that decay-correcting calibration sources will be performed by the radiation safety staff, and the SERP determined that no license amendment was required to make this program change. The inspectors reviewed the SERP, and its supporting documentation, and concluded that the change did not require prior NRC approval.

During interviews with the licensee, the inspectors identified an inconsistency with existing operations verses the conclusion documented in a previously approved SERP evaluation. SERP evaluation 12-10, entitled, "Approval to Conduct a Pilot Test to Receive and Extract Uranium from Uranium Loaded Resin from a Small Community Water System," dated November 1, 2012, documents the licensee's compliance review using NRC Regulatory Issue Summary (RIS) 2012-06 to determine if a license amendment was required to process uranium-loaded resins from municipal water treatment facilities as equivalent feed. RIS 2012-06 outlined NRC's policy regarding the

processing of equivalent feed at licensed uranium recovery facilities and how licensees evaluate the need for a license amendment. The licensee concluded in SERP 12-10 that they did not need a license amendment and the site had met all requirements specified in RIS 2012-06.

The inspectors determined that the licensee's current method of processing uranium-loaded resins from municipalities was not in accordance with the approved SERP 12-10. Specifically, SERP 12-10 states that, "the process will be the same one used to process uranium from the commercial production circuit in the central processing plant," and, "the resin will become the property of Crow Butte and kept for future use in the central processing plant or reverse osmosis circuit." The licensee informed the inspectors that they were not using the uranium extracted from the municipal resins as equivalent feed due to the inclusion of unforeseen constituents that are incompatible with the current production circuit. The licensee also stated that in order to use the extracted uranium as equivalent feed, they would need a new system to remove the unwanted constituents. In addition, the licensee was returning the stripped resin to the customer, which is contrary to SERP 12-10 statements. The failure of the licensee to revise SERP 12-10 or complete a new SERP evaluation to analyze and justify the current method for processing municipal uranium-loaded resins as equivalent feed was identified as a violation of License Condition 9.4 (VIO 040-08943/2022-01-02).

In addition, the inspectors identified an unresolved item (URI 040-08943/2022-01-03) regarding the methodology that the licensee used to process equivalent feed relative to the guidance provided in RIS 2012-06. The inspectors questioned whether the licensee's methodology, as described in SERP 12-10 (as revised), was consistent with the guidance provided in the RIS. The inspectors concluded that additional review of the SERP determinations was necessary. This unresolved item remains under NRC review.

c. Annual Program Reviews

10 CFR 20.1101(c) requires the licensee to periodically (at least annually) review the radiation protection program content and implementation. The inspectors reviewed the licensee's annual audits for calendar years 2018-2021. The audits, performed by members of the health physics organization from the licensee's corporate headquarters, included an evaluation of occupational exposures, radiation survey results, public doses, training and compliance with license and regulatory requirements. The inspectors concluded that the annual program reviews met the intent of regulatory requirements.

d. Additional Protocols

The inspectors verified that the licensee had provided the NRC with appropriate documentation to comply with the requirements of 10 CFR 75.11 related to the agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States. The licensee provided the necessary forms from 2019 through 2021, which included contact information, the capacity of production, the actual annual production, and the quantity of material on hand. The inspectors concluded that the reports were completed in accordance with regulatory requirements.

6.3 Conclusions

The licensee's organizational structure met license requirements, and the licensee had sufficient staff for the work in progress. The inspectors reviewed one Safety and Environmental Review Panel evaluation completed since the last inspection, and the inspectors confirmed that the licensee conducted and documented the evaluation in accordance with license requirements. The inspectors identified one violation related to the licensee's failure to update a SERP evaluation to reflect a change in operations. An unresolved item was identified regarding the licensee's current methodology for processing equivalent feed material as compared to NRC guidance. Annual program reviews were conducted in accordance with regulatory requirements. The licensee implemented the Additional Protocol requirements in accordance with regulatory requirements.

7 Exit Meeting Summary

The inspectors presented the inspection findings to the licensee's representatives at the conclusion of the onsite portion of the inspection on August 4, 2022. A final inspection briefing was held on November 9, 2022, with Doug Pavlick, General Manager for US Operations, and other licensee staff. The inspectors discussed the unresolved item with Doug Pavlick and other licensee staff via a telephonic exit meeting on December 15, 2022. During the inspection, the licensee did not identify any information reviewed by the inspectors as proprietary.

SUPPLEMENTAL INSPECTION INFORMATION

Partial List of Persons Contacted

Licensee Personnel

T. Dyer, Radiation Safety Officer
T. Hagman, Restoration Manager
B. Taylor, Plant Foreman
D. Pavlick, General Manager for US Operations
C. Yada, Coordinator, SHEQ/HPT

Inspection Procedures Used

IP 89020 Groundwater and Water Management at Uranium Recovery and 11e.(2)
Byproduct Material Facilities
IP 89030 Radiation Protection at Uranium Recovery and 11e.(2) Byproduct Material
Facilities
IP 89035 Radioactive Waste Management and Transportation at Uranium Recovery and
11e.(2) Byproduct Material Facilities
IP 89045 Effluent Control and Environmental Protection at Uranium Recovery and 11e.(2)
Byproduct Material Facilities
IP 89045 Emergency Preparedness and Fire Protection at Uranium Recovery and 11e.(2)
Byproduct Material Facilities
IP 89005 Management Organization and Controls at Uranium Recovery and 11e.(2)
Byproduct Material Facilities

Items Opened, Closed and Discussed

Opened

| | | |
|----------------------|-----|---|
| 040-08943/2022-01-01 | VIO | Failure to provide natural uranium data to NRC for two overlying aquifer monitoring wells on excursion status |
| 040-08943/2022-01-02 | VIO | Failure to revise a SERP to reflect current operations |
| 040-08943/2022-01-03 | URI | Determine if licensee's method for processing equivalent feed was consistent with RIS 2012-06 guidance |

Closed

None

Discussed

None

List of Acronyms

| | |
|-------|---|
| ADAMS | Agencywide Documents Access and Management System |
| CEDE | committed effective dose equivalent |
| CFR | <i>Code of Federal Regulations</i> |
| DDW | deep disposal well |
| IP | NRC Inspection Procedure |
| μR/hr | microRoentgen per hour |
| MIT | mechanical integrity test |
| MU | mine unit |
| NRC | U.S. Nuclear Regulatory Commission |
| RIS | Regulatory Issue Summary |
| RSO | radiation safety officer |
| SERP | Safety and Environmental Review Panel |
| URI | Unresolved Item |
| VIO | violation |