



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001

August 10, 2015

Mr. Larry Teahon, Manager  
SHEQ  
Cameco Resources  
Crow Butte Operation  
86 Crow Butte Road  
P.O. Box 169  
Crawford, Nebraska 69339-0169

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION, RESPONSE TO LICENSE  
CONDITION 9.12, QUALITY ASSURANCE PROGRAM, CROW BUTTE  
RESOURCES, INC., CRAWFORD, NEBRASKA, LICENSE SUA-1534 (TAC  
L00766)

Dear Mr. Teahon:

By letter dated December 31, 2014, the licensee submitted to the U.S. Nuclear Regulatory Commission (NRC) staff a description of its quality assurance program (QAP) in accordance with LC 9.12 (Agencywide Documents Access and Management System (ADAMS) accession # ML15021A149). On April 30, 2015, the licensee provided revised QAP text to clarify that all samples taken for compliance with Regulatory Guide 4.14, Radiological Effluent and Environmental Monitoring at Uranium Mills, are submitted to an independent third party accredited laboratory (ADAMS accession # ML15120A378). The NRC staff has accepted these submittals for a detailed technical review and has completed its technical review of the responses. During our technical review, the NRC staff identified certain areas of deficiency for which we are requesting additional information. The NRC staff's request for additional information (RAI) is enclosed herein. This RAI is organized according to the sections in the QAP. Please either respond to this RAI or provide a schedule for submitting your responses within 30 days of receipt of this letter.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

L. Teahon

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If you have any questions, please contact me at 301-415-6443, or by e-mail at [Ronald.Burrows@nrc.gov](mailto:Ronald.Burrows@nrc.gov).

Sincerely,

**/RA/**

Ronald A. Burrows, Project Manager  
Uranium Recovery Licensing Branch  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards

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

Enclosure:  
Request for Additional Information

cc: D. Miesbach, NDEQ  
D. Pavlick, CBR

L. Teahon

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cc: D. Miesbach, NDEQ  
D. Pavlick, CBR

**ML15218A369**

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**U.S. Nuclear Regulatory Commission  
Request for Additional Information  
Technical Review of Response to License Condition 9.12  
Cameco Resources Crow Butte Operation  
For Source Material License SUA-1534**

The purpose of the following Request for Additional Information (RAI) is to provide the additional information and data that are necessary for the U.S. Nuclear Regulatory Commission (NRC) to review Cameco Resources Crow Butte Operation's (Cameco's, or the licensee) response to License Condition 9.12 (Cameco, 2014, 2015).

**Background**

License Condition (LC) 9.12 states:

The licensee shall submit a Quality Assurance Program (QAP) to the NRC for review and approval. The QAP will address the topics recommended in Regulatory Guide 4.15 (as revised).

In its submittal dated December 31, 2014, the licensee provided a description of its quality assurance program (QAP) in accordance with LC 9.12 (Cameco, 2014). On April 30, 2015, the licensee provided revised QAP text to clarify that all samples taken for compliance with Regulatory Guide 4.14, Radiological Effluent and Environmental Monitoring at Uranium Mills, are submitted to an independent third party accredited laboratory (Cameco, 2015).

**Table of Contents**

**RAI 1:**

**Description of Deficiency**

The NRC staff cannot complete its evaluation of the QAP required by LC 9.12 due to missing information.

**Basis for Request**

LC 9.12 requires the QAP to address topics recommended in Regulatory Guide 4.15 (as revised). There appears to be information that is recommended in Regulatory Guide 4.15 that NRC staff cannot find in the QAP.

**Request for Additional Information**

Please provide the following information:

- A. Please address Section 8 of Regulatory Guide 4.15, Verification and Validation, or describe where this information can found in the QAP.
- B. Please address Section 10 of Regulatory Guide 4.15, Preventive and Corrective Actions, or describe where this information can found in the QAP.

Enclosure

## **Section 5 Instrument Calibration**

### **RAI 2:**

#### **Description of Deficiency**

The NRC staff cannot complete its evaluation of Section 5 of the QAP required by LC 9.12 due to missing information.

#### **Basis for Request**

Section 5.3 of the QAP introduces a staff position titled “designee” that is not described in either Section 2 or Section 3 of the QAP.

#### **Request for Additional Information**

Please provide information on the staff position of designee regarding where this position fits within the organizational structure, responsibilities, and qualifications and training related to the quality assurance program.

### **RAI 3:**

#### **Description of Deficiency**

The NRC staff requires clarification of the formula used to calculate self-absorption of radiation on air filter collection media.

#### **Basis for Request**

In Section 5.6.5 of the QAP, the licensee presents the following calculation to calculate self-absorption of radiation on air filter collection media:

$$\% \text{ Self Absorption} = \frac{C_2 - C_3}{2C_1 + C_2 - C_3} \times 100$$

where:

$C_1$	=	cpm on front of filter
$C_2$	=	cpm on back of filter
$C_3$	=	cpm on front of filter covered by new filter of the same type

The NRC staff cannot confirm the origin of this formula.

#### **Request for Additional Information**

Please provide the NRC staff with a reference for this equation. In particular, please provide a reference that discusses the origin of the “2C<sub>1</sub>” term in the denominator.

### **RAI 4:**

#### **Description of Deficiency**

The NRC staff cannot verify that all necessary radiation survey instrument calibrations and checks are being performed at the required intervals.

#### Basis for Request

LC 9.7 requires the licensee to follow the guidance set forth in Regulatory guide 8.30, "Health Physics Surveys in Uranium Recovery Facilities" (as revised).

Guidance in Section 8 of Regulatory Guide 8.30 recommends that survey instruments be checked for constancy prior to each usage with a radiation check source. An instrument should not differ from the reference reading by more than 20%.

The licensee discusses radiation survey checks in Section 5 of the QAP. Section 5.2.2.4 discusses what a response source check is, but provides no quantitative comparison as described in Regulatory Guide 8.30.

In Section 5.1.1.6 of the QAP, the licensee stated that the radiation survey instrument calibration frequency is annual or at the frequency recommended by the manufacturer, whichever is more frequent.

However, guidance in Section 8 of Regulatory Guide 8.30 recommends that alpha counting systems used for radon daughter measurements should be calibrated at least monthly by using a known standard alpha source.

#### Request for Additional Information

Please update Section 5 of the QAP as necessary to incorporate the guidance in Regulatory Guide 8.30.

### **Section 7 Occupational Sample Collection**

#### RAI 5:

#### Description of Deficiency

In its discussion of using gross alpha counting of area air filters, the licensee provided a statement that is contradictory to a previous statement addressing the same procedure.

#### Basis for Request

In Section 7.1.1 of the QAP, the licensee stated:

"Measurement of airborne uranium is performed by gross alpha counting of the area air filters using an alpha scaler such as a Ludlum L-2000 or equivalent. The analytical results are compared to the derived air concentration (DAC) for soluble (D classification) natural uranium of  $5 \times 10^{-10}$   $\mu\text{Ci/ml}$  from Appendix B to 10 CFR §§20.1001 - 20.2401. This is a conservative method because the gross alpha results include uranium-238 and several of its daughters (notably radium-226 and thorium-230) which are alpha emitters."

This statement contradicts a previous response from the licensee addressing an RAI for the North Trend amendment (refer to RAI 5.7.3.2.c of Crow Butte Resources, Inc., 2009a) where the licensee found this method not to be conservative.

#### Request for Additional Information

Please correct the statement above to reflect the requirements of 10 CFR 20.1204 regarding mixtures of radionuclides in air.

#### RAI 6:

##### Description of Deficiency

The licensee did not provide sufficient justification for the use of the survey detector proposed for performing beta dose rate surveys. In addition, the licensee did not address surveys for beta contamination levels.

##### Basis for Request

The requirements in 10 CFR 20.1501(a)(2)(iii) specify that licensees shall make surveys of areas that are reasonable under the circumstances to evaluate the potential radiological hazards of the radiation levels and residual radioactivity detected.

In Section 7.3.3, the licensee proposed using the Ludlum Model 3 survey meter with Ludlum Model 44-6 G-M detector, or equivalent. However, the NRC staff observes that the Ludlum Model 44-6 G-M beta gamma survey detector has a beta cutoff energy of 200 keV in the open window configuration. According to Ludlum's technical information: "The detector incorporates a rotary shield, which when opened, allows the detection of beta radiation for energies above approximately 200 keV."

See, for example, [http://www.ludlums.com/images/stories/data\\_sheets/M44-6.pdf](http://www.ludlums.com/images/stories/data_sheets/M44-6.pdf).

The NRC staff also observes that Th-234, a daughter product of U-238 and beta-emitter, decays by beta emission with energies significantly below the 200 Kev cutoff energy of the Model 44-6 G-M detector, making it unlikely that these beta particles will be detected. Any detector equivalent to the Ludlum Model 44-6 will exhibit this same shortcoming.

#### Request for Additional Information

Please provide appropriate detectors for beta dose rate surveys as well as beta contamination surveys.

#### RAI 7:

##### Description of Deficiency

There appear to be typographical errors in the numbering of some of the sections.

### Basis for Request

The table of contents lists “Section 7.4 Surface Contamination” and “Section 7.5 Bioassay Program”. The Surface Contamination section is not enumerated in the text of the QAP and the Bioassay section is labeled as “7.4”.

### Request for Additional Information

Please review the table of contents and make the appropriate changes in the text of the QAP.

## **Section 8 Sample Management and Quality Control**

### RAI 8:

#### Description of Deficiency

The NRC staff cannot verify that all topics recommended in Regulatory Guide 4.15 have been incorporated into the licensee’s QAP.

### Basis for Request

Section 5 of Regulatory Guide 4.15 recommends that:

“Sampling of solids, liquids, and gases involves the measurement of sample masses, flow rates, or volumes. The ACCURACY of the instruments or containers used for this purpose should be determined and checked regularly to ensure that sampling performance criteria remain within the limits specified by the MQOs. The results of mass, flow rate, or volume calibrations and associated UNCERTAINTIES should be recorded.”

In addition, Section 6 of Regulatory Guide 4.15 recommends that:

“Performance criteria for radioanalytical measurements should be selected to provide a management tool for tracking and trending performance and to identify precursors to nonconforming conditions. Laboratories should satisfy program-specific criteria for all measurement processes, including necessary levels of PRECISION, acceptable BIAS, and applicable detection levels.”

The NRC staff observes that Section 6.1 of Regulatory Guide 4.15 also provides recommendations for nonradiological instruments, measurement, and test equipment.

LC 11.1(D) requires the licensee to submit a semiannual report consistent with the terms of Regulatory Guide 4.14, “Radiological Effluent and Environmental Monitoring at Uranium Mills”. Sections 6 and 7 of Regulatory Guide 4.14 provide recommendations on the recording and reporting of results of effluent and environmental monitoring including error estimates.

Section 8 of the licensee’s QAP discusses replicate and blank samples in general, and lower limits of detection for radiological and nonradiological parameters.

However, the NRC staff could not locate a discussion on the licensee’s expectations on measurement uncertainties for reporting purposes and for the purpose of tracking and trending performance and to identify precursors to nonconforming conditions.

In its renewal application, the licensee stated that its airborne sampling procedures implemented the guidance in Regulatory Guide 8.25, "Air Sampling in the Workplace" (refer to Section 5.8.3.1 of Crow Butte Resources, Inc., 2009b). Regulatory position 5.3 of Regulatory Guide 8.25 provides recommendations on calculating the uncertainty in the volume of air sampled.

#### Request for Additional Information

Please provide a discussion on how the precision and accuracy of the licensee's monitoring processes are determined. The response should include a discussion on how errors are estimated for all pertinent measurement parameters including, for example, sample masses, flow rates, volumes, and sampling time for radiological and nonradiological analyses performed by the licensee.

Please also provide a description of activities that are implemented by the licensee for the purpose of tracking and trending performance and to identify precursors to nonconforming conditions.

#### **Section 11 Records**

##### RAI 9:

##### Description of Deficiency

The proposed record storage duration does not appear to meet the requirements of 10 CFR Part 20, 10 CFR Part 40, and the conditions of License SUA-1534.

##### Basis for Request

In Section 11.4 of its QAP, the licensee stated:

"The minimum storage duration for records containing the results of sampling, analysis, surveys and monitoring, reports of audits and inspections, and investigations and corrective actions is five years. Data used for determination of personnel exposures must be retained until the termination of the NRC Source Materials License."

Various regulatory requirements in 10 CFR Part 20, 10 CFR Part 40 specify record retention periods significantly longer than five years. The following citations are examples of record retention requirements pertinent to those measurements discussed in Section 11 of the licensee's QAP:

- 10 CFR 20.1501(b)
- 10 CFR 20.2103(b)(4)
- 10 CFR 20.2107(b)
- 10 CFR 40.61(b)

Regulatory Position C.4 of Regulatory Guide 4.15 states, in part:

"...The licensee should establish a retention time for records consistent with licensing conditions and in accordance with the licensee's overall QA program."

LC 9.10 states:

“The results of the following activities, operations, or actions shall be documented: sampling; analyses; surveys or monitoring; survey/ monitoring equipment calibrations; reports on audits and inspections; all meetings and training courses; and any subsequent reviews, investigations, or corrective actions required by NRC regulation or this license. Unless otherwise specified in a license condition or applicable NRC regulation, all documentation required by this license shall be maintained until license termination, and is subject to NRC review and inspection.”

Various license conditions specify monitoring that results in records that are addressed by LC 9.10. For example:

- LC 11.3
- LC 11.4
- LC 11.5
- LC 11.6

#### Request for Additional Information

Please review all regulatory and licensing requirements for record retention requirements and revise Section 11 of the QAP as appropriate.

#### RAI 10:

##### Description of Deficiency

The NRC staff cannot complete its evaluation of Section 11 of the QAP required by LC 9.12 due to missing information.

##### Basis for Request

Section 11 of the QAP introduces a staff position titled “designee” that is not described in either Section 2 or Section 3 of the QAP.

#### Request for Additional Information

Please provide information on the staff position of designee regarding where this position fits within the organizational structure, responsibilities, and qualifications and training related to the quality assurance program.

### **Section 12 Audits and Inspections**

#### RAI 11:

##### Description of Deficiency

The NRC staff cannot complete its evaluation of Section 5 of the QAP required by LC 9.12 due to missing information.

### Basis for Request

Sections 12.4.1 and 12.4.2 of the QAP introduce staff positions titled “qualified designated operator”, “qualified designees”, and Operations Manager that are not described in either Section 2 or Section 3 of the QAP.

LC 9.7 requires the licensee to follow the guidance set forth in Regulatory guide 8.31, “Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as Is Reasonably Achievable” (as revised), with a specific exception for the performance of daily inspections.

Regulatory guide 8.31 recommends that the radiation safety officer (RSO) and the facility foreman should conduct a weekly inspection of all facility areas. Contrary to this recommendation, the licensee stated in Section 12.4.2 of that QAP that, in addition to the RSO and Operations Manager, qualified designees may conduct weekly inspections.

### Request for Additional Information

Please provide information on the staff positions of “qualified designated operator”, “qualified designees”, and Operations Manager regarding where these positions fit within the organizational structure, responsibilities, and qualifications and training related to the quality assurance program.

In addition, please revise the description of weekly inspections to be consistent with LC 9.7 regarding personnel performing the inspection.

### References

Cameco, 2015. E-mail from L. Teahon, Cameco Resources Crow Butte Operation, to R. Burrows, U.S. NRC, Revised QA Program, April 30, 2015, ADAMS Accession No. ML15120A378.

Cameco, 2014. Letter from D. Pavlick, Cameco Resources Crow Butte Operation, to U.S. NRC, Response to License Condition 9.12, December 31, 2014, ADAMS Accession No. ML15021A149.

(Crow Butte Resources, Inc., 2009a) Letter from S. Collings, Crow Butte Resources, Inc., to S. Cohen, U.S. NRC, Response to letter received November 20, 2008 (Dated November 17, 2008) – Request for Additional Information, License Amendment for the North Trend Expansion Area, Crow Butte Resources, Inc., Crawford, Nebraska, Source Materials License SUA-1534 (TAC J00523), February 27, 2009, ADAMS Accession No. ML090750430.

(Crow Butte Resources, Inc., 2009b) Letter from S. Collings, Crow Butte Resources, Inc., to R. Burrows, U.S. NRC, Response to letter received January 20, 2009 (Dated January 16, 2009) – Request for Additional Information, License Renewal Amendment Request, Crow Butte Resources, Inc., Crawford, Nebraska, License SUA-1534 (TAC J00555), May 12, 2009, ADAMS Accession No. ML091470116.