

**From:** Burrows, Ronald  
**Sent:** Thursday, September 04, 2014 1:10 PM  
**To:** Crow Butte (Larry\_Teahon@cameco.com)  
**Subject:** ACKNOWLEDGMENT OF RECEIPT, STATUS, AND TAC NUMBER TO TRACK REVIEW OF JULY 30, 2014, SUBMITTAL

Larry Teahon  
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SUBJECT: ACKNOWLEDGMENT OF RECEIPT, STATUS, AND TAC NUMBER TO TRACK REVIEW OF JULY 30, 2014, SUBMITTAL, CROW BUTTE URANIUM IN SITU RECOVERY PROJECT LICENSING ACTIVITIES, CROW BUTTE RESOURCES, INC., DAWES COUNTY, NEBRASKA, DOCKET # 040-08943

Dear Mr. Teahon:

By e-mail dated July 30, 2014, Crow Butte Resources, Inc. (CBR) submitted information related to draft License Condition (LC) 11.10 of the draft renewal Source and Byproduct Materials License SUA-1534 (refer to ADAMS ML12324039). Specifically, CBR submitted information related to a beta-gamma survey program (the submittal) for review by, and written verification from, the U.S. Nuclear Regulatory Commission (NRC) staff. This submittal is in ADAMS at ML14212A063. The NRC staff has opened TAC J00732 (Crow Butte Response to Draft License Condition 11.10 – Beta/Gamma Survey Program) to track costs related to the review of draft LC 11.10. This e-mail provides a status on this request.

The information described above to address draft LC 11.10 has not been accepted for a detailed technical review. The NRC staff has determined that there is insufficient information in the submittal for it to initiate a detailed review. For example:

- On page 1 of the submittal, CBR refers to the minimum detectable concentration (MDC) of 500 dpm/100 cm<sup>2</sup> as conservative as it is 10% of the total activity limit (i.e., 5000 dpm/100 cm<sup>2</sup>). However, the NRC staff observes that CBR's release procedures (refer to Section 3.2.d of NRC Inspection Report 040-08943/14-001 (ADAMS ML14199A537)) currently utilize an action level of 750 dpm/100cm<sup>2</sup> total alpha contamination for releasing items for unrestricted use. Please address this discrepancy.
- On page 1 of the submittal, CBR provides an equation (referenced as Equation (1)) from authors Strom and Stansbury for determining MDC that is taken from NUREG-1507 (refer to Table 3.1 on page 3-8 of ADAMS ML003676046). In describing this equation, CBR refers to the efficiency term in the denominator (annotated as epsilon, or e, in Equation 1 of the submittal) as "counter efficiency". However, the NRC staff observes that the efficiency term in Equation 1 is the overall counting efficiency (i.e., counts per disintegration (see, for example, the Strom and Stansbury reference in Table 3.1 of NUREG-1507 and the discussion by Currie in NUREG/CR-4007 (<http://www.osti.gov/scitech/servlets/purl/6411049>)). Please clarify what efficiency is used in Equation 1 and how it is determined.
- On page 1 of the submittal, CBR states that the "efficiency assumption for all equipment was 18%" and that this is "below the nominal equipment efficiency of 20% reported by

Ludlum in their equipment specifications.” However, the NRC staff observes that this is not correct for at least two of the survey probes referenced (see, for example, Model 43-5: <http://www.ludlums.com/component/virtuemart/area-monitoring-5/detectors-57/alpha-scintillation-59/alpha-detector-151-detail?Itemid=0> ,Model 43-65: <http://www.ludlums.com/component/virtuemart/area-monitoring-5/detectors-57/alpha-scintillation-59/alpha-detector-152-detail?Itemid=0> ). In addition, the efficiencies cited by Ludlum are referenced to Pu-239. The alpha particles associated with Pu-239 decay are > 5 MeV, and are more energetic than those in the Uranium decay chain. Please clarify the assumed equipment efficiency.

- On page 2 of the submittal, CBR provides an equation (referenced as Equation (2)) for the scan MDC. The NRC staff observes that this equation is not for alpha contamination (refer to Section 6.8 of NUREG-1507. Please address this discrepancy.
- On page 3 of the submittal, CBR refers to an “alpha to beta/gamma contamination ratio” and a “beta/gamma to alpha ratio”. Please clarify what ratio was calculated.
- On page 3 of the submittal, CBR refers to an expected one-to-one ratio. The NRC staff observes that this appears to assume that there are no other alpha or beta emitters other than uranium and its short-lived decay products (e.g., Ra-226, Pb-210). Has CBR performed any isotopic analyses of surface contamination at the plant? If so, please provide a summary of results.
- On page 4 of the submittal, CBR refers to a “kernel estimation method” to derive a beta to alpha ratio of 1.8:1. The NRC staff is not familiar with this methodology. Please describe this methodology, with appropriate citations, and address what appears to be a significant number of data points in Table 3 of the submittal that have ratio values much higher than 1.8:1.
- On page 10 of the submittal, CBR states that a conservative ratio of 2:1 beta to alpha is suggested for personnel and equipment surveys. As in the previous comment, the NRC staff observes that many measurements presented in Table 3 of the submittal, particularly for skin, have calculated ratio values significantly higher than 2:1. For example, 26 skin measurements (hand) out of a total of 113 (23%) had a calculated beta to alpha ratio of 6:1 or higher and 5 skin measurements had a calculated beta to alpha ratio of 15:1 or higher. Please clarify how an assumed ratio of 2:1 beta to alpha would be conservative in these cases and similar cases for materials released.
- On page 10 of the submittal, CBR refers to a beta to alpha ratio for concrete of 1:9.2. This ratio appears to be reversed based on Table 3 entries. Please clarify the beta to alpha ratio for concrete.
- The NRC staff observes that some uranium recovery facilities utilize a shoe washing station that uses water to clean the bottom of shoes prior to exiting a restricted area and prior to performing a personnel survey. The NRC staff also observes that water can attenuate alpha and beta particles, making them difficult to detect. Please describe any similar procedures used by CBR and how the survey statistics presented in the submittal are affected by these procedures.

Please either respond to the deficiencies identified in this e-mail, or provide a schedule for submitting CBR’s response, within 30 days of receipt of this e-mail.

In accordance with 10 CFR 2.390 of the NRC’s “Agency Rules of Practice and Procedure,” a copy of this e-mail 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>.

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

Sincerely,

*Ronald A. Burrows*

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