UNITED STATES
NUCLEAR REGULATORY COMMISSION
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October 14, 2016

MEMORANDUM TO: Bill Von Till, Chief
Uranium Recovery Licensing Branch
Division of Decommissioning, Uranium Recovery,
and Waste Management
Office of Nuclear Material Safety
and Safeguards

FROM: Douglas Mandeville, Project Manager ***/RA/***
Uranium Recovery Licensing Branch
Division of Decommissioning, Uranium Recovery,
and Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: PUBLIC MEETING SUMMARY

On September 14, 2016, a Public Meeting was held with Power Resources, Inc., doing business as Cameco Resources, at the U.S. Nuclear Regulatory Commission Headquarters. The purpose of the meeting was to discuss demonstration of stability of groundwater restoration efforts. The List of Attendees; Meeting Agenda; and Meeting Summary are enclosed.

Docket Numbers: 40-8964, 40-8943
License Numbers: SUA-1548, SUA-1543

Enclosures:
1. Meeting Summary
2. Meeting Attendees
3. Meeting Agenda
4. Material Shared with NRC

cc: Meeting Attendees (via email)

CONTACT: Douglas Mandeville, NMSS/DUWP
(301) 415-0724

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ADAMS Accession Number: ML16270A029

OFFICE	DUWP	DUWP	DUWP
NAME	D. Mandeville	S. Achten	D. Mandeville
DATE	9/28/16	9/30/16	10/4/16

OFFICIAL RECORD COPY

MEETING SUMMARY

DATE: September 14, 2016

TIME: 9:30 a.m. to 12:05 p.m.

PLACE: U.S. Nuclear Regulatory Commission
Two White Flint North, Room T8C5c
Rockville, Maryland

PURPOSE: The purpose of the meeting was to discuss Cameco's demonstration of stability of groundwater restoration efforts at their uranium recovery facilities.

ATTENDEES:

See List of Attendees (Enclosure 2).

BACKGROUND:

Cameco Resources (Cameco), currently operates two uranium in situ recovery facilities licensed by the U.S. Nuclear Regulatory Commission (NRC). In Wyoming, Cameco operates the Smith Ranch Highland Uranium Project (SRHUP) under Source Material License SUA-1548. In Nebraska, Cameco operates the Crow Butte facility under Source Material License SUA-1543. Between the two facilities, Cameco has three mine units (Mine Unit 1 at SRHUP and Mine Units 2 and 3 at Crow Butte) where groundwater restoration activities have been performed to the point where the licensee has conducted at least 12 months of monitoring to determine if restoration stability has been achieved. In reviewing its groundwater restoration stability data, Cameco has identified several issues. Cameco requested this public meeting to discuss these issues with the staff.

DISCUSSION:

NRC staff read the opening statement for the meeting. Attendees of the meeting were asked to provide brief introductions. NRC staff provided an overview of the discussion topics planned for the meeting. Enclosure 2 contains the meeting agenda. NRC staff informed the meeting attendees of the following aspects of this particular meeting:

- There are no pending licensing actions related to groundwater restoration for these mine units before the NRC staff.
- Cameco did not prepare a PowerPoint presentation. Cameco staff would be speaking from their own notes.
- Documents shared with the staff would be included as enclosures to the meeting summary.
- The NRC staff was not recording or transcribing the meeting. No other attendees indicated that they were recording the meeting.

During the meeting, Cameco staff often referred to and discussed an internal draft document that describes Cameco's approach for determining restoration stability. Although Cameco staff discussed or read from parts of this document in the meeting, Cameco did not share the document with the NRC staff during or after the meeting. Therefore, the Cameco internal draft document is not included as an enclosure to this meeting summary.

Enclosure 4 contains the documents that were shared with the staff during the meeting.

A summary of the key discussion points from the meeting is contained below.

Cameco statements

- Cameco has performed statistical analyses of the restoration stability data obtained from the three mine units.
- The analyses were based on a wellfield average provided the data were normally distributed; if not, the analysis was based on a production pattern (individual well) basis using nonparametric methods
- Cameco used the Mann-Kendall and Theil-Sen tests within the ProUCL software to perform the restoration stability analyses.
- If the Mann-Kendall or Theil-Sen tests did not show a statistical trend, Cameco determined the groundwater quality to be stable.
- Cameco discussed its demonstration of stability using the most recently groundwater monitoring data within a particular data set.
- Cameco used a 95% confidence level when evaluating the stability trends in the data.
- Cameco has and continues to obtain core samples from within the mine unit and on the down gradient side of the mine unit. Core samples are used to evaluate geochemical conditions within the production zone aquifer.
- Cameco intends to use geochemical field data in geochemical fate and transport models of specific groundwater constituents for the mine units.
- Cameco has not detected any excursions at SRHUP Mine Unit 1.
- Cameco discussed the aquifer exemption boundaries at SRHUP and Crow Butte. Cameco provided a document showing the monitoring well ring at SRHUP for Mine Unit 1 (see page 1 of Enclosure 4). Cameco provided a second document for Crow Butte showing the locations of Mine Units 2 and 3 with respect to the aquifer exemption boundary (see page 2 of Enclosure 4). The Crow Butte figure indicates that the monitor well ring for Mine Units 2 and 3 is well inside the aquifer exemption boundary.
- For SRHUP, Cameco has received approval from the Environmental Protection Agency (EPA) to revise the aquifer exemption boundary to outside the monitoring well ring for many mine units. Cameco will seek to provide written documentation for this revision to NRC.
- Cameco is likely headed towards submittal of a request for alternate concentration limits (ACL) for these three mine units.
- Cameco briefly discussed "hot spots."
- Cameco is targeting the spring of 2017 for submittal of the first ACL application.
- Cameco recognizes that post stability monitoring will be required with an ACL request and is formulating a monitoring plan for this purpose.

- Cameco described the research efforts it has initiated related to groundwater. Cameco is working with staff at several universities and National Laboratories to better understand groundwater flow and chemistry within the ore zone. Much of this work has been focused on the SRHUP site.
- Cameco stated they have started to think about institutional controls.
- Cameco proposes that a stability monitoring report be submitted for NRC review prior to an ACL application.

NRC staff comments and observations

- Demonstration of the stability of groundwater constituents after groundwater restoration is a key aspect of the staff's review of ground water restoration efforts.
- The current NRC guidance does not provide specific recommendations on how to demonstrate groundwater restoration stability.
- Cameco should use an appropriate statistical method to demonstrate restoration stability.
- EPA has recommended using the Mann-Kendall approach in its proposed rulemaking for Title 40 of the *Code of Federal Regulations* Part 192 and in its guidance on statistical analysis of groundwater monitoring data at RCRA facilities, and that approach is acceptable to NRC.
- NRC staff asked Cameco if it would be possible to use geochemical data and modeling to demonstrate stability of the source term within the production zone.
- Having a clear understanding of the location of the aquifer exemption boundary is key in any potential ACL application.
- If an ACL application is submitted, NRC staff would follow its procedures in reviewing the application. The first step would be an acceptance review. If accepted, the staff would proceed with a detailed review.
- NRC staff is evaluating how to address institutional controls for ACLs at in situ recovery facilities.
- When possible and applicable, Cameco should use statistical methods recommended in EPA guidance on statistical analysis of groundwater restoration stability data.
- NRC staff recognizes that the ability to provide feedback on the demonstration of groundwater restoration stability may be helpful for licensees.

Questions or comments from the public

- Mr. Wireman commented that the statistical approach to demonstrate stability is not empirical.
- Mr. Wireman also commented that while analyses tend to be based on average flow conditions, preferential groundwater flow paths do exist.
- Mr. Wireman commented that he would be interested in Cameco's report on how they plan to demonstrate restoration stability.
- Mr. Wireman asked for the references to the peer reviewed research articles that Cameco has supported.
- Mr. Wireman asked if the staff could provide the EPA statistical guidance documents that were discussed during the meeting.
- Mr. Frankel commented that baseline conditions at Crow Butte are based on only eight

data points prior to operation. Mr. Frankel questioned any decision on restoration stability that is based on the limited pre-operation data.

- Mr. Frankel commented that the documents discussed at the meeting should have been made available to the public prior to the meeting, and NRC staff needs to make the documents discussed in the meeting available to the public.

ACTION ITEMS:

Three action items were identified during the meeting, all are for the NRC staff.

1. The NRC staff will have an internal discussion based on the topics identified during the meeting and provide feedback to Cameco on possible approaches moving forward.

2. Provide the references for peer reviewed publications with which Cameco is involved. Cameco has supported research efforts for the following four publications:

   "Characterization of cores from an in-situ recovery mined uranium deposit in Wyoming: Implications for post-mining restoration", G. Woldegabriel, *et al*., ***Chemical Geology*** 390, pp. 32-45 (2014)

   "Persistent U(IV) and U(VI) following in-situ recovery (ISR) mining of a sandstone uranium deposit, Wyoming, USA", T.J. Gallegos, *et al*., ***Applied Geochemistry*** 63, pp. 222-234 (2015)

   "An Evaluation of health risk to the public as a consequence of in situ mining in Wyoming, USA" Ruedig and Johnson, ***Journal of Environmental Radioactivity*** 150, pp. 170-178 (2015)

   "Isotopic Evidence for Reductive Immobilization of Uranium Across a Roll-Front Mineral Deposit", Brown, *et al*., ***Environmental Science and Technology*** 50(12), pp. 6189-6198 (2016)

3. NRC staff will provide a link to the relevant EPA guidance discussed during the meeting.

   EPA's guidance, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities", EPA 530/R-09-007, is available in the NRC Agencywide Documents Access and Management System (ADAMS) under Accession Number ML15048A124. During the meeting the NRC staff identified Chapter 22 as being relevant to the discussion. The document can be found in ADAMS at the following link:

   http://www.nrc.gov/docs/ML1504/ML15048A124.pdf

   NRC staff also suggested that consideration be given to the technical basis developed by EPA for its in-situ recovery rulemaking effort. This document may be found at the following link:

https://www.epa.gov/sites/production/files/2015-05/documents/EPA-HQ-OAR-2012-0788-DRAFT-0017.pdf

The NRC staff agreed to complete these action items. Action items 2 and 3 are completed by this meeting summary.

The meeting concluded at approximately 12:05 p.m. Eastern Time.

Meeting Attendees
Monday September 28, 2015
Room T8C5
9:30 a.m. to 12:05 p.m.

TOPIC: Demonstration of stability of groundwater restoration efforts

NAME	AFFILIATION
Doug Mandeville	U.S. NRC
Elise Striz	U.S. NRC
John Saxton	U.S. NRC
Jose Valdes	U.S. NRC
Tom Lancaster	U.S. NRC
Larry Reimann	Cameco
Mike Thomas	Cameco
Larry Teahon	Cameco
Jim Clay	Cameco
Ken Garoutte (phone)	Cameco
Marcia Simon (phone)	U.S. NRC
Travis Coleman (phone)	Cameco
Jack Fritz (phone)	WWC
Larry Wilbanks (phone)	Cameco
David Frankel (phone)	Member of public
Mike Wireman (phone)	Member of public

Enclosure 2

PUBLIC MEETING AGENDA:

Technical meeting with Cameco
September 14, 2016, 09:30 AM to 03:00 PM
NRC Two White Flint North, T8C5c
11545 Rockville Pike Rockville, MD

MEETING PROCESS:

Time	**Topic**	**Lead**
9:30 a.m.	Introductions	All
	Opening Remarks	Cameco and NRC
	Discussion of Demonstration of Stability	Cameco
	Closing Remarks	
	Questions from public to NRC (if any)	
	Adjourn	

Enclosure 3