

**Cameco Resources  
Crow Butte Operation**



**86 Crow Butte Road  
P.O. Box 169  
Crawford, Nebraska 69339-0169**

**(308) 665-2215  
(308) 665-2341 – FAX**

June 16, 2016

**CERTIFIED MAIL  
RETURN RECEIPT REQUESTED**

Attn: Document Control Desk, Director  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Commercial Evaporation Pond #3  
Corrective Action Report  
Source Materials License SUA-1534  
Docket Number 40-8943

Dear Director:

On May 18, 2016, water level readings from the north middle, northwest, south middle, and southwest underdrains on Cameco Resources – Crow Butte Operation (CBO) Commercial Evaporation Pond #3 indicated a potential liner leak. Samples were obtained from the underdrains and analyzed for alkalinity, chloride, conductivity, sodium, and sulfate. Upon verification of the potential liner leak, CBO notified Ron Burrows by phone on May 18, 2014 in accordance with License Condition 11.6. As required by License Condition 11.9, the following corrective action plan is being submitted for NRC review.

**Actions Taken**

May 19, 2016 – Started transferring water into Commercial Evaporation Pond #1 to lower the pond level to eliminate the liner leak.

May 23, 2016 – Inspected the liner for damage. A cut in the liner was identified on the west side of the pond at the 9 foot level. A temporary patch was installed over the cut.

June 9, 2016 – Permanently repaired the damaged area.

June 10, 2016 – Started transferring water back out of Commercial Evaporation Pond #1 into the pond to cover the repaired area.

June 15, 2016 - Underdrain measurements indicated that the damaged area had been effectively repaired.

Attachment #1 contains copies of the Weekly Evaporation Pond Underdrain Analysis for the period of May 18, 2016 to June 15, 2016.

**Water Quality in Affected Underdrains**

NM5520

# CROW BUTTE OPERATION



Attachment #2 contains copies of the water chemistry of the affected underdrains for the period of May 18, 2016 to June 15, 2016. The affected underdrains will be sampled for an additional two weeks.

## Commercial Pond Monitor Wells

In addition to analysis of the affected underdrains, CBO also obtained samples from pond monitor wells CPM-1 and CPM-2. The two monitor wells are completed in the first aquifer and are located at the fenced restricted area boundary and down gradient of Commercial Evaporation Pond #3. The samples were obtained and analyzed for the indicator parameters for the period of May 18, 2016 to June 14, 2016. Analytical results, contained in Attachment #3, were consistent with historical sampling results indicating no breach has occurred to the secondary liner.

## Impact to Waste Disposal Capacity

On June 15, 2016, the water level in Commercial Evaporation Pond #3 was at 9.3 ft. On June 10, 2016, CBO began transferring water back into the pond from Commercial Evaporation Pond #1 to cover the patched area to test the integrity of the repair and to lower the contents of Pond #1 to inspect for a potential liner leak identified on June 8, 2016.

Current waste flow from the plant to the pond is 5 GPM. Transfer from the pond to the Pond Water Treatment circuit for disposal down the deep disposal wells is 15 GPM. Based upon the declining water level, evaporation is estimated at 30 GPM. From these values it is estimated that the pond level is being lowered at a rate of 40 GPM.

Current waste flows, deep disposal well capacity, and the capacity remaining in Commercial Evaporation Pond #1 has allowed CBO to repair the liner in Commercial Evaporation Pond #3 with minimal impact to the total waste disposal capacity.

If you have any questions, please feel free to contact me at (308) 665-2215 Ext 122.

Sincerely,  
CAMECO RESOURCES  
CROW BUTTE OPERATION

Bob Tiensvold  
Restoration Manager

cc: NRC Deputy Director  
Marty Link – NDEQ Water Quality Division Administrator  
CBO - File  
ec: Nancy Harris – NDEQ Program Coordinator  
Kory Winters – NDEQ Field Office  
CR – Casper Office

**Attachment #1**

**Weekly Evaporation Pond Underdrain Analysis**

WJ

**CAMECO RESOURCES/CROW BUTTE OPERATION  
WEEKLY EVAPORATION POND UNDERDRAIN ANALYSIS**

COMMERCIAL PONDS		UNDERDRAIN WATER DEPTH / INCHES	METER READING	TEMP °C	CONDUCTIVITY µmhos/cm	LAB RESULTS µmhos/cm																					
Depth = 17 feet	POND # 1	POND LEVEL	9.1'																								
		*FREEBOARD	7.9'																								
		NE UNDERDRAIN	3"																								
		NM UNDERDRAIN	5"																								
		NW UNDERDRAIN	9"	88.7 ms	18.1°C																						
		SE UNDERDRAIN	2"																								
		SM UNDERDRAIN	4"																								
		SW UNDERDRAIN	12"	86.9 ms	16.0°C																						
Depth = 17.5 feet	POND # 3	POND LEVEL	9.3'																								
		*FREEBOARD	8.2'																								
		NE UNDERDRAIN	4"																								
		NM UNDERDRAIN	12"	51.3 ms	11.9°C																						
		NW UNDERDRAIN	6"	58.4 ms	13.8°C																						
		SE UNDERDRAIN	0"																								
		SM UNDERDRAIN	7"	75.8 ms	11.1°C																						
		SW UNDERDRAIN	13"	90.9 ms	15.0°C <del>15.0°C</del> <sup>15.0°C</sup>																						
Depth = 17.5 feet	POND # 4	POND LEVEL	7.80'																								
		*FREEBOARD	16.5'																								
		NE UNDERDRAIN	2"	39.54 ms	25.3°C																						
		NM UNDERDRAIN	4"	51.70 ms	20.0°C																						
		NW UNDERDRAIN	7"	61.87 ms	25.4°C																						
		SE UNDERDRAIN	7"	23.61 ms	25.2°C																						
		SM UNDERDRAIN	6"	12.91 ms	20.3°C																						
		SW UNDERDRAIN	2"	14.07 ms	21.4°C																						
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SAMPLER: W. Nelson																											
DATE: 6/15/16																											

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**CAMECO RESOURCES/CROW BUTTE OPERATION  
WEEKLY EVAPORATION POND UNDERDRAIN ANALYSIS**

COMMERCIAL PONDS		UNDERDRAIN WATER DEPTH / INCHES	METER READING	TEMP °C	CONDUCTIVITY µmhos/cm	LAB RESULTS µmhos/cm
Depth = 17 feet	POND # 1	POND LEVEL	10.2'			
		*FREEBOARD	6.8'			
		NE UNDERDRAIN	3"			
		NM UNDERDRAIN	4"			
		NW UNDERDRAIN	7"	81.5 ms	15.2°C	
		SE UNDERDRAIN	1"			
		SM UNDERDRAIN	4"			
		SW UNDERDRAIN	10"	82.7 ms	15.1°C	
Depth = 17.5 feet	POND # 3	POND LEVEL	8.5'			
		*FREEBOARD	9.0'			
		NE UNDERDRAIN	4"	81.2 ms		
		NM UNDERDRAIN	10"	51.2 ms	10.9°C	
		NW UNDERDRAIN	2"			
		SE UNDERDRAIN	0"			
		SM UNDERDRAIN	5"	71.1 ms	10.6°C	
		SW UNDERDRAIN	8"	86.6 ms	13.69°C	
Depth = 17.5 feet	POND # 4	POND LEVEL	T-50'			
		*FREEBOARD	16.5'			
		NE UNDERDRAIN	13"	52.0 ms	29.4°C	
		NM UNDERDRAIN	5"			
		NW UNDERDRAIN	7"	9.72 ms	24.1°C	
		SE UNDERDRAIN	10"	22.70 ms	24.0°C	
		SM UNDERDRAIN	6"	11.91 ms	19.1°C	
		SW UNDERDRAIN	12"	14.03 ms	25.2°C	
R & D POND LEVELS (Depth = 15 ft)						
EAST LEVEL:		7.1'				
**EAST FREEBOARD:		7.9'				
EAST UNDERDRAIN:		0"				
WEST LEVEL:		7.5'				
**WEST FREEBOARD:		7.5'				
WEST UNDERDRAIN:		0				
REMARKS:		Pond sprays look good Potential leak in Pond #1				
**COMMERCIAL POND FREEBOARD = 5 FT MIN						
** R&D POND FREEBOARD = 3 FT MIN						
SAMPLER:		W. Nelson				
DATE:		6/8/16				

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**CAMECO RESOURCES/CROW BUTTE OPERATION  
WEEKLY EVAPORATION POND UNDERDRAIN ANALYSIS**

COMMERCIAL PONDS		UNDERDRAIN WATER DEPTH / INCHES	METER READING	TEMP °C	CONDUCTIVITY µmhos/cm	LAB RESULTS µmhos/cm																			
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	*FREEBOARD	8.6'																							
	NE UNDERDRAIN	4"																							
	NM UNDERDRAIN	11"	58.7ms	9.6°C																					
	NW UNDERDRAIN	4"	53.7ms	11.4°C																					
	SE UNDERDRAIN	0"																							
	SM UNDERDRAIN	7"	62.9ms	15.7°C																					
	SW UNDERDRAIN	8"	85.1ms	12.4°C																					
Depth = 17.5 feet POND # 4	POND LEVEL	T-50'																							
	*FREEBOARD	16.5'																							
	NE UNDERDRAIN	13"	47.9ms	22.1°C																					
	NM UNDERDRAIN	5"																							
	NW UNDERDRAIN	9"	6.6ms	20.5°C																					
	SE UNDERDRAIN	11"	20.97ms	19.8°C																					
	SM UNDERDRAIN	7"	11.0ms	16.1°C																					
	SW UNDERDRAIN	13"	12.86ms	21.4°C																					
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SAMPLER: Walt Nelson																									
DATE: 6/1/16																									

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### CAMECO RESOURCES/CROW BUTTE OPERATION WEEKLY EVAPORATION POND UNDERDRAIN ANALYSIS

COMMERCIAL PONDS	UNDERDRAIN WATER DEPTH / INCHES	METER READING	TEMP °C	CONDUCTIVITY µmhos/cm	LAB RESULTS µmhos/cm
POND # 1 Depth = 17 feet	POND LEVEL	9.7'			
	*FREEBOARD	7.3'			
	NE UNDERDRAIN	2"			
	NM UNDERDRAIN	1"			
	NW UNDERDRAIN	3"			
	SE UNDERDRAIN	1"			
	SM UNDERDRAIN	0"			
	SW UNDERDRAIN	5"			
POND # 3 Depth = 17.5 feet	POND LEVEL	9.6'			
	*FREEBOARD	7.9'			
	NE UNDERDRAIN	4"			
	NM UNDERDRAIN	15"	47.85ms	9.2°C	
	NW UNDERDRAIN	17"	51.9ms	11.0°C	
	SE UNDERDRAIN	0"			
	SM UNDERDRAIN	28"	61.4ms	9.1°C	
	SW UNDERDRAIN	18"	85.2ms	11.4°C	
POND # 4 Depth = 17.5 feet	POND LEVEL	7.45'			
	*FREEBOARD	16.5'			
	NE UNDERDRAIN	14"	45.25ms	17.8°C	
	NM UNDERDRAIN	5"			
	NW UNDERDRAIN	7"	8.47ms	18.8°C	
	SE UNDERDRAIN	11"	20.53ms	18.7°C	
	SM UNDERDRAIN	8"	10.83ms	14.7°C	
	SW UNDERDRAIN	12"	12.35ms	19.5°C	
R & D POND LEVELS (Depth = 15 ft)			<b>REMARKS:</b> Pond sprays were off Monthly inspection  **COMMERCIAL POND FREEBOARD = 5 FT MIN ** R&D POND FREEBOARD = 3 FT MIN  <b>SAMPLER:</b> W. Nelson <b>DATE:</b> 5/25/16		
EAST LEVEL:		7.4'			
**EAST FREEBOARD:		2.6'			
EAST UNDERDRAIN:		0"			
WEST LEVEL:		7.8'			
**WEST FREEBOARD:		7.2'			
WEST UNDERDRAIN:		0"			

WD

**CAMECO RESOURCES/CROW BUTTE OPERATION  
WEEKLY EVAPORATION POND UNDERDRAIN ANALYSIS**

COMMERCIAL PONDS		UNDERDRAIN WATER DEPTH / INCHES	METER READING	TEMP °C	CONDUCTIVITY µmhos/cm	LAB RESULTS µmhos/cm
Depth = 17 feet <b>POND # 1</b>	POND LEVEL	9.1'				
	*FREEBOARD	7.9'				
	NE UNDERDRAIN	1"				
	NM UNDERDRAIN	1"				
	NW UNDERDRAIN	2"				
	SE UNDERDRAIN	1"				
	SM UNDERDRAIN	0"				
	SW UNDERDRAIN	3"				
Depth = 17.5 feet <b>POND # 3</b>	POND LEVEL	10.4'				
	*FREEBOARD	7.1'				
	NE UNDERDRAIN	4"				
	NM UNDERDRAIN	31"	69.0ms	9.6°C		
	NW UNDERDRAIN	14"	27.64ms	9.3°C		
	SE UNDERDRAIN	0"				
	SM UNDERDRAIN	33"	67.2ms	8.5°C		
	SW UNDERDRAIN	32"	70.9ms	9.9°C		
Depth = 17.5 feet <b>POND # 4</b>	POND LEVEL	7-35'				
	*FREEBOARD	16.5'				
	NE UNDERDRAIN	11"	44.46ms	13.2°C		
	NM UNDERDRAIN	1"				
	NW UNDERDRAIN	9"	7.4ms	15.2°C		
	SE UNDERDRAIN	8"	19.26ms	14.3°C		
	SM UNDERDRAIN	6"	10.18ms	12.9°C		
	SW UNDERDRAIN	12"	10.96ms	15.7°C		
<b>R &amp; D POND LEVELS (Depth = 15 ft)</b> EAST LEVEL: 7.5' **EAST FREEBOARD: 7.5' EAST UNDERDRAIN: 0" WEST LEVEL: 7.9' **WEST FREEBOARD: 7.1' WEST UNDERDRAIN: 0"			<b>REMARKS:</b> Pond spray in # 1-OK Potential leak in Pond # 3. <b>*COMMERCIAL POND FREEBOARD = 5 FT MIN</b> <b>** R&amp;D POND FREEBOARD = 3 FT MIN</b> <b>SAMPLER:</b> W. H. Nelson <b>DATE:</b> 5/17/16			



**Attachment #2**

**Water Chemistry of the Affected Underdrains**

Date  
6/15/2016

<u>Sample ID</u>	<u>Cl mg/L</u>	<u>ALK = CaCO3</u>	<u>COND microseimen/cm</u>	<u>Na mg/L</u>	<u>SO4 mg/L</u>
Pond 3	52470	3750	120,600	33580	5688
Pond 3 North West Underdrain	30490	1588	76,100	18650	3350
Pond 3 North Middle Underdrain	29071	1225	73,100	17610	3213
Pond 3 South West Underdrain	48216	3315	113,000	30650	5019
Pond 3 South Middle Underdrain	41835	1850	99,900	25610	4440

Date  
6/8/2016

<u>Sample ID</u>	<u>Cl mg/L</u>	<u>ALK = CaCO3</u>	<u>COND microseimen/cm</u>	<u>Na mg/L</u>	<u>SO4 mg/L</u>
Pond 3	51761	3750	121,200	34340	5480
Pond 3 North Middle Underdrain	29071	1350	74,800	17940	3350
Pond 3 South West Underdrain	48216	3350	112,500	30970	5158
Pond 3 South Middle Underdrain	39707	1850	98,300	25800	4476
Pond 3 Northwest Underdrain					

Underdrain level was 2". Could not obtain a sample.

Date  
6/1/2016

<u>Sample ID</u>	<u>Cl mg/L</u>	<u>ALK = CaCO3</u>	<u>COND microseimen/cm</u>	<u>Na mg/L</u>	<u>SO4 mg/L</u>
Pond 3	52470	3800	119,000	32410	5411
Pond 3 North West Underdrain	28362	1550	73,600	17290	3307
Pond 3 North Middle Underdrain	34744	1625	84,900	20360	3756
Pond 3 South West Underdrain	48925	3300	112,900	30200	5194
Pond 3 South Middle Underdrain	41125	1825	98,900	24770	4455

Date  
5/25/2016

<u>Sample ID</u>	<u>Cl mg/L</u>	<u>ALK = CaCO3</u>	<u>COND microseimen/cm</u>	<u>Na mg/L</u>	<u>SO4 mg/L</u>
Pond 3	49634	3700	117,600	31380	4994
Pond 3 North West Underdrain	29781	1500	74,900	17890	3019
Pond 3 North Middle Underdrain	35456	1850	89,900	22350	3887
Pond 3 South West Underdrain	48216	3300	112,200	29870	4758
Pond 3 South Middle Underdrain	38289	2100	95,200	24670	4147

Date  
5/18/2016

<u>Sample ID</u>	<u>Cl mg/L</u>	<u>ALK = CaCO3</u>	<u>COND microseimen/cm</u>	<u>Na mg/L</u>	<u>SO4 mg/L</u>
Pond 3	49634	3550	113,300	31010	4944
Pond 3 North West Underdrain	24817	1300	63,400	14440	2589
Pond 3 North Middle Underdrain	46089	3025	112,100	28660	4837
Pond 3 South West Underdrain	46798	3275	113,500	29420	4736
Pond 3 South Middle Underdrain	43962	2475	105,000	26660	4496

**Attachment #3**

**Commercial Pond Monitor Well Analysis**

6-14-16

MO

	<u>Alk</u>	<u>Cl</u>	<u>Cond</u>	<u>SO4</u>	<u>Na</u>
	mg/L	mg/L	umhos	mg/L	mg/L
<b>Commercial Pond Monitor #1</b>	201	11.9	463	14.93	17.93
<b>Commercial Pond Monitor #2</b>	185	6.7	433	14.45	15.65



6-8-16

MO

	<u>Alk</u>	<u>Cl</u>	<u>Cond</u>	<u>SO4</u>	<u>Na</u>
	mg/L	mg/L	umhos	mg/L	mg/L
<b>Commercial Pond Monitor #1</b>	201	11.5	459	15.53	16.36
<b>Commercial Pond Monitor #2</b>	184	6.6	420	14.78	14.38

6-1-16

MO

	<u>Alk</u>	<u>Cl</u>	<u>Cond</u>	<u>SO4</u>	<u>Na</u>
	mg/L	mg/L	umhos	mg/L	mg/L
<b>Commercial Pond Monitor #1</b>	199	11.0	460	14.82	14.80
<b>Commercial Pond Monitor #2</b>	184	6.5	421	14.68	13.90

5-25-16

MO

	<u>Alk</u>	<u>Cl</u>	<u>Cond</u>	<u>SO4</u>	<u>Na</u>
	mg/L	mg/L	umhos	mg/L	mg/L
<b>Commercial Pond Monitor #1</b>	199	11.3	466	14.89	15.58
<b>Commercial Pond Monitor #2</b>	184	6.6	424	14.31	14.77

5-18-16

MO

	<u>Alk</u>	<u>Cl</u>	<u>Cond</u>	<u>SO4</u>	<u>Na</u>
	mg/L	mg/L	umhos	mg/L	mg/L
<b>Commercial Pond Monitor #1</b>	200	11.0	462	15.45	16.57
<b>Commercial Pond Monitor #2</b>	184	6.5	421	14.47	13.61