

**CAMECO RESOURCES
CROW BUTTE OPERATION**



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February 28, 2014

Attn: Document Control Desk
Deputy Director, Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
Mailstop T8-F5
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Semiannual Radiological Effluent and Environmental Monitoring Report
Source Materials License # SUA-1534, Docket No. 40-8943

Dear Document Control:

Enclosed please find one copy of the Semiannual Radiological Effluent and Environmental Monitoring Report for the Crow Butte Uranium Project. The report is provided in accordance with License Condition 12.1 of Source Materials License SUA-1534 and 10 CFR Part 40. This report covers the third and fourth quarters of 2013.

If you have any questions concerning the report, please feel free to call me at (307) 316-7588.

Sincerely,
CAMECO RESOURCES

Josh Leftwich
Director of Safety, Health, Environment & Quality

cc: Ron Burrows - NRC
Nancy Harris – NDEQ, Lincoln Office
CBO File

ec: CR – Cheyenne Office

FSMEZO



**CROW BUTTE URANIUM PROJECT
RADIOLOGICAL EFFLUENT
AND
ENVIRONMENTAL MONITORING
REPORT**

For

THIRD AND FOURTH QUARTERS, 2013

USNRC Source Materials License SUA 1534



**Second Half 2013 Semiannual Radiological Effluent
and Environmental Monitoring Report**

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1 WATER QUALITY MONITORING DATA

1.1 Excursion Monitoring

Biweekly excursion monitoring in the shallow aquifer and perimeter monitor wells was continued in Mine Units 2 through 11 during the third and fourth quarters of 2013.

On September 11, 2013, well CM11-10 was placed on excursion status for exceedance of upper control limits. This well was removed from excursion status on November 8, 2013.

On December 9, 2013, well SM10-18 was placed on excursion status for exceedance of upper control limits. The well was left on for several days and the water purged from the well collected behind a berm located several feet downhill causing the purged water to collect around the well. Currently the corrective actions in place have been effective in correcting this problem.

Excursion reports have been submitted to NRC as required in License Condition 12.2. Complete excursion monitoring results are available on site for inspection. A summary table for monitor wells on excursion status during the second half of 2013 follows:

Monitor Well ID	Date On Excursion	Date Off Excursion	Biweekly Sampling Resumed	Causal Factor(s)
CM11-10	12 Sep 13	8 Nov 13	12 Nov 13	Over Injection
SM10-18	11 Dec 13	On going		Purge Water

1.2 Water Supply Wells and Surface Water

Summary sheets of quarterly radiological analytical data for the reporting period from all surface waters and water supply wells within one kilometer of the active wellfield boundary are included in Appendix A.

The reported radiological data are within the expected ranges for each well and surface water sampling points. Samples were obtained from all sample locations with the exceptions noted in Appendix A.

2 OPERATIONAL



**Second Half 2013 Semiannual Radiological Effluent
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2.1 Production Data Summary

Mining operations continued through the third and fourth quarters of 2013. The average operating production flow rate was 6,877 gpm for the third quarter and 6,851 gpm for the fourth quarter. Injection and production totals from the totalizers and the calculated bleed totals for the reporting period are included in Appendix B.

2.2 Wastewater Summary

The total volume of wastewater discharged to the ponds was 3,350,265 gallons during the third quarter and 913,337 gallons during the fourth quarter. Currently, all five evaporation ponds contain wastewater.

Wastewater that is not disposed of in the evaporation ponds is injected down two Deep Disposal Wells. Currently, the wells are operated on a nearly continuous basis and 60,750,864 gallons of wastewater was injected into the wells during the second half of 2013. A summary of the total volume of wastewater injected and the average radionuclide content is contained in Appendix D.

2.3 Effluent Release

10 CFR §40.65 requires licensees to report quantities of radionuclides in liquid and gaseous effluent releases to the environment. In the Application for Renewal of Source Materials License SUA-1534, submitted December 1995, Table 7.3(A) presented calculations of the annual radon emissions for the Crow Butte Plant. These calculations assumed a 7.04×10^{-4} Curies/m³ radon release from leaching operations and the radon release calculations for the second half of 2013 use this release rate estimate.

During the third quarter, production occurred at an average flow rate of 6,877 gpm (26,032 lpm). Production was maintained nearly continuously for 92 days during the third quarter with an operating factor of 99.9 %. The production flow for the third quarter results in a calculated radon release of 1,746 Curies. During the fourth quarter, production occurred at an average flow rate of 6,851 gpm (25,934 lpm). Production was maintained nearly continuously for 92 days during the fourth quarter with an operating factor of 97.0%. The production flow for the fourth quarter results in a calculated radon release of 1,689 Curies. Calculations for radon release from production operations are shown in Appendix E.

Additional wells were brought on line during the second half of 2013. Calculations for the start-up of 12.6 acres of a new wellfield are shown in Appendix E. The calculated radon released from start-up of 12.6 acres is 16 Curies.



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The total radon emission due to leaching operations from the Crow Butte plant for the second half of 2013 was 3,452 Curies. This calculated release rate is comparable with the releases estimated in CBR's License Renewal Application.

Radon gas is also released from restoration activities. For restoration water that is treated by ion exchange only, the radon concentration is 0.697 $\mu\text{Ci/l}$. Of the total restoration production flow it is assumed that 25% of the radon is released through wellfield loss and 10% of the remaining radon is released during pressurized ion exchange treatment. For water that is treated by reverse osmosis, it is assumed that 100% of the remaining radon is released. For water treated by reverse osmosis the radon concentration is 0.470 $\mu\text{Ci/l}$ after adjusting for wellfield loss and ion exchange loss.

During the second half of 2013, a total of 177,761,869 gallons (672,899,779 l) of restoration water was produced from Mine Units 2, 3, 4, 5, and 6. Based upon an estimated radon concentration of 0.697 $\mu\text{Ci/l}$, the total amount of radon in the restoration solution was calculated to be 469 Curies as shown in Appendix E. The estimated release of radon through wellfield loss at 25% of this total was 117 Curies. The plant loss for ion exchange treatment of the restoration water is estimated at 10% of the remaining radon, or 35 Curies. For water that is treated by reverse osmosis, it is assumed that 100% of the remaining radon is released. For water treated by reverse osmosis the radon concentration is 0.470 $\mu\text{Ci/l}$ after adjusting for wellfield loss and ion exchange loss.

Of the total amount of restoration water produced in the second half of 2013, 122,682,866 gallons (464,403,721 l) of the water was treated by reverse osmosis. The total estimated radon release from reverse osmosis treatment was 218 Curies. An additional 1.9 acres of wellfields were placed into restoration during the second half of 2013. The calculated radon released from start-up of 1.9 acres is 2 Curie. Calculations for the start-up of 1.9 acres of a wellfield placed in restoration are shown in Appendix E.

Based upon the calculations shown in Appendix E, the total estimated semiannual radon emission for the second half of 2013 from restoration activities was 373 Curies. This resulted in a total estimated radon release from the Crow Butte project during the second half of 2013 of 3,825 Curies.

2.4 Restoration

Restoration activities continued in Mine Units 2, 3, 4, 5, and 6 during the second half of 2013. Reverse osmosis permeate continued to be injected into Mine Units 4 and 5. IX treatment continued in Mine Unit 6. On June 19, 2013, Mine Units 2 and 3 were placed into stability monitoring and continued to be in stabilization. Restoration injection and production totals are included in Appendix B. Restoration injection pressures are included in Appendix C.



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and Environmental Monitoring Report**

3 ENVIRONMENTAL MONITORING

3.1 Air Monitor Stations

Seven air monitoring stations are used to monitor the Crow Butte Plant. Ambient radon-222 concentrations and radionuclide concentrations in air for each monitoring site are listed in Appendix F. All air monitoring results were within expected historical ranges.

3.2 OSL Monitors

Environmental OSL monitors are located at each air monitoring station. The results of the area OSL monitors fall within the expected ranges and are listed in Appendix G.

3.3 Stream Sediments

Sediment samples are collected from three locations on Squaw Creek (S-1, S-2, and S-5), two locations on English Creek (E-1, and E-5), and from three impoundments on English Creek (I-3, I-4, and I-5) on an annual basis during the fourth quarter. The results of sediment sampling for 2013 are included in Appendix H.

The concentration of natural uranium at the upper end of English Creek was above the regional background levels. CBR has noted these elevated concentrations in the English Creek drainage during preoperational monitoring, which indicates that these levels are anomalous natural background concentrations. Composite samples obtained from E-1 and E-2 as part of the preoperational sampling program from 1982 through 1986 had average results with elevated natural uranium (3.4 pCi/g) and lead-210 (1.4 pCi/g) when compared with the other surface water sample locations. Samples obtained in 1998 before mining operations began in this area showed similar elevated uranium concentrations.

This sample location is in a wetland area in the upper course of English Creek that was dry most of the year due to drought conditions. The area has a large amount of organic matter and low water flows as compared with the other surface water sampling locations for the project. CBR believes that the upper courses of English Creek are an area with reducing conditions that favor deposition of radionuclides. Appendix H contains a trend graph for English Creek sediment sample points since 1998 that shows the elevated uranium concentrations noted in past sediment samples along with a trend graph for Squaw Creek showing the elevated uranium concentrations upstream from the current operation.

Appendix A

Private Well and Surface Water Radiological Monitoring Results

Third and Fourth Quarter, 2013

<p style="text-align: center;">CROW BUTTE RESOURCES, INC.</p> <p style="text-align: center;">PRIVATE WELL AND SURFACE WATER RADIOLOGICAL MONITORING RESULTS</p> <p style="text-align: center;">Third Quarter, 2013</p>					
SAMPLE ID	DATE SAMPLED	URANIUM mg/l	URANIUM μCi/ml	RADIUM-226 pCi/l	RADIUM-226 precision \pm
Well #8	09/19/13	0.0131	8.90E-09	0.3	0.1
Well #11	Well Off-No Sample				
Well #12	09/19/13	0.0044	3.00E-09	ND	0.04
Well #26	09/06/13	0.0063	4.30E-09	ND	0.2
Well #28	09/19/13	0.0030	4.30E-09	0.3	0.1
Well #41	09/06/13	0.0066	4.50E-09	0.3	0.2
Well #61	09/20/13	ND	ND	3.8	0.2
Well #63	05/20/13	0.0143	9.70E-09	0.3	0.1
Well #66	09/20/13	0.0216	1.46E-08	0.4	0.1
Well #125	09/06/13	0.0052	3.50E-09	ND	0.1
Well #129	09/09/13	0.0058	3.90E-09	ND	0.2
Well #131	09/06/13	0.0047	3.20E-09	ND	0.1
Well #133	09/06/13	0.0083	5.60E-09	0.3	0.1
Well #134	09/06/13	0.0078	5.30E-09	0.2	0.1
Well #135	09/20/13	0.0177	1.20E-08	<.2	0.1
Well #138	09/06/13	0.0184	1.25E-08	0.3	0.1
Well #140	09/19/13	0.0107	7.20E-09	0.2	0.1
Well #435	09/06/13	0.0061	4.10E-09	ND	0.1
Drinking Water Well	09/20/13	0.0078	5.30E-09	ND	0.04
Well #38	09/06/13	0.0031	2.10E-09	ND	0.2
Well #445	09/06/13	0.0109	7.40E-09	ND	0.2
Stream S-1	09/06/13	0.0039	2.60E-09	ND	0.2
Stream S-2	09/20/13	0.0045	3.10E-09	ND	0.04
Stream S-5	Dry				
Stream E-1	09/06/13	0.0142	9.60E-09	0.4	0.1
Stream E-5	09/06/13	0.0066	4.50E-09	ND	0.2
Impoundment I-3	Dry				
Impoundment I-4	Dry				
Impoundment I-5	09/06/13	0.0025	1.70E-09	ND	0.1
Reporting Limit		0.0003	2.00E-10	0.2	-

ND-Not detected at the reporting limit

<p style="text-align: center;">CROW BUTTE RESOURCES, INC.</p> <p style="text-align: center;">PRIVATE WELL AND SURFACE WATER RADIOLOGICAL MONITORING RESULTS</p> <p style="text-align: center;">Fourth Quarter, 2013</p>					
SAMPLE ID	DATE SAMPLED	URANIUM mg/l	URANIUM μCi/ml	RADIUM-226 pCi/l	RADIUM-226 precision \pm
Well #8	11/12/13	0.0154	1.04E-08	0.3	0.1
Well #11	Well Off-No Sample				
Well #12	11/12/13	0.0038	2.60E-09	ND	0.2
Well #26	11/12/13	0.0055	3.70E-09	ND	0.2
Well #28	11/12/13	0.0068	4.60E-09	0.2	0.1
Well #41	11/13/13	0.0058	3.90E-09	ND	0.2
Well #61	11/13/13	ND	ND	3.3	0.2
Well #63	12/17/13	0.0161	1.09E-08	0.3	0.1
Well #66	11/13/13	0.0218	1.48E-08	0.3	0.1
Well #125	12/17/13	0.0064	4.30E-09	ND	0.1
Well #129	11/12/13	0.0062	4.20E-09	ND	0.2
Well #131	11/13/13	0.0045	3.10E-09	ND	0.2
Well #133	12/17/13	0.0089	6.00E-09	1	0.1
Well #134	11/12/13	0.0090	6.10E-09	0.3	0.1
Well #135	11/12/13	0.0157	1.06E-08	0.3	0.1
Well #138	12/17/13	0.0137	9.30E-09	0.3	0.1
Well #140	11/12/13	0.0087	5.90E-09	ND	0.2
Well #435	11/13/13	0.0064	4.30E-09	ND	0.2
Drinking Water Well	12/17/13	0.0070	4.70E-09	ND	0.04
Well #38	11/11/13	0.0032	2.20E-09	ND	0.2
Well #445	11/12/13	0.0118	8.00E-09	ND	0.2
Stream S-1	11/11/13	0.0037	2.50E-09	ND	0.2
Stream S-2	11/11/13	0.0039	2.60E-09	ND	0.04
Stream S-5	11/11/13	0.0056	3.80E-09	ND	0.04
Stream E-1	11/11/13	0.1020	6.91E-08	0.3	0.1
Stream E-5	10/25/13	0.0073	4.90E-09	ND	0.2
Impoundment I-3	11/11/13	0.1070	7.24E-08	0.2	0.2
Impoundment I-4	10/25/13	0.0443	3.00E-08	ND	0.2
Impoundment I-5	10/25/13	0.0109	7.40E-09	ND	0.2
Reporting Limit		0.0003	2.00E-10	0.2	-

ND-Not detected at the reporting limit

Appendix B

Plant Production and Waste Totals

Third and Fourth Quarter, 2013

WASTE VOLUME Third Quarter 2013						
TOTALIZER	PLANT TO PONDS	PLANT TO DDW 1 & 2	RESTORATION TO DDW	CLEAN WATER INTO PLANT	DDW TOTAL INJECTED	TRUCKS TO POND
July	982,480	4,889,136	4,893,678	574,759	9,782,814	72,750
August	994,380	5,013,851	4,412,627	587,439	9,426,478	98,325
September	1,181,160	4,471,114	4,287,809	661,740	8,758,923	21,170
TOTAL GAL. EOQ	3,158,020	14,374,101	13,594,114	1,823,938	27,968,215	192,245

TOTAL 3rd QTR VOLUME DISCHARGED TO WASTE PONDS =	3,350,265 GALLONS
TOTAL 3rd QTR VOLUME DISCHARGED TO DEEP WELL =	27,968,215 GALLONS
TOTAL 3rd QTR VOLUME DISCHARGED TO WASTE PONDS + DPWELL =	31,318,480 GALLONS
TOTAL 3rd QTR VOLUME WF BLEED FROM WELLFIELDS=	29,302,297 GALLONS

WELLFIELD BLEED Third Quarter 2013			
MONTH	July	August	September
BLEED	2.6%	2.5%	2.4%

PLANT FLOW Third Quarter 2013	
AVERAGE OPERATING FLOW RATE=	6,877 GPM EOQ
TOTAL GALLONS PRODUCED=	911,047,223 GALLONS EOQ
TOTAL GALLONS INJECTED=	893,515,102 GALLONS EOQ

	TOTAL GALS. PRODUCED	TOTAL GALS. INJECTED	HOURS IN MONTH	HOURS IN PRODUCTION	AVERAGE PROD. GPM	AVERAGE COM INJ GPM	AVERAGE REST INJ GPM	HRS. DOWN TIME
Prev. YTD	1,815,972,361	1,778,192,375	4,344	4,344	6,967	6,822	637	0
July	306,116,305	300,244,689	744	744	6,857	6,726	566	0
August	308,154,312	302,146,081	744	744	6,903	6,769	576	0
September	296,776,606	291,124,332	720	718	6,870	6,739	589	2
EOQ TOTAL	911,047,223	893,515,102	2,208	2,206	6,877	6,745	577	2
YTD TOTAL	2,727,019,584	2,671,707,477	6,552	6,550	6,937	6,796	617	2

	TOTAL MUIII GALS PRODUCED	TOTAL MUIII GALS PRODUCED	TOTAL MUIV GALS PRODUCED	TOTAL MUV GALS PRODUCED	TOTAL MUVI GALS PRODUCED	MUIII BLEED TO WASTE	MUIII BLEED TO WASTE	MUIV BLEED TO WASTE	MUV BLEED TO WASTE	MUVI BLEED TO WASTE
Prev. YTD	18,335,858	16,616,569	65,508,747	45,559,151	44,300,824	1,275,988	-10,308,835	8,861,448	19,778,221	4,698,939
July	20,775	19,036	13,208,961	9,262,798	7,871,843	20,775	19,036	2,828,661	1,312,620	957,088
August	21,816	18,081	12,151,449	11,190,964	7,190,856	21,816	18,081	2,383,588	1,267,587	1,148,609
September	24,485	15,955	11,706,932	11,824,826	6,604,024	24,485	15,955	2,305,476	1,337,507	1,112,917
EOQ TOTAL	67,076	53,072	37,067,342	32,278,588	21,666,723	67,076	53,072	7,517,725	3,917,714	3,218,614
YTD TOTAL	18,402,934	16,669,641	102,576,089	77,837,739	65,967,547	1,343,064	-10,255,763	16,379,173	23,695,935	7,917,553

	TOTAL BRINE GALS PRODUCED	TOTAL PERM GALS PRODUCED	COMM BLEED TO RO FEED
Prev. YTD	30,989,738	111,779,594	0
July	4,893,678	14,687,176	0
August	4,412,627	15,028,356	0
September	4,287,809	16,870,718	0
EOQ TOTAL	13,594,114	46,586,250	0
YTD TOTAL	44,583,852	158,365,844	0

WASTE VOLUME Fourth Quarter 2013						
TOTALIZER	PLANT TO PONDS	PLANT TO DDW 1 & 2	RESTORATION TO DDW	CLEAN WATER INTO PLANT	DDW TOTAL INJECTED	TRUCKS TO POND
October	369,870	5,187,419	4,782,358	563,287	9,969,777	12,200
November	260,600	5,095,073	6,374,560	578,698	11,469,633	7,900
December	246,350	5,095,995	6,247,244	617,881	11,343,239	16,417
TOTAL GAL. EOQ	876,820	15,378,487	17,404,162	1,759,866	32,782,649	36,517

TOTAL 4th QTR VOLUME DISCHARGED TO WASTE PONDS =	913,337 GALLONS
TOTAL 4th QTR VOLUME DISCHARGED TO DEEP WELL =	32,782,649 GALLONS
TOTAL 4th QTR VOLUME DISCHARGED TO WASTE PONDS + DPWELL =	33,695,986 GALLONS
TOTAL 4th QTR VOLUME WF BLEED FROM WELLFIELDS =	31,899,603 GALLONS

WELLFIELD BLEED Fourth Quarter 2013			
MONTH	October	November	December
BLEED	2.4%	2.6%	2.5%

PLANT FLOW Fourth Quarter 2013	
AVERAGE OPERATING FLOW RATE =	6,851 GPM EOQ
TOTAL GALLONS PRODUCED =	907,665,892 GALLONS EOQ
TOTAL GALLONS INJECTED =	891,410,585 GALLONS EOQ

	TOTAL GALS. PRODUCED	TOTAL GALS. INJECTED	HOURS IN MONTH	HOURS IN PRODUCTION	AVERAGE PROD. GPM	AVERAGE COM INJ GPM	AVERAGE REST INJ GPM	HRS. DOWN TIME
Prev. YTD	2,727,019,584	2,671,707,477	6,552	6,550	6,937	6,796	617	2
October	289,460,151	283,902,862	744	687	6,484	6,360	578	57
November	306,122,900	300,767,227	720	720	7,086	6,962	536	0
December	312,082,841	306,740,496	744	744	6,991	6,871	496	0
EOQ TOTAL	907,665,892	891,410,585	2,208	2,151	6,851	6,729	536	57
YTD TOTAL	3,634,685,476	3,563,118,062	8,760	8,701	6,915	6,779	597	59

	TOTAL MUII GALS PRODUCED	TOTAL MUIII GALS PRODUCED	TOTAL MUIV GALS PRODUCED	TOTAL MUV GALS PRODUCED	TOTAL MUVI GALS PRODUCED	MUII BLEED TO WASTE	MUIII BLEED TO WASTE	MUIV BLEED TO WASTE	MUV BLEED TO WASTE	MUVI BLEED TO WASTE
Prev. YTD	18,402,934	16,669,641	102,576,089	77,837,739	65,967,547	1,275,988	-10,308,835	8,861,448	19,778,221	4,698,939
October	28,675	15,572	10,951,200	12,029,257	5,857,501	28,653	15,572	2,119,215	2,053,069	839,161
November	30,406	17,216	11,148,985	12,441,020	6,084,790	30,406	17,216	3,107,146	2,550,686	845,274
December	31,771	15,852	11,299,566	10,452,110	6,225,147	31,761	15,852	2,365,060	2,753,051	709,129
EOQ TOTAL	90,852	48,640	33,399,751	34,922,387	18,167,438	90,820	48,640	7,591,421	7,356,806	2,393,564
YTD TOTAL	18,493,786	16,718,281	135,975,840	112,760,126	84,134,985	1,366,808	-10,260,195	16,452,869	27,135,027	7,092,503

	TOTAL BRINE GALS PRODUCED	TOTAL PERM GALS PRODUCED	COMM BLEED TO RO FEED
Prev. YTD	44,583,852	158,365,844	0
October	4,782,358	14,655,075	0
November	6,374,560	17,213,965	0
December	6,247,244	13,785,061	0
EOQ TOTAL	17,404,162	45,654,101	0
YTD TOTAL	61,988,014	204,019,945	0

Wellfield Injection Pressures

Third and Fourth Quarter, 2013

WELLFIELD INJECTION PRESSURE - PSI										CBR-018
Third Quarter 2013										
	WF HOUSE #3		WF HOUSE #4		WF HOUSE #5		WF HOUSE #6		WF HOUSE #7	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	71	78	79	85	65	72	72	78	56	66
August	71	78	79	88	65	74	72	82	58	62
September	75	78	80	85	67	72	73	81	57	62
AVERAGE	72	78	80	88	66	74	72	82	57	66
	WF HOUSE #8		WF HOUSE #9		WF HOUSE #10		WF HOUSE #11		WF HOUSE #12	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	70	76	28	44	19	38	13	31	31	33
August	72	76	28	46	19	38	14	32	27	30
September	71	76	29	57	19	24	14	20	23	26
AVERAGE	71	76	28	57	19	38	14	32	27	33
	WF HOUSE #13		WF HOUSE #14		WF HOUSE #15		WF HOUSE #16		WF HOUSE #17	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	0	2	71	78	0	0	0	0	58	63
August	0	0	69	76	0	0	53	86	57	78
September	0	0	71	76	0	2	80	85	56	61
AVERAGE	0	2	70	78	0	2	44	86	57	78
	WF HOUSE #18		WF HOUSE #19		WF HOUSE #20		WF HOUSE #21		WF HOUSE #22	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	73	80	80	86	15	24	71	78	75	77
August	45	78	78	84	5	13	71	77	73	75
September	48	78	79	84	12	42	71	85	72	76
AVERAGE	55	80	79	86	11	42	71	85	73	77
	WF HOUSE #23		WF HOUSE #24		WF HOUSE #25		WF HOUSE #26		WF HOUSE #27	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	77	87	89	92	94	95	79	92	91	94
August	73	88	87	92	89	94	79	81	88	92
September	74	88	87	93	88	92	78	91	86	90
AVERAGE	74	88	88	93	90	95	79	92	89	94
	WF HOUSE #28		WF HOUSE #29		WF HOUSE #30		WF HOUSE #31		WF HOUSE #32	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	37	76	61	66	55	59	13	39	38	45
August	64	75	68	79	61	70	38	47	43	54
September	78	89	78	88	73	83	49	58	55	64
AVERAGE	60	89	69	88	63	83	33	58	45	64
	WF HOUSE #33		WF HOUSE #34		WF HOUSE #35		WF HOUSE #36		WF HOUSE #37	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	43	48	91	94	90	92	87	89	89	91
August	49	58	89	92	91	94	88	90	85	87
September	60	70	87	92	87	92	85	89	84	91
AVERAGE	51	70	89	94	89	94	87	90	86	91
	WF HOUSE #38		WF HOUSE #39		WF HOUSE #40		WF HOUSE #41		WF HOUSE #42	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	87	92	81	84	86	89	64	74	66	79
August	85	89	79	83	87	90	72	85	74	87
September	83	89	78	84	85	90	81	86	84	91
AVERAGE	85	92	80	84	86	90	72	86	75	91
	WF HOUSE #43		WF HOUSE #44		WF HOUSE #45		WF HOUSE #46		WF HOUSE #46A	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	60	71	64	74	52	62	84	87	91	94
August	67	80	70	80	59	72	84	88	92	92
September	80	92	82	92	75	82	82	84	92	94
AVERAGE	69	92	72	92	62	82	83	88	92	94
	WF HOUSE #47		WF HOUSE #47A		WF HOUSE #48		WF HOUSE #49		WF HOUSE #50	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	41	84	23	92	90	92	89	90	88	89
August	48	61	28	42	89	90	89	90	88	89
September	61	70	43	59	89	90	89	90	89	90
AVERAGE	50	84	31	92	89	92	89	90	88	90
	WF HOUSE #51		WF HOUSE #52		WF HOUSE #53		WF HOUSE #54		WF HOUSE #55	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	90	91	90	91	89	91	68	85	72	80
August	90	90	89	92	90	92	72	90	77	88
September	89	91	90	92	90	92	71	73	80	88
AVERAGE	90	91	90	92	90	92	70	90	76	88
	WF HOUSE #56		WF HOUSE #57							
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM						
July	65	78	July							
August	72	90	August							
September	72	77	September	81						
AVERAGE	70	90	AVERAGE	81						
	WF HOUSE #60		WF HOUSE #61		WF HOUSE #62		WF HOUSE #63		WF HOUSE #63	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
July	66	75	63	75	50	66	66	80	71	86
August	73	85	67	83	56	75	70	86	71	85
September	85	88	82	86	75	78	87	92	86	89
AVERAGE	75	88	70	86	60	78	79	92	79	89

WELLFIELD INJECTION PRESSURE - PSI										CBR-018
Fourth Quarter 2013										
	WF HOUSE #3		WF HOUSE #4		WF HOUSE #5		WF HOUSE #6		WF HOUSE #7	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	70	77	78	85	67	85	72	78	57	63
November	74	84	81	86	68	74	75	83	59	65
December	67	74	74	81	61	68	67	76	53	72
AVERAGE	70	84	78	86	65	85	71	83	56	72
	WF HOUSE #8		WF HOUSE #9		WF HOUSE #10		WF HOUSE #11		WF HOUSE #12	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	70	76	26	68	19	58	14	53	22	64
November	71	76	51	78	41	60	35	54	20	68
December	65	78	41	62	31	64	25	48	25	37
AVERAGE	69	78	39	78	30	64	25	54	22	68
	WF HOUSE #13		WF HOUSE #14		WF HOUSE #15		WF HOUSE #16		WF HOUSE #17	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	0	0	67	76	0	0	77	84	53	63
November	0	2	74	78	3	75	82	88	58	62
December	0	2	68	74	2	62	74	84	54	64
AVERAGE	0	2	70	78	2	75	77	88	55	64
	WF HOUSE #18		WF HOUSE #19		WF HOUSE #20		WF HOUSE #21		WF HOUSE #22	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	68	78	75	85	7	22	70	78	72	76
November	75	80	81	86	14	70	70	72	74	75
December	70	80	76	82	1	32	71	75	74	76
AVERAGE	71	80	77	86	7	70	70	78	73	76
	WF HOUSE #23		WF HOUSE #24		WF HOUSE #25		WF HOUSE #26		WF HOUSE #27	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	71	80	86	92	86	91	77	82	86	90
November	70	72	87	90	88	90	78	81	89	90
December	71	74	89	92	90	91	80	82	90	90
AVERAGE	71	80	88	92	88	91	78	82	88	90
	WF HOUSE #28		WF HOUSE #29		WF HOUSE #30		WF HOUSE #31		WF HOUSE #32	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	80	88	80	88	74	87	52	66	57	64
November	79	84	80	88	75	78	50	54	56	60
December	86	91	87	90	81	86	57	62	63	68
AVERAGE	82	91	82	90	77	87	53	66	58	68
	WF HOUSE #33		WF HOUSE #34		WF HOUSE #35		WF HOUSE #36		WF HOUSE #37	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	62	70	87	94	84	94	84	88	86	92
November	61	66	88	90	88	91	87	89	90	92
December	69	74	89	90	89	91	87	89	90	92
AVERAGE	64	74	88	94	87	94	86	89	88	92
	WF HOUSE #38		WF HOUSE #39		WF HOUSE #40		WF HOUSE #41		WF HOUSE #42	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	83	89	78	86	84	90	81	86	83	90
November	87	90	82	85	87	90	85	88	87	90
December	87	89	82	87	87	90	85	88	89	92
AVERAGE	86	90	80	87	86	90	84	88	87	92
	WF HOUSE #43		WF HOUSE #44		WF HOUSE #45		WF HOUSE #46		WF HOUSE #46A	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	77	86	77	85	69	79	76	80	88	97
November	81	83	81	84	73	76	80	92	91	94
December	82	85	84	87	73	76	75	86	92	93
AVERAGE	80	86	81	87	72	79	77	92	90	97
	WF HOUSE #47		WF HOUSE #47A		WF HOUSE #48		WF HOUSE #49		WF HOUSE #50	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	59	73	40	46	87	90	86	90	85	90
November	61	64	42	45	89	91	90	93	88	90
December	63	93	44	62	89	92	88	89	89	90
AVERAGE	61	93	42	62	88	92	88	93	87	90
	WF HOUSE #51		WF HOUSE #52		WF HOUSE #53		WF HOUSE #54		WF HOUSE #55	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	87	90	87	95	87	90	67	72	77	86
November	90	91	90	91	90	93	70	72	72	90
December	90	91	90	94	90	92	69	72	75	80
AVERAGE	89	91	89	95	89	93	69	72	75	90
	WF HOUSE #56		WF HOUSE #57							
	AVERAGE	MAXIMUM		AVERAGE	MAXIMUM					
October	68	78	October	88	90					
November	71	80	November	83	89					
December	71	77	December	80	89					
AVERAGE	70	80	AVERAGE	81	90					
	WF HOUSE #60		WF HOUSE #61		WF HOUSE #62		WF HOUSE #63		WF HOUSE #64	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
October	82	88	79	86	74	80	85	91	85	90
November	83	88	82	85	78	80	89	92	88	90
December	86	89	83	86	79	82	89	93	88	92
AVERAGE	84	89	81	86	77	82	89	93	88	92

Deep Disposal Well Injection Radiological Data

Third and Fourth Quarter, 2013

Crow Butte Uranium Mine
Deep Disposal Well #1 Injection Radiological Data

Month	Total Gallons Injected	Average Natural Uranium (mg/l)	Total Natural Uranium Injected (mg)	Total Natural Uranium Injected (μCi)	Average Radium-226 (pCi/l)	Total Radium-226 Injected (μCi)
July-13	8,129,021	2	6.15E+07	4.17E+04	1,040	3.20E+04
August-13	7,787,334	3	8.84E+07	5.99E+04	946	2.79E+04
September-13	7,187,709	3	8.16E+07	5.53E+04	822	2.24E+04
October-13	8,460,577	3	9.61E+07	6.50E+04	807	2.58E+04
November-13	9,920,208	2	7.51E+07	5.08E+04	1,320	4.96E+04
December-13	9,982,358	3	1.13E+08	7.67E+04	954	3.60E+04
Totals	51,467,207		5.16E+08	3.49E+05		1.94E+05

Crow Butte Uranium Mine
Deep Disposal Well #2 Injection Radiological Data

Month	Total Gallons Injected	Average Natural Uranium (mg/l)	Total Natural Uranium Injected (mg)	Total Natural Uranium Injected (μCi)	Average Radium-226 (pCi/l)	Total Radium-226 Injected (μCi)
July-13	16,953,793	1	6.42E+07	4.34E+04	783	5.02E+04
August-13	1,639,144	1	6.20E+06	4.20E+03	775	4.81E+03
September-13	1,571,214	2	1.19E+07	8.05E+03	703	4.18E+03
October-13	1,509,200	1	5.71E+06	3.87E+03	747	4.27E+03
November-13	1,549,425	1	5.87E+06	3.97E+03	825	4.84E+03
December-13	1,360,881	1	5.15E+06	3.49E+03	768	3.96E+03
Totals	24,583,657		9.90E+07	6.70E+04		7.23E+04

Appendix E
Radon Release Calculations
Third and Fourth Quarter, 2013

Radon Effluent Release Calculation (Production and Startup)

Third Quarter 2013 Radon Release from Leaching Operations:

<i>Curies/M3</i>	<i>Production Flow (liters)</i>	<i>Radon-222 Decay Constant</i>	<i>Operating Days</i>	<i>Operating Factor</i>	<i>M3/liter conversion</i>	<i>Hours/Day Conversion</i>	<i>Minutes/Hour Conversion</i>	<i>Total Radon Release from Leaching</i>
7.04E-04	26.032	0.72	92	99.9%	0.001	24	60	1.746

Fourth Quarter 2013 Radon Release from Leaching Operations:

<i>Curies/M3</i>	<i>Production Flow (liters)</i>	<i>Radon-222 Decay Constant</i>	<i>Operating Days</i>	<i>Operating Factor</i>	<i>M3/liter conversion</i>	<i>Hours/Day Conversion</i>	<i>Minutes/Hour Conversion</i>	<i>Total Radon Release from Leaching</i>
7.04E-04	25.934	0.72	92	97.0%	0.001	24	60	1.689

Second Half 2013 Radon Release From Startup:

<i>Curies/M3</i>	<i>Total Acres of New Wellfield</i>	<i>Meter3/Acre Conversion</i>	<i>Orebody Thickness (meters)</i>	<i>Porosity</i>	<i>Total Radon Release from Startup</i>
7.04E-04	16.6	4,074	1.52	0.29	21

Total Estimated Radon Release from Production (curies):**3,457****Radon Effluent Release Calculation (Restoration)**

Secon Half 2013 Radon Release From Restoration:

<i>Total Restoration Flow (liters)</i>	<i>Microcuries/liter</i>	<i>Curies/Microcurie</i>	<i>Production Potential</i>
672,899,779	0.697	1.00E-06	469

Wellfield Loss (25% of Production Potential):

117

Ion Exchange Loss (10% of Production Potential minus Wellfield Loss):

35

Reverse Osmosis Loss (100% of remaining activity at 0.470 microcuries/liter)

218

<i>Total Reverse Osmosis Flow (liters)</i>	<i>Microcuries/liter</i>	<i>Curies/Microcurie</i>
464,403,721	0.470	1.00E-06

Second Half 2013 Radon Release From Startup of New Restoration:

<i>Curies/M3</i>	<i>Total Acres of New Wellfield</i>	<i>Meter3/Acre Conversion</i>	<i>Orebody Thickness (meters)</i>	<i>Porosity</i>	<i>Total Radon Release from Startup</i>
7.04E-04	1.9	4074	1.52	0.29	2

Total Estimated Radon Release from Restoration (curies):**373****Total Estimated Radon Release, Second Half 2013 (curies):****3,830**

Appendix F
Environmental Air Monitoring Results
Third and Fourth Quarter, 2013

**Crow Butte Resources
Crow Butte Uranium Project**

Perimeter Air Monitoring Stations

Analyte	Result	Precision \pm	Result	Precision \pm	RL	10 CFR Pt 20 Effluent Limit	Effluent	% Effluent
	pCi/filter	pCi/filter	uCi/ml	uCi/ml	uCi/ml		Class	Concentration
Third Quarter 2013								
AM-1 [Sample Air Volume 6,289,028 liters]								
Lead 210	90.4	5.8	1E-14	9E-16	2E-15	6E-13	Day	1.70
Radium 226	0.3	0.1	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	<0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-2 [Sample Air Volume 6,303,955 liters]								
Lead 210	21.6	3.4	3E-15	5E-16	2E-15	6E-13	Day	0.50
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	3.1	--	5E-16	--	1E-16	9E-14	Year	0.56
AM-3 [Sample Air Volume 6,137,566 liters]								
Lead 210	65.7	5.0	1E-14	8E-16	2E-15	6E-13	Day	1.70
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.6	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-4 [Sample Air Volume 6,306,375 liters]								
Lead 210	119.0	6.5	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	0.4	0.1	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.4	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-5 [Sample Air Volume 6,250,794 liters]								
Lead 210	124.0	6.7	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	0.5	0.1	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.5	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-6 [Sample Air Volume 6,046,630 liters]								
Lead 210	179.0	8.0	3E-14	1E-15	2E-15	6E-13	Day	5.00
Radium 226	0.4	0.1	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.4	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-8 [Sample Air Volume 6,089,024 liters]								
Lead 210	65.2	4.9	1E-14	8E-16	2E-15	6E-13	Day	1.70
Radium 226	0.5	0.1	<1E-16		1E-16	9E-13	Week	0.00
Thorium 230	<0.3	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	<0.3		<1E-16		1E-16	9E-14	Year	0.00

RL – Reporting Limit

uCi/ml – microuries per milliliter

pCi/filter – picocuries per filter

**Crow Butte Resources
Crow Butte Uranium Project**

Perimeter Air Monitoring Stations

Analyte	Result	Precision \pm	Result	Precision \pm	RL	10 CFR Pt 20 Effluent Limit	Effluent	% Effluent
	pCi/filter	pCi/filter	uCi/ml	uCi/ml	uCi/ml		Class	Concentration
Fourth Quarter 2013								
AM-1 [Sample Air Volume 6,532,658 liters]								
Lead 210	132.0	8.1	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	<0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-2 [Sample Air Volume 6,764,620 liters]								
Lead 210	149.0	8.2	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	0.3	0.1	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-3 [Sample Air Volume 6,826,653 liters]								
Lead 210	135.0	8.2	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	<0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-4 [Sample Air Volume 6,871,513 liters]								
Lead 210	139.0	8.2	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.4	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-5 [Sample Air Volume 6,823,253 liters]								
Lead 210	126.0	7.7	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	0.3	0.2	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-6 [Sample Air Volume 6,952,327 liters]								
Lead 210	152.0	8.6	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	<0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00
AM-8 [Sample Air Volume 6,822,322 liters]								
Lead 210	128.0	7.8	2E-14	1E-15	2E-15	6E-13	Day	3.30
Radium 226	<0.3	--	<1E-16	--	1E-16	9E-13	Week	0.00
Thorium 230	<0.2	--	<1E-16	--	1E-16	3E-14	Year	0.00
Uranium	0.3	--	<1E-16	--	1E-16	9E-14	Year	0.00

RL – Reporting Limit

uCi/ml – microuries per milliliter

pCi/filter – picouries per filter

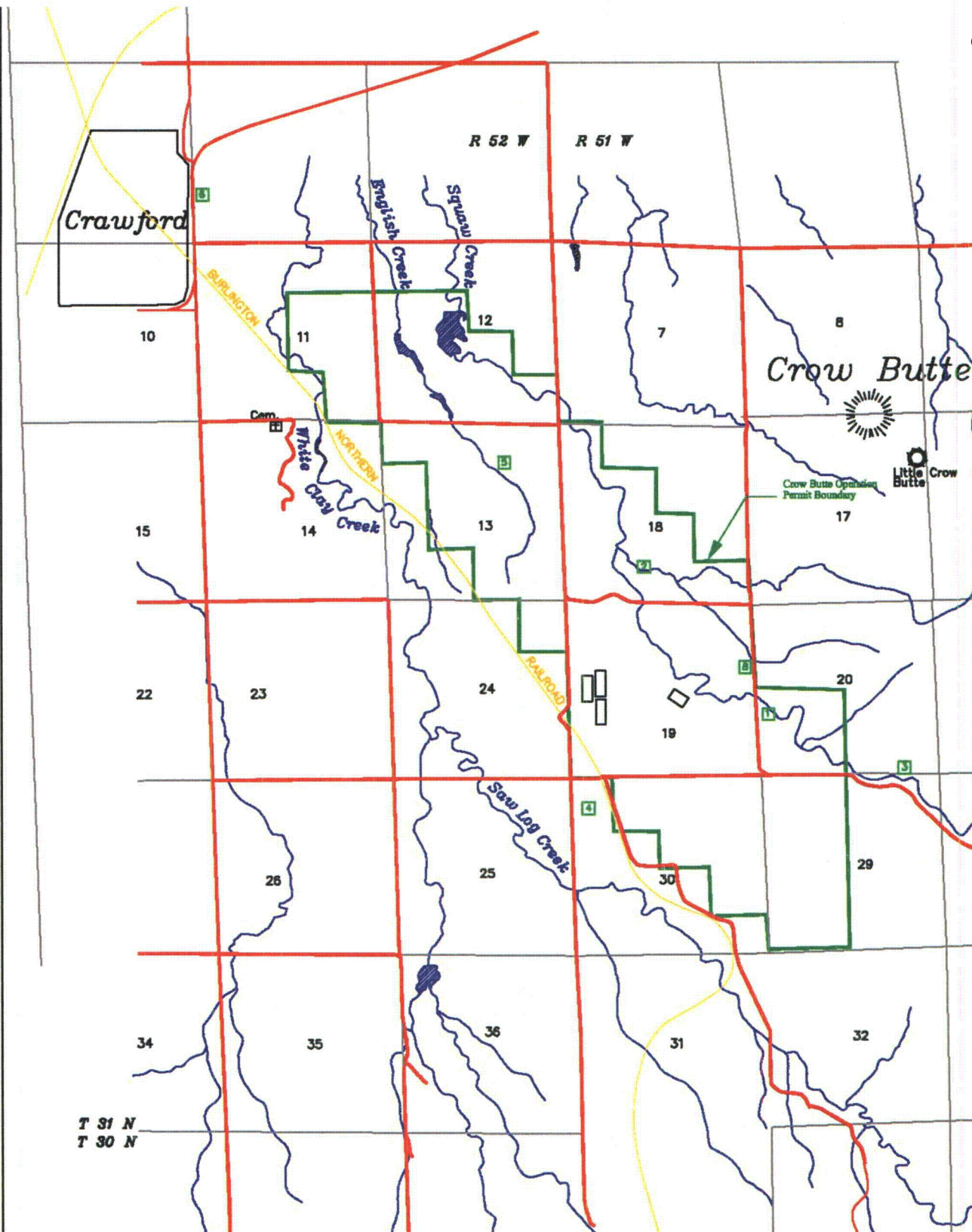
Crow Butte Resources, Inc.
Crow Butte Uranium Project

Track Etch Cup Ambient Radon Concentrations

*Air Monitoring Station
No.*

Period: July 1, 2013 to January 2, 2014

	Gross Count	Average Radon Concentration (x 10 ⁻⁹ µCi/ml)	Accuracy (x 10 ⁻⁹ µCi/ml)	Percent Effluent Concentration
AM-1	253.0	0.7	0.04	7.0%
AM-2	531.0	2.5	0.11	25.0%
AM-3	556.0	2.6	0.11	26.0%
AM-4	120.0	0.2	0.02	2.0%
AM-5	189.0	0.3	0.02	3.0%
AM-6	127.0	0.2	0.02	2.0%
AM-8	627.0	3.0	0.12	30.0%
AB-1 (AM-1 Duplicate)	247.0	0.6	0.04	6.0%
AB-2 (AM-2 Duplicate)	614.0	2.9	0.12	29.0%
AB-6 (AM-6 Duplicate)	144.0	0.2	0.02	2.0%
LLD (x 10 ⁻⁹ µCi/ml)				0.2
Effluent Concentration Limit, 10 CFR 20 App B Column 2:				10



15 Air Monitoring Station, Radon, Vegetation
Soil, Direct Radiation

15 - PERMIT AREA



1/4 MILE 1/2 MILE
5280' (ONE MILE)

**CROW BUTTE
RESOURCES, INC.**

Environmental Sample Locations

Date: 8-21-2012

Fig. 1

Appendix G

Environmental OSL Monitoring Results

Third and Fourth Quarter, 2013

Crow Butte Resources
Crow Butte Uranium Project
Perimeter Air Monitoring Stations

Gamma Exposure Results

Location	Exposure of Dosimeter		Net Cumulative Totals		
	(mrems ambient dose equivalent)				
	Gross	Net	Calendar Quarter	Year to Date	Permanent
10/01/2012 - 12/31/2012					
Transient Control	--	0.0	Q4	2012	--
Deploy Control	27.5	0.0	--	--	--
AM-1	35.2	7.8	7.8	29.6	159.3
AM-2	36.9	9.5	9.5	36.9	165.4
AM-3	37.8	10.3	10.3	34.3	178.2
AM-4	33.6	6.2	6.2	25.0	131.3
AM-5	35.9	8.4	8.4	36.4	175.6
AM-6	36.5	9.0	9.0	36.4	164.6
AM-8	40.6	13.1	13.1	44.8	216.9

mrem – millirems

AM-1 air sampling locations

Minimum Detectable Dose = 0.1 mrems ambient dose equivalent

Crow Butte Resources
Crow Butte Uranium Project
Perimeter Air Monitoring Stations

Gamma Exposure Results

Location	Exposure of Dosimeter		Net Cumulative Totals		
	(mrems ambient dose equivalent)				
	Gross	Net	Calendar Quarter	Year to Date	Permanent
07/01/2013 - 09/30/2013					
Transient Control	--	0.0	Q3	2013	--
Deploy Control	30.6	0.0	--	--	--
AM-1	39.2	8.6	8.6	22.2	181.4
AM-2	35.9	5.4	5.4	21.8	187.2
AM-3	39.7	9.1	9.1	30.4	208.5
AM-4	37.3	6.7	6.7	20.9	152.2
AM-5	40.0	9.5	9.5	25.9	201.6
AM-6	38.4	7.9	7.9	19.9	184.5
AM-8	42.2	11.6	11.6	35.7	252.6

mrem – millirems

AM-1 air sampling locations

Minimum Detectable Dose = 0.1 mrems ambient dose equivalent

Crow Butte Resources
Crow Butte Uranium Project
Perimeter Air Monitoring Stations

Gamma Exposure Results

Location	Exposure of Dosimeter		Net Cumulative Totals		
	(mrems ambient dose equivalent)				
	Gross	Net	Calendar Quarter	Year to Date	Permanent
10/01/2013 - 12/31/2013					
Transient Control	--	0.0	Q4	2013	--
Deploy Control	26.0	0.0	--	--	--
AM-1	34.9	8.9	8.9	31.0	190.3
AM-2	34.8	8.8	8.8	30.7	196.0
AM-3	35.6	9.6	9.6	39.9	218.1
AM-4	32.0	6.0	6.0	27.0	158.2
AM-5	34.5	8.5	8.5	34.4	210.1
AM-6	34.3	8.3	8.3	28.2	192.9
AM-8	37.3	11.3	11.3	47.0	263.9

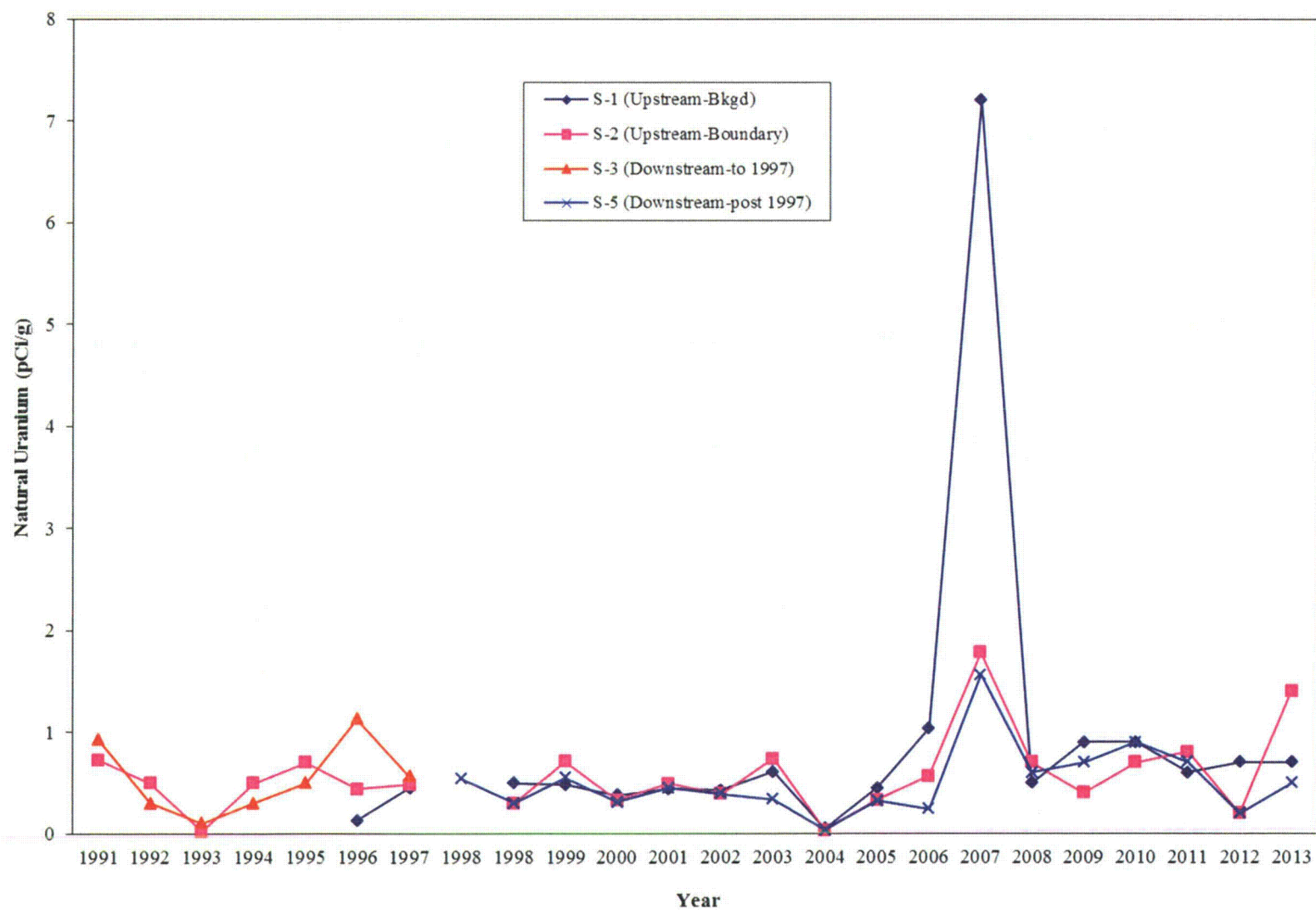
mrem – millirems

AM-1 air sampling locations

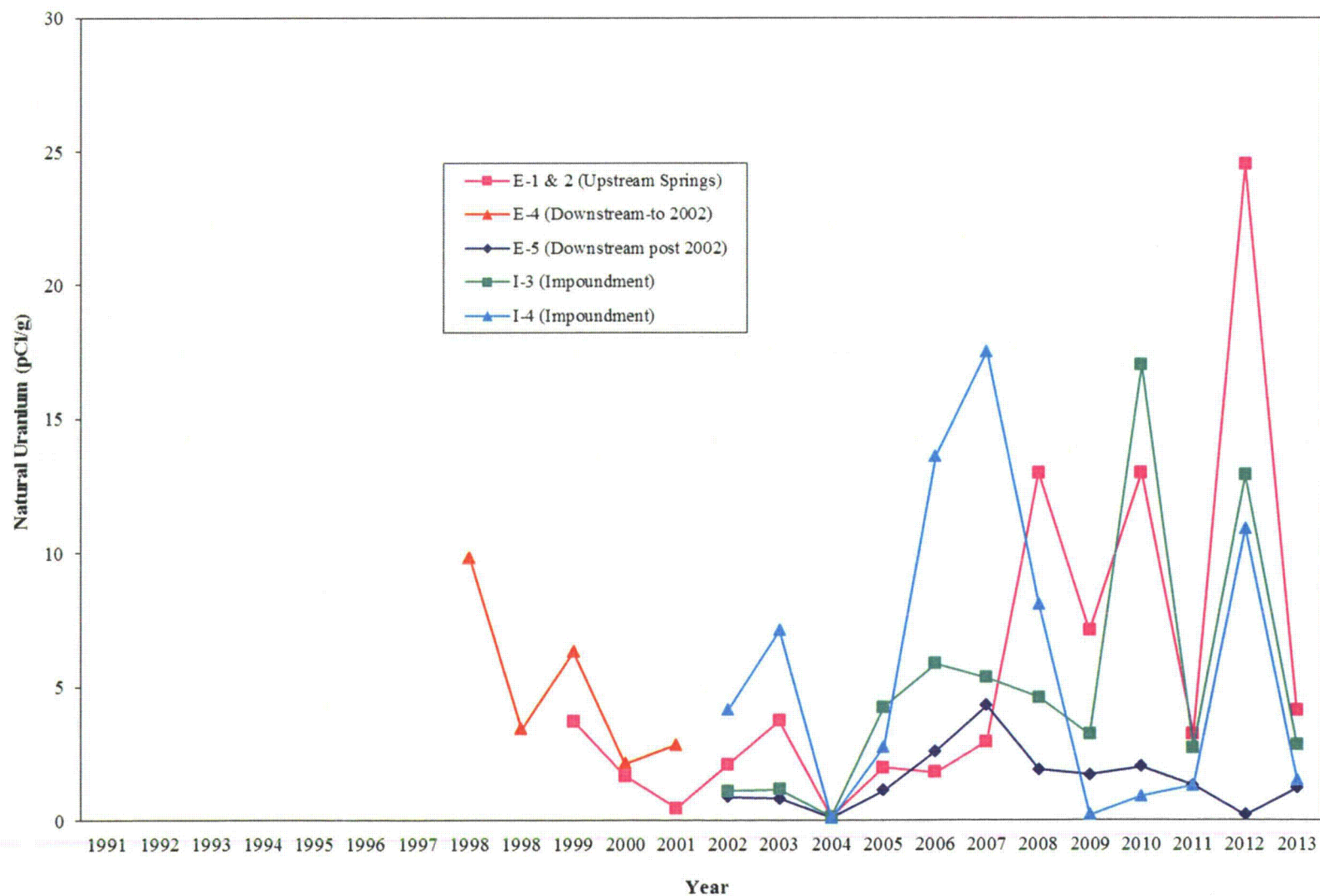
Minimum Detectable Dose = 0.1 mrems ambient dose equivalent

Appendix H
Sediment Monitoring Results
Third and Fourth Quarter, 2013

Squaw Creek Sediment Uranium Concentration



English Creek Sediment Uranium Concentration





Inter-Mountain Labs

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-001
ClientSample ID: Stream E-5
COC: WEB

WorkOrder: S1311295
CollectionDate: 10/25/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Total							
Lead 210	1.1	pCi/g		1	OTW01	12/18/2013 1215	SH
Lead 210 Precision (±)	0.4	pCi/g			OTW01	12/18/2013 1215	SH
Radium 226	1.6	pCi/g		0.2	E901.1 Mod.	12/20/2013 1628	SH
Radium 226 Precision (±)	0.6	pCi/g			E901.1 Mod.	12/20/2013 1628	SH
Thorium 230	0.7	pCi/g		0.2	ACW10	12/13/2013 1205	MB
Thorium230 Precision (±)	0.2	pCi/g			ACW10	12/13/2013 1205	MB
Thorium229 Tracer (30-120)	57.3	%			ACW10	12/13/2013 1205	MB
Metals - Total							
Uranium	1.2	pCi/g		0.2	EPA 200.8	12/02/2013 1933	MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by: Wade Nieuwsma
Wade Nieuwsma, Assistant Laboratory Manager



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Your Environmental Monitoring Partner

Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-002
ClientSample ID: Impoundment I5
COC: WEB

WorkOrder: S1311295
CollectionDate: 10/25/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	0.9	pCi/g		0.7	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.4	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	1.2	pCi/g		0.2	E901.1 Mod.	12/20/2013 1649 SH
Radium 226 Precision (±)	0.4	pCi/g			E901.1 Mod.	12/20/2013 1649 SH
Thorium 230	0.3	pCi/g		0.2	ACW10	01/07/2014 1223 MB
Thorium230 Precision (±)	0.1	pCi/g			ACW10	01/07/2014 1223 MB
Thorium229 Tracer (30-120)	82.1	%			ACW10	01/07/2014 1223 MB
Metals - Total						
Uranium	1.4	pCi/g		0.2	EPA 200.8	12/02/2013 1938 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by: Wade Nieuwsma
Wade Nieuwsma, Assistant Laboratory Manager



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Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-003
ClientSample ID: Stream S2
COC: WEB

WorkOrder: S1311295
CollectionDate: 11/11/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	1.1	pCi/g		1	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.3	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	0.4	pCi/g		0.2	E901.1 Mod.	12/20/2013 1709 SH
Radium 226 Precision (±)	0.5	pCi/g			E901.1 Mod.	12/20/2013 1709 SH
Thorium 230	0.6	pCi/g		0.2	ACW10	12/13/2013 1205 MB
Thorium230 Precision (±)	0.3	pCi/g			ACW10	12/13/2013 1205 MB
Thorium229 Tracer (30-120)	30.3	%			ACW10	12/13/2013 1205 MB
Metals - Total						
Uranium	1.4	pCi/g		0.2	EPA 200.8	12/02/2013 1944 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:	* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
	C Calculated Value	E Value above quantitation range
	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits
	L Analyzed by a contract laboratory	M Value exceeds Monthly Ave or MCL
	ND Not Detected at the Reporting Limit	O Outside the Range of Dilutions
	S Spike Recovery outside accepted recovery limits	

Reviewed by:

Wade Nieuwsma, Assistant Laboratory Manager



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Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-004
ClientSample ID: E1
COC: WEB

WorkOrder: S1311295
CollectionDate: 11/11/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	1.6	pCi/g		1	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.4	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	1.5	pCi/g		0.2	E901.1 Mod.	12/20/2013 1730 SH
Radium 226 Precision (±)	0.6	pCi/g			E901.1 Mod.	12/20/2013 1730 SH
Thorium 230	0.2	pCi/g		0.2	ACW10	12/13/2013 1205 MB
Thorium230 Precision (±)	0.1	pCi/g			ACW10	12/13/2013 1205 MB
Thorium229 Tracer (30-120)	49.4	%			ACW10	12/13/2013 1205 MB
Metals - Total						
Uranium	4.1	pCi/g		0.2	EPA 200.8	12/02/2013 1949 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by: Wade Nieuwsma
Wade Nieuwsma, Assistant Laboratory Manager



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Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-005
ClientSample ID: Impoundment I4
COC: WEB

WorkOrder: S1311295
CollectionDate: 10/20/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	0.9	pCi/g		0.7	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.3	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	1.2	pCi/g		0.2	E901.1 Mod.	12/20/2013 1751 SH
Radium 226 Precision (±)	0.4	pCi/g			E901.1 Mod.	12/20/2013 1751 SH
Thorium 230	0.3	pCi/g		0.2	ACW10	01/07/2014 1223 MB
Thorium230 Precision (±)	0.1	pCi/g			ACW10	01/07/2014 1223 MB
Thorium229 Tracer (30-120)	85.1	%			ACW10	01/07/2014 1223 MB
Metals - Total						
Uranium	1.5	pCi/g		0.2	EPA 200.8	12/02/2013 2005 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by:

Wade Nieuwsma, Assistant Laboratory Manager



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Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-006
ClientSample ID: Impoundment I3
COC: WEB

WorkOrder: S1311295
CollectionDate: 11/11/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	1.1	pCi/g		1	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.3	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	1.2	pCi/g		0.2	E901.1 Mod.	12/20/2013 1811 SH
Radium 226 Precision (±)	0.3	pCi/g			E901.1 Mod.	12/20/2013 1811 SH
Thorium 230	<0.2	pCi/g		0.2	ACW10	12/16/2013 1048 MB
Thorium230 Precision (±)	NA	pCi/g			ACW10	12/16/2013 1048 MB
Thorium229 Tracer (30-120)	40.7	%			ACW10	12/16/2013 1048 MB
Metals - Total						
Uranium	2.8	pCi/g		0.2	EPA 200.8	12/02/2013 2010 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by: Wade Nieuwsma
Wade Nieuwsma, Assistant Laboratory Manager



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Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-007
ClientSample ID: Stream S5
COC: WEB

WorkOrder: S1311295
CollectionDate: 11/11/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init
Radionuclides - Total						
Lead 210	0.9	pCi/g		0.7	OTW01	12/18/2013 1430 SH
Lead 210 Precision (±)	0.4	pCi/g			OTW01	12/18/2013 1430 SH
Radium 226	0.6	pCi/g		0.2	E901.1 Mod.	12/20/2013 1832 SH
Radium 226 Precision (±)	0.3	pCi/g			E901.1 Mod.	12/20/2013 1832 SH
Thorium 230	0.4	pCi/g		0.2	ACW10	12/16/2013 1048 MB
Thorium230 Precision (±)	0.1	pCi/g			ACW10	12/16/2013 1048 MB
Thorium229 Tracer (30-120)	80.8	%			ACW10	12/16/2013 1048 MB
Metals - Total						
Uranium	0.5	pCi/g		0.2	EPA 200.8	12/02/2013 2031 MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:	* Value exceeds Maximum Contaminant Level	B Analyte detected in the associated Method Blank
	C Calculated Value	E Value above quantitation range
	H Holding times for preparation or analysis exceeded	J Analyte detected below quantitation limits
	L Analyzed by a contract laboratory	M Value exceeds Monthly Ave or MCL
	ND Not Detected at the Reporting Limit	O Outside the Range of Dilutions
	S Spike Recovery outside accepted recovery limits	

Reviewed by:

Wade Nieuwsma, Assistant Laboratory Manager



Inter-Mountain Labs

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Sample Analysis Report

Company: Cameco Resources, Crow Butte Operation
PO Box 169
Crawford, NE 69339

Date Reported 1/9/2014
Report ID S1311295001

ProjectName: Crow Butte annual Sediment Samples
Lab ID: S1311295-008
ClientSample ID: Stream S1
COC: WEB

WorkOrder: S1311295
CollectionDate: 11/11/2013
DateReceived: 11/19/2013 10:43:00 AM
FieldSampler:
Matrix: Sediment

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Total							
Lead 210	1.1	pCi/g		0.2	OTW01	01/24/2014 1311	SH
Lead 210 Precision (±)	0.2	pCi/g			OTW01	01/24/2014 1311	SH
Radium 226	0.6	pCi/g		0.2	E901.1 Mod.	12/20/2013 1853	SH
Radium 226 Precision (±)	0.2	pCi/g			E901.1 Mod.	12/20/2013 1853	SH
Thorium 230	0.6	pCi/g		0.2	ACW10	12/16/2013 1048	MB
Thorium230 Precision (±)	0.2	pCi/g			ACW10	12/16/2013 1048	MB
Thorium229 Tracer (30-120)	41.9	%			ACW10	12/16/2013 1048	MB
Metals - Total							
Uranium	0.7	pCi/g		0.2	EPA 200.8	12/02/2013 2036	MS

These results apply only to the samples tested.

RL - Reporting Limit

Qualifiers:

- * Value exceeds Maximum Contaminant Level
- C Calculated Value
- H Holding times for preparation or analysis exceeded
- L Analyzed by a contract laboratory
- ND Not Detected at the Reporting Limit
- S Spike Recovery outside accepted recovery limits

- B Analyte detected in the associated Method Blank
- E Value above quantitation range
- J Analyte detected below quantitation limits
- M Value exceeds Monthly Ave or MCL
- O Outside the Range of Dilutions

Reviewed by: Wade Nieuwsma
Wade Nieuwsma, Assistant Laboratory Manager