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LOST CREEK ISR, LLC

March 17, 2016

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

**Re: Semi-Annual Effluent and Environmental Monitoring Report 2nd Half 2015
Lost Creek ISR Project License SUA-1598 Docket 40-9068**

To Whom It May Concern:

The attached Effluent and Environmental Monitoring Report for the second half of 2015 has been submitted in accordance with License Condition 11.1(D) for Lost Creek ISR, LLC's (LCI) Lost Creek ISR Project License SUA-1598 consistent with NRC Regulatory Guide (RG) 4.14, pursuant to 10 CFR 40.65, and as described in LCI's NRC License Application Technical Report (TR) Section 5.7.7.

A request for late submittal was sent to NRC dated February 26, 2016. If you have any questions regarding this submittal please contact me at the Casper office.

Sincerely,

Michael D. Gaither
Manager EHS and Regulatory Affairs
Ur-Energy USA, Inc

Attachment: **Semi-Annual Effluent and Environmental Monitoring Report for 2nd Half 2015**

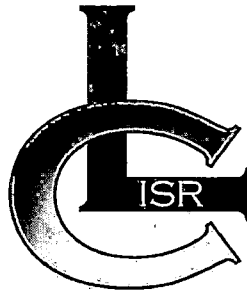
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SEMI-ANNUAL EFFLUENT AND ENVIRONMENTAL MONITORING REPORT

Lost Creek ISR Project



**LOST CREEK ISR, LLC
SWEETWATER COUNTY, WY**

**NRC License SUA-1598
Docket 40-9068**

July 1, 2015 to December 31, 2015

March 17, 2016



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1.0 INTRODUCTION

Environmental monitoring of air, water, and soil was conducted to quantify radiological effluents as a result of operations at Lost Creek ISR, LLC's (LCI) Lost Creek ISR Project (LC-ISR) in Sweetwater County, Wyoming. Sampling and monitoring was performed during the reporting period consistent with NRC Regulatory Guide (RG) 4.14, as described in LCI's NRC License Application Technical Report (TR) Section 5.7.7, and as detailed in the LC-ISR Environmental Monitoring Program Standard Operating Procedures. The reporting period is July 1, 2015 through December 31, 2015.

The sampling and monitoring is divided into the following categories:

- Radiological particulates in air
- Non-routine surface water
- Groundwater
- Soils
- Passive Gamma Radiation
- Passive Radon

The operational monitoring data is provided on **Tables 1** through **6**. Sample locations are shown in figures from the NRC Technical Report included in the **Appendix** and descriptions are provided on the following summary table:

Monitoring Category	Sample or Monitoring Location	Description
Radiological Particulates in Air; Soils (Data Table 1 and Table 4); (TR Figure 2.9-27)	HV-1	Nearest residence monitor located in Town of Bairoil about 15 miles to the northeast of LC. This location is the nearest fulltime residence to LC.
	HV-2	Located downwind approximately 50 ft to the east of the Plant. This location is the highest expected concentration of effluents from operations.
	HV-3	Boundary monitor located approximately 3 miles upwind of the plant in the southwest corner on the edge of the site License boundary. Represents background.
	HV-4	Boundary monitor located downwind approximately 2.5 miles to the east on the site License boundary.
	HV-5	Boundary monitor located approximately 0.75 miles to the northwest of the processing facility generally upwind of the Plant.



Monitoring Category	Sample or Monitoring Location	Description
Non-Routine Surface Water (Data Table 2); (TR Figure 2.7-5)	LC1	Autosampler to capture western-draw inflow in the NW area
	LC2	Autosampler to capture middle-draw outflow at mid-south boundary
	LC3	Autosampler to capture middle-draw outflow at mid-south boundary
	LC4	Autosampler to capture eastern-draw south boundary outflow from Battle Spring Draw
	LC5	Autosampler to capture Crooked Well Reservoir within Battle Spring Draw
	LC6	Autosampler to capture eastern-draw (Battle Spring Draw) inflow at north boundary of eastern leg
	LC7	Autosampler to capture middle-draw outflow at southern corner
	LC8	Autosampler to capture western-draw outflow at south boundary of southern leg
	LC9	Autosampler to capture western-draw outflow at south boundary of southern leg
	LC10	Autosampler to capture middle-draw outflow at mid-south boundary
	LC11	Autosampler to capture middle-draw inflow at mid-north boundary
	LC12	Autosampler to capture middle-draw inflow at mid-north boundary
	LC13	Autosampler to capture mid-draw outflow at mid-south boundary
Groundwater (Data Table 3); (TR Figure 2.2-4)	BLM-4451	Private stock well (BLM Battle Spring Draw Well No. 4451) east of permit boundary
	BLM-4775	Private stock well (BLM Boundary Well No. 4775) north east of permit boundary
	BLM-4777	Private stock well (BLM Battle Spring Well No. 4777) south of permit boundary
	BLM-EEN	Private stock well (BLM East Eagle Nest Draw Well) northwest of permit boundary



Monitoring Category	Sample or Monitoring Location	Description
Passive Gamma Radiation and Passive Radon (Data Table 5 and Table 6); (TR Figure 2.9-27)	PR-1	Co-located at the HV-1 air sampling station in Bairoil
	PR-2	Co-located with HV-3 representing background
	PR-3	Co-located with HV-5
	PR-4	Located just to the north of the Plant
	PR-5	Co-located with HV-2
	PR-6	Located on the NE edge of the License boundary approximately 1.5 mi to the ENE of the Plant
	PR-7	Located on the western edge of the License boundary approximately 2 mi SW of the Plant
	PR-8	Located on the east edge of the southern leg of the License boundary approximately 2 mi S of the Plant
	PR-9	Located mid-site to sample area over the ore body within Mine Unit 1 approximately 0.5 mi S of the Plant.
	PR-10	Co-located with HV-4
	PR-11	Located on a mid-southern corner of the License boundary approximately 1.5 mi S of the Plant
	PR-12	Located on the south edge of the east leg of the License boundary approximately 1.5 mi ESE of the Plant
Supplemental Passive Radon (Data Table 6)	Pond 1	Located on the fence just downwind to the east of the Plant on the west edge of the Storage Ponds.
	Pond 3	Located on the fence just downwind to the east of the Plant on the west edge of the Storage Ponds.
	Pond 4	Located on the fence just downwind to the east of the Plant on the west edge of the Storage Ponds.
	Pond 6	Located on the fence just downwind to the east of the Plant on the west edge of the Storage Ponds.
	N Pond	Located at the fence on the east end of the Storage Pond area downwind of the Plant.
	S Pond	Located at the fence on the east end of the Storage Pond area downwind of the Plant.
	North Vent	Mounted on the center of the HVAC exhaust vent screen within the Plant on the north vent on the west wall.
	South Vent	Mounted on the center of the HVAC exhaust vent screen within the Plant on the south vent on the west wall.
	Plant Shop Vent	Mounted on the exhaust vent on the east wall of the Plant shop area

2.0 RADIOLOGICAL PARTICULATES IN AIR

Operational air particulate sampling for LC-ISR was conducted at five locations HV-1 through HV-5. Samples were collected on glass fiber filter paper using F&J Specialty air sampling model



DF-40L-8 and operating at a rate of 30 L/min. Filters were typically changed weekly, batched, and submitted for quarterly composite analysis. The filters were sent to Energy Labs in Casper, Wyoming for analysis of U-nat, Ra-226, Th-230, and Pb-210. Analytical data is provided on **Table 1**.

All radionuclide concentrations were significantly less than the Effluent Concentration Limit (ECL) and comparable to the background levels represented by HV-3. All concentrations were below the ALARA constraint value of 20% of the ECL. The data shows a slight increasing trend for U-nat at HV-2 compared to previous monitoring periods, from the start of operations in the third quarter 2013, which is not unexpected since the monitoring station is just downwind of the Plant. The U-nat concentrations are still much less than the ECL (3.6%). The other parameter data (not shown) follows no apparent trends.

Calibration of each air sampler flow rate is performed annually with an F&J Specialty air flow calibrator model CD-802V.2-1-O. The air flow calibrator is sent to the manufacturer annually for calibration.

3.0 SURFACE WATER

As stated in TR Section 5.7.8.2, surface water samples are not routinely collected since surface water does not typically exist due to the ephemeral nature of drainages at the site. However, the existing automatic storm water samplers at locations LC1 through LC13 remain in place to allow for monitoring of runoff following any unplanned releases. If sufficient runoff from precipitation events has occurred, surface water may have accumulated in the sampler and be retrieved for analysis. Analytical parameters that will be requested include suspended and dissolved U-nat, Ra-226, and if feasible Th-230. The analysis of Pb-210 and Po-210 required in RG 4.14 is typically not feasible due to volume being limited to 1 liter.

No storm water had accumulated in the samplers during the reporting period and therefore no results are available to report (**Table 2**).

4.0 PUBLIC GROUNDWATER

The public groundwater wells near the project area are Bureau of Land Management (BLM) wells used for stock watering purposes. Four BLM wells, BLM-4451, BLM-4775, BLM-4777 and BLM-EEN, are in operation intermittently and sampled quarterly if they are operating. As described in TR Section 5.7.8.2 *Private Well Monitoring* samples are to be analyzed for U-nat and Ra-226 only. No wells were in operation during the reporting period and therefore no samples were collected for analysis.



5.0 SOILS

Soil sampling is conducted annually during operations in accordance with RG 4.14 typically in the spring. No samples were collected during the reporting period (**Table 4**) since they were collected in the previous period.

6.0 PASSIVE GAMMA RADIATION

Gamma radiation is measured on a quarterly basis by the use of environmental dosimeters placed at the passive radiation (PR) sampling locations PR-1 through PR-12. Potential exposure rates were determined by the use of X9 Environmental/Low Level dosimetry badges supplied by Landauer. The dosimeters were deployed for the approximate duration of each calendar quarter and sent to Landauer for analysis. The data is reported as gross dose in mrem for the monitoring quarter. The results of dosimeter exposure are provided in milliroentgens per quarter (mR/qtr) and (mR/day) on **Table 5**. The gamma rates are slightly higher during the period (including the background levels) but remain consistent with background levels demonstrating no significant increases due to operations.

7.0 PASSIVE RADON

Radon-222 (Rn-222) gas is quantified using Landauer Radtrak® long-term monitors equipped with a thoron-proof filter in order to measure only Rn-222. Radon quantities in air are determined on a quarterly basis (**Table 6**) using radon detectors at sampling locations co-located with the environmental dosimeters at PR-1 through PR-12. Five monitors, PR-1, PR-2, PR-3, PR-5, and PR-10, are co-located with the air particulate sampling locations HV-1 through HV-5. Background values are represented by PR-2 (co-located with HV-3) and have not been subtracted from the results. The detection limit specified by the manufacturer for Radtrak monitors is 0.33 pCi/L ($3.3\text{E-}10$ $\mu\text{Ci/mL}$) over 90 days. The radon concentrations are consistent with background levels (PR-2) and are slightly higher overall than results from the previous reporting period. All radon values are below the ECL.

Supplemental Passive Radon

To aid in quantifying radon potentially released from the Plant, additional Radtrak monitors have been deployed at areas within or directly adjacent to the Plant. These monitors are intended to detect radon potentially vented out of the Plant by the use of the HVAC system. Two monitors (North Vent and South Vent) are affixed on the main HVAC exhaust vents in the Plant, one monitor (Plant Shop Vent) is affixed on the shop area exhaust vent on the east wall, and six monitors (Pond-1, -3, -4, -6, N Pond, and S Pond) are affixed to the Storage Pond perimeter fence at locations directly downwind of the Plant. The supplemental Rn-222 results are included on **Table 6**. The results are all consistent with background levels with the exception of the monitors within the Plant (South Vent and Plant Shop Vent) for the fourth quarter that fell onto the floor. This may be the result of the radon collecting at the floor due to radon's higher density.



TABLES

**Table 1: Radiological Air Particulate Data
Second Half of 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Period	Radionuclide	Measured Conc.	Error Estimate (Precision)	Lab MDC or Reporting Limit (RL)	RG 4.14 LLD	ECL	% ECL*
			$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	
HV-1	2015 Q3	U-nat (W)	1.50E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	1.20E-16	6.50E-17	8.70E-17	1.00E-16	3.00E-14	0.4%
		Ra-226	1.20E-16	8.80E-17	1.20E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	1.10E-14	2.10E-15	1.60E-15	2.00E-15	6.00E-13	1.8%
	2015 Q4	U-nat (W)	3.40E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	1.30E-16	5.50E-17	6.30E-17	1.00E-16	3.00E-14	0.4%
		Ra-226	3.70E-16	1.60E-17	1.60E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	2.10E-14	3.70E-15	1.80E-15	2.00E-15	6.00E-13	3.5%
HV-2	2015 Q3	U-nat (W)	9.00E-15	--	1.00E-16 (RL)	1.00E-16	9.00E-13	1.0%
		Th-230 (Y)	6.30E-17	3.40E-17	4.10E-17	1.00E-16	3.00E-14	0.2%
		Ra-226	2.50E-16	8.70E-17	7.90E-17	1.00E-16	9.00E-13	0.0%
		Pb-210	8.70E-15	1.60E-15	9.80E-16	2.00E-15	6.00E-13	1.5%
	2015 Q4	U-nat (W)	3.20E-14	--	1.00E-16 (RL)	1.00E-16	9.00E-13	3.6%
		Th-230 (Y)	2.50E-16	4.70E-17	7.50E-17	1.00E-16	3.00E-14	0.8%
		Ra-226	4.30E-16	1.70E-16	1.40E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	2.30E-14	3.90E-15	1.80E-15	2.00E-15	6.00E-13	3.8%
HV-3 (background)	2015 Q3	U-nat (W)	1.40E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	1.10E-16	5.80E-17	7.60E-17	1.00E-16	3.00E-14	0.4%
		Ra-226	2.20E-16	1.20E-16	1.40E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	1.00E-14	2.00E-15	1.60E-15	2.00E-15	6.00E-13	1.7%
	2015 Q4	U-nat (W)	3.40E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	1.60E-16	6.50E-17	7.40E-17	1.00E-16	3.00E-14	0.5%
		Ra-226	2.90E-16	1.40E-16	1.40E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	2.30E-14	4.00E-15	1.80E-15	2.00E-15	6.00E-13	3.8%
HV-4	2015 Q3	U-nat (W)	1.00E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	5.10E-17	3.10E-17	4.20E-17	1.00E-16	3.00E-14	0.2%
		Ra-226	1.30E-16	7.10E-17	9.10E-17	1.00E-16	9.00E-13	0.0%
		Pb-210	7.90E-15	1.50E-15	1.20E-15	2.00E-15	6.00E-13	1.3%
	2015 Q4	U-nat (W)	4.03E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	7.73E-17	5.38E-17	7.06E-17	1.00E-16	3.00E-14	0.3%
		Ra-226	2.25E-16	1.75E-16	2.12E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	1.82E-14	3.50E-15	2.62E-15	2.00E-15	6.00E-13	3.0%
HV-5	2015 Q3	U-nat (W)	1.20E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	1.20E-16	3.10E-17	8.70E-17	1.00E-16	3.00E-14	0.4%
		Ra-226	1.80E-16	7.10E-17	1.50E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	1.50E-14	1.50E-15	1.80E-15	2.00E-15	6.00E-13	2.5%
	2015 Q4	U-nat (W)	3.20E-16	--	1.00E-16 (RL)	1.00E-16	9.00E-13	0.0%
		Th-230 (Y)	5.40E-17	3.70E-17	5.00E-17	1.00E-16	3.00E-14	0.2%
		Ra-226	3.60E-16	1.60E-16	1.40E-16	1.00E-16	9.00E-13	0.0%
		Pb-210	1.50E-14	2.80E-15	1.90E-15	2.00E-15	6.00E-13	2.5%

* The %ECL should be less than 20% to meet the 10 CFR 20.1101(d) ALARA constraint
MDC: Minimum detectable concentration
LLD: Lower limit of detection
ECL: Effluent Concentration Limit (10 CFR 20 App B Table 2)
Italics: Indicates non-detect. Number represents detection limit
W or Y: Solubility class

**Table 2: Surface Water Sample Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Date	Sample Type	Radio-nuclide	Measured Conc.	Error Estimate (Precision)	Lab MDC or Reporting Limit (RL)	RG 4.14 LLD	Comments
				$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	
LC1	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC2	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC3	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC4	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC5	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC6	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC7	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC8	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC9	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC10	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC11	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC12	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
LC13	N/A	Stormwater	U-nat	--	--	--	2.00E-10	No sample/Insufficient runoff
			Ra-226	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	

LLD: Limit of Detection

**Table 3: Groundwater Sample Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Date	Radionuclide	Measured Conc.	Error Estimate (Precision)	Lab LLD or Reporting Limit (RL)	RG 4.14 LLD	ECL	% ECL	Comments
			$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$		
BLM-4451	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
BLM-4775	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
BLM-4777	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
BLM-EEN	(2015Q3)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		
	(2015Q4)	U-nat (diss)	--	--	--	2.00E-10	3.00E-07		Well not operating
		U-nat (susp)	--	--	--	2.00E-10	3.00E-07		
		Ra-226 (diss)	--	--	--	2.00E-10	6.00E-08		
		Ra-226 (susp)	--	--	--	2.00E-10	6.00E-08		

Italics: Indicates non-detect. Number represents detection limit
ECL: Effluent Concentration Limit from 10 CFR 20 Appendix B Table 2

**Table 4: Soil Sample Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Date	Radio-nuclide	Measured Conc.	Error Estimate (Precision)	Lab MDC or Reporting Limit	RG 4.14 LLD	Comments
			$\mu\text{Ci/g}$	$\pm \mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	
HV-1	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Th-230	--	--	--	2.00E-07	
		Ra-226	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	
HV-2	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Th-230	--	--	--	2.00E-07	
		Ra-226	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	
HV-3 (background)	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Ra-226	--	--	--	2.00E-07	
		Th-230	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	
HV-4	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Th-230	--	--	--	2.00E-07	
		Ra-226	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	
HV-4 Dup RPD	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Th-230	--	--	--	2.00E-07	
		Ra-226	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	
HV-5	N/A	U-nat	--	--	--	2.00E-07	Sampled first half
		Th-230	--	--	--	2.00E-07	
		Ra-226	--	--	--	2.00E-07	
		Pb-210	--	--	--	2.00E-07	

MDC: Minimum detectable concentration

LLD: Lower limit of detection

RPD: Relative Percent Difference

**Table 5: Passive Gamma Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Period	Start Date	End Date	Deploy Duration	Gross Exposure	Gross Exposure Rate	Comments
				days	mR/qtr	mR/day	
PR-1 (HV-1)	2015Q3	1-Jul-2015	30-Sep-2015	91	61.7	0.68	
	2015Q4	1-Oct-2015	31-Dec-2015	91	54.4	0.60	
PR-2 (HV-3, bkg)	2015Q3	1-Jul-2015	30-Sep-2015	91	59.5	0.65	
	2015Q4	1-Oct-2015	31-Dec-2015	91	60.2	0.66	
PR-3 (HV-5)	2015Q3	1-Jul-2015	30-Sep-2015	91	62.1	0.68	
	2015Q4	1-Oct-2015	31-Dec-2015	91	60.5	0.66	
PR-4	2015Q3	1-Jul-2015	30-Sep-2015	91	69.3	0.76	
	2015Q4	1-Oct-2015	31-Dec-2015	91	75.5	0.83	
PR-5 (HV-2)	2015Q3	1-Jul-2015	30-Sep-2015	91	66.4	0.73	
	2015Q4	1-Oct-2015	31-Dec-2015	91	67.4	0.74	
PR-6	2015Q3	1-Jul-2015	30-Sep-2015	91	63.6	0.70	
	2015Q4	1-Oct-2015	31-Dec-2015	91	64.8	0.71	
PR-7	2015Q3	1-Jul-2015	30-Sep-2015	91	70.5	0.77	
	2015Q4	1-Oct-2015	31-Dec-2015	91	66.1	0.73	
PR-8	2015Q3	1-Jul-2015	30-Sep-2015	91	65.0	0.71	
	2015Q4	1-Oct-2015	31-Dec-2015	91	61.7	0.68	
PR-9	2015Q3	1-Jul-2015	30-Sep-2015	91	70.6	0.78	
	2015Q4	1-Oct-2015	31-Dec-2015	91	73.8	0.81	
PR-10 (HV-4)	2015Q3	1-Jul-2015	30-Sep-2015	91	74.6	0.82	
	2015Q4	1-Oct-2015	31-Dec-2015	91	83.4	0.92	
PR-10 Dup <i>RPD</i>	2015Q3	1-Jul-2015	30-Sep-2015	91	80.0	0.88	
					7		
<i>RPD</i>	2015Q4	1-Oct-2015	31-Dec-2015	91	84.7	0.93	
					2		
PR-11	2015Q3	1-Jul-2015	30-Sep-2015	91	64.7	0.71	
	2015Q4	1-Oct-2015	31-Dec-2015	91	72.5	0.80	
PR-12	2015Q3	1-Jul-2015	30-Sep-2015	91	55.1	0.61	
	2015Q4	1-Oct-2015	31-Dec-2015	91	68.0	0.75	

RPD: Relative percent difference

**Table 6: Passive Radon Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Period	Start Date	End Date	Period Duration	Rn-222 Conc.	Error Estimate	Rn-222 Avg. Conc.	Error Estimate	RG 4.14 LLD	ECL	% ECL	Comments
				days	μCi/mL-days	+/- μCi/mL-days	μCi/mL	+/- μCi/mL	μCi/mL	μCi/mL		
PR-1 (HV-1)	2015Q3	6/29/2015	10/1/2015	94	1.54E-07	1.10E-08	1.60E-09	1.20E-10	2.00E-10	1.00E-08	16%	
	2015Q4	10/1/2015	1/11/2016	102	9.19E-08	7.91E-09	9.00E-10	8.00E-11	2.00E-10	1.00E-08	9.0%	
PR-2 (HV-3, bkg)	2015Q3	6/29/2015	10/1/2015	94	2.09E-07	1.31E-08	2.20E-09	1.40E-10	2.00E-10	1.00E-08	22.0%	
	2015Q4	10/1/2015	1/11/2016	102	2.91E-07	1.55E-08	2.90E-09	1.50E-10	2.00E-10	1.00E-08	29.0%	
PR-3 (HV-5)	2015Q3	6/29/2015	10/1/2015	94	1.85E-07	1.22E-08	2.00E-09	1.30E-10	2.00E-10	1.00E-08	20.0%	
	2015Q4	10/1/2015	1/11/2016	102	2.77E-07	1.51E-08	2.70E-09	1.50E-10	2.00E-10	1.00E-08	27.0%	
PR-4	2015Q3	6/29/2015	10/2/2015	95	2.12E-07	1.32E-08	2.20E-09	1.40E-10	2.00E-10	1.00E-08	22.0%	
	2015Q4	10/2/2015	1/14/2016	104	3.44E-07	1.70E-08	3.30E-09	1.60E-10	2.00E-10	1.00E-08	33.0%	
PR-5 (HV-2)	2015Q3	6/29/2015	10/2/2015	95	1.85E-07	1.22E-08	1.90E-09	1.30E-10	2.00E-10	1.00E-08	19.0%	
	2015Q4	10/2/2015	1/14/2016	104	3.13E-07	1.61E-08	3.00E-09	1.60E-10	2.00E-10	1.00E-08	30.0%	
PR-6	2015Q3	7/2/2015	10/1/2015	91	1.68E-07	1.16E-08	1.80E-09	1.30E-10	2.00E-10	1.00E-08	18.0%	
	2015Q4	10/1/2015	1/14/2016	105	2.32E-07	1.37E-08	2.20E-09	1.30E-10	2.00E-10	1.00E-08	22.0%	
PR-7	2015Q3	7/2/2015	10/1/2015	91	1.82E-07	1.21E-08	2.00E-09	1.30E-10	2.00E-10	1.00E-08	20.0%	
	2015Q4	10/1/2015	1/14/2016	105	2.74E-07	1.50E-08	2.60E-09	1.40E-10	2.00E-10	1.00E-08		
PR-8	2015Q3	7/2/2015	10/1/2015	91	2.75E-07	1.53E-08	3.00E-09	1.70E-10	2.00E-10	1.00E-08	30.0%	
	2015Q4	--	--	--	--	--	--	--	2.00E-10	1.00E-08	--	
PR-9	2015Q3	7/2/2015	10/2/2015	92	2.03E-07	1.29E-08	2.20E-09	1.40E-10	2.00E-10	1.00E-08	22.0%	
	2015Q4	10/2/2015	1/14/2016	104	4.10E-07	1.87E-08	3.90E-09	1.80E-10	2.00E-10	1.00E-08	39.0%	
PR-10 (HV-4)	2015Q3	6/29/2015	10/1/2015	94	2.24E-07	1.36E-08	2.40E-09	1.40E-10	2.00E-10	1.00E-08	24.0%	
	2015Q4	10/1/2015	1/11/2016	102	2.49E-07	1.42E-08	2.40E-09	1.40E-10	2.00E-10	1.00E-08	24.0%	
PR-10Dup RPD	2015Q3	6/29/2015	10/1/2015	94	2.46E-07 9	1.43E-08	2.60E-09 8	1.50E-10	2.00E-10	1.00E-08	26.0%	
	2015Q4	10/1/2015	1/11/2016	102	2.65E-07 6	1.47E-08	2.60E-09 8	1.40E-10	2.00E-10	1.00E-08	26.0%	
PR-11	2015Q3	6/29/2015	10/1/2015	94	--	--	--	--	2.00E-10	1.00E-08	--	Damaged
	2015Q4	10/1/2015	1/14/2016	105	3.21E-07	1.64E-08	3.10E-09	1.60E-10	2.00E-10	1.00E-08	31.0%	
PR-12	2015Q3	7/2/2015	10/1/2015	91	2.71E-07	1.49E-08	2.60E-09	1.40E-10	2.00E-10	1.00E-08	--	
	2015Q4	10/1/2015	1/14/2016	105	2.18E-07	1.34E-08	2.30E-09	1.40E-10	2.00E-10	1.00E-08	--	
Ponds 1	2015Q3	7/2/2015	10/2/2015	92	1.91E-07	1.24E-08	2.10E-09	1.40E-10	2.00E-10	1.00E-08	21.0%	
	2015Q4	10/2/2015	1/14/2016	104	2.96E-07	1.57E-08	2.80E-09	1.50E-10	2.00E-10	1.00E-08	28.0%	

**Table 6: Passive Radon Data
Second Half 2015
Lost Creek ISR Project SUA-1598**

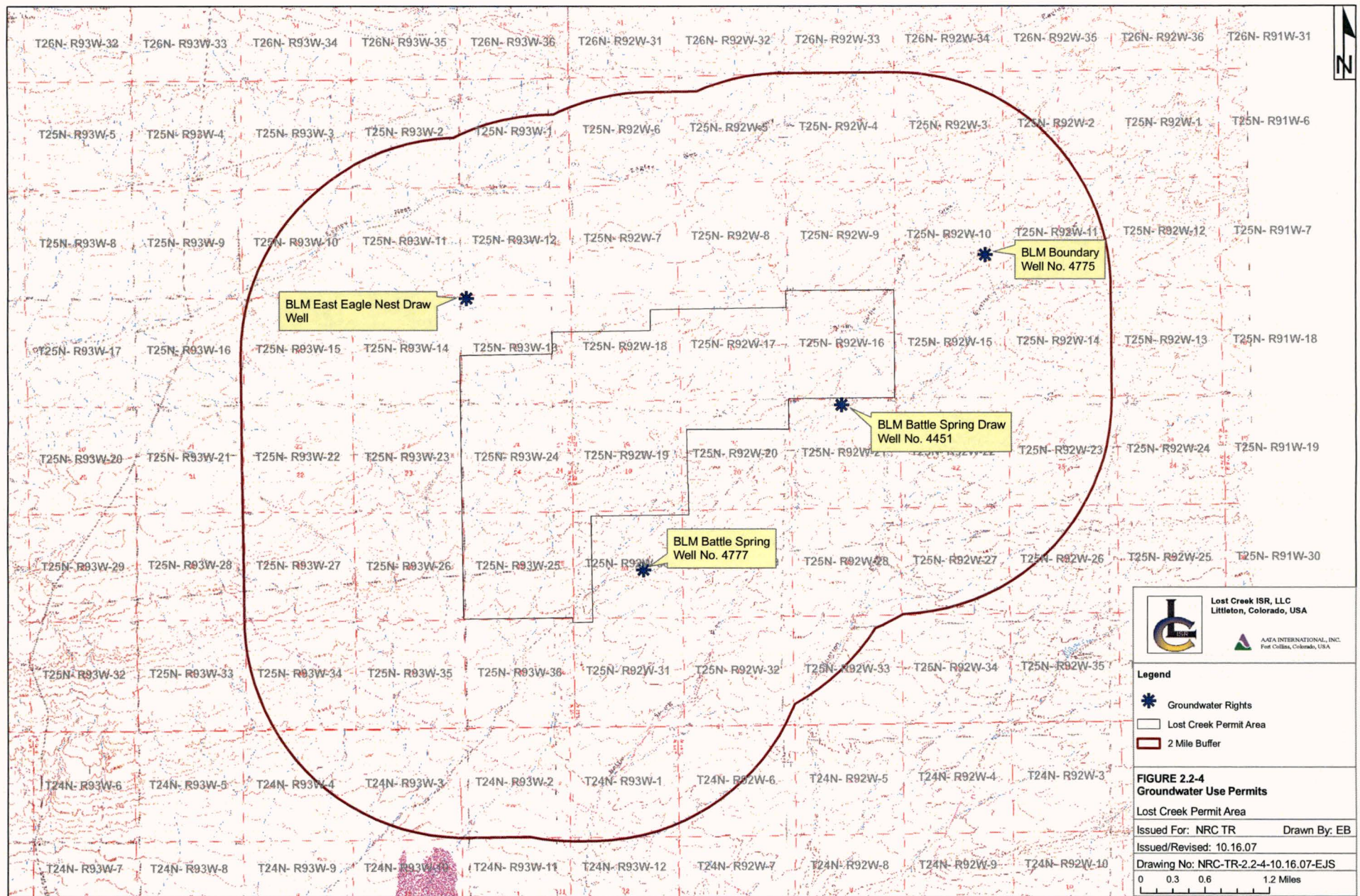
Sample Location	Sample Period	Start Date	End Date	Period Duration days	Rn-222 Conc. $\mu\text{Ci/mL-days}$	Error Estimate $\pm \mu\text{Ci/mL-days}$	Rn-222 Avg. Conc. $\mu\text{Ci/mL}$	Error Estimate $\pm \mu\text{Ci/mL}$	RG 4.14 LLD $\mu\text{Ci/mL}$	ECL $\mu\text{Ci/mL}$	% ECL	Comments
Ponds 3	2015Q3	7/2/2015	10/2/2015	92	2.13E-07	1.32E-08	2.30E-09	1.40E-10	2.00E-10	1.00E-08	23.0%	
	2015Q4	10/2/2015	1/14/2016	104	2.66E-07	1.47E-08	2.60E-09	1.40E-10	2.00E-10	1.00E-08	26.0%	
Ponds 4	2015Q3	7/2/2015	10/2/2015	92	1.76E-07	1.18E-08	1.90E-09	1.30E-10	2.00E-10	1.00E-08	19.0%	
	2015Q4	10/2/2015	1/14/2016	104	2.54E-07	1.44E-08	2.40E-09	1.40E-10	2.00E-10	1.00E-08	24.0%	
Ponds 6	2015Q3	7/2/2015	10/2/2015	92	1.67E-07	1.15E-08	1.80E-09	1.30E-10	2.00E-10	1.00E-08	18.0%	
	2015Q4	10/2/2015	1/14/2016	104	2.77E-07	1.51E-08	2.70E-09	1.50E-10	2.00E-10	1.00E-08	27.0%	
N Pond	2015Q3	7/2/2015	10/2/2015	92	--	--	--	--	2.00E-10	1.00E-08	--	Damaged
	2015Q4	10/2/2015	1/14/2016	104	3.29E-07	1.66E-08	3.20E-09	1.60E-10	2.00E-10	1.00E-08	32.0%	
S Pond	2015Q3	7/2/2015	10/2/2015	92	1.98E-07	1.27E-08	2.10E-09	1.40E-10	2.00E-10	1.00E-08	21.0%	
	2015Q4	10/2/2015	1/14/2016	104	3.44E-07	1.70E-08	3.30E-09	1.60E-10	2.00E-10	1.00E-08	33.0%	
North Vent (Plant HVAC)	2015Q3	7/2/2015	10/12/2015	102	2.86E-07	1.56E-08	2.80E-09	1.50E-10	2.00E-10	1.00E-08	28.0%	
	2015Q4	--	--	--	--	--	--	--	2.00E-10	1.00E-08	--	Unit missing/lost
South Vent (Plant HVAC)	2015Q3	7/2/2015	10/12/2015	102	3.00E-07	1.60E-08	2.90E-09	1.60E-10	2.00E-10	1.00E-08	29.0%	
	2015Q4	10/12/2015	1/20/2016	100	8.69E-07	2.80E-08	8.70E-09	2.80E-10	2.00E-10	1.00E-08	87.0%	Fell onto floor
Plant Shop Vent	2015Q3	7/2/2015	10/12/2015	102	4.10E-07	1.90E-08	4.00E-09	1.90E-10	2.00E-10	1.00E-08	40.0%	Fell onto floor
	2015Q4	10/12/2015	1/20/2016	100	6.10E-07	2.32E-08	6.10E-09	2.30E-10	2.00E-10	1.00E-08	61.0%	
Plant Shop Vent Dup	2015Q3	7/2/2015	10/12/2015	102	4.02E-07	1.88E-08	3.90E-09	1.80E-10	2.00E-10	1.00E-08	39.0%	
	RPD				2		3					
	2015Q4	10/12/2015	1/20/2016	100	5.10E-07	2.10E-08	5.10E-09	2.10E-10	2.00E-10	1.00E-08	51.0%	
	RPD				18		18					

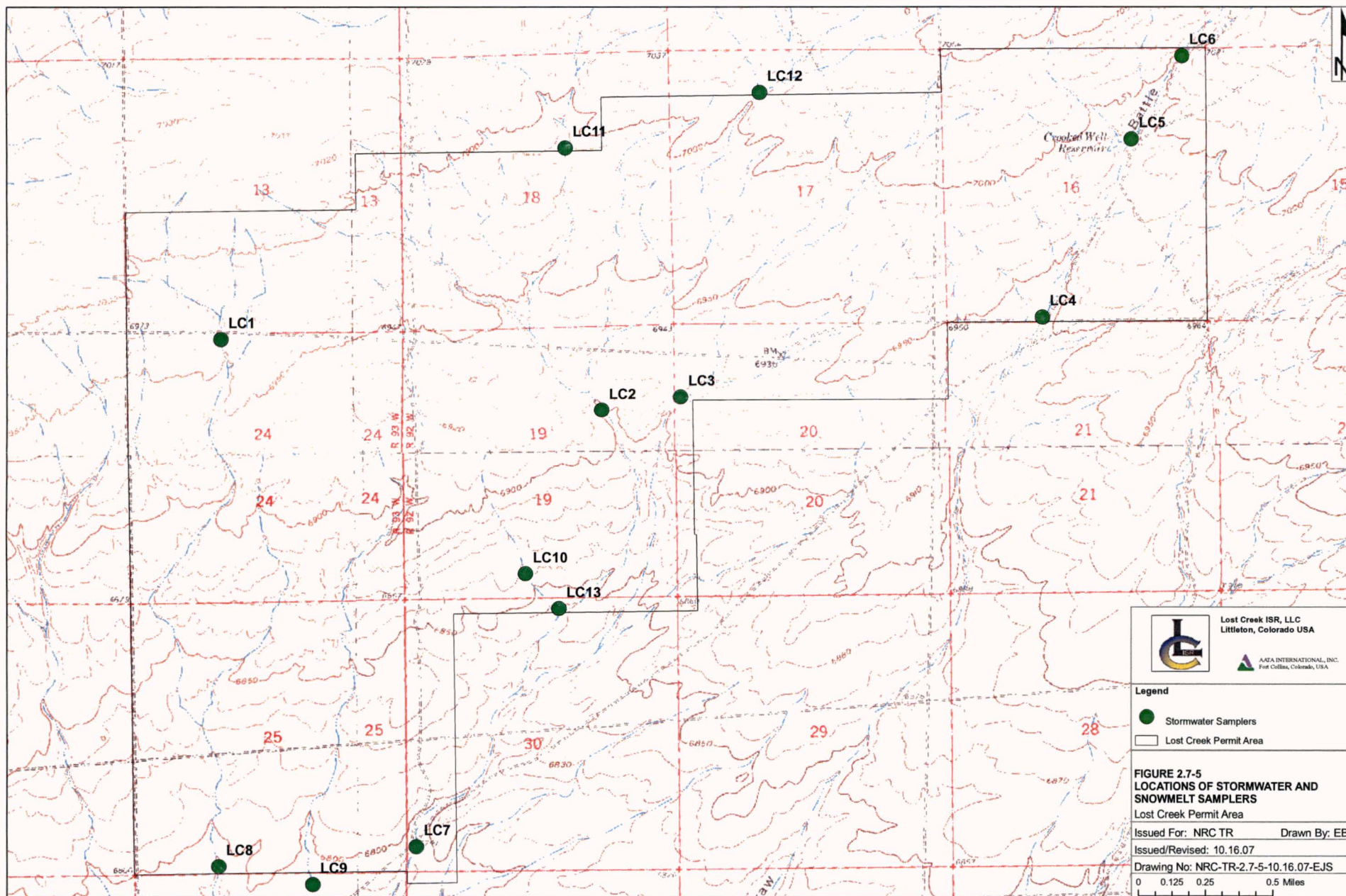
LLD: Lower Limit of Detection as suggested in Regulatory Guide (RG) 4.14


ECL: Effluent Concentration Limit from 10 CFR 20 App B Table 2




APPENDIX







Lost Creek ISR, LLC
Littleton, Colorado USA



AASA INTERNATIONAL, INC.
Fort Collins, Colorado, USA

Legend

- Stormwater Samplers
- Lost Creek Permit Area

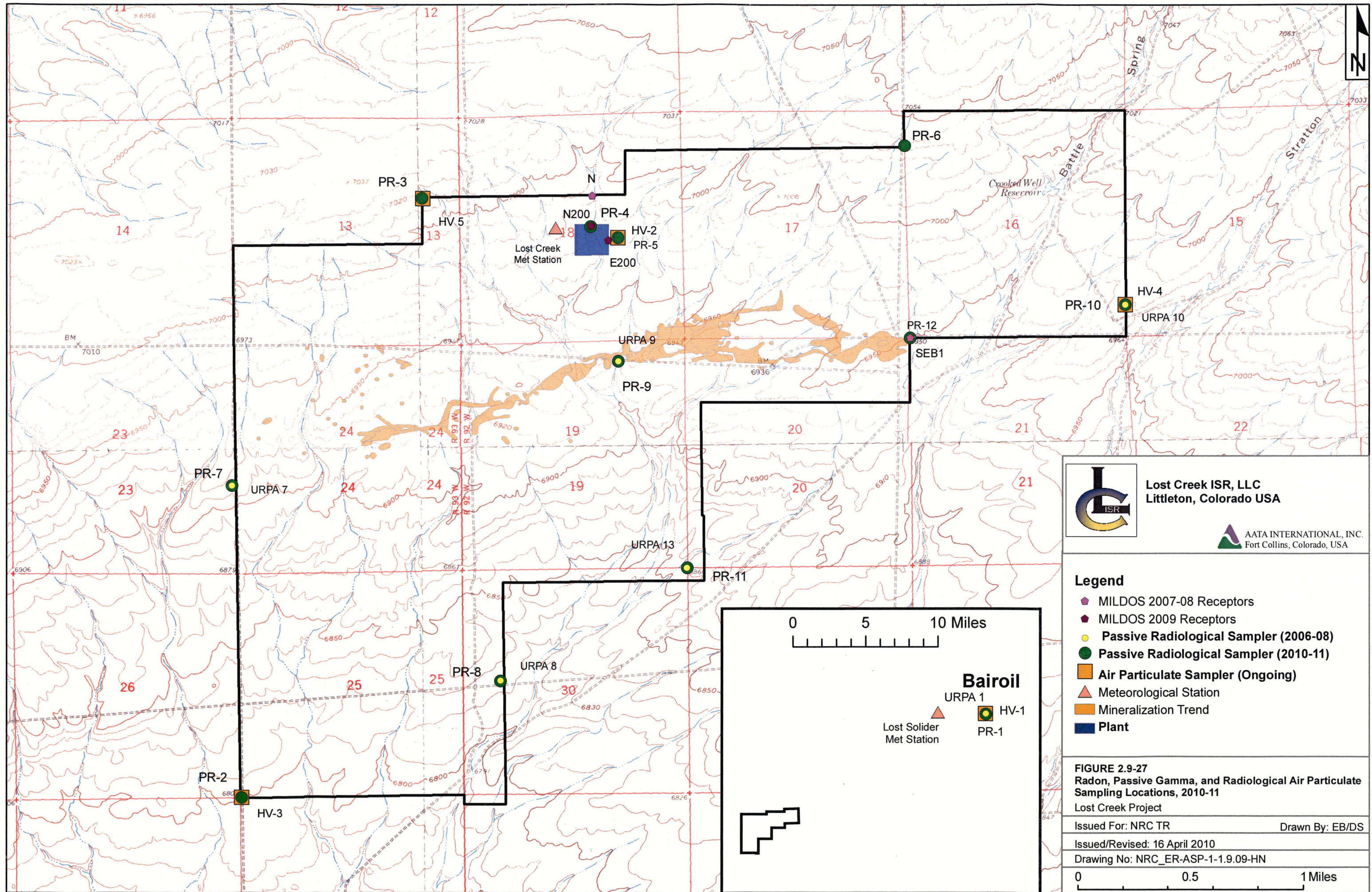
**FIGURE 2.7-5
LOCATIONS OF STORMWATER AND
SNOWMELT SAMPLERS**
Lost Creek Permit Area

Issued For: NRC TR Drawn By: EB

Issued/Revised: 10.16.07

Drawing No: NRC-TR-2.7-5-10.16.07-EJS

0 0.125 0.25 0.5 Miles



Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA

Legend

- MILDOS 2007-08 Receptors
- MILDOS 2009 Receptors
- Passive Radiological Sampler (2006-08)
- Passive Radiological Sampler (2010-11)
- Air Particulate Sampler (Ongoing)
- Meteorological Station
- Mineralization Trend
- Plant

FIGURE 2.9-27
Radon, Passive Gamma, and Radiological Air Particulate
Sampling Locations, 2010-11

Lost Creek Project

Issued For: NRC TR Drawn By: EB/DS

Issued/Revised: 16 April 2010

Drawing No: NRC_ER-ASP-1-1.9.09-HN

0 0.5 1 Miles