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LOST CREEK ISR, LLC

August 29, 2018

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

**Re: Semi-Annual Effluent and Environmental Monitoring Report 1st Half 2018
Lost Creek ISR Project License SUA-1598 Docket 40-9068**

To Whom It May Concern:

The attached Effluent and Environmental Monitoring Report for the first half of 2018 has been submitted pursuant to Lost Creek ISR, LLC's (LCI) Lost Creek ISR Project License SUA-1598 License Condition 11.1(D) in accordance with NRC Regulatory Guide (RG) 4.14, 10 CFR 40.65, LCI's NRC License Application Technical Report (TR) Section 5.7.7, and License Amendment 4 Safety Evaluation Report.

Some of the data was not available from the commercial laboratories as of the report due date. The data will be provided when it is received. If you have any questions regarding this submittal please contact me at the Casper office.

Sincerely,
Lost Creek ISR, LLC
By its Member/Manager, Ur-Energy USA Inc.

By: 
Michael Gaither
Manager EHS and Regulatory Affairs

Attachments: Semi-Annual Effluent and Environmental Monitoring Report for 1st Half 2018

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Lost Creek ISR, LLC is a wholly-owned subsidiary of Ur-Energy Inc.

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NM59

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**

January 1, 2018 to June 30, 2018

August 29, 2018



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1.0 INTRODUCTION

Environmental and effluent monitoring of air, water, and soil was conducted to quantify radionuclides and determine potential exposures 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 were 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 January 1 through June 30, 2018.

Data from the additional monitoring schemes described in the Safety Evaluation Report to Amendment 4 of the NRC License dated March 18, 2016 are also included.

In accordance with monitoring requirements in License Condition 10.20, quantities of radionuclides in the injectate from the Class V injection system are calculated from the concentration results and included herein.

The sampling and monitoring is therefore divided into the following categories:

- Radiological particulates in air
- Non-routine surface water
- Groundwater
- Soils
- Direct (Gamma) Radiation
- Radon and Radon Progeny
- Class V Injectate

The operational monitoring data is provided on **Tables 1** through **7**. Calculations are provided on **Tables 8** and **9** as a result of the monitoring. Sample locations are shown in **Figures 1** through **3**. Descriptions of the sampling locations associated with the monitoring categories are provided on the following summary tables:



Monitoring Category	Monitoring Location ID	Description
Radiological Particulates in Air; (Data Table 1) (Figure 3)	HV-2/E-13D	Located downwind approximately 50 ft to the east of the Plant. 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 northwest of the processing facility generally upwind of the Plant.
Surface Water (Data Table 2) (Figure 3)	Various Non-routine	Various locations of Autosamplers that may be used to collect samples as feasible.
Public Well Groundwater (Data Table 3) (Figure 3)	BLM-4451	Stock well (BLM Battle Spring Draw Well No. 4451) east of permit boundary
	BLM-4775	Stock well (BLM Boundary Well No. 4775) north east of permit boundary
	BLM-4777	Stock well (BLM Battle Spring Well No. 4777) south of permit boundary
	BLM-EEN	Stock well (BLM East Eagle Nest Draw Well) northwest of permit boundary
Soils (Data Table 4a & 4b)	HV-2 through HV-5	See description above
	Unplanned releases	Releases to soil at various locations
Passive Gamma Radiation (Data Table 5) (Figure 3)	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-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
Supplemental Gamma (Data Table 5) (Figure 2)	E10	SW corner Maintenance Building (Warehouse) – <i>Maximally exposed member of the public</i>
	E11	Just E of Maintenance Building
	E12	SW corner of Plant
	E13A	NE corner of Plant fence
	E13B	Just NE of Plant
	E13C	Downrange E of Plant area
	E13D	Same location as HV-2 and PR-5
	E13E	E side of Plant fence
	E13F	Just SE of Plant



Monitoring Category	Monitoring Location ID	Description
Passive Radon (Data Table 6a) (Figure 3)	E13G	SE corner of Plant fence
	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-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-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 6a) (Figure 1)	E1	Main Vent in Plant Shop
	E7	Various Header Houses
	E8	Various Injection Wellhead
	E9	Various Production Wellhead
Supplemental Passive Radon (Data Table 6a) (Figure 2)	E10	SW corner Maintenance Building (Warehouse) – <i>Maximally exposed member of the public</i>
	E11	Just E of Maintenance Building
	E12	SW corner of Plant
	E13A	NE corner of Plant fence
	E13B	Just NE of Plant
	E13C	Downrange E of Plant area
	E13D	Same location as HV-2 and PR-5
	E13E	E side of Plant fence
	E13F	Just SE of Plant
Radon Effluent (Data Table 8) (Figure 1)	E13G	SE corner of Plant fence
	E2	Precipitation tanks vent
	E3	Eluate tanks vent
	E4	Waste water tanks vent
	E5	Resin water tanks vent
	E6	Shaker deck vent
	E14	RO System Tank
	E15	RO Permeate Tank
Radon Progeny (Data Table 6b)	E16	Class V Holding Tank
	E1; E10 through E13G	Described above
Class V Injectate (Table 7)	Class V Composite	Class V Injection system monthly composite sample



2.0 RADIOLOGICAL PARTICULATES IN AIR

Operational air particulate sampling for LC-ISR was conducted at four locations HV-2 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 approximately 30 L/min. Filters were typically changed weekly (as feasible considering winter limitations), batched, and submitted for quarterly composite analysis. The filters were sent to Inter-Mountain Labs in Casper, WY for analysis of U-nat, Ra-226, Th-230, and Pb-210. Analytical data is provided on **Table 1a**.

All radionuclide concentrations at the HVs were significantly less than the Effluent Concentration Limit (ECL) and comparable to the background levels represented by HV3. All concentrations were below the ALARA constraint value of 20% of the ECL. The concentration for U-nat at HV2 just downwind of the Plant which is typically greater than background was less than previous results and only slightly greater than background. The other parameter data were consistent with previous results, follow no apparent trends, and are significantly low.

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.

Uranium particulates were sampled to characterize concentrations at the various downwind locations E10 through E13G. The results are provided on **Table 1b**. Samples were collected on glass fiber filter paper using F&J Specialty air sampling model DF-40L-8 and operating at a rate of approximately 30 L/min. Sample duration varied and ranged from 129 – 272 minutes. Filters were counted for alpha activity which was conservatively assumed to be from uranium for determination of concentration. Due to shorter sampling times compared to continuous monitoring of the HV locations, the LLDs for discrete uranium particulate sampling are greater.

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, automatic storm water samplers are used to allow monitoring of runoff following any unplanned releases that significantly impact drainage. Analytical parameters that are typically requested include U-nat and Ra-226 since the analysis of Th-230, Pb-210, and Po-210 required in RG 4.14 is typically not feasible due to the limited volume of sample.

Samples of storm water runoff were collected during the reporting period via autosampler at LC2A, LC3 and LC14. Downstream sampler LC2A is a replacement for LC2 and LC14 was installed in 2017 to monitor runoff upstream of MU1 drainage. The samplers were utilized to monitor the runoff in the drainage that passes through MU1 to assess potential spill impacts. Only two parameters, U-nat (total) and Ra-226 (total), were analyzed due to the limited volume. Results are provided on **Table 2**. The results for U-nat and Ra-226 at the three locations have been slightly elevated compared to the pre-operational background values. The concentrations



at LC2A are elevated for both parameters compared to previous results. LC3 uranium is near background levels and there was insufficient volume for Ra-226 analysis. For LC14 (upstream), uranium is less than previous results and Ra-226 concentrations are slightly greater. Additional data is necessary to determine if there are any meaningful trends in the concentrations of constituents.

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, BLM4451, BLM4775, BLM4777 and BLMEEN, are in operation intermittently and sampled quarterly if they are operating. As described in TR Section 5.7.8.2 *Private Well Monitoring* samples have been analyzed for U-nat and Ra-226. However, going forward, the water will be analyzed for Th-230, Pb-210, and Po-210 in addition to U-nat and Ra-226 in accordance with Regulatory Guide 4.14.

None of the wells were in operation during the reporting period and therefore no samples were collected.

5.0 SOILS

Soil sampling is conducted annually during operations at the air particulate monitoring locations in accordance with RG 4.14 typically in the spring. Samples were collected on June 14, 2018 from the four air monitoring station locations. The soil was analyzed for U-nat, Ra-226 and Pb-210 the results of which were consistent with previous results and are on the order of background levels and no significant trends are apparent.

When data is available, effluent to soil from reportable unplanned releases is quantified on **Table 4**. Soil samples from the 0-15cm interval are collected from the areas impacted by reportable spills. No reportable unplanned releases occurred during the reporting period. When applicable, net concentration of uranium and Ra-226 is the result of analysis of impacted soil minus the average pre-operational background values.

6.0 DIRECT RADIATION

Gamma radiation is measured on a quarterly basis at the passive radiation (PR) sampling locations PR-2 through PR-5, PR-9, and PR-10 and at Plant-area locations E10 through E13G. Four monitor locations, PR-2, PR-3, PR-5, and PR-10, are co-located with the air particulate sampling locations HV-2 through HV-5. Potential exposure rates were determined by the use of X9 Environmental/Low Level dosimetry badges supplied by Landauer or by direct measurement with a Ludlum Model 19 instrument. The dosimeters were deployed at the PR locations and the retrieved dosimeters were sent to Landauer for analysis. Gamma exposure at locations E10 through E13G was measured with a Model 19 gamma detector.



The data is reported as a gross dose in millirem (mrem) for the monitoring quarter and net exposure following subtraction of the background dosimeter value at PR-2 and thus the results of exposure measurement are provided in mrem per quarter (mrem/qtr) on **Table 5**. The gamma rates remain consistent with background levels demonstrating no significant increases due to operations. The results of PR-10 on the eastern boundary of the project have been elevated from the other locations since monitoring began and may be due to the effects of mineralization trends in that area.

7.0 RADON AND RADON PROGENY

Passive Radon

Radon-222 (Rn-222) gas was quantified using Landauer RapiDOS® long-term monitors equipped with a thoron-proof filter in order to measure only Rn-222. The detection limit, based on information specified by the manufacturer; for RapiDOS monitors is 0.11 pCi/L (1.08E-10 $\mu\text{Ci/mL}$) over 90 days. Radon quantities in air are determined on a quarterly basis (**Table 6a**) using radon detectors PR-2 through PR-6, PR-9, PR-10 and PR-12. Four monitors, PR-2, PR-3, PR-5, and PR-10, are co-located with the air particulate sampling locations HV-2 through HV-5. Additionally, passive radon monitoring was conducted at the added wellfield locations E7 through E9 and the Plant area locations E10 through E13G. These supplemental Rn-222 results are included on **Table 6a**.

Results have been adjusted for background by subtracting the PR-2 location data from the gross results of the locations. The radon concentrations for the PR locations are consistent with background levels. With the exception of PR-10 which was slightly elevated similarly to the elevated gamma levels in that area likely due to natural causes. Concentrations for the first quarter that were greater than the ECL include the aforementioned PR-10 as well as indoor monitor E1.

Radon Progeny Sampling

Sampling to quantify radon progeny using the Modified Kusnetz method was conducted at the additional locations E7 through E13G. The results are provided reported on **Table 6b** in milliWorking Levels (mWL) of radon. The mWL were converted to $\mu\text{Ci/mL}$ using the $1\text{WL} = 100\text{ pCi/L}$ conversion factor. Potential doses from progeny are negligible.

8.0 CLASS V INJECTION

In accordance with License Condition 10.20, injectate from the Class V injection system, permitted by the Wyoming Department of Environmental Quality Water Quality Division (WDEQ-WQD) Underground Injection Control (UIC) Program, is monitored for radionuclide concentrations on a monthly basis. Composite samples, comprised from daily aliquots during system operation, were collected and submitted to a contract lab for analysis to quantify the radionuclides in the injectate. The nuclide concentrations and discharge volumes are presented on **Table 7** and the radionuclide quantities were calculated in μCi and included therein. No concentrations of effluent exceeded the effluent limits with the exception of gross beta for



February and April. A request to the UIC Program for relief from beta limits was submitted in January 2018 and a decision is pending. In the interim, notifications are sent to UIC in the event that beta limits are exceeded in the quarterly discharge.

9.0 EFFLUENT QUANTITY

LCI has committed to quantifying effluent from point and diffuse sources at locations E1 through E9. Radon and radon progeny are the primary constituents in the effluent from the Plant venting and wellfield sources. The summary of the quantity of various radionuclides is provided on **Table 8**.

Because the venting is from wet processes, uranium particulates were not measured from Plant venting or injection or production wells since there would be no particulate effluent. However, air particulates were sampled in several header houses to conservatively calculate potential uranium content. The calculation is conservative since the concentration of uranium is determined from the gross alpha activity on the filter which also includes alpha activity from radon progeny. The average of the activity concentration measurements per quarter was used to determine the effluent value.

The effluent values for locations E1 and E7 through E9 were determined from the passive radon measurements and also from direct radon measurement. Radon measurement was conducted three times per quarter at the effluent locations E2 through E6 and E14 through E16 using a DurrIDGE RAD7 radon detector. The average concentration of the three measurements is provided for quarterly quantification. Radon progeny concentrations were determined, if not assumed to be in equilibrium with radon-222, by air sampling using the modified Kusnetz method and averaged for each quarter, if applicable. Where applicable, progeny was conservatively assumed to be in equilibrium with Rn-222 as committed in the License Amendment 4 Safety Evaluation Report.

The concentrations of radon are reported in uCi/mL and effluent quantities in both uCi and Ci of radon. Air flow volumes were calculated for each sample point.

The total effluent quantity, approximately 3 Ci for radon and radon progeny combined, is less than the previous reporting period and is significantly less than the projected effluent quantity for radon alone as listed on Table 6 of Attachment 7.2-1 of the Technical Report. To compare, the average (over 9 years of operation) of radon effluent as projected by MILDOS was 240 Ci.

10.0 COMPLIANCE WITH PUBLIC DOSE LIMITS

The demonstration of compliance with public dose limits and determination of public doses downwind of the Plant is facilitated by the additional monitoring at downwind locations E10 through E13G. A total effective dose equivalent (TEDE) is calculated for two different scenarios for members of the public based on the data collected for the various locations near the Plant.



A theoretical TEDE is determined for a casual member of the public with an estimated residence time of 4 hours per year in areas near and around the Plant. The potentially maximum exposed member of the public is declared to be for a delivery driver at location E10 with residence time of 52 hours per year. The theoretical TEDE for those individuals is provided on **Table 9**. The calculations demonstrate that for each scenario, the public dose limit of 100 mrem/yr is not exceeded.



TABLES

Table 1a: Environmental - Radiological Air Particulate Data
1st Half of 2018
Lost Creek ISR Project SUA-1598

Sample Location	Sample Period	Radio-nuclide	Conc.*	Error Estimate (Precision)	Lab MDC or RL	RG 4.14 LLD	ECL	% ECL**	Comments
			$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$		
HV2	2018Q1	U-nat	2.90E-15	---	1.00E-16	1.00E-16	9.00E-13	0.32%	
		Th-230	2.00E-16	1.40E-16	1.00E-16	1.00E-16	3.00E-14	0.67%	
		Ra-226	2.00E-16	4.80E-17	1.00E-16	1.00E-16	9.00E-13	0.02%	
		Pb-210	1.70E-14	1.30E-15	2.00E-15	2.00E-15	6.00E-13	2.83%	
	2018Q2	U-nat	Pend.	---	Pend.	1.00E-16	9.00E-13	Pend.	
		Th-230	Pend.	Pend.	Pend.	1.00E-16	3.00E-14	Pend.	
		Ra-226	Pend.	Pend.	Pend.	1.00E-16	9.00E-13	Pend.	
		Pb-210	Pend.	Pend.	Pend.	2.00E-15	6.00E-13	Pend.	
HV3 (Background)	2018Q1	U-nat	1.00E-16	---	1.00E-16	1.00E-16	9.00E-13	0.01%	Non-detect
		Th-230	2.30E-16	1.20E-16	1.00E-16	1.00E-16	3.00E-14	0.77%	Non-detect
		Ra-226	1.00E-16	---	1.00E-16	1.00E-16	9.00E-13	0.01%	
		Pb-210	1.60E-14	1.20E-15	2.00E-15	2.00E-15	6.00E-13	2.67%	
	2018Q2	U-nat	Pend.	---	Pend.	1.00E-16	9.00E-13	Pend.	
		Th-230	Pend.	Pend.	Pend.	1.00E-16	3.00E-14	Pend.	
		Ra-226	Pend.	Pend.	Pend.	1.00E-16	9.00E-13	Pend.	
		Pb-210	Pend.	Pend.	Pend.	2.00E-15	6.00E-13	Pend.	
HV4	2018Q1	U-nat	1.00E-16	---	1.00E-16	1.00E-16	9.00E-13	0.01%	Non-detect
		Th-230	1.00E-16	7.50E-17	1.00E-16	1.00E-16	3.00E-14	0.33%	
		Ra-226	1.10E-16	3.70E-17	1.00E-16	1.00E-16	9.00E-13	0.01%	
		Pb-210	1.70E-14	1.20E-15	2.00E-15	2.00E-15	6.00E-13	2.83%	
	2018Q2	U-nat	Pend.	---	Pend.	1.00E-16	9.00E-13	Pend.	
		Th-230	Pend.	Pend.	Pend.	1.00E-16	3.00E-14	Pend.	
		Ra-226	Pend.	Pend.	Pend.	1.00E-16	9.00E-13	Pend.	
		Pb-210	Pend.	Pend.	Pend.	2.00E-15	6.00E-13	Pend.	
HV5	2018Q1	U-nat	1.40E-16	---	1.00E-16	1.00E-16	9.00E-13	0.02%	
		Th-230	1.70E-16	1.40E-16	1.00E-16	1.00E-16	3.00E-14	0.57%	
		Ra-226	1.70E-16	4.70E-17	1.00E-16	1.00E-16	9.00E-13	0.02%	
		Pb-210	2.00E-14	1.60E-15	2.00E-15	2.00E-15	6.00E-13	3.33%	
	2018Q2	U-nat	Pend.	---	Pend.	1.00E-16	9.00E-13	Pend.	
		Th-230	Pend.	Pend.	Pend.	1.00E-16	3.00E-14	Pend.	
		Ra-226	Pend.	Pend.	Pend.	1.00E-16	9.00E-13	Pend.	
		Pb-210	Pend.	Pend.	Pend.	2.00E-15	6.00E-13	Pend.	

* Background not subtracted

** The %ECL should be less than 20% to meet the 10 CFR 20.1101(d) ALARA constraint

MDC: Minimum detectable concentration

RL: Reporting Limit

LLD: Lower limit of detection RG 4.14

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

**Table 1b: Uranium Air Particulate Data
1st Half of 2018
Lost Creek ISR Project SUA-1598**

Sample Location	Sample Period	Radio-nuclide	Alpha Conc-entration	Calculated LLD	RG 4.14 LLD	10CFR20 DAC	% DAC	Potential Dose (100% occupancy)	Comments
			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$		mrem/qr	
E10 (Max public)	2018Q1	U-nat	2.30E-13	8.82E-13	1.00E-16	3.00E-10	0.1%	4.2	
	2018Q2	U-nat	0.00E+00	6.44E-13	1.00E-16	3.00E-10	0.0%	0.0	
E11	2018Q1	U-nat	9.95E-13	8.82E-13	1.00E-16	3.00E-10	0.3%	18.2	
	2018Q2	U-nat	0.00E+00	6.44E-13	1.00E-16	3.00E-10	0.0%	0.0	
E12	2018Q1	U-nat	7.27E-13	8.82E-13	1.00E-16	3.00E-10	0.2%	13.3	
	2018Q2	U-nat	0.00E+00	6.44E-13	1.00E-16	3.00E-10	0.0%	0.0	
E13A	2018Q1	U-nat	7.65E-14	8.82E-13	1.00E-16	3.00E-10	0.0%	1.4	
	2018Q2	U-nat	1.55E-13	6.44E-13	1.00E-16	3.00E-10	0.1%	2.8	
E13B	2018Q1	U-nat	0.00E+00	8.82E-13	1.00E-16	3.00E-10	0.0%	0.0	
	2018Q2	U-nat	1.24E-12	6.44E-13	1.00E-16	3.00E-10	0.4%	22.6	
E13C	2018Q1	U-nat	2.30E-13	8.82E-13	1.00E-16	3.00E-10	0.1%	4.2	
	2018Q2	U-nat	0.00E+00	6.44E-13	1.00E-16	3.00E-10	0.0%	0.0	
E13D	2018Q1	U-nat	1.42E-12	8.82E-13	1.00E-16	3.00E-10	0.5%	25.8	
	2018Q2	U-nat	6.59E-13	6.44E-13	1.00E-16	3.00E-10	0.2%	12.0	
E13E	2018Q1	U-nat	3.06E-12	8.82E-13	1.00E-16	3.00E-10	1.0%	55.9	
	2018Q2	U-nat	1.94E-13	6.44E-13	1.00E-16	3.00E-10	0.1%	3.5	
E13F	2018Q1	U-nat	1.15E-13	8.82E-13	1.00E-16	3.00E-10	0.0%	2.1	
	2018Q2	U-nat	5.04E-13	6.44E-13	1.00E-16	3.00E-10	0.2%	9.2	
E13G	2018Q1	U-nat	1.07E-12	8.82E-13	1.00E-16	3.00E-10	0.4%	19.6	
	2018Q2	U-nat	7.75E-13	6.44E-13	1.00E-16	3.00E-10	0.3%	14.1	

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

LLD: Lower limit of detection RG 4.14

Table 2: Surface Water Sample Data
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample Location	Sample Date	Sample Type	Radio-nuclide	Measured Conc.	Error Estimate (Precision)	Lab MDC or RL	RG 4.14 LLD	Comments
				$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	
LC2A	5/17/2018	Storm Water	U-nat, total	7.04E-08	--	2.01E-10	2.00E-10	Insufficient sample volume
			Ra-226, total	1.46E-08	6.00E-10	2.00E-10	2.00E-10	
			Th-230	--	--	--	2.00E-10	
			Pb-210	--	--	--	2.00E-10	
			Po-210	--	--	--	2.00E-10	
LC3	5/17/2018	Storm Water	U-nat, total	2.68E-10	--	2.01E-10	2.00E-10	Insufficient sample volume
			Ra-226, total	--	--	--	2.00E-10	
			Th-230	--	--	--	2.00E-10	
			Pb-210	--	--	--	2.00E-10	
			Po-210	--	--	--	2.00E-10	
LC14	5/17/2018	Storm Water	U-nat, total	6.16E-09	--	2.01E-10	2.00E-10	Insufficient sample volume
			Ra-226, total	6.60E-09	4.00E-10	2.00E-10	2.00E-10	
			Th-230	--	--	--	2.00E-10	
			Pb-210	--	--	--	2.00E-10	
			Po-210	--	--	--	2.00E-10	

RL: Reporting Limit

LLD: Lower Limit of Detection

Table 3: Groundwater Sample Data
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample Location	Sample Date	Radionuclide	Measured Conc.	Error Estimate (Precision)	Lab MDC or Reporting Limit (RL)	RG 4.14 LLD	ECL	% ECL	Comments
			$\mu\text{Ci/mL}$	$\pm \mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$		
BLM4451	2018Q1	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
	2018Q2	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
BLM4775	2018Q1	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
	2018Q2	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	
		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	--	
BLM4777	2018Q1	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
	2018Q2	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
BLMEEN	2018Q1	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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	--	
	2018Q2	U-nat (diss)	--	--	--	2.00E-10	3.00E-07	--	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 4a: Soil Sample Data
1st Half 2018
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 Target LLD	Comments
			$\mu\text{Ci/g}$	$\pm \mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	
HV2	6/14/2018	U-nat	1.20E-06	---	1.35E-07	2.00E-07	
		Ra-226	1.70E-06	2.00E-07	1.35E-07	2.00E-07	
		Pb-210	9.00E-07	3.00E-07	1.35E-07	2.00E-07	
HV3 (Background)	6/14/2018	U-nat	1.10E-06	---	1.35E-07	2.00E-07	
		Ra-226	1.30E-06	1.00E-07	1.35E-07	2.00E-07	
		Pb-210	1.40E-06	3.00E-07	1.35E-07	2.00E-07	
HV4	6/14/2018	U-nat	2.00E-06	---	1.35E-07	2.00E-07	
		Ra-226	2.00E-06	2.00E-07	1.35E-07	2.00E-07	
		Pb-210	1.20E-06	3.00E-07	1.35E-07	2.00E-07	
HV5	6/14/2018	U-nat	1.00E-06	---	1.35E-07	2.00E-07	
		Ra-226	9.00E-07	1.00E-07	1.35E-07	2.00E-07	
		Pb-210	1.40E-06	3.00E-07	1.35E-07	2.00E-07	
HV DUP	6/14/2018	U-nat	ND	---	1.35E-07	2.00E-07	HV5 was source of duplicate
		Ra-226	1.00E-06	1.00E-07	1.35E-07	2.00E-07	
		Pb-210	1.40E-06	3.00E-07	1.35E-07	2.00E-07	

MDC: Minimum detectable concentration

LLD: Lower limit of detection

Table 4b: Effluent to Soil from Reportable Unplanned Releases
1st Half 2018
Lost Creek ISR Project SUA-1598

Release ID	Release Date	Net Release Volume <i>gal</i>	Radio-nuclide	Net Conc.*	Units	Quantity	Comments
						<i>Ci</i>	
N/A			U-nat		mg/kg	0.00E+00	No reportable releases occurred in Q2
			Ra-226		pCi/g	0.00E+00	
TOTAL			U-nat			0.00E+00	Ci
			Ra-226			0.00E+00	Ci

**Background subtracted from analytical results*

Table 5: Gamma Exposure Data
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample Location	Period	Method	Gross Exposure	Net*	Comments
			mrem/qtr	mrem/qtr	
PR-2 (HV3) (Background)	2018Q1	Dosimeter	53.9	0.0	
	2018Q2	Dosimeter	55.6	0.0	
PR-3 (HV5)	2018Q1	Dosimeter	57.2	3.3	
	2018Q2	Dosimeter	53.3	0.0	
PR-4	2018Q1	Dosimeter	64.9	11.0	
	2018Q2	Dosimeter	61.2	5.6	
PR-5/E13D (HV2)	2018Q1	Dosimeter	62.6	8.7	
	2018Q2	Dosimeter	65.0	9.4	
PR-9	2018Q1	Dosimeter	68.3	14.4	
	2018Q2	Dosimeter	69.4	13.8	
PR-10 (HV4)	2018Q1	Dosimeter	72.9	19.0	
PR-10 Dup	2018Q1	Dosimeter	80.6	26.7	
		RPD	10		
PR-10 (HV4)	2018Q2	Dosimeter	75.3	19.7	
PR-10 Dup	2018Q2	Dosimeter	76.0	20.4	
		RPD	1		
E10	2018Q1	Dosimeter	55.5	1.6	
(Max exposed public)	2018Q2	Dosimeter	49.5	0.0	
E10	2018Q1	Model 19**	42.5	0.0	
(Max exposed public)	2018Q2	Model 19**	43.2	0.0	
E11	2018Q1	Model 19**	51.8	0.0	
	2018Q2	Model 19**	56.2	0.6	
E12	2018Q1	Model 19**	50.4	0.0	
	2018Q2	Model 19**	66.2	10.6	
E13A	2018Q1	Model 19**	51.1	0.0	
	2018Q2	Model 19**	56.2	0.6	
E13B	2018Q1	Model 19**	69.1	15.2	
	2018Q2	Model 19**	74.9	19.3	
E13C	2018Q1	Model 19**	56.2	2.3	
	2018Q2	Model 19**	57.6	2.0	
E13D (PR-5/HV2)	2018Q1	Model 19**	63.4	9.5	
	2018Q2	Model 19**	72.0	16.4	
E13E	2018Q1	Model 19**	67.7	13.8	
	2018Q2	Model 19**	83.5	27.9	
E13F	2018Q1	Model 19**	57.6	3.7	
	2018Q2	Model 19**	63.4	7.8	
E13G	2018Q1	Model 19**	57.6	3.7	
	2018Q2	Model 19**	54.7	0.0	

RPD: Relative Percent Difference

* Net exposure = gross minus background (PR-2)

** Measurements averaged for the quarter

Table 6a: Passive Radon (Rn-222) Data
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample Location	Period	Conc.	Net* Conc.	Error Estimate	ECL†	% ECL	Comments
		µCi/mL	µCi/mL	+/- µCi/mL	µCi/mL		
PR-2 (HV-3) (Background)	2018Q1	9.70E-10	0.00E+00	1.70E-10	1.00E-10	0%	
	2018Q2	1.43E-09	0.00E+00	2.17E-10	1.00E-10	0%	
PR-3 (HV-5)	2018Q1	7.00E-10	-2.70E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.18E-09	-2.59E-10	1.98E-10	1.00E-10	0%	
PR-4	2018Q1	8.60E-10	-1.10E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.77E-09	3.34E-10	2.53E-10	1.00E-10	0%	
PR-5 (HV-2)/E-13D	2018Q1	7.30E-10	-2.40E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.35E-09	-8.70E-11	2.17E-10	1.00E-10	0%	
PR-6	2018Q1	4.90E-10	-9.45E-10	1.10E-10	1.00E-10	0%	
	2018Q2	1.56E-09	1.26E-10	2.20E-10	1.00E-10	0%	
PR-9	2018Q1	9.20E-10	-5.00E-11	1.70E-10	1.00E-10	0%	
	2018Q2	1.39E-09	-4.35E-11	2.17E-10	1.00E-10	0%	
PR-10 (HV-4)	2018Q1	1.10E-09	1.30E-10	1.70E-10	1.00E-10	130%	
PR-10 Dup	2018Q1	9.20E-10	-5.00E-11	1.70E-10	1.00E-10	-50%	
	RPD	18					
PR-10 (HV-4)	2018Q2	1.46E-09	2.68E-11	2.20E-10	1.00E-10	27%	
PR-10 Dup	2018Q2	1.48E-09	4.87E-11	2.20E-10	1.00E-10	49%	
	RPD	1					
PR-12	2018Q1	8.10E-10	-1.60E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.14E-09	-2.92E-10	1.98E-10	1.00E-10	0%	
E1 (Plant Indoor)	2018Q1	2.10E-09	1.13E-09	2.80E-10	1.00E-10	1130%	
	2018Q2	Pend.	Pend.	Pend.	1.00E-10	Pend.	
E7 (Header House)	2018Q1	1.10E-08	1.00E-08	1.54E-09	N/A	N/A	
	2018Q2	1.97E-08	1.83E-08	3.24E-09	N/A	N/A	
E8 (Injection Well)	2018Q1	5.76E-08	5.66E-08	1.04E-08	N/A	N/A	
	2018Q2	1.08E-07	1.07E-07	1.95E-08	N/A	N/A	
E9 (Production Well)	2018Q1	1.05E-08	9.53E-09	1.30E-09	N/A	N/A	
	2018Q2	1.65E-07	1.64E-07	1.97E-09	N/A	N/A	
E10 (Max exposed public)	2018Q1	7.30E-10	-2.40E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.18E-09	-2.59E-10	1.98E-10	1.00E-10	0%	
E11	2018Q1	8.40E-10	-1.30E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.30E-09	-1.38E-10	1.98E-10	1.00E-10	0%	
E12	2018Q1	8.60E-10	-1.10E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.18E-09	-2.59E-10	1.98E-10	1.00E-10	0%	
E13A	2018Q1	7.60E-10	-2.10E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.18E-09	-2.59E-10	2.20E-10	1.00E-10	0%	
E13B	2018Q1	7.60E-10	-2.10E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.09E-09	-3.48E-10	1.96E-10	1.00E-10	0%	
E13C	2018Q1	7.80E-10	-1.90E-10	1.70E-10	1.00E-10	0%	
	2018Q2	1.31E-09	-1.27E-10	2.20E-10	1.00E-10	0%	
E13E	2018Q1	7.60E-10	-2.10E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.44E-09	4.78E-12	2.20E-10	1.00E-10	0%	
E13F	2018Q1	6.50E-10	-3.20E-10	1.10E-10	1.00E-10	0%	
	2018Q2	1.20E-09	-2.39E-10	1.96E-10	1.00E-10	0%	
E13G	2018Q1	8.40E-10	-1.30E-10	1.40E-10	1.00E-10	0%	
	2018Q2	1.27E-09	-1.60E-10	2.20E-10	1.00E-10	0%	

* Net is conc. minus background (PR-2)

† Effluent Concentration Limit (ECL) from 10 CFR 20 Appendix B Table 2 (Rn-222)

Table 6b: Radon Progeny (Kusnetz) Data
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample ID	Period	Conc.	Conc.	Comments
		mWL	$\mu\text{Ci/mL}$	
E7	2018Q1	22.54	2.25E-09	Header house quarterly average
	2018Q2	34.06	3.41E-09	Header house quarterly average
E8	2018Q1	8.66	8.66E-10	Injection well quarterly average
	2018Q2	2.71	2.71E-10	Injection well quarterly average
E9	2018Q1	6.75	6.75E-10	Production well quarterly average
	2018Q2	10.23	1.02E-09	Production well quarterly average
E10 (max exposed public)	2018Q1	1.35	1.35E-10	
	2018Q2	4.68	4.68E-10	
E11	2018Q1	1.71	1.71E-10	
	2018Q2	5.31	5.31E-10	
E12	2018Q1	1.68	1.68E-10	
	2018Q2	1.58	1.58E-10	
E13A	2018Q1	1.25	1.25E-10	
	2018Q2	4.13	4.13E-10	
E13B	2018Q1	1.74	1.74E-10	
	2018Q2	3.21	3.21E-10	
E13C	2018Q1	0.95	9.52E-11	
	2018Q2	3.20	3.20E-10	
E13D	2018Q1	1.84	1.84E-10	
	2018Q2	5.94	5.94E-10	
E13E	2018Q1	1.85	1.85E-10	
	2018Q2	3.70	3.70E-10	
E13F	2018Q1	0.85	8.49E-11	
	2018Q2	4.20	4.20E-10	
E13G	2018Q1	1.44	1.44E-10	
	2018Q2	4.05	4.05E-10	

Table 7: Class V Injectate
1st Half 2018
Lost Creek ISR Project SUA-1598

Sample ID	Sample Date	Radionuclide (dissolved)	Measured Conc.	Error Estimate (Precision)	Lab MDC or Reporting Limit	Discharge Limit	Discharge Volume	Radionuclide Quantity	Comments
			pCi/L	+/- pCi/L	pCi/L	pCi/L	L	µCi	
Class V Comp	Jan 2018	Gross alpha, adj.	2.6	5.8	1.5	15	1060324	2.8	
		Gross beta	7.7	1.4	2.6	15.1	1060324	8.2	
		U-nat (mg/L)	0.0365	—	0.0003	0.158 mg/L	1060324	0.0	
		Ra-226	0.5	0.2	0.2	5.4	1060324	0.5	
		Ra-228	2.3	1.1	2.0	10	1060324	2.4	
		Pb-210	1.3	1.5	2.4	10	1060324	1.4	
		Po-210	0.3	0.6	0.9	40	1060324	0.3	
		Th-230	0.1	0.1	0.2	100	1060324	0.1	
Class V Comp	Feb 2018	Gross alpha, adj.	11.3	12.5	14.3	15	1138360	12.9	
		Gross beta	36.2	16.4	27.5	15.1	1138360	41.2	
		U-nat (mg/L)	0.0085	—	0.0003	0.158 mg/L	1138360	0.0	
		Ra-226	0.2	0.1	0.2	5.4	1138360	0.2	
		Ra-228	0.4	0.9	1.5	10	1138360	0.5	
		Pb-210	3.2	1.3	1.3	10	1138360	3.6	
		Po-210	0.6	0.9	1.4	40	1138360	0.7	
		Th-230	0.1	0.1	0.1	100	1138360	0.1	
Class V Comp	Mar 2018	Gross alpha, adj.	1.0	—	2.0	15	2381480	2.4	Non-detect. 1/2 MDC used
		Gross beta	6.6	1.5	3.1	15.1	2381480	15.7	
		U-nat (mg/L)	0.0085	—	0.0003	0.158 mg/L	2381480	0.0	Non-detect. 1/2 MDC used
		Ra-226	0.3	0.1	0.2	5.4	2381480	0.7	
		Ra-228	0.5	—	1.0	10	2381480	1.2	Non-detect. 1/2 MDC used
		Pb-210	1.8	0.3	1.0	10	2381480	4.3	
		Po-210	0.5	—	1.0	40	2381480	1.2	Non-detect. 1/2 MDC used
		Th-230	0.1	—	0.2	100	2381480	0.2	
Class V Comp	Apr 2018	Gross alpha, adj.	8	3.4	4.8	15	1488222	11.9	Non-detect. 1/2 MDC used
		Gross beta	21.7	5.9	12.2	15.1	1488222	32.3	
		U-nat (mg/L)	0.0085	—	0.0003	0.158 mg/L	1488222	0.0	
		Ra-226	0.6	0.1	0.2	5.4	1488222	0.9	
		Ra-228	0.5	—	1.0	10	1488222	0.7	
		Pb-210	2.6	0.4	1.0	10	1488222	3.9	
		Po-210	0.5	—	1.0	40	1488222	0.7	
		Th-230	0.3	0.1	0.2	100	1488222	0.4	
Class V Comp	May 2018	Gross alpha, adj.	1.0	—	2.0	15	2636893	2.6	Non-detect. 1/2 MDC used
		Gross beta	1.5	—	3.0	15.1	2636893	4.0	
		U-nat (mg/L)	0.0123	—	0.0003	0.158 mg/L	2636893	0.0	Non-detect. 1/2 MDC used
		Ra-226	1.3	0.1	0.2	5.4	2636893	3.4	
		Ra-228	1.2	1.7	1.0	10	2636893	3.2	
		Pb-210	1.8	0.5	1.0	10	2636893	4.7	
		Po-210	0.5	—	1.0	40	2636893	1.3	
		Th-230	0.1	—	0.2	100	2636893	0.3	
Class V Comp	Jun 2018	Gross alpha, adj.	Pend.			15	756543	Pend.	
		Gross beta	Pend.			15.1	756543	Pend.	
		U-nat (mg/L)	Pend.			0.158 mg/L	756543	Pend.	
		Ra-226	Pend.			5.4	756543	Pend.	
		Ra-228	Pend.			10	756543	Pend.	
		Pb-210	Pend.			10	756543	Pend.	
		Po-210	Pend.			40	756543	Pend.	
		Th-230	Pend.			100	756543	Pend.	
TOTALS for 2017H2		Gross alpha, adj.					3.25E+01		
Gross beta						1.01E+02			
U-nat						1.14E-01			
Ra-226						5.79E+00			
Ra-228						7.99E+00			
Pb-210						1.79E+01			
Po-210						4.25E+00			
Th-230						1.15E+00			

Table 8: Effluent Quantity
1st Half of 2018
Lost Creek ISR Project SUA-1598

Sample Location	Sample Period	Radio-nuclide	Air Volume	Measured or Average Conc.	Quantity	Quantity	Comments
			mL/qtr	µCi/mL	µCi	Ci	
E1 (Shop Vent)	2018 Q1	U-nat	1.83E+14	1.61E-12	2.95E+02	0.000	50000 cfm
		Rn-222	1.83E+14	1.13E-09	2.07E+05	0.207	
		Rn Prog.	1.83E+14	6.71E-10	1.23E+05	0.123	Kusnetz
	2018 Q2	U-nat	1.83E+14	1.96E-13	3.60E+01	0.000	50000 cfm
		Rn-222	1.83E+14	Pend.	Pend.	Pend.	
		Rn Prog.	1.83E+14	8.66E-10	1.59E+05	0.159	Kusnetz
E2 (Precip. Tanks)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	4.16E+10	3.79E-08	1.58E+03	0.002	
		Rn Prog.	---	---	1.58E+03	0.002	Assumed 100% Equil.*
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	4.12E+10	6.15E-08	2.53E+03	0.003	
		Rn Prog.	---	---	2.53E+03	0.003	Assumed 100% Equil.*
E3 (Eluate Tanks)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.58E+10	3.41E-07	1.22E+04	0.012	
		Rn Prog.	---	---	1.22E+04	0.012	Assumed 100% Equil.*
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	6.61E-09	2.02E+02	0.000	
		Rn Prog.	---	---	2.02E+02	0.000	Assumed 100% Equil.*
E4 (Waste Water Tanks)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	9.07E-07	2.77E+04	0.028	
		Rn Prog.	---	---	2.77E+04	0.028	Assumed 100% Equil.*
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	1.18E-06	3.60E+04	0.036	
		Rn Prog.	---	---	3.60E+04	0.036	Assumed 100% Equil.*
E5 (Resin Water Tanks)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.57E+11	1.61E-07	2.53E+04	0.025	
		Rn Prog.	---	---	2.53E+04	0.025	Assumed 100% Equil.*
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	5.84E+10	1.17E-06	6.83E+04	0.068	
		Rn Prog.	---	---	6.83E+04	0.068	Assumed 100% Equil.*
E6 (Shaker Deck)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	6.88E+10	2.29E-08	1.58E+03	0.002	
		Rn Prog.	---	---	1.58E+03	0.002	Assumed 100% Equil.*
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	8.83E+10	7.29E-09	6.44E+02	0.001	
		Rn Prog.	---	---	6.44E+02	0.001	Assumed 100% Equil.*
E7 (Header House)	2018 Q1	U-nat	2.94E+12	6.17E-12	1.81E+01	0.000	800 cfm
		Rn-222	2.94E+12	1.10E-08	3.23E+04	0.032	
		Rn Prog.	2.94E+12	2.25E-09	6.62E+03	0.007	Kusnetz
	2018 Q2	U-nat	2.94E+12	6.92E-12	2.03E+01	0.000	800 cfm
		Rn-222	2.94E+12	1.97E-08	5.79E+04	0.058	
		Rn Prog.	2.94E+12	3.12E-09	9.16E+03	0.009	Kusnetz
E8 (Injection Well) 702 Injectors	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.83E+07	5.76E-08	7.41E+02	0.001	65 gal of air/day
		Rn Prog.	1.83E+07	8.66E-10	1.12E+01	0.000	Kusnetz
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.83E+07	1.08E-07	1.40E+03	0.001	65 gal of air/day
		Rn Prog.	1.83E+07	2.71E-10	3.49E+00	0.000	Kusnetz
E9 (Production Well) 339 Producers	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	2.46E+05	1.05E-08	8.76E-01	0.000	65 gal of air
		Rn Prog.	2.46E+05	6.75E-10	5.63E-02	0.000	Kusnetz
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	2.46E+05	1.65E-07	1.38E+01	0.000	65 gal of air
		Rn Prog.	2.46E+05	1.02E-09	8.53E-02	0.000	Kusnetz

Table 8: Effluent Quantity
1st Half of 2018
Lost Creek ISR Project SUA-1598

Sample Location	Sample Period	Radio-nuclide	Air Volume	Measured or Average Conc.	Quantity	Quantity	Comments
			mL/qtr	µCi/mL	µCi	Ci	
E14 (RO Tank)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.29E+11	1.22E-08	1.58E+03	0.002	Assumed 100% Equil.*
		Rn Prog.	---	---	1.58E+03	0.002	
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	1.55E-05	4.72E+05	0.472	Assumed 100% Equil.*
		Rn Prog.	---	---	4.72E+05	0.472	
E15 (Perm Tank)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.45E+10	1.14E-05	1.66E+05	0.166	Assumed 100% Equil.*
		Rn Prog.	---	---	1.66E+05	0.166	
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	8.28E-08	2.53E+03	0.003	Assumed 100% Equil.*
		Rn Prog.	---	---	2.53E+03	0.003	
E16 (Class V Tank)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	3.05E+10	8.57E-06	2.61E+05	0.261	Assumed 100% Equil.*
		Rn Prog.	---	---	2.61E+05	0.261	
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.02E+10	1.10E-08	1.12E+02	0.000	Assumed 100% Equil.*
		Rn Prog.	---	---	1.12E+02	0.000	
E17 (Restoration IX Area)	2018 Q1	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	N/A	N/A	N/A	N/A	Not sampled
		Rn Prog.	N/A	N/A	N/A	N/A	Not sampled
	2018 Q2	U-nat	N/A	N/A	N/A	N/A	Zero effluent
		Rn-222	1.29E+11	6.83E-09	8.79E+02	0.001	Assumed 100% Equil.*
		Rn Prog.	---	---	8.79E+02	0.001	
TOTAL		U-nat				0.000 Ci	
		Rn-222				1.379 Ci	
		Rn Prog.				1.377 Ci	

*Equilibrium fraction commitment in Amendment 4 SER

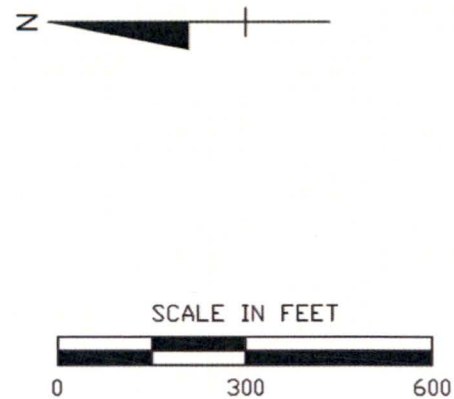
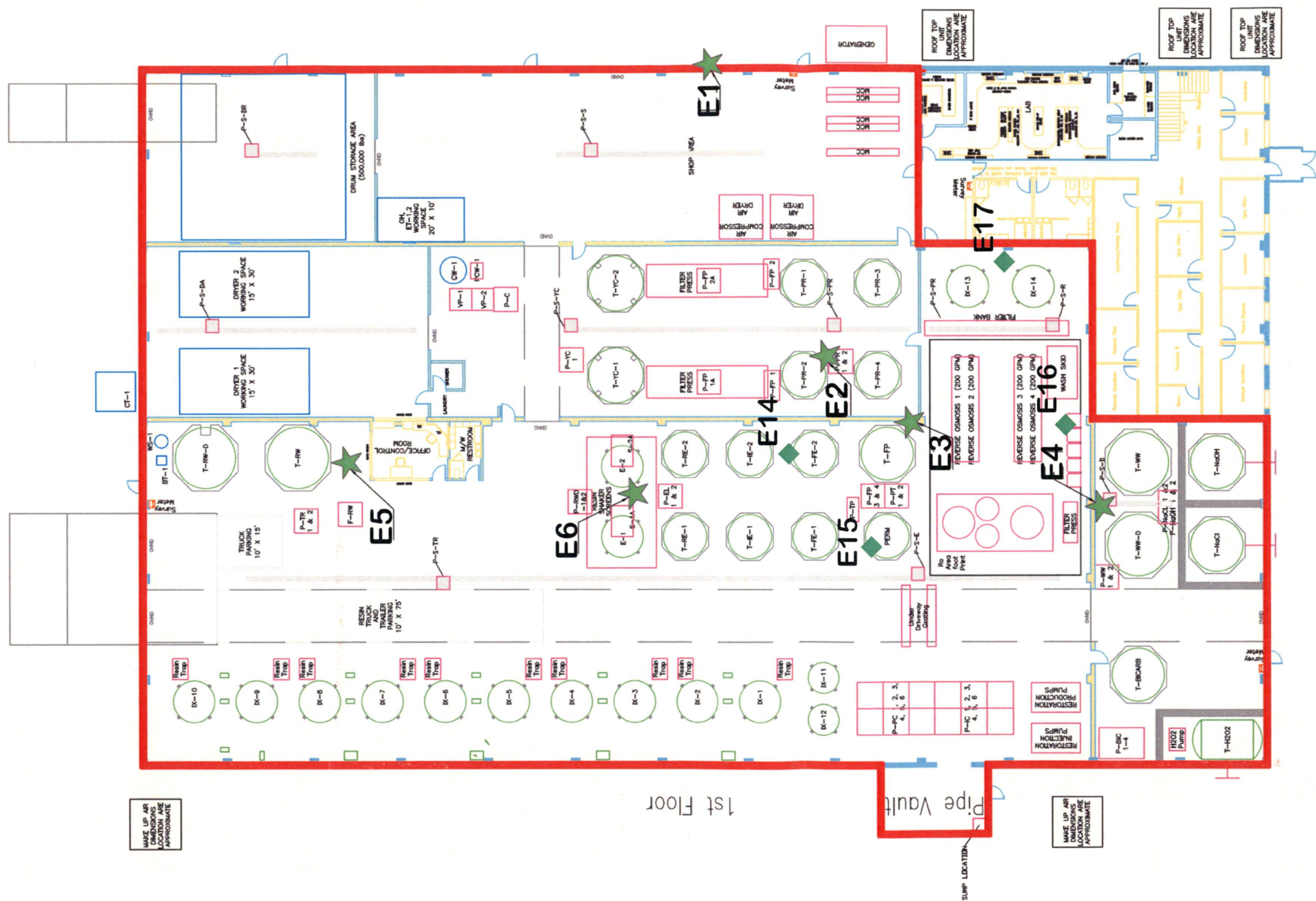
2.756

**Table 9: Theoretical Annual TEDE for Members of the Public Near the Plant
1st Half 2018
Lost Creek ISR Project SUA-1598**

Sample Location	Period	Radon Dose	Radon Progeny Dose	Gamma Dose Rate	Unat Dose	Theoretical Quarterly Dose (100% Occupancy)	Theoretical Public TEDE (4hr Occupancy)	Theoretical TEDE of Max Exposed Public (52hr Occupancy)	Comments
		mrem/qtr	mrem/qtr	mrem/qtr	mrem/qtr	mrem/qtr	mrem/yr	mrem/yr	
E10 (Max exposed public)	2018Q1	0.0	22.4	0.0	4.2	26.6	0.10	1.2	
	2018Q2	0.0	77.6	0.0	0.0	77.6			
E11	2018Q1	0.0	1.5	0.0	18.2	19.6	0.02	---	
	2018Q2	0.0	4.6	0.6	0.0	5.2			
E12	2018Q1	0.0	1.5	0.0	13.3	14.7	0.02	---	
	2018Q2	0.0	1.4	10.6	0.0	12.0			
E13A	2018Q1	0.0	1.1	0.0	1.4	2.5	0.01	---	
	2018Q2	0.0	3.6	0.6	2.8	7.0			
E13B	2018Q1	0.0	1.5	15.2	0.0	16.7	0.06	---	
	2018Q2	0.0	2.8	19.3	22.6	44.7			
E13C	2018Q1	0.0	0.8	2.3	4.2	7.3	0.01	---	
	2018Q2	0.0	2.8	2.0	0.0	4.8			
E13D	2018Q1	0.0	1.6	9.5	25.8	36.9	0.06	---	
	2018Q2	0.0	5.1	16.4	12.0	33.6			
E13E	2018Q1	0.0	1.6	13.8	55.9	71.2	0.10	---	
	2018Q2	4.5	3.2	27.9	3.5	39.2			
E13F	2018Q1	0.0	0.7	3.7	2.1	6.5	0.02	---	
	2018Q2	0.0	3.6	7.8	9.2	20.6			
E13G	2018Q1	0.0	1.2	3.7	19.6	24.5	0.04	---	
	2018Q2	0.0	3.5	0.0	14.1	17.6			



FIGURES



LEGEND

- Restricted Area
- Wall/Door
- ★ Approximate Sampling Point



Lost Creek ISR, LLC
Littleton, Colorado USA

Figure 1
Lost Creek Plant Monitoring
for Compliance with 10CFR 40.65

Scale: 1:300 Drawn By: JHC

Issued / Revised: 01.15.2015

Drawing Name: Lost Creek Plant Sampling Points.DWG

File Path: S:\GIS\Lost Creek\Plant\



LEGEND

- ACCESS ROAD
- ★ Approximate Sampling Point



Lost Creek ISR, LLC
Littleton, Colorado USA

Figure 2
Monitoring Plan to Demonstrate
Compliance with LC 12.10B
Scale: 1:300 Drawn By: JHC
Issued / Revised: 01.16.2015
Drawing Name: External Monitoring Sites.dwg
File Path: S:/GIS/LostCreek/Monitoring Sites

Legend

