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LOST CREEK ISR, LLC

July 12, 2013

Mr. John Saxton
Project Manager
U.S. Nuclear Regulatory Commission
Submitted via E-mail

Re: Lost Creek Project,
NRC License SUA-1598, Docket No. 40-9068
Amendment Request to Remove License Conditions 12.10, 12.11 and 12.12

Dear Sir:

On June 13, 2013, Lost Creek ISR, LLC (LCI) submitted a letter requesting the removal of several license conditions. LCI hereby requests that the June 13th submittal be withdrawn and replaced with this revised request. With this letter, LCI requests to amend Lost Creek ISR, LLC's NRC License SUA-1598 to remove License Conditions 12.10, 12.11 and 12.12 in accordance with (IAW) specified License requirements.

License Condition 12.10 requires LCI, prior to the preoperational inspection, to provide the following information for the airborne effluent and environmental monitoring program in which it shall develop written procedures to:

A) Discuss how, in accordance with 10 CFR 40.65, the quantity of the principal radionuclides from all point and diffuse sources will be accounted-for in, and verified by, surveys and/or monitoring.

One of the seven Volumes of the "*Lost Creek ISR, LLC, Environment, Health And Safety Management System*" is "*Volume V: Environmental Protection Program*". This Volume is the overarching document which outlines the comprehensive LCI Environmental Protection Program (EPP) and refers to the formal LCI Standard Operating Procedures (SOPs) which implement the EPP IAW the LCI NRC License Conditions and all Federal, State, and Local Regulatory and Permit Requirements.

As presented in the LCI Technical Report (TR) baseline radiological data has been compiled IAW the guidance of NRC Regulatory Guide (RG) 4.14. LCI has developed the following SOPs which are the procedures whereby the Operational surveys and monitoring will account-for and verify the quantity of the principal radionuclides from all point and diffuse sources:

SOP_LC_ENV-004_Env Rad Monitoring - Air Particulates_10Jul2103.docx
SOP_LC_ENV-008_Env Rad Monitoring - Soil_10Jul2013.docx
SOP_LC_ENV-013_Env Rad Monitoring - Passive Gamma_10Jul2013.doc
SOP_LC_ENV-014_Env Rad Monitoring - Passive Radon_10Jul2013.docx

Per RG 8.31 the RSO will be reviewing this data for the monthly ALARA report looking for trends indicating a need for changes to the Radiation Protection Program (RPP) and/or ALARA programs. These radionuclide quantities will be summarized in the mandatory, 10 CFR 40.65, "Semi-Annual Effluent and Environmental Monitoring Report". SOP HP-004, SOP HP-013 and SOP HP-014 each contain an "Example Table" that illustrates how the potential dose analyses will be tabulated for the Semi-Annual Report.

LCI does not propose to monitor Central Processing Plant (CPP) tank vent stack releases since the only radionuclide vented from the tanks will be fresh radon with negligible in-growth of daughters. LCI proposes that the array of passive radon detectors, posted per LCI SOP_LC_ENV-014_Env Rad Monitoring - Passive Radon, along the downwind boundary to the unrestricted area fulfills the 10 CFR 40.65 requirement to specify the radon quantity to the unrestricted area from the CPP tank vents. LCI will compare the radon detector results (uCi/ml) with the 10 CFR 20, Appendix B, Table 2, radon without progeny ECL of 1E-8 uCi to determine if maximum levels remain below the public internal exposure limit of 50 mrem/yr. LCI proposes that this approach will provide sufficient information to allow the Commission to "estimate maximum potential annual radiation doses to the public" (10CFR40.65) resulting from the portion of fresh radon emitted from the CPP tank vent stacks.

B) Evaluate the member(s) of the public likely to receive the highest exposures from licensed operations consistent with 10 CFR 20.1302.

As presented in the LCI Technical Report (TR), MILDOS was used to establish the location where an individual is likely to receive the highest dose from LCI Operations. Soil samples and twenty-four months of baseline air particulate, passive radon and passive gamma radiological data have been collected at this location (AP2) which is centered on the Central Processing Plant (CPP), downwind (east) at the boundary between the operationally controlled area and the unrestricted area (TR Plate 3.1-1, attached). Similarly, baseline data was collected at four other locations as presented in the LCI TR. All data was collected IAW RG 4.14 using the above listed LCI SOPs.

Following commencement of operations, per RG 4.14, soil samples, air particulate, passive radon and passive gamma radiological monitoring will continue at the previously established monitoring locations. However, per SOP_LC_ENV-014_Env Rad Monitoring - Passive Radon, six additional radon monitors will be positioned at forty foot intervals, three on either side of AP2, along the downwind (east) fence at the boundary between the operationally controlled area and the uncontrolled, unrestricted area to further ensure that LCI can demonstrate compliance with the dose limits for individual members of the public in 10 CFR 20.1301. The results of this monitoring will be summarized in the mandatory 10 CFR 40.65 "Semi-Annual Effluent and Environmental Monitoring Report".

LCI RSO will be reviewing the most current semi-annual effluent data during preparation of the monthly RG 8.31 ALARA report, For the monthly report, the RSO will also be reviewing the results of monitoring IAW LCI SOP_LC_HP-019_Determining Dose of Unmonitored Employees. These reviews will enable the RSO to determine if visitors,

delivery drivers etc. might potentially receive doses higher than a full time occupant at the AP2 location or along the adjacent unrestricted boundary fence. Should such doses occur, such individuals potentially become "the member(s) of the public likely to receive the highest exposures". The RSO will then respond by making appropriate changes to the RPP and ALARA programs as necessary to control these exposures.

C) Discuss and identify how radon (radon-222) progeny will be factored into analyzing potential public dose from operations consistent with 10 CFR Part 20, Appendix B, Table 2.

Public dose, including dose due to radon and progeny, is determined per LCI SOP_LC_HP-016_Radiation Dose Determinations (Section 6.2). The procedures developed to account for the principal radionuclides from all point and diffuse sources are listed above in response to part A. SOP HP-14 contains an "Example Table" showing how the potential dose analyses will be tabulated for the Semi-Annual Report. Additionally relevant to possible public dose is SOP_LC_HP-019_Determining Dose of Unmonitored Employees which will also facilitate monitoring of potential dose to visitors and delivery personnel.

D) Discuss how, in accordance with 10 CFR 20.1501, the occupational dose (gaseous and particulate) received throughout the entire license area from licensed operations will be accounted for in, and verified by, surveys and/or monitoring.

The second Volume of the "*Lost Creek ISR, LLC, Environment, Health And Safety Management System*" is "*Volume II: Radiation Protection Program*". This Volume is the overarching document which outlines the comprehensive LCI Radiation Safety Program (RPP) and refers to the formal LCI Standard Operating Procedures (SOPs) which implement the RPP IAW the LCI NRC License Conditions and all Federal, State, and Local Regulatory and Permit Requirements.

LCI has developed the following SOPs which are the procedures whereby the Operational surveys and monitoring will account for and verify the occupational dose (gaseous and particulate) received throughout the entire license area from licensed operations:

SOP_LC_HP-004_Radiation Detection Instrumentation
SOP_LC_HP-002_Personnel External Radiation Dosimetry
SOP_LC_HP-007_Personnel Surveys
SOP_LC_HP-010_Surface Contamination (Swipe) Surveys
SOP_LC_HP-005_Indoor Radon Monitoring and Mitigation
SOP_LC_HP-006_Gamma Surveys
SOP_LC_HP-008_Indoor Airborne Radionuclide Sampling
SOP_LC_HP-009_Bioassay Monitoring
SOP_LC_HP-016_Radiation Dose Determinations
SOP_LC_HP-017_Breathing Zone Air Monitoring

Lost Creek Project,
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Amendment Request to Remove License Conditions 12.10, 12.11 and 12.12

License Condition 12.11 requires LCI, prior to the preoperational inspection, develop a survey program for beta-gamma contamination for personnel contamination from restricted areas, and beta-gamma contamination in unrestricted and restricted areas, that will meet the requirements of 10 CFR Part 20, Subpart F.

> The LCI RPP, described above in the response to License Condition 12.10 (D), also references the SOPs which are the procedures for survey of beta-gamma contamination for personnel with potential contamination from restricted areas, and beta-gamma contamination in unrestricted and restricted areas, that will meet the requirements of 10 CFR Part 20, Subpart F.

License Condition 12.11 also requires LCI, to provide, for NRC review and written verification, the surface contamination detection capability (scan MDC) for radiation survey meters used for contamination surveys to release equipment and materials for unrestricted use and for personnel contamination surveys. The detection capability in the scanning mode for the alpha and beta-gamma radiation expected shall be provided in terms of dpm per 100 cm2.

> LCI has developed the following SOPs which are the procedures for contamination detection and control. They contain the surface contamination detection capability (scan MDC) for radiation survey meters used for contamination surveys to release equipment and materials for unrestricted use and for personnel contamination surveys. The detection capability in the scanning mode for the expected alpha and beta-gamma radiation is provided in terms of dpm per 100 cm^2: A summary table with MDCs is attached.
>
> SOP_LC_HP-004_Radiation Detection Instrumentation
> SOP_LC_HP-007_Personnel Surveys
> SOP_LC_HP-010_Surface Contamination Surveys
> SOP_LC_HP-013_11e2 Byproduct Waste Management
> SOP_LC_HP-014_Screening and Decon of Materials
> SOP_LC_HP-018_Alpha-Beta Counting Systems

License Condition 12.12 requires LCI, prior to the preoperational inspection, to submit to the NRC for review and approval the procedures by which it will ensure that unmonitored employees will not exceed 10 percent of the dose limits in 10 CFR Part 20, Subpart C.

> Per the LCI RPP, SOP_LC_HP-019_Determining Dose of Unmonitored Employees (Attached) contains the procedures to ensure unmonitored employees will not exceed 10 percent of the dose limits in 10 CFR Part 20, Subpart C.

Lost Creek Project,
NRC License SUA-1598, Docket No. 40-9068
Amendment Request to Remove License Conditions 12.10, 12.11 and 12.12

Please contact me or Dr. Charles Kelsey at the Casper office if you have any questions regarding this submittal.

Regards,

John Cash
Vice President
Lost Creek ISR, LLC

Cc: Theresa Horne – Ur-Energy USA Inc., Littleton

ATTACHMENTS

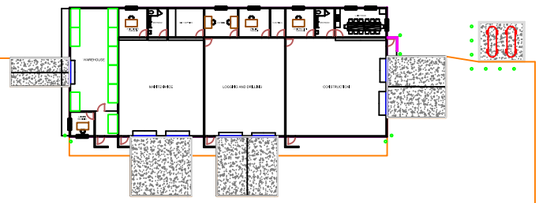
Lost Creek ISR, LLC, Technical Report Plate 3.1-1, Site Layout

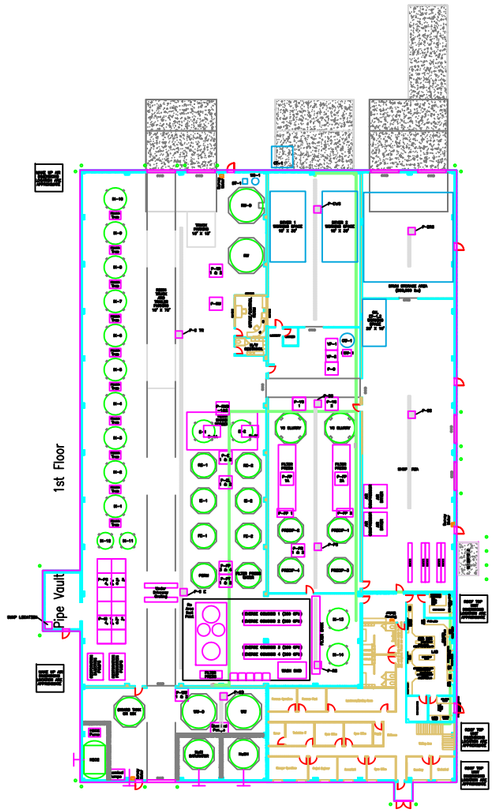
TABLE of MDAs and MDCs for Representative Lost Creek Site Survey Instruments

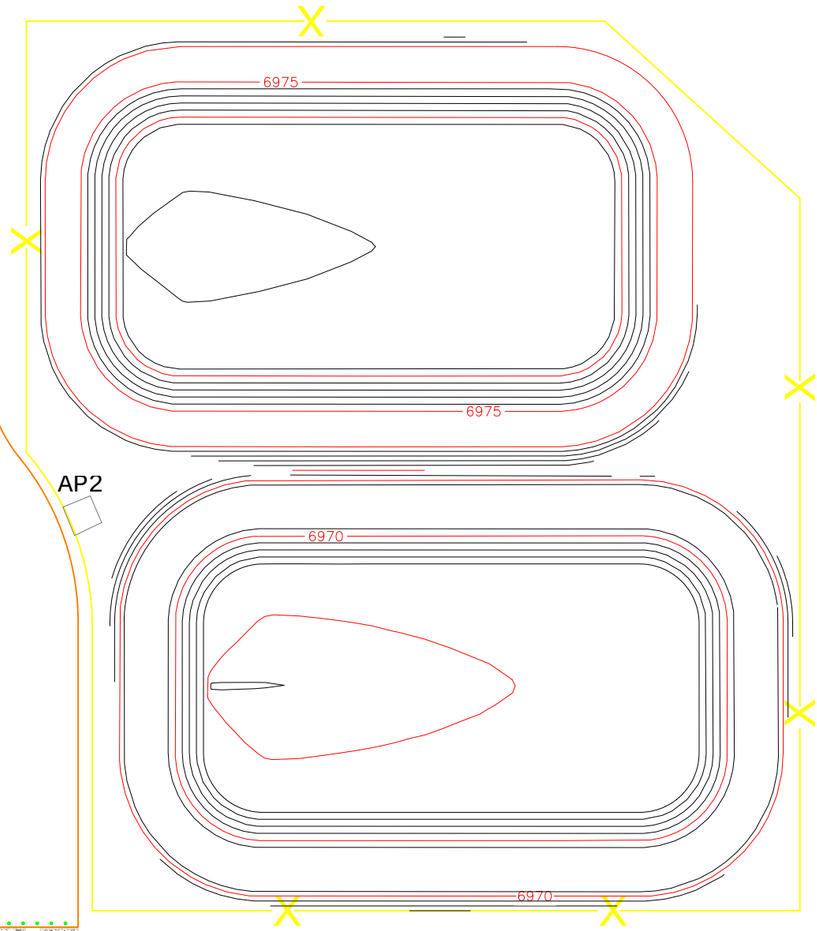
LCI SOP_LC_HP-019 "Determining Dose of Unmonitored Employees"

NORTH

EAST







Lost Creek ISR, LLC
Littleton, Colorado USA

PLATE 3.1-1
Site Layout
Lost Creek Permit Area

Issued For: NRC	Drawn By: CLB
Issued / Revised: 12.7.2011	
Dwg No. NRCTR 1.0 PLT 3.1-1 12.6.2011 CLB	

TABLE of MDAs and MDCs for Representative Lost Creek Site Survey Instruments

The three instruments listed in the following table are representative Ludlum radiation instruments used at the Lost Creek Project. The Ludlum Model 43-93 detector is used with a Ludlum Model 2360 data logger. This combination is the main instrument (five units on hand) used at the Lost Creek Project for contamination release surveys. This instrument discriminately and simultaneously measures alpha and beta-gamma. The personnel survey procedures for release (release limit: 1,000 dpm/100cm^2) to unrestricted areas is based on using this instrument. The alpha MDA and MDC values for the other two listed Geiger-Mueller instruments are not as low, and may be used for surveying items in the plant and the wellfield, such as 11e2 waste.

The efficiency determinations and MDA/MDC calculations (SOP_LC_HP-004_Radiation Detection Instrumentation) are based on measurements taken with Spectrum Technique check sources. The sources were a 0.1 μCi Po-210 alpha source and a 0.1 μCi Sr-90 beta-gamma source. The check sources have an accuracy of 20% within labeled activity. Lost Creek has placed an order from Eckert and Ziegler for a 0.1 μCi Sr-90 beta source and a 370 MBq Th-230 alpha source, which are within 5% of the labeled activity. The efficiency measurements were performed by setting the detector on .25 inch (6 mm) spacers to approximate Lost Creek Project scan geometry and performing a scalar (or cpm for the 3/44-9) count of the source for 1 minute.

Ludlum Instrument Model #	Alpha Efficiency (%)	Beta-Gamma Efficiency (%)	Background count time (min)	Survey time (sec)	Detector Active Area (cm^2)	MDA Alpha (dpm)	MDC Alpha (dpm per 100 cm^2)	MDA Beta (dpm)	MDC Beta (dpm per 100 cm^2)
2360/43-93	13.3	32.7	1	4	88	305	346	819	931
3/44-9	10.3	33.5	0.233	14	15	714	4762	216	1440
26 Frisker	9.1	34.2	1	14	15	725	4836	193	1289

	UR-ENERGY USA, INC. LOST CREEK ISR, LLC STANDARD OPERATING PROCEDURE	
DETERMINING DOSE OF UNMONITORED EMPLOYEES		
Edition: 10Jul2013	**SOP Number:** SOP_LC_HP-019	**Author:** CJP

Reviewed By: JWC 7/07/2013; CTK 7/9/2013	***Final Approval:***

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish the method by which Lost Creek ISR (LC-ISR) Project will validate that the external and internal radiation doses to unmonitored employees will be less than 10% of the 10CFR20 occupational dose limits for radiation workers. Not all of the step-by-step procedures for sampling are included in this SOP, but the pertinent sampling SOPs are referenced.

Most of the employees working at the LC site will be monitored in some way. Those working in the plant routinely will be part of the most detailed monitoring. The monitoring of employees outside the plant is covered by a combination of environmental monitoring stations and representative thermoluminescent dosimeter (TLD) or equivalent badges. There are environmental monitoring stations located around the LC site which ensure the effluent concentrations are within acceptable limits (SOPs ENV- 4, 13, and 14). Dose from external radiation will be monitored by having representative employees from each work type wearing TLD badges (covered by SOP HP- 2). As long as the doses to the representative employees are below 10% of the limit then it is reasonable to expect the dose from other employees performing the same tasks will be below the limits.

2.0 RESPONSIBILITIES

The Radiation Safety Officer (RSO) and/or Health Physics Technician (HPT) are responsible for:

- Performing sampling outlined and referenced in this SOP
- Writing a report detailing the likely dose to unmonitored employees based on the sampling outlined in this SOP.

3.0 PREREQUISITES AND TRAINING

The person performing the dose assessments should be familiar with the facility and health physics principals relevant for determining dose.

4.0 DEFINITIONS

Annual Limit of Intake (ALI): derived limit for amount of radiation through ingestion or inhalation. These limits can be found in 10 CFR 20 Appendix B

As Low as Reasonably Achievable (ALARA): maintaining occupational doses and doses to members of the public as low as is reasonably achievable using, to the extent practical, procedures and engineering controls based upon sound radiation protection principles.

CDE (Comitted Dose Equivalent): The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

CEDE (Comitted Effective Dose Equivalent): The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

DDE (Deep Dose Equivalent): External whole-body exposure dose equivalent at a tissue depth of 1 cm (1000 mg/cm^2).

EDE (Effective Dose Equivalent): The sum of the products of the dose equivalent to the organ or tissue (H_T) and the weighting factors (W_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \Sigma W_T H_T$).

Roentgen Equivalent Man (rem): the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem=0.01 sievert).

Sievert (Sv): the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv=100 rems).

TEDE (Total Effective Dose Equivalent): The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Working level (WL): "is any combination of short-lived radon daughters (for radon-222: polonium-218, lead-214, bismuth- 214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth- 212, and polonium-212) in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha particle energy." (10CFR20)

Working level month (WLM): "means an exposure to 1 working level for 170 hours (2,000 working hours per year/12 months per year=approximately 170 hours per month)." (10CFR20)

5.0 HAZARD ASSESSMENT AND PPE

N/A

6.0 PROCEDURE

The total radiation dose to an individual is comprised of an external dose and an internal dose. A representative external dose will be determined from area monitoring TLDs placed to measure exposure to unmonitored employees. Internal dose at LC-ISR is attributed to intake of process emissions of radon/radon progeny and other airborne particulate natural uranium decay chain radionuclides. Landauer Radtrak radon samplers, or other similar devices as approved by the RSO, will be used as quarterly area monitors for determining representative internal doses due to radon. Kusnetz method sampling will be used to determine dose from radon progeny. Potential presence of particulate U-nat will be sampled by collection on glass fiber filters and measured with alpha/beta detectors. Dose will be estimated by the following equation:

$$TEDE = CEDE + DDE$$

Where:
DDE is the dose from the office TLD results in rem (see section 6.1)

CEDE is the internal dose, in rem, based on radon measurements (see section 6.2) and airborne particulate sampling (see section 6.3)

6.1 External Exposure

TLD or equivalent dosimeters will be located in representative areas in the plant offices (Appendix) to validate that unmonitored employees do not receive more than 10 percent of the limits provided in 10 CFR 20, Subpart C. The TLDs will be exchanged quarterly. The dose rates from these monitors should represent worst-case scenario for likely doses to office personnel. To account for time workers actually spend in the office, an occupancy factor of 0.25 will be applied to the TLD results (based on the typical 2,000 hours spent at work in a year).

Some employees who do not work in the plant, and who do not work in the office, will not be badges. To ensure these individuals are receiving doses below 10% of the limit representative workers from each work crew will wear badges. Details of this are explained in section 6.3 of SOP_LC_HP-002_*Personnel External Radiation Dosimetry*.

Spare badges may be assigned to employees that do not typically wear badges, if they are going to be doing work in the plant, or other area with increased external radiation dose rates. Giving an individual a spare badge will depend on the activity, duration, frequency and the location to be occupied.

6.2 Radon and Radon Progeny

The sampling locations (Appendix) for air particulates, radon, and progeny are located to assess the distribution of airborne radionuclides. Sampling will be performed in the foyer connecting the plant to the offices. If contamination is present in the office, then it should be present in this area. Sampling will also be performed in the lab, because lab personnel handle samples from the plant area. Sampling will be performed in the secretary's office by the office front entrance, and in a first floor office down one of the hallways. The concentration of airborne radionuclides is expected to be less in the second floor offices, because this area is further away from the entrance to the office area. Second floor office sampling will be performed near the hallway entrance to the conference room.

Sampling will be performed for the first year of operations. The sampling will be used to demonstrate which employees are likely to receive less than 10% of the annual dose limit.

Two sampling methods will be used to determine the radon and radon progeny dose to employees working in the offices. Radtraks will be used to measure Rn-222. Radon progeny will be measured with the Kusnetz method.

Radon dose to employees working outside the CPP building are monitored by default, because the effluent from the plant must also meet the limits for members of the public.

6.2.1 Radtrak Results

The Radtraks will measure the levels of Rn-222 in the office. Radon concentration measurements can give a reasonable approximation of the concentration of radon progeny, but the radon progeny will be measured based on the Kusnetz sampling method (section 6.2.2). Radtrak results will be compared to the conservative DAC for Rn-222 (3×10^{-8} uCi/ml) to determine potential for exceeding 10% of the dose due to radon gas when daughters are present at some level of equilibrium. Given that a typical employee works 2000 hours in a year, an employee exposed to an average concentration equivalent to the DAC would result in a 5 rem dose. This ratio (DAC/5rem) can be used to determine the dose contribution from radon progeny to the TEDE.

Radtraks will be quarter long sampling periods. Sampling locations are shown in the appendix.

6.2.2 Kusnetz Results

The Kusnetz method is detailed in SOP_LC_HP-005_*Radon Monitoring and Mitigation.* The results of this procedure are given in Working Levels (WL). The WL is a measure of the radon progeny dose. This is compared to the DAC for Rn-222 with progeny present (0.33 WL). Given that a typical employee works 2000 hours in a year, a 0.33 WL concentration would result in the equivalent of 5 rem dose. This ration (0.33WL/5rem) can be used to determine the dose contribution from radon progeny to the TEDE.

Kusnetz air sampling will be at least 1 time every 2 weeks for the first 6 months of operation. If the results of the sampling show the radon progeny concentrations are at a steady state comparable to normal site quarterly fluxuations, then sample frequency will be reduced to 1 time every month. Sampling locations are shown in the appendix.

6.3 Airborne Radionuclides

Air samples will be collected on glass fiber filters to analyze the concentration of uranium decay chain radionuclides in the air. Only U-nat will be considered part of the measurement from the air sample unless the semi-annual plant characterization indicates other radionuclides of concern (see section 6.2 of SOP_LC_HP-008_*Indoor Airborne Radionuclide Sampling*). The method for sampling and analyzing the samples is detailed in SOP_LC_HP-008_*Indoor Airborne Radionuclide Sampling*.

Sampling will be at least 1 time every 2 weeks for the first 6 months of operation. If the results of the sampling show the uranium concentrations are steadily below 10 percent of occupational limits, then sample frequency will be reduced to 1 time every month. Sampling locations are shown on the figure in the Appendix.

Airborne radionuclide dose to employees working outside the CPP building are monitored by default as less than 10 percent of the occupational dose, because the effluent from the plant must also meet the limits for members of the public.

7.0 DOCUMENTS AND RECORDS

The results of the sampling performed for this procedure will be analyzed by the HP staff to determine necessary occupational dose monitoring. The results of monitoring analysis will be reported in the annual Radiation Protection Program Report .

8.0 REFERENCES

Code of Federal Regulation Title 10 Part 20 Appendix B: *Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure*

NRC, Regulatory Guide 8.34: *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses*, July 1992

NRC License Technical Report, Section 2.9.3.1: *Supplementary MILDOS Modeling*

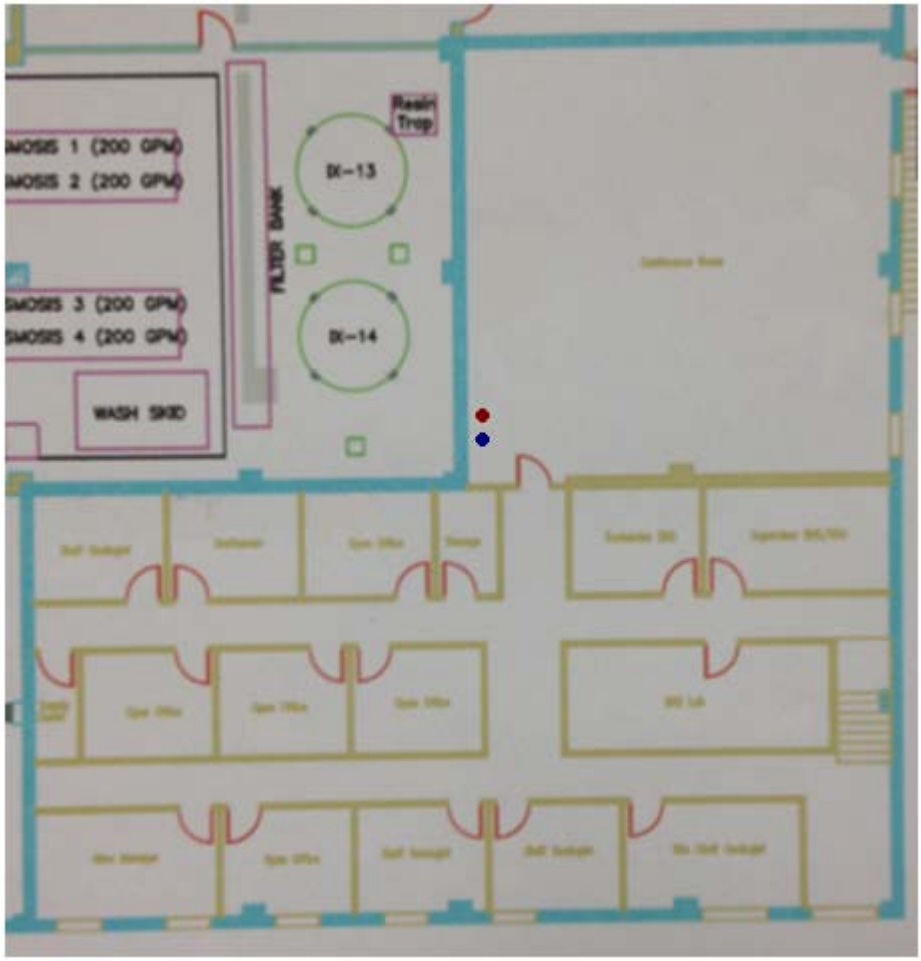
NRC License Technical Report, Section 5.7.4: *Worker Dose Calculations*

Appendix: Sampling Locations in Office Area

1st Floor

- TLD
- Radtrak/Kusnetz
- Airborne Radionuclides

2nd Floor



- TLD
- Radtrak/Kusnetz
- Airborne Radionuclides