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1 February 2016

Mr. John Tappert, Deputy Director
Division of Decommissioning, Uranium Recovery, & Waste Programs
Office of Federal and State Materials and Environmental Management Programs
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852-2738

Dear Mr. Tappert:

SUBJECT: Sweetwater Uranium Project - Docket Number 40-8584
Source Materials License SUA-1350 - Semiannual 10 CFR 40.65 Report
Airborne Effluents

Enclosed is Kennecott Uranium Company's Semiannual 10 CFR 40.65 Report for the second half of 2015 for airborne effluents. This report addresses the requirements of License Condition 11.5 of SML #SUA-1350, as well as the requirements of 10 CFR 40.65(a)(1).

Kennecott Uranium Company is only required to monitor for ambient gamma and airborne particulates at the downwind location (Air 4A) and radon at the upwind (Air 2) and downwind (Air 4A) locations as long as operations remain suspended as per License Condition 11.5 and a letter dated September 23, 1983 from the Nuclear Regulatory Commission (NRC). Kennecott is not required to perform stack, soil, sediment or vegetation sampling as long as operations remain suspended.

Kennecott Uranium Company has examined the data included in this report, calculated the dose to the nearest resident in millirems per year for the second half of 2015 from the licensed activities and concluded that the dose does not exceed the 100 mrem per year dose limit. A copy of the calculation sheet as well as an explanation of the calculation method is included. This is being done at the request of Elaine Brummett, previously of your staff, in an email dated September 7, 2001.

Additional information from the responses to the Nuclear Regulatory Commission’s (NRC’s) Requests for Additional Information (RAI’s) dated July 13, 2015 regarding the Renewal Request for Source Material License (SML) – 1350 is being included at the request of James Webb in a telephone conversation on the morning of Tuesday January 12, 2016

Should you have any questions, please contact me at (307) 328-1476.

Sincerely yours,

Oscar A Paulson

Oscar Paulson
Facility Supervisor

cc: James Webb, Project Manager
Director - USNRC DNMS, Region IV (w/o enc.)
Rich Atkinson

KENNECOTT URANIUM COMPANY
SWEETWATER URANIUM PROJECT
Source Material License SUA-1350

2015
RadTrak Radon Monitor
(pCi/L)

DATE	LOCATION	RADIONUCLIDE	CONCENTRATION	ERROR ESTIMATE	LOWER LIMIT OF DETECTION (LLD)	
				pCi/L	pCi/L-Days	pCi/L
1/5/15 – 3/31/15	Downwind - Air 4A	Radon	0.5 pCi/L	+/- 0.02	6.0	0.06
1/5/15 – 3/31/15	Upwind - Air 2-A[2]	Radon	4.2 pCi/L	+/- 0.16	6.0	0.06
1/5/15 – 3/31/15	Upwind – Air 2-B[1]	Radon	2.9 pCi/L	+/- 0.13	6.0	0.06
	Average – Air 2		**2.9 pCi/L**			
3/31/15 – 7/1/15	Downwind - Air 4A	Radon	2.1 pCi/L	+/- 0.10	6.0	0.06
3/31/15 – 7/1/15	Upwind - Air 2-A[1]	Radon	2.4 pCi/L	+/- 0.11	6.0	0.06
3/31/15 – 7/1/15	Upwind – Air 2-B[1]	Radon	2.7 pCi/L	+/- 0.12	6.0	0.06
	Average – Air 2		**2.6 pCi/L**			
7/1/15 – 10/1/15	Downwind - Air 4A	Radon	2.5 pCi/L	+/- 0.11	6.0	0.06
7/1/15 – 10/1/15	Upwind - Air 2-A[1]	Radon	3.4 pCi/L	+/- 0.14	6.0	0.06
7/1/15 – 10/1/15	Upwind – Air 2-B[1]	Radon	3.5 pCi/L	+/- 0.14	6.0	0.06
	Average – Air 2		**3.5 pCi/L**			
10/1/15 – 1/4/16	Downwind - Air 4A	Radon	2.9 pCi/L	+/- 0.12	6.0	0.06
10/1/15 – 1/4/16	Upwind - Air 2-A[1]	Radon	3.5 pCi/L	+/- 0.13	6.0	0.06
10/1/15 – 1/4/16	Upwind – Air 2-B[1]	Radon	3.4 pCi/L	+/- 0.13	6.0	0.06
	Air 2-A		**3.5 pCi/L**			

[1] A second RadTrak was deployed at the upwind Air 2 location during all four (4) quarters of 2015 for comparative and quality assurance/quality control purposes. The results from both RadTraks were averaged to generate the final values for the second, third, and fourth quarters of 2015 for monitoring station Air 2 (upwind air). The result of the single 2-B RadTrak was the only upwind result used for the first quarter of 2015 since the first 2-A RadTrak was found on the ground on March 31, 2015.

[2] Fence posts and barbed wire were placed around the Air 2 monitoring location to prevent animals (cattle and horses) from knocking down the detectors.

KENNECOTT URANIUM COMPANY
SWEETWATER URANIUM PROJECT
Source Material License SUA-1350

2015
DIRECT RADIATION MEASUREMENTS

Location	Date	Exposure Rate (mr/Qtr)	Lower Limit of Detection (LLD) Millirems
Environmental Dosimeter			
0000 – Deploy Control	1/4/15 – 3/31/15	38.1	1[1]
0004 - Air 4A	1/4/15 – 3/31/15	45.1	1[1]
Security Trailer	1/4/15 – 3/31/15	45.4	1[1]
Environmental Dosimeter			
0000 – Deploy Control	3/31/14 – 7/1/15	36.8	1[1]
0004 - Air 4A[1]	3/31/14 – 7/1/15	49.1	1[1]
Security Trailer	3/31/14 – 7/1/15	45.0	1[1]
Environmental Dosimeter			
0000 – Deploy Control	7/1/15 – 10/1/15	40.8	1[1]
0004 - Air 4A	7/1/15 – 9/30/15	48.9	1[1]
Security Trailer	7/1/15 – 10/1/15	49.1	1[1]
Environmental Dosimeter			
0000 – Deploy Control	10/1/15 – 1/4/16	41.9	1[1]
0004 - Air 4A	9/30/15 – 1/4/16	51.9	1[1]
Security Trailer	10/1/15 – 1/4/16	51.5	1[1]

[1] Please see the following copy of a brochure from Landauer, Inc. containing information on Lower Limits of Detection (LLDs).

Note: The Deploy Control dose used on this form and in this report is the dose listed on the Environmental Dosimetry Report as Control Dose Used. Landauer, Inc. no longer provides labeled Deploy and Transit Control doses.

CONTINUOUS LOW-VOLUME AIR PARTICULATE ANALYSIS

STATION 4A – 2015

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/ml	Error Estimate µCi/ml	LLD µCi/ml	Effluent Conc.* µCi/ml	% Effluent Concentration
1st Quarter	U-nat	2.5 E-17	N/A	1E-16	9E-14	2.7 E-02
1/5/15–3/30/15	Th-230	1.5 E-17	6.2E-18	1E-16	3E-14	5.0 E-02
Air Vol in mLs	Ra-226	1.9 E-17	2.0E-17	1E-16	9E-13	2.1 E-03
4.19 E+10	Pb-210	2.4 E-14	3.9E-15	2E-15	6E-13	3.9 E+00
2nd Quarter	U-nat	6.6 E-17	N/A	1E-16	9E-14	7.4 E-02
3/30/15–7/6/15	Th-230	4.6 E-17	8.7E-18	1E-16	3E-14	1.5 E-01
Air Vol in mLs	Ra-226	4.1 E-17	1.7E-17	1E-16	9E-13	4.6 E-03
4.93 E+10	Pb-210	1.5 E-14	2.5E-15	2E-15	6E-13	2.6 E+00
3rd Quarter	U-nat	1.0 E-16	N/A	1E-16	9E-14	1.1 E-01
4/6/15-10/5/15	Th-230	3.2 E-17	6.2E-18	1E-16	3E-14	1.1 E-01
Air Vol in mLs	Ra-226	3.2 E-17	1.3E-17	1E-16	9E-13	3.6 E-03
4.40 E+10	Pb-210	2.2 E-14	3.6E-15	2E-15	6E-13	3.7 E+00
4th Quarter	U-nat	1.0 E-16	N/A	1E-16	9E-14	1.1 E-01
10/5/15-1/4/16	Th-230	5.4 E-17	1.0E-17	1E-16	3E-14	1.8 E-01
Air Vol in mLs	Ra-226	2.6 E-17	1.2E-17	1E-16	9E-13	2.9 E-03
4.59 E+10	Pb-210	2.7 E-14	4.4E-15	2E-15	6E-13	4.5 E+00

LLD's are as published in Reg. Guide 4.14
*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2
Year for Natural Uranium
Year for Thorium-230
Week for Radium-226
Day for Lead-210

Radionuclide Releases
From the Sweetwater Uranium Project

The Sweetwater Mill is not operating, thus there are no releases from stacks related to the mill such as the dryer stack, exhausts from the Solvent Extraction (SX) Building, or any other stacks. There is no ore on the Ore Pad and the Ore Pad was cleaned following cessation of operations on April 15, 1983, thus there are no emissions (windblown ore dust or radon) from stockpiled ore. The tailings impoundment has been largely covered with fluid-filled, lined lagoons minimizing any windblown tailings. The attached map entitled **Tailings Impoundment – December 2009** and the most recent Google Earth image entitled **Tailings Impoundment – June 8, 2014** attest to the current water covered condition of the impoundment.

The impoundment is tested as required by 40 CFR Part 61 Subpart W annually to determine average Radon-222 flux. The most recent test for which complete information is available was completed on Wednesday, August 5, 2015. In addition, concurrent with the test, the impoundment was surveyed to determine the total area of 11(e).2 byproduct material as well as the total water covered area. The results of the 2015 Method 115 Test and survey are as follows:

Area Description	**Area (square meters)**	**Radon-222 Flux (pCi/m^2-sec)**
Exposed tailings	62,470.7	18.06
Water covered areas	95,609.1	0
Total	158,079.8	7.14 (average)

The total area of 11(e).2 byproduct material of 158,079.8 square meters has an average flux rate of 7.14 pCi/m^2 –sec. This equates to a total annual Radon-222 release from the impoundment of:

(7.14 pCi/m^2–sec) (158,079.8 square meters) (365 days/year) (24 hours/day) (60 minutes/hour) (60 seconds/minute) = 3.56 E+13 pCi = 35.6 curies of Radon-222 per year.

This average flus rate of 7.14 pCi/m^2-sec is slightly higher than the average background flux rate of 5.47 pCi/m^2-sec based on ten (10) background radon flux measurements taken concurrently with the 2015 Method 115 Test in undisturbed locations south and west of the facility. Radon-222 activities of air downwind of the facility averaged less than upwind Radon-222 activities in the second half of 2015. This situation (downwind average Radon-222 activities in air being less than upwind activities) has been consistently observed for the facility for at least the past two (2) decades.

No liquid effluents have been released from the facility in 2015. All contaminated liquids as well as pumpback water are placed in the tailings impoundment.

1 February 2016

To: File – 10 CFR 40.65 Report

Subject: Dose to the General Public in Millirems per Year as Represented by the Nearest Resident – Second Half 2015

The following is a dose calculation for the nearest resident (the contract security guard) for the second half of 2015.

Calculation Assumptions:

1. The nearest resident for dose calculation purposes is considered to be the site security officer when he is not on duty and sleeping inside the Security Trailer. The site security officer is scheduled to be on site from 5:30 p.m. on Thursday of each week to 10:00 p.m. the following Sunday, on holidays and at times that the Facility Technician is on vacation. In spite of the fact that the site security officer does not reside on site continuously, no occupancy factor is assigned to him and for dose calculation purposes he is assumed to reside on site continuously. The security officer's trailer is located immediately south of the site's southern chain link fence. As such, the calculated dose to the security officer would also apply to any member of the general public approaching the site fence. No member of the general public would be in close proximity to the site for as long as the security officer, whose dose is calculated based on continuous occupancy, in spite of the fact that he does not reside on site continuously. This methodology is extremely conservative and provides an estimate of dose that exceeds approximately double the actual dose. A map showing the location of the Security Trailer is attached.
2. Radon concentrations are measured in the Security Trailer with RadTrak detectors placed in the kitchen and bedroom and changed quarterly. The results from these detectors are averaged to derive a semiannual radon concentration in PicoCuries per liter for the Security Trailer.
3. Radon decay product exposures in working levels are measured semiannually in the Security Trailer using a calibrated Buck Basic 12, Bendix BDX-44, MSA or Sensidyne GilAir II air pump and filter. The filter is read by the modified Kusnetz Method.
4. The radon concentration and exposure are used to calculate the equilibrium factor. The equilibrium factors calculated semiannually are averaged to derive a site equilibrium factor.
5. This equilibrium factor is applied to the upwind radon concentrations to derive a background radon dose and to the average semiannual radon concentration in the Security Trailer to derive a radon dose to the nearest resident. An equilibrium factor table is attached.
6. The dose from the semiannual downwind airborne particulate concentrations of natural uranium, radium-226 and thorium-230 are used to calculate the dose from airborne particulates in the Security Trailer in spite of the fact that the Security Trailer is not downwind of the facility. The use of airborne particulate data from downwind of the facility provides conservative particulate concentrations.
7. Beginning in the third quarter of 2010 an environmental dosimeter was placed in the Security Trailer and exchanged quarterly to directly measure actual gamma dose in the trailer.
8. The doses from radon-222, airborne particulate radionuclides and gamma radiation are summed to produce a dose to the nearest resident (the Security Trailer).
9. The radon concentrations measured at the upwind air monitoring station during the two (2) quarters for a given semiannual period are averaged, corrected for the site equilibrium factor and converted to a background radon dose for the facility.

10. This background radon dose is summed with the background gamma radiation dose (from the revised Environmental Report – dated August 1994) and the doses derived from the background airborne particulate concentrations (natural uranium, radium-226 and thorium-230 as described in the revised Environmental Report dated August 1994) to yield a background radiation dose for the facility for the given semiannual period.
11. The background dose is subtracted from the calculated dose to the nearest resident (Security Trailer) to derive a dose to the nearest resident from the facility.
12. This method was discussed with James Webb, Project Manager, of the Nuclear Regulatory Commission in an email dated Wednesday, January 19, 2011. In an email dated Monday, February 28, 2011, he replied that Kennecott Uranium Company should continue to follow the methods identified in the semiannual effluent (10 CFR 40.65) reports until directed otherwise. The emails are included in this report.

BACKGROUND

		Average Concentration	Dose (mrem)
Gamma Exposure:			200.70 (approx. 22.9 uR/hr)
Airborne Particulates:			
	U nat	6.2 E-16 µCi/ml	0.34
	Ra-226	3.9 E-16 µCi/ml	0.22
	Th-230	3.9 E-16 µCi/ml	0.65
	Gases:		
	Radon-222	3.46 pCi/l	207.3
Total			**409.2**

Notes:

1. An equilibrium factor of 0.136 was used for radon based on thirty-eight (38) comparisons of radon-222 and radon-222 daughter concentrations over twenty-two (22) years. Please see attached sheet entitled "Equilibrium Factors for Nearest Resident".
2. Gamma and airborne particulate background data is from the revised Environmental Report (August 1994).
3. The average background radon concentration of the RadTraks deployed at Air 2 in the third and fourth quarters of 2015 of 3.46 pCi/L was used for the second half 2015 radon concentration.
4. Calculation: (Radon concentration (pCi/l))*(Equilibrium factor)*(0.44 rems/pCi/l) = Dose (rems)
5.

SECURITY TRAILER

		Average Concentration	Dose (mrem)
Gamma Exposure:			201.2
Airborne Particulates:			
	U nat	1.00 E-17 µCi/ml	0.056
	Ra-226	4.30 E-17 µCi/ml	0.072
	Th-230	2.90 E-17 µCi/ml	0.002
Gases:			
	Radon-222	2.94 pCi/l	176.1
		Total	**377.4**

Note: Average radon concentration may vary slightly from those elsewhere in the document due to rounding differences

Notes:

1. An equilibrium factor of 0.136 was used for radon based on thirty-eight (38) comparisons of radon-222 and radon-222 daughter concentrations over twenty-two (22) years.
2. Downwind airborne particulate concentrations for the third and fourth quarters of 2015 were used for the security trailer. These doses were converted to millirems per year (mrem/yr).
3. Radon concentration was measured in the security trailer for the first and second quarters of 2015 and is based on an average of RadTrak units located in two (2) locations; the kitchen and the bedroom.
4. The gamma exposure for the Security Trailer is based upon an environmental dosimeter placed in the Security Trailer and exchanged quarterly.

Second Half – 2015		
	Third Quarter	**Fourth Quarter**
Kitchen	2.5 pCi/L	3.1 pCi/L
Bedroom	2.6 pCi/L	3.5 pCi/L
Trailer Average:		**2.94 pCi/L**

5. The annual gamma dose rate is calculated by doubling the sum of the third and fourth quarter dosimeter readings, converting them to an annual dose rate.

The calculated net (dose to the nearest resident minus background dose) annual TEDE from the licensed operations for the second half of 2015 is **0.0** mrem/year, which is below the 100 mrem/year dose limit to members of the general public.

Oscar A Paulson

Oscar Paulson

Avg dose.doc

Additional Requested Radon Information

This section contains the additional relevant radon dose and concentration information requested in the telephone conversation with James Webb on Tuesday, January 12, 2016, and is excerpted from the responses to the July 13, 2015 Requests for Additional Information (RAI's) regarding the Renewal Request for Source Material License (SML) SUA-1350. The excerpted information is in italics.

Modeled Radon Concentration and Dose Data

> *Radon-222 concentrations at the requested receptor point locations (Air Station 4A and Security Trailer) were modeled using the MILDOS-AREA computer code (ANL, 2015).In addition, the spatial distribution of Rn-222 air concentrations and corresponding doses to a hypothetical receptor at any given location in the general vicinity of the Mill were modeled for 3,723 individual receptor points on a 100 × 100 meter grid covering approximately 8,900 acres with the impoundment situated at the center of the grid*

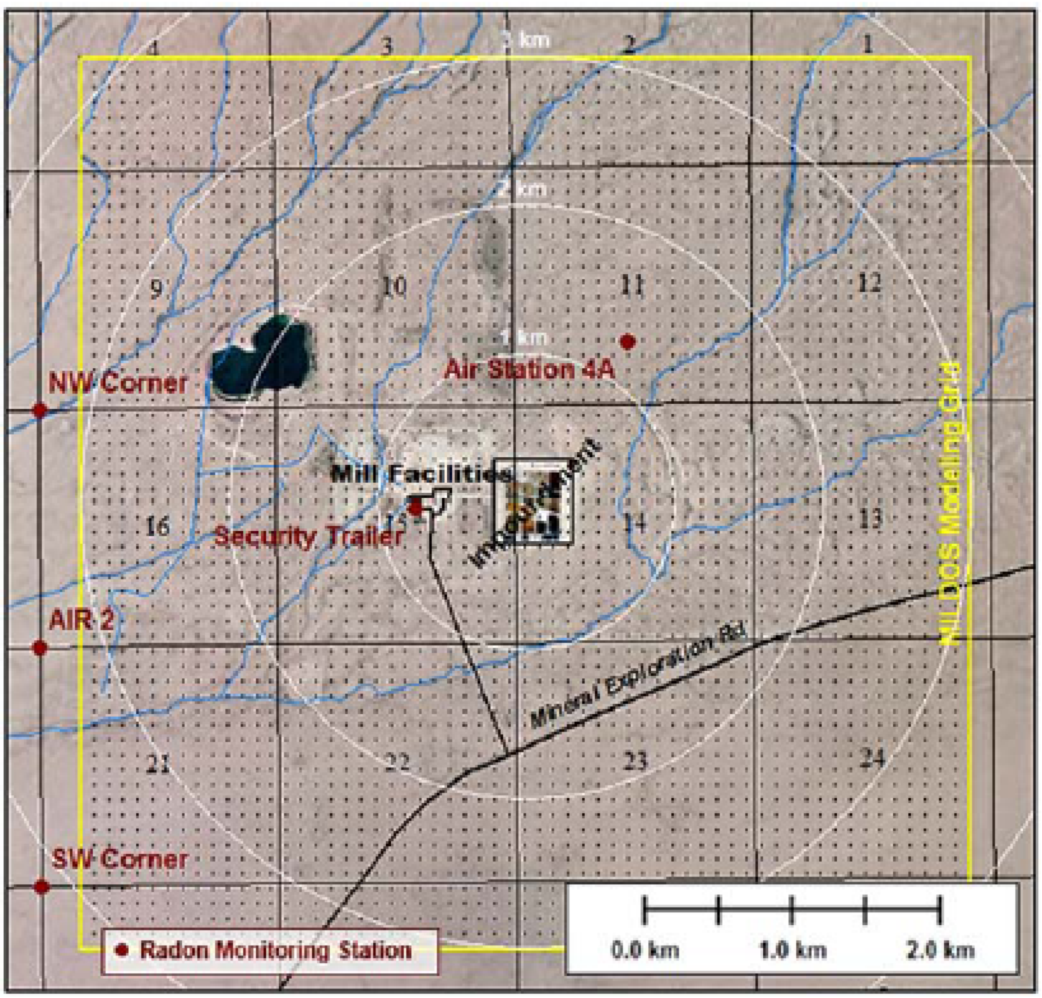


Figure 8-1: MILDOS modeling grid (receptor locations on 100-m centers).

The Rn-222 effluent source term for the tailings impoundment was based on an average radon flux of 8.97 pCi/m2-s across a total area of 157,449 m2 (about 39 acres) as reported in the 2014 Semi-annual Effluent Report (Kennecott, 2014). The value of 8.97 pCi/m2-s is based on the average flux value for the exposed tailings divided over the entire areal extent of 11(e).2 byproduct material residing within the impoundment, including both water covered areas and areas with exposed tailings. Radon flux measurements and determination of the average flux across the impoundment were performed in accordance with Method 115 in 40 CFR Part 61 Subpart W.

Atmospheric dispersion modeling in MILDOS requires joint wind and atmospheric stability frequency data in a "STAR" (.STR) file format. The only multi-year set of Site specific meteorological (MET) data which included the necessary joint frequency tables to create a .STR file was provided in the 1994 Revised Environmental Report (SMI, 1994). These data were reported for the years 1983-1987, and were used for MILDOS modeling in the 1994 Revised Environmental Report to support planned resumption of milling activities in a respective submittal to the U.S. Nuclear Regulatory Commission (NRC) (SMI, 1994). This data was accepted for use by the NRC.

Current review of all historical MET data for the Site suggests that the Site's annual wind rose for the 1983 87 time period was somewhat different relative to data collected in later years (1994 1997) (SMI, 1999). Moreover, the later data appear to agree more closely with typical regional wind rose data for both Rawlins and Casper, WY (Figure 8-2). In addition, in the Technical Report portion of a recent NRC license application for the nearby Lost Creek ISR project (Lost Creek ISR, 2010), a statistical analysis was performed showing that the meteorology at Rawlins, WY is statistically representative of meteorology at the now licensed Lost Creek ISR site (NRC License SUA 1598). The Lost Creek ISR facility is located about 10 km northeast of the Sweetwater Mill, and lacking any significant topography in this part of Wyoming (within the Great Divide Basin), it is reasonable to assume that meteorological conditions at both sites are very similar.

Joint wind/atmospheric stability data for Rawlins, WY are available in the required .STR file format from the RESRAD-OFFSITE computer code (ANL, 2009). Due to uncertainty with respect to the most representative MET data to use for atmospheric dispersion modeling of radon effluents from the tailings impoundment, a joint frequency .STR file was generated for the site-specific 1983-87 data set for use in the modeling, and the .STR file for Rawlins, WY from the RESRAD-OFFSITE program was also used to separately model atmospheric dispersion of radon effluents in the event that this data set is more representative of long-term meteorological conditions at Sweetwater.

In addition to modeling the spatial distribution of atmospherically dispersed radon effluents from the tailings impoundment, the corresponding effective dose to a hypothetical human receptor at each grid location was modeled based on standard MILDOS assumptions of 100% occupancy and age weighted dose conversion factors for members of the public (NRC, 1982; ANL, 2008). This modeled dose takes into account the spatial variability in effluent radon progeny and equilibrium ratios with distance from the impoundment source term as discussed in the response to RAI #6 (see Figure 6-3). (Included in the October 2015 Responses to NRC Requests for Additional Information but not in this discussion)

MILDOS modeling output for each meteorological scenario (Rawlins .STR file or Sweetwater .STR file) as described above was mapped using commercially available GIS software (Global Mapper®). This software was further used to develop continuous color coded contour gradients representing the spatial distributions of modeled values for radon effluent concentrations and receptor doses (based on triangular interpolation between receptor grid points). The results are presented in Figure 8-3 through Figure 8-5.

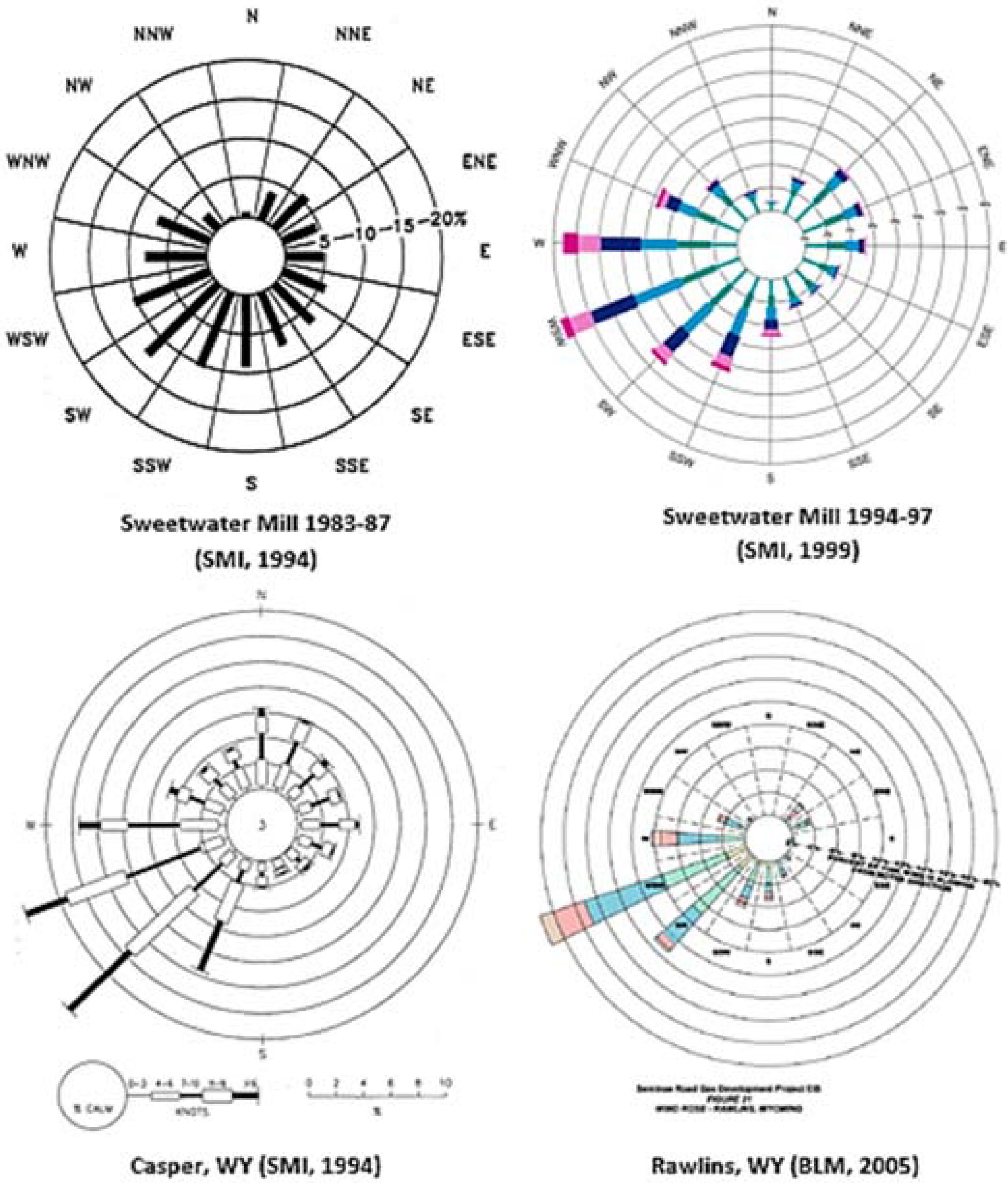


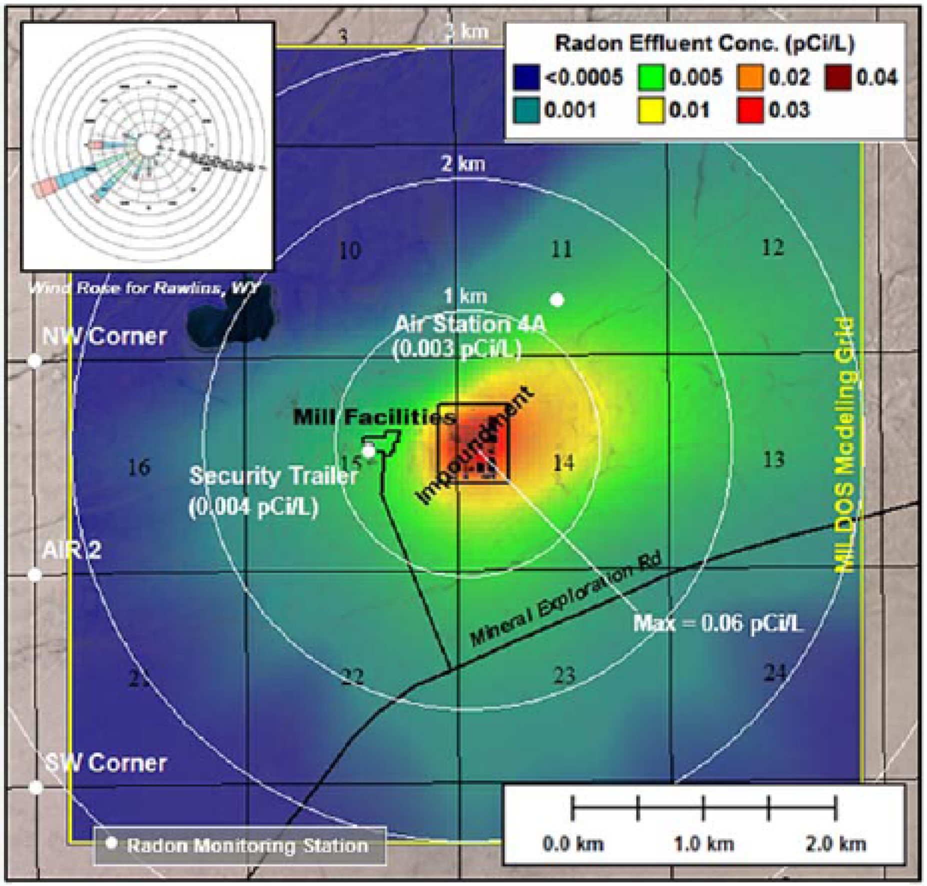
Figure 8-2 Annual average wind rose data for the Sweetwater Mill Site (top) compared to typical regional wind roses for Casper, WY (bottom left) and Rawlins, WY (bottom right).

The modeling results in Figure 8-3 through Figure 8-5 indicate negligible radon concentrations and doses at the Security Trailer and Air Station 4A due to effluents from the impoundment (values are annotated in the Figures). Radon effluents from licensed materials cannot be measured with track etch detectors at either of these locations as is demonstrated by the data comparisons in Table 8-1, which include reported analytical uncertainties and detection limits. MILDOS modeling based on actual radon flux measurements indicates that effluents from licensed materials at these locations are expected to be an order of magnitude lower than detection limits and data uncertainties for track etch monitoring devices.

Station	Quarter	2014 RadTrak® Radon Monitoring Results			Modeled Radon Effluent Concentration from Licensed Materials (pCi/L)	
		Mean Conc (pCi/L)	Uncertainty (pCi/L)	LLD (pCi/L)	Based on Rawlins Joint Frequency Surrogate MET Data	Based on 1983-1987 Sweetwater Joint Frequency MET Data
4A	1	1.3	0.08	0.06	0.003	0.003
	2	1.6	0.08	0.06		
	3	1.9	0.10	0.06		
	4	2.3	0.11	0.06		
	Mean	1.8	0.09			
	Std Dev	0.4	0.02			
Security Trailer	1	1.5	0.09	0.06	0.004	0.006
	2	1.0	0.07	0.06		
	3	1.3	0.08	0.06		
	4	2.4	0.11	0.06		
	Mean	1.5	0.08			
	Std Dev	0.6	0.02			

Table 8-1 Comparison of Quarterly Track Etch Radon Monitoring Data Versus Modeled Radon Effluents From Licensed Materials at the Security Trailer and Downwind Radon Monitoring Station 4A

With respect to locations other than the Security Trailer where a public receptor could potentially receive a radiological dose due to radon effluents from licensed materials, the maximum dose to any public receptor residing 100% of the time anywhere beyond the impoundment would be less than 2 mrem/y. Based on the MILDOS modeling results shown in Figure 8-3 and Figure 8-6, the consistently higher background radon concentrations measured upwind of the site with track etch detectors (versus those measured downwind of the site) as discussed in the July 2014 License Renewal Application are not related to airborne effluents from the impoundment.



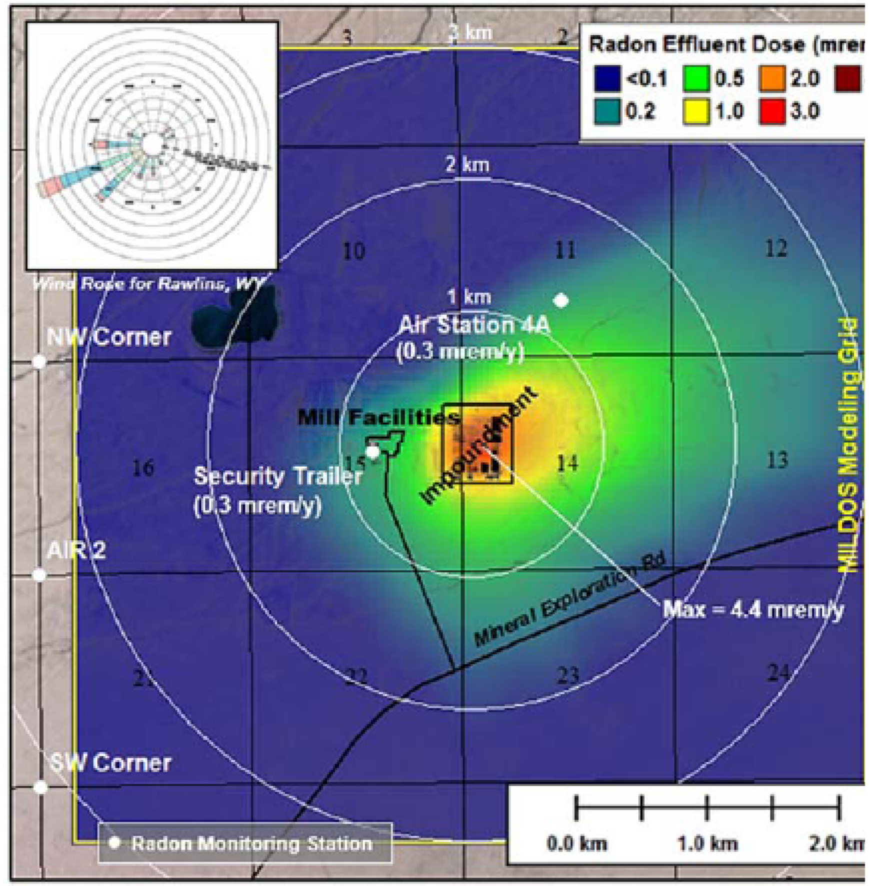


Figure 8-3: Modeled Spatial Distribution of Rn-222 Concentrations in Air in the Vicinity of the Sweetwater Mill Due to Effluents from the Impoundment. (Based on radon flux measurements across the impoundment along with joint wind and atmospheric stability frequency data for Rawlins, WY [used as a representative surrogate for meteorological data for the Sweetwater Mill area]).

Figure 8-4: Modeled Spatial Distribution of Radiological Doses to a Hypothetical Receptor Located Anywhere in the Vicinity of the Sweetwater Mill Due to Rn-222 Effluents from the Impoundment. (Based on radon flux measurements across the impoundment along with joint wind and atmospheric stability frequency data for Rawlins, WY [used as a representative surrogate for meteorological data for the Sweetwater Mill area]).

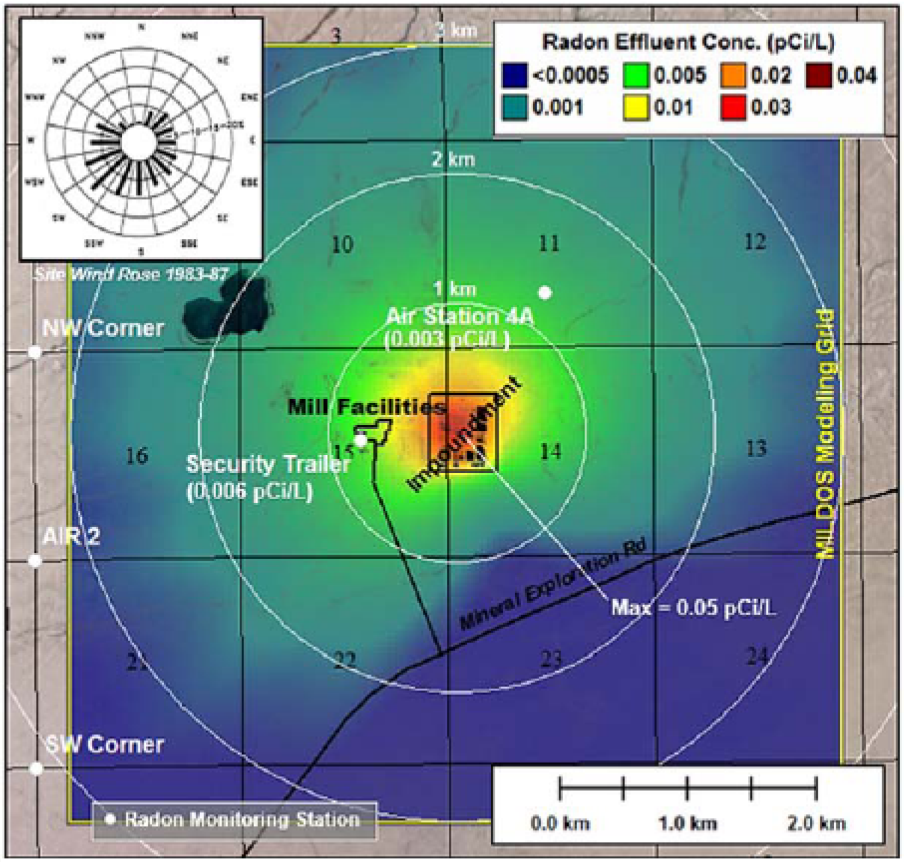


Figure 8-6: Modeled Spatial Distribution of Rn-222 Concentrations in Air in the Vicinity of the Sweetwater Mill Due to Effluents from the Impoundment. (Based on radon flux measurements across the impoundment along with site-specific joint wind and atmospheric stability frequency data collected between 1983 and 1987 [SMI, 1994]).

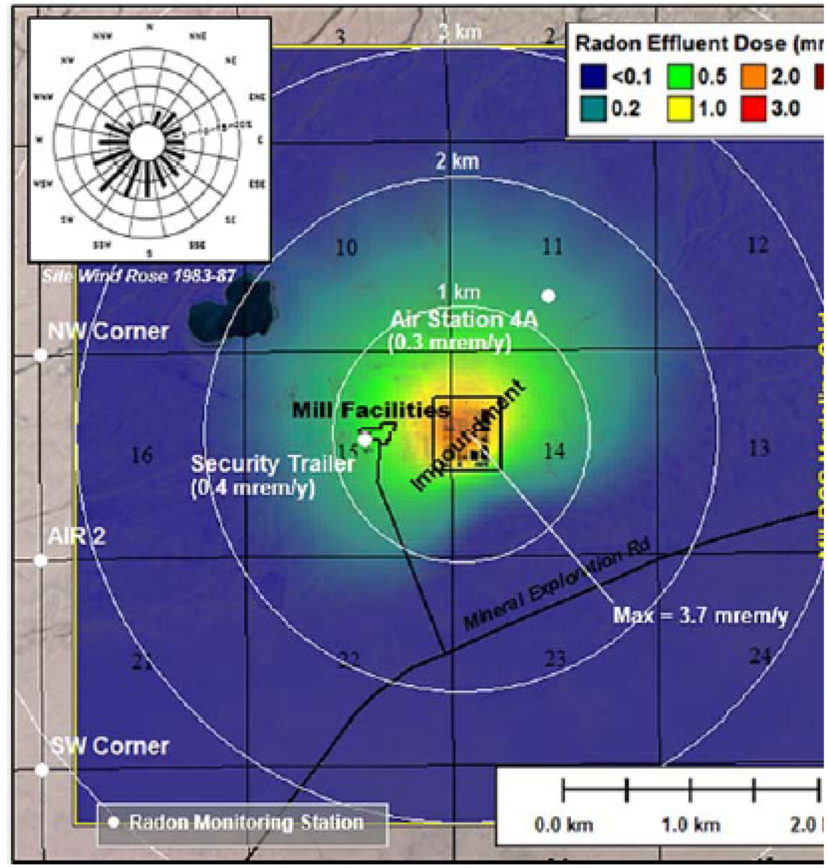


Figure 8-5: Modeled Spatial Distribution of Radiological Doses to a Hypothetical Receptor Located Anywhere in the Vicinity of the Sweetwater Mill Due to Rn-222 Effluents from the Impoundment. (Based on radon flux measurements across the impoundment along with site-specific joint wind and atmospheric stability frequency data collected between 1983 and 1987 [SMI, 1994]).

The only source of radon on site is the tailings impoundment. This modeling data shows that the modeled Radon-222 activity at the Security Trailer from licensed activities (the tailings impoundment) varied from 0.004 to 0.006 pci/L with a maximum of 0.05 to 0.06 pCi/L in the center of the tailings impoundment resulting in a dose of 0.3 to 0.4 millirems per year at the Security Trailer with a maximum of 1.7 to 4.4 millirems per year at the center of the tailings impoundment based upon the 2014 radon flux rate of 8.97 pCi/M2-sec form the tailings impoundment in 2014. The 2015 radon flux from the tailings impoundment in 2015 was less at 7.14 pci/m2-sec. This would have resulted in a lower dose in 2015. Given these low doses the public dose limit at the Security Trailer could not have been exceeded in 2015.

Enhanced Measurement of Radon -222 Decay Product Activities in the Security Trailer.

In the third and fourth quarters of 2015 enhanced measurements of Radon-222 decay product activities were made in the Security Trailer. Normally Radon-222 decay product activities are measured via the modified Kusnetz Method using a personal breathing zone sampler generally operating at a flow rate of no greater than 10 liters per minute.

Enhanced modifed Kusnetz Method measurements were made in the Security Trailer in the third and fourth quarters of 2015 at flow rates at or slightly greater than 400 liters per minute via the following method, the technical specifications of which are as follows:

The technical specifications of the method are as follows:

- *The method used is the modified Kusnetz Method as described by EPA (EPA, 2011) and elsewhere (e.g. CNSC, 2003), except that a larger sample is collected to increase method sensitivity (decease the LLD).*
- *The air is sampled for approximately 5 minutes with an F & J Model DFHV-1DS high volume sampling pump at a typical flow rate on the order of 465 liters/minute.*
- *The sampling filter is an F&J Specialty Products glass-fiber filter with diameter of 10 cm (4 inches).*
- *The typical elapsed time between the end of the collection interval and the beginning of the counting interval is approximately 60 minutes, with a typical applied hold time correction factor of about 110 in accordance with the standard Kusnetz Method table of correction factors.*
- *The filters are counted on an Eberline SACR-5 alpha scintillation detector calibrated within the previous six months.*

The results are as follows:

Date	Location	Sample Volume (L)	Working Level	LLD[1]	LLD[2]
7/30/2015	Kitchen	2210	0.0017	0.00003	0.0003
8/10/2015	Bedroom	1968	0.0019	0.00002	0.0004
8/10/2015	Kitchen	1964	0.0013	0.00002	0.0003
8/11/2015	Bedroom	2229	0.0008	0.00002	0.0002
8/11/2015	Kitchen	2095	0.0009	0.00002	0.0002
8/13/2015	Bedroom	2088	0.0013	0.00003	0.0006
8/13/2015	Kitchen	2139	0.0013	0.00003	0.0006
8/19/2015	Bedroom	2054	0.0017	0.00002	0.0003
8/19/2015	Kitchen	2008	0.0021	0.00002	0.0003
8/26/2015	Bedroom	2243	0.0019	0.00002	0.0002
8/26/2015	Kitchen	2109	0.0024	0.00002	0.0002
9/3/2015	Bedroom	2147	0.0004	0.00002	0.0003
9/3/2015	Kitchen	2100	0.0005	0.00002	0.0003
9/10/2015	Bedroom	2175	0.0008	0.00002	0.0002
9/10/2015	Kitchen	2268	0.0010	0.00002	0.0002
12/30/15	Bedroom	2071	0.0008	N/C	N/C
	Kitchen	1901	0.0012	N/C	N/C
Average:			0.0013		

[1]LLD based on applicable equations provided in Cember and Johnson (2009) and Knoll (2000).

[2]LLD based on incorrect equation provided in Appendix B of Regulatory Guide 8.30 (NRC, 2002).

[3] N/C – Not Calculated

Table 7-1 Measured Working Levels and Lower Limits of Detection for Radon Progeny within the Security Trailer in the Summer of 2015

Give the Radon-222 decay product activity of 0.0013 Working Levels and an average Radon-222 activity in air for the trailer for the second half of 2015 of 2.94 pCi/L the equilibrium factor is:

((0.0013 WL)/(2.94))*(100) = 0.0442

This value is less than the equilibrium factor of 0.136 used in the dose calculation.

If this equilibrium factor were used the dose in the Security Trailer due to Radon-222 progeny would be:

(2.94 pCi/l)*(0.0442)*(440 millirems per pci/L) = 57.2 millirems.

This is less than the calculated dose due to Radon-222 progeny of 176.1 millirems

This demonstrates the inherent conservatism of the dose calculation method used in the report.