

Office of Environmental Management – Grand Junction



Environmental Air Monitoring Data Quarterly Report for the Moab and Crescent Junction, Utah, Sites

Fourth Quarter 2006 (October through December 2006)



U.S. Department
of Energy

Office of Environmental Management

Moab/Crescent Junction, Utah
Environmental Air Monitoring Results
October through December 2006

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Summary of Results

Site: Moab, Utah

Sampling Period: October through December 2006

Atmospheric Radon-222: U.S. Department of Energy (DOE) Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a guideline for atmospheric emissions of radon-222 gas that is applicable to the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project Site (Moab Site). This guideline is 3.0 picocuries per liter (pCi/L) above background. Background concentrations of radon-222 in the Moab area have been established at 0.7 pCi/L; based on 3 years of data from 2003 through 2005, therefore, the guideline for radon-222 emissions at the Moab Site is 3.7 pCi/L. Monitoring data collected during the fourth quarter of 2006 indicate that this guideline was exceeded at three on-site monitoring locations. Additionally, an anomalous result was reported at one off-site location, which has been used thus far to characterize background. Refer to Table 1 and Table 2 for a review of radon-222 data for the Moab Site. Sample locations for the Moab Site are presented in Figure 1 and Figure 2.

Direct Environmental Gamma Radiation: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a dose limit of 100 millirem per year (mrem/yr) above naturally occurring gamma levels (background). Background gamma radiation for the Moab area has been established at 82 mrem/yr; therefore, the gamma dose limit for the Moab Site is 182 mrem/yr (45.5 mrem/quarter [qtr]). Based on the monitoring data collected during the fourth quarter of 2006, five on-site monitoring locations exceeded the gamma dose limit, while none of the off-site monitoring locations exceeded the quarterly gamma radiation dose limit. Refer to Table 1 and Table 2 for a review of gamma data for the Moab Site.

Although the exposure rates were exceeded at several locations along the DOE site property boundary, this does not reflect expected doses to the public. These data represent the dose that a member of the public could receive if he or she resided at the point where the data were collected for an entire year. This is not a realistic representation of actual or expected public exposure conditions because no member of the public permanently resides at or near these locations of elevated readings. Monitoring data observed at the maximum exposed individual (MEI) location, just east of the Moab Site, represents the greatest potential exposure to a member of the public. The average annual gamma radiation dose measured at the MEI during 2006 was 63.7 mrem/yr (Table 2). This annual dose at the MEI location is consistent with the 2005 result, which was 66 mrem/yr (DOE 2006).

Radioparticulates: No standards or radiological exposure limits were exceeded at any of the nine radioparticulate monitoring locations during the fourth quarter of 2006. Analytical data for all analytes (radium-226, thorium-230, polonium-210, and uranium-total) were below their respective Derived Concentration Guidelines (DCGs), as found in DOE Order 5400.5, *Radiation Protection of the Public and Environment* (Figure III-1). Concentrations of the radioparticulates have been consistently below DCGs since DOE assumed ownership of the site in 2001. DOE Order 5400.5 also requires that the radiological dose resulting from airborne emissions be less than 10 mrem/yr. All off-site sampling location concentrations, when converted to dose, using the relationship: (measured concentration)/(DCG concentration) x (100 mrem/yr), were indistinguishable from the average background value of 0.8 mrem/yr.

During the fourth quarter 2006, the on-site dose resulting from airborne emissions, including background, was 0.9 mrem/yr at location 0102 and 1.4 mrem/yr at location 0105. Refer to Table 3 for a review of radioparticulate air monitoring data for the Moab Site.

Table 1. Moab Environmental Air Monitoring Locations with Samples that Exceeded Applicable Regulatory Standards, Limits, or Guidelines During 2006

Analyte	Standard/Guideline	Sample Locations Exceeding Standards/Guidelines During the Fourth Quarter	Sampling Locations Exceeding Standards/Guidelines During 2006
Radon-222	3.7 pCi/L	0106, 0107, 0108	0106, 0107, 0108,
Direct Gamma Radiation	182 mrem/yr (45.5 mrem/qtr)	0107, 0108, 0109, 0110, 0111	0101, 0105, 0107, 0108, 0109, 0110, 0111, 0113†

† 0113 exceedance is estimated based on two quarters of data.

Site: Crescent Junction, Utah

Sampling Period: October through December 2006

Atmospheric Radon-222: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a guideline for atmospheric emissions of radon-222 gas that will be applicable to the Crescent Junction Site (3.0 pCi/L above background). Because the uranium mill tailings have yet to be placed at the disposal site, all sampling results to date represent baseline conditions (i.e., natural background conditions). The data collected until tailing placement begins will be used to calculate a background value and ultimately a site-specific radon standard. Sample locations for the Crescent Junction Site are presented in Figure 3. Refer to Table 4 for a review of radon data for the Crescent Junction Site.

Direct Environmental Gamma Radiation: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a dose limit of 100 mrem/yr above naturally occurring gamma levels (background). Because the uranium mill tailings have yet to be placed at the disposal site, all sampling data results to date represent baseline conditions (i.e., natural background conditions). The data collected until tailing placement begins will be used to calculate a background value and ultimately a site-specific gamma radiation standard. Refer to Table 4 for a review of gamma data for the Crescent Junction Site.

Radioparticulates: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes DCGs for concentrations of radioparticulates in air. Because the uranium mill tailings have yet to be placed at the disposal site, all sampling data results to date represent baseline conditions (i.e., natural background conditions). The data collected until tailing placement begins will be used to calculate a background value and ultimately a site-specific radioparticulate standard. Refer to Table 5 for a review of radioparticulate air monitoring data for the Crescent Junction Site.



Kenneth E. Karp, Moab Project Manager

3-23-07
Date

Data Assessment

Environmental Air Monitoring Field Activities Verification Checklist

Project	Moab/Crescent Junction, Utah	Date(s) of Air Sampling	October through December 2006
Date(s) of Verification	February 21-22, 2006	Name of Verifier	Mark Kautsky

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
2. Were the sampling locations specified in the SAP?	Yes	Measured air flow values were 61, 56, 56, 56, and 58 liters/minute at stations 0117, 0102, 0121, 0123, and 0122, respectively. Electrical power at station 0105 was switched off for maintenance of the electrical line and could not be measured.
3. Were low-volume air samplers operating at or near 60 Liters/minute \pm 10%?	Yes	All air samplers were within 10% of the 60 liter/minute sample rate; however, as a best management practice, airflow rates were adjusted to exactly 60 liters/minute at stations 0117, 0102, 0121, 0123, and 0122. Because the power was off at Station 105 (see item 2 above), its calibration status was not determined.
4. Did any of the samplers require airflow adjustment?	No	TLD and radon cup at 0304 were found on the ground at the Crescent Junction Site. Radon cup was found on the ground at background location 0117. For this reason, the radon concentration and direct gamma radiation at 0304, and the radon concentration at 0117 were "R" flagged (determined unusable). The duplicate sample at location 0117 was reported in place of the unusable sample from location 0117. Radon cup and TLD were lost at 0113.
5. Were detectors (radon cups, TLDs) and monitoring equipment found to be in undisturbed and operable condition upon arrival?	No	
6. Were the hourly clocks on the low-volume air samplers operational upon arrival?	Yes	
7. Were the run times recorded for each radioparticulate monitoring location?	Yes	Duplicate sample at background location 0117 was unusually elevated for radon in comparison to historical background concentrations
8. Were duplicates (for radon and gamma radiation) taken at a frequency of one per 20 samples?	Yes	
9. Were equipment blanks (for radioparticulates) taken at a frequency of one per 20 samples?	No	Not required. Concentration of uranium slightly above detection; contribution of uranium in filter matrix will be negated when subtracting background concentrations.
10. Were trip blanks (for radon and gamma radiation) included with each shipment?	No	A trip blank was not used for the radon monitoring; however, a trip blank was used for the direct gamma radiation monitoring
11. Was the identity of the QC sample locations protected?	Yes	

Environmental Air Monitoring Field Activities Verification Checklist (continued)

Project	<u>Moab/Crescent Junction, Utah</u>	Date(s) of Air Sampling	<u>October through December 2006</u>
Date(s) of Verification	<u>February 21-22, 2006</u>	Name of Verifier	<u>Mark Kautsky</u>

	Response (Yes, No, NA)	Comments
12. Were the true locations of the QC samples recorded in the Field Log Book?	<u>Yes</u>	
13. Were all samples collected as specified in the SAP?	<u>Yes</u>	
14. Were chain of custody records completed and was sample custody maintained?	<u>Yes</u>	
15. Are field data sheets signed and dated by sampling personnel?	<u>Yes</u>	
16. Was all other pertinent information documented on the field data sheets?	<u>Yes</u>	

Data Assessment Summary

Atmospheric Radon-222 Analyses

Radon detectors were analyzed by Landauer Inc. in accordance with Landauer's *Quality Assurance Manual for Radon Monitoring Services, Revision Number 9, March, 2004*. Fourth quarter 2006 analytical radon data were received in a report dated January 11, 2006. Unlike radioparticulate analyses, radon-222 data are not reported with qualifiers. In the event that the detectors are either missing, damaged, or cannot be read, the laboratory would make a special comment. After the data report was received, sampling personnel reviewed the data to make sure that the results were consistent with other data points collected for each monitoring location. Data reports were checked to verify that the reported concentrations were correct.

Direct Environmental Gamma Radiation Analyses

Thermoluminescent dosimeters (TLDs) are used for continuous dose measurements and are analyzed by Environmental, Inc., Midwest Laboratory in accordance with their analytical procedure *Preparation and Readout of Teledyne Isotopes TLD Card, TIML-TLD-01, Revision 7* (Teledyne Isotopes 2001). Fourth quarter 2006 environmental gamma radiation data were received in a report dated January 24, 2007. After the laboratory results were received, sampling personnel reviewed the data to verify that the results were consistent with data points collected previously at each monitoring location. Data reports were checked to verify that the reported concentrations were correct.

Radioparticulate Analyses

Severn Trent Laboratories (STL)-St. Louis, Missouri, analyzed the radioparticulate samples for radium-226, thorium-230, polonium-210, and total uranium. Results for the fourth quarter 2006 sampling period are in Report Identification Number (RIN) 07010643. Polonium-210 and thorium-230 were analyzed by alpha spectrometry, STL methods STL-RC-0210 and EML A-01-R MOD, respectively. Radium-226 was analyzed by gas proportional counting, STL method EML RA-06-RC MOD. Total uranium was analyzed by inductively coupled plasma-mass spectrometry, EPA method SW-846 6020. Radioparticulate analytical data for samples collected during the fourth quarter of 2006 were reviewed, validated, and summarized in the *Data Review and Validation Report for RIN 07010643* (February 6, 2007).

Field Activities

Duplicate direct gamma measurements were made at three Moab locations: (1) 0117, one of the background monitoring locations; (2) 0107, an on-site location with consistently elevated readings; and (3) MEI, an off-site location. Duplicate samples for radon-222 monitoring were collected at five locations: (1) 0106, an on-site location along the eastern property line of the Moab Site; (2) 0107, an on-site location at the southern property line of the Moab Site; (3) 0117, a background monitoring location; and (4) 0123, a background monitoring location along the east bank of the Colorado River, approximately 2 miles south of the Moab Site; and (5) MEI, located immediately east of the Moab Site property boundary and represents the greatest potential exposure scenario to a member of the public. Duplicate direct gamma and radon-222 measurements were made at Crescent Junction locations 0306 and 0307, which are near private residences.

Duplicate samples are not collected for radioparticulate samples. Because the radioparticulate sample data collected to date indicate that all of the isotopes are well below their respective DCGs, the costs associated with purchasing a duplicate sampler, providing additional electrical power, and incurring additional analytical expenses are not justified.

Suspected Anomalies

All analytical data are reviewed for anomalous or outlying data points. This review consists of evaluating monitoring data against historical and minimum/maximum values to determine if the reported data are within reasonable expected ranges. Because there are relatively few sample locations (i.e., data points), and the historical data set is relatively short, this review is currently conducted manually. An automated review of reported analytical data against historical and minimum/maximum values may be initiated after it is determined that the data set has become too large or cumbersome for an accurate manual review.

Because location 0117 is adjacent to a parking area for outdoor enthusiasts, it is probable that both radon detectors might have been tampered with during the fourth quarter. The background radon detector at location 0117 was found lying on the ground next to the sample-mounting post and its reading was elevated by a factor of approximately 20 above previous background results; therefore, the result of 11.5 pCi/L at location 0117 is deemed unusable. Although the duplicate radon detector was found in its sample container, the result from the duplicate sample was elevated by more than a factor of 10 above the previous results; therefore, the duplicate result of 6.4 pCi/L at location 0117 was deemed suspect. Both samples collected at location 0117 were "R" flagged to signify the data are unusable.

Summary

Data collected during the fourth quarter of 2006 met the applicable laboratory control criteria for their respective analyses, and all data were reviewed by qualified personnel. Except for the anomalous radon concentration at location 0117, the results were found to be within the acceptable limits associated with each matrix. Because prior radon-222 results at 0117 have always been within the range of background, the future results at this location are expected to remain at background levels. Data reported in this environmental air monitoring report are considered validated and may be treated as final results.

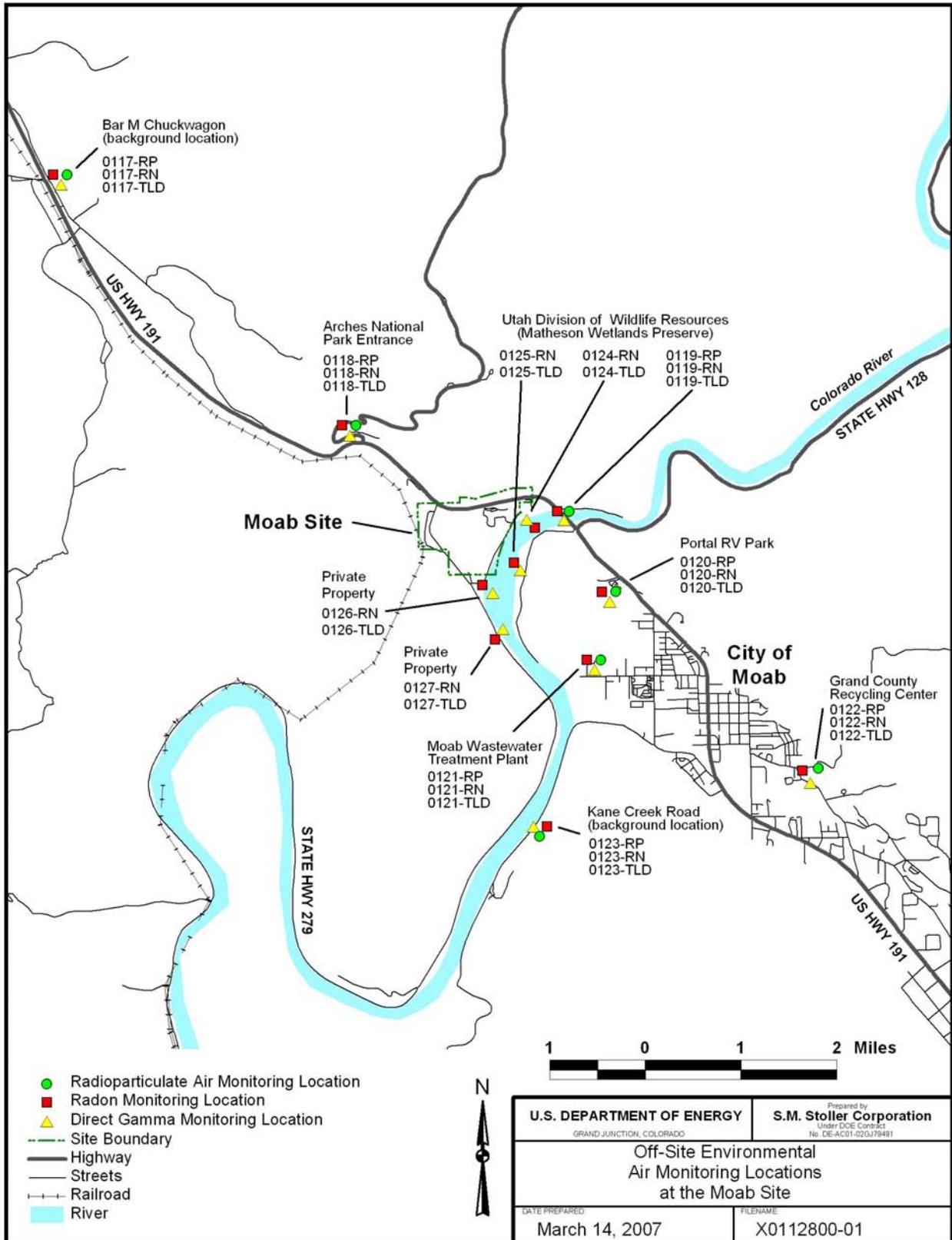
Mark Kautsky

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Environmental Scientist

3-23-07

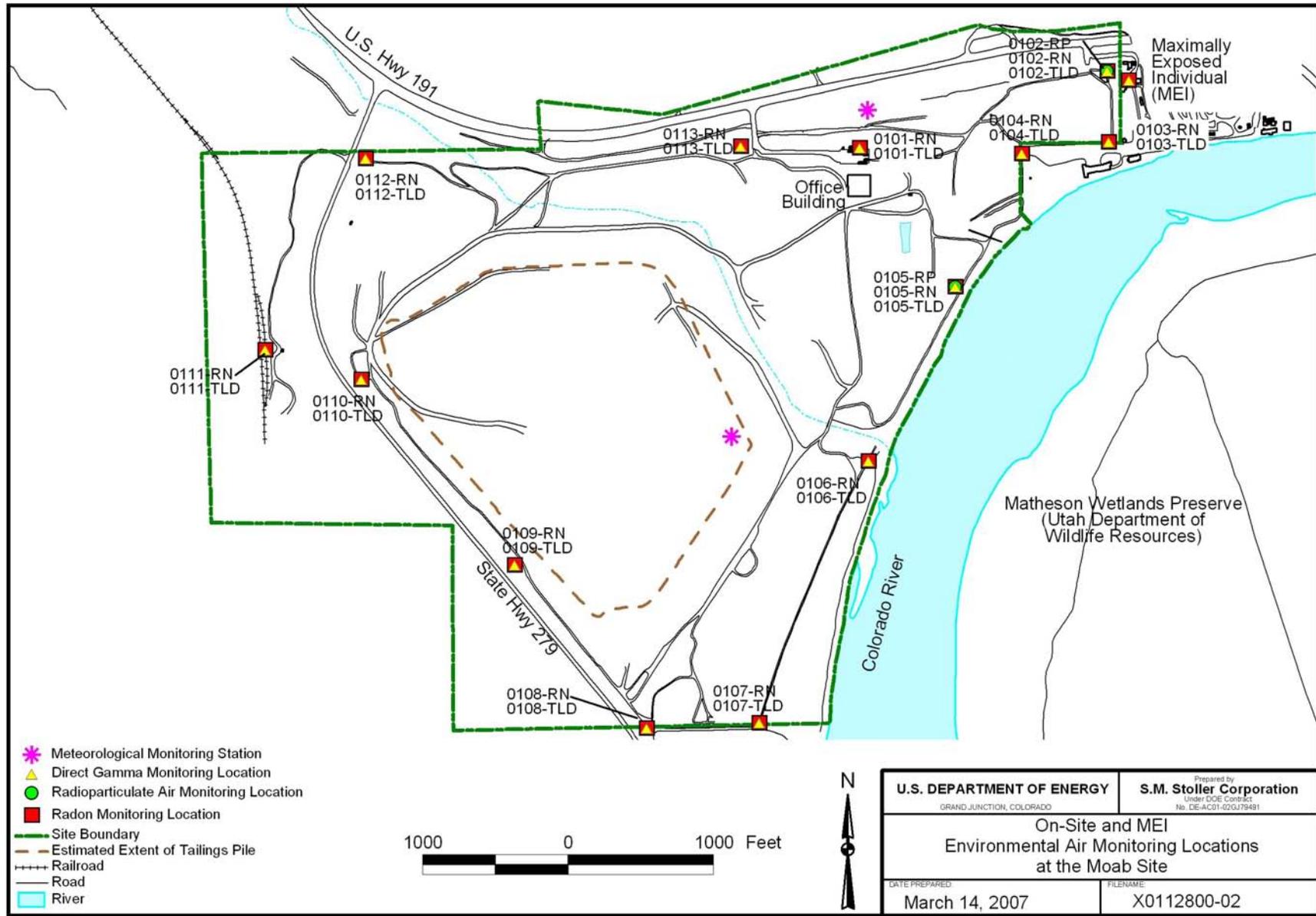
Date

Sample Location Maps



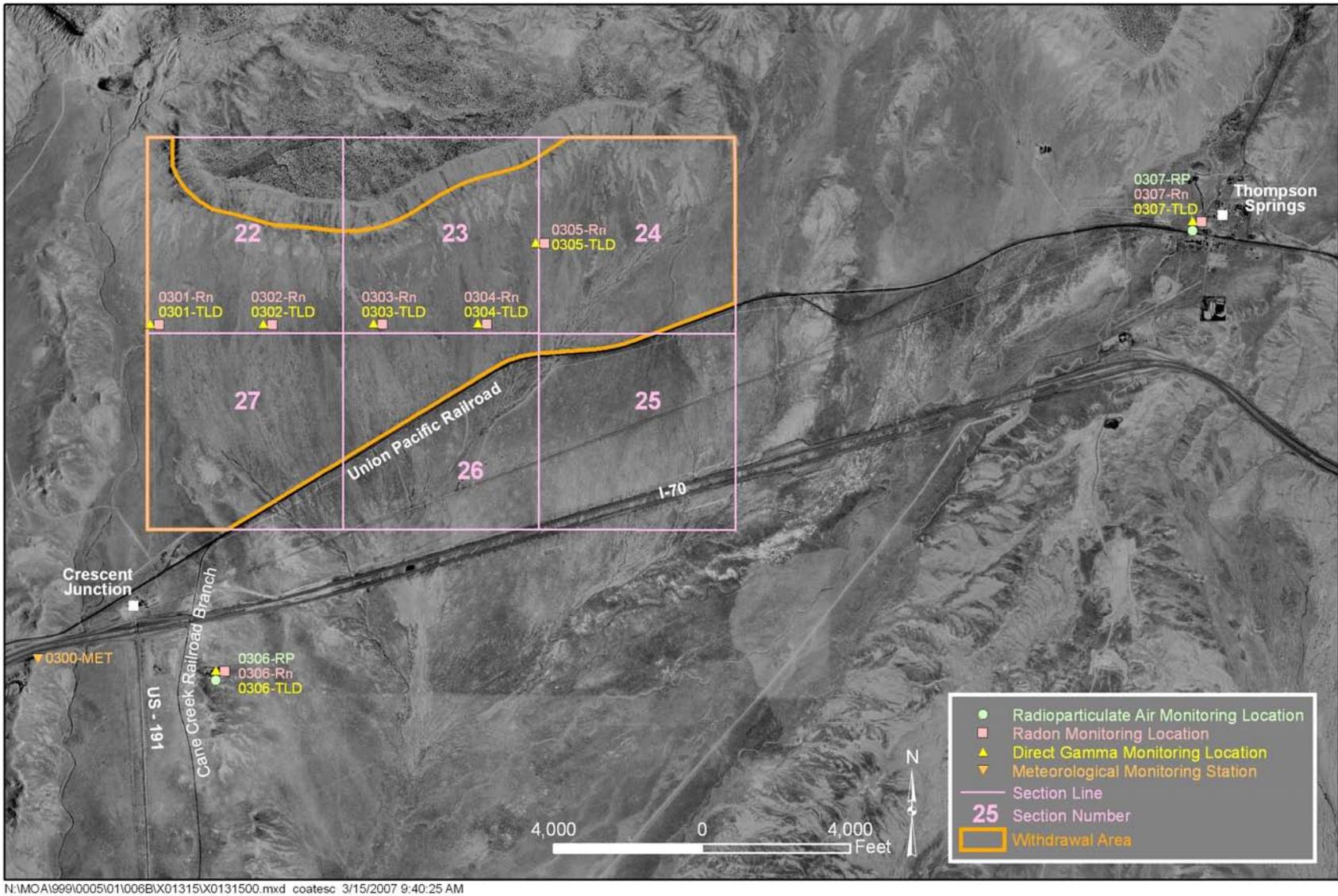
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Figure 1. Off-site Radon, Direct Gamma, and Radioparticulate Monitoring Locations, 2006



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Figure 2. On-site Radon, Direct Gamma, and Radioparticulate Monitoring Locations, 2006



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Figure 3. Sampling Location Map for the Crescent Junction Site

Environmental Air Monitoring Data

Environmental Air Monitoring Data Summary

This section contains data summary tables for each environmental air-monitoring matrix. Radon and direct gamma radiation for the Moab Site are summarized in Table 2; radioparticulate data for the Moab Site are summarized in Table 3. Radon and direct gamma radiation for the Crescent Junction Site are summarized in Table 4; radioparticulate data for the Crescent Junction Site are summarized in Table 5.

Time-concentration graphs have also been prepared for each matrix sampled at the Moab Site (Figure 4 through Figure 9). Time-concentration graphs for the Crescent Junction Site will not be prepared until mill-tailing placement begins. After mill tailings disposal does begin, location 0306 will likely become the MEI location. Location 0307, approximately 5 miles east of the disposal site, will probably represent the second greatest risk, and locations 0301 through 0305 will provide property line data for the disposal site. Time-concentration graphs have been plotted only for selected locations for each matrix. The rationale used for selecting each location is summarized below.

Radon-222 and Direct Gamma Radiation

Radon-222 and gamma radiation data have been graphed (Figure 8 and Figure 9) for the following Moab Site locations: (1) Location MEI, which is considered to represent the greatest potential exposure scenario to a member of the public; (2) Location 0108, which is on the southern property boundary of the Moab Site and has recorded the highest radon concentrations during 2006, which is consistent with the 2005 results; (3) Location 0106, which is along the southeast property boundary has recorded the highest direct gamma radiation during 2006, and the result is consistent with 2005; (4) Location 0117, which is approximately 5 miles north of the Moab Site property, is a background monitoring location; (4) Location 0120, which is near the Portal RV Park, approximately 1 mile southeast of the Moab Site, and represents the second greatest risk, behind the MEI location, for off-site exposure to a member of the public.

Radioparticulates

Radioparticulate monitoring data have been graphed (Figure 4 through Figure 7) for the following Moab Site locations: (1) Location 0102, one of two on-site radioparticulate monitoring locations, is the radioparticulate sampling location closest to the MEI; (2) Location 0105, is closest to the emissions source (i.e., the mill tailings pile) and is at the site boundary adjacent to the Colorado River and the Matheson Wetlands Preserve; (3) Location 0117 (near the Bar-M Chuckwagon) is a background monitoring location approximately 5 miles north of the Moab Site property and represents ambient or naturally occurring conditions; (4) Location 0120 (near the Portal RV Park) is approximately 1 mile southeast of the Moab Site and represents the second greatest risk (second to the MEI location) for off-site exposure to a member of the public.

Table 2. Summary of Environmental Radon and Gamma Radiation Monitoring Data for the Moab Site for Calendar Year 2006

Station Number	1st Quarter 2006 (01/04/06–04/04/06)		2nd Quarter 2006 (04/04/06–06/28/06)		3rd Quarter 2006 (06/28/06–10/11/06)		4th Quarter 2006 (10/11/06–01/03/07)		2006 Annual Average	
	Radon pCi/L	Gamma mrem/91 d ³	Radon pCi/L	Gamma mrem/yr						
On-Site Locations										
0101	2.5	54.8	1.9	46.76	1.3	50.22	2.5	38.96	2.1	190.74
0102	1.9	23.7	1.2	19.21	0.9	22.01	1.8	22.99	1.5	87.91
0103	1.9	25.1	1.1	19.56	0.5	23.93	1.5	21.46	1.3	90.05
0104	2.4	26.2	1.2	19.97	0.7	25.04	1.6	22.59	1.5	93.80
0105	4.1	46.9	2.1	39.71	1.2	45.73	3	40.41	2.6	172.75
0106	9.2	39.7	5.9	33.58	3	38.69	6.4	34.04	6.1	146.01
0107	7.9	52.9	4.8	47.28	2.1	45.45	4.7	45.61	4.9	194.79
0108	4.8	112.5	4.9	118.45	3.6	119.93	4.5	96.43	4.5	447.31
0109	1.7	51.3	2.5	47.75	1.8	49.48	1.6	46.03	1.9	194.56
0110	2.4	80.7	3.1	74.53	1.8	76.36	2.2	66.34	2.4	297.93
0111	0.9	63.8	1	51.29	0.6	62.64	0.7	55.47	0.8	233.20
0112	1.7	38.6	1.8	31.11	1.3	NDA	1.7	36.2	1.6	141.21
0113	2.7	Lost	2.7	64.83	1.9	57.69	Lost	Lost	2.4	245.04
Off-Site Locations										
0117 ¹	0.6	22	0.5	19.36	0.5	19.70	Unusable	23.83	0.5 [†]	87.53
0118	0.8	20.2	0.6	18.97	0.6	20.61	0.9	21.07	0.7	80.85
0119	1	21.4	0.8	21.18	0.8	23.53	1.4	27.03	1.0	93.14
0120	0.6	17.8	0.7	17.28	0.5	19.82	0.7	21.7	0.6	76.60
0121	0.8	20.1	0.7	18.62	0.6	22.9	0.9	20.7	0.8	82.32
0122	0.6	18.5	0.5	18.07	<0.3	18.96	<0.4	17.45	0.4	72.98
0123 ¹	0.4	18.1	<0.4	14.82	<0.3	19.38	0.5	15.21	0.4	67.51
0124	1.6	20.5	1.3	20.04	0.8	21.23	1.1	22.61	1.2	84.38
0125	2.2	23.7	1.7	21.25	0.8	25.43	1.9	23.44	1.7	93.82
0126	2.7	22	1.8	19.48	1.0	22.8	2.5	23.55	2.1	87.83
0127	0.9	19.7	0.9	20.85	0.4	21.74	0.9	22.6	0.8	84.89
MEI ²	2	17.4	<0.4	12.97	0.6	19.25	1.4	14.29	1.1	63.71

¹ Designated background monitoring locations. Background locations are located at sufficient distances away from the millsite to be free from any affects or influences from potential site contaminants.

² The maximally exposed individual (MEI) is the continually occupied residential property that is closest to the DOE property boundary.

³ mrem value is prorated to a 91-day exposure period.

[†] Average is based on first 3 quarters of data collected during 2006.

NA = Not Applicable.

NDA = No Data Available.

Table 3. Summary of Radioparticulate Air Monitoring Data for the Moab Site for Calendar Year 2006

Station Number	Isotope	1st Quarter 2006 (μCi/mL) ⁵	2nd Quarter 2006 (μCi/mL)	3rd Quarter 2006 (μCi/mL)	4th Quarter 2006 (μCi/mL)	Annual Average (μCi/mL)
On-Site Locations						
0102-RP	Uranium ¹	8.1E-17	1.2E-16	5.0E-17	6.80E-17	8.0E-17
	Thorium-230 ²	9.6E-17	2.5E-16	7.8E-17	8.00E-17	1.3E-16
	Radium-226 ³	1.5E-16	2.2E-16	1.3E-16	2.70E-16	1.9E-16
	Polonium-210 ⁴	8.1E-15	3.1E-15	4.2E-15	6.20E-15	5.4E-15
0105-RP	Uranium ¹	2.2E-16	2.5E-16	2.0E-16	2.20E-16	2.2E-16
	Thorium-230 ²	1.7E-16	3.3E-16	1.2E-16	2.60E-16	2.2E-16
	Radium-226 ³	2.0E-16	1.8E-16	9.6E-17	3.30E-16	2.0E-16
	Polonium-210 ⁴	7.8E-15	3.0E-15	6.4E-15	7.30E-15	6.1E-15
Off-Site Locations						
0117-RP	Uranium ¹	1.4E-17	2.7E-17	8.0E-18	2.5E-17	1.9E-17
	Thorium-230 ²	9.1E-17	1.2E-16	5.0E-17	6.5E-17	8.2E-17
	Radium-226 ³	1.8E-16	2.2E-16	8.4E-17	2.9E-16	1.9E-16
	Polonium-210 ⁴	4.2E-15	2.8E-15	3.9E-15	6.2E-15	4.3E-15
0118-RP	Uranium ¹	5.9E-17	4.9E-17	2.4E-17	3.2E-17	4.1E-17
	Thorium-230 ²	1.2E-16	7.5E-17	3.2E-17	8.5E-17	7.8E-17
	Radium-226 ³	2.7E-16	1.7E-16	1.0E-16	2.2E-16	1.9E-16
	Polonium-210 ⁴	7.0E-15	3.5E-15	4.8E-15	6.3E-15	5.4E-15
0119-RP	Uranium ¹	4.3E-17	3.5E-17	1.5E-17	1.9E-17	2.8E-17
	Thorium-230 ²	2.9E-16	4.1E-17	1.2E-16	1.0E-16	1.4E-16
	Radium-226 ³	1.6E-16	1.9E-16	1.1E-16	3.0E-16	1.9E-16
	Polonium-210 ⁴	6.5E-15	2.9E-15	4.2E-15	5.1E-15	4.7E-15
0120-RP	Uranium ¹	2.6E-17	4.8E-17	2.0E-17	2.3E-17	2.9E-17
	Thorium-230 ²	3.5E-17	1.1E-16	9.8E-17	1.1E-16	8.8E-17
	Radium-226 ³	1.8E-16	1.8E-16	9.0E-17	2.7E-16	1.8E-16
	Polonium-210 ⁴	4.2E-15	2.1E-15	4.0E-15	5.3E-15	3.9E-15
0121-RP	Uranium ¹	2.4E-17	3.6E-17	2.2E-17	1.9E-17	2.5E-17
	Thorium-230 ²	7.3E-17	8.8E-17	1.8E-16	6.1E-17	1.0E-16
	Radium-226 ³	2.0E-16	1.8E-16	1.1E-16	3.1E-16	2.0E-16
	Polonium-210 ⁴	4.6E-15	2.6E-15	4.4E-15	5.8E-15	4.4E-15
0122-RP	Uranium ¹	2.7E-17	3.2E-17	1.2E-17	2.0E-17	2.3E-17
	Thorium-230 ²	3.1E-16	1.1E-16	1.3E-16	6.7E-17	1.5E-16
	Radium-226 ³	2.1E-16	1.7E-16	9.3E-17	3.2E-16	2.0E-16
	Polonium-210 ⁴	6.2E-15	2.9E-15	4.7E-15	5.1E-15	4.7E-15
0123-RP	Uranium ¹	2.1E-17	5.6E-17	1.9E-17	1.8E-17	2.9E-17
	Thorium-230 ²	8.7E-17	7.7E-17	1.9E-16	5.7E-17	1.0E-16
	Radium-226 ³	1.9E-16	1.8E-16	9.4E-17	3.3E-16	2.0E-16
	Polonium-210 ⁴	5.5E-15	3.1E-15	6.2E-15	5.7E-15	5.1E-15

¹DOE DCG for Total Uranium = 2.E-12

²DOE DCG for Thorium-230 = 4.E-14

⁵μCi/mL = microCuries per milliliter

³DOE DCG for Radium-226 = 1.E-12

⁴DOE DCG for Polonium-210 = 1.E-12

DOE DCG is equivalent to a dose of 100 mrem/yr

Table 4. Summary of Environmental Radon and Gamma Radiation Monitoring Data for the Crescent Junction Site for Calendar Year 2006

Station Number	1st Quarter 2006 (01/04/06–04/04/06)		2nd Quarter 2006 (04/04/06–06/28/06)		3rd Quarter 2006 (06/28/06–10/09/06)		4th Quarter 2006 (10/11/06–01/03/07)		2006 Annual Average	
	Radon pCi/L	Gamma mrem/91 d ¹	Radon pCi/L	Gamma mrem/91 d ¹						
0301	0.6	Lost	0.6	22.34	0.5	23.23	0.9	22.36	0.65	90.57
0302	0.5	20.5	0.6	22.13	0.9	24.78	0.6	24.43	0.65	91.84
0303	1.2	Lost	Damaged	22.21	0.6	24.15	1.1	25.13	0.97	95.32
0304	0.9	21.6	<0.4	18.71	0.7	24.92	Unusable ²	21.7	0.60 ³	86.93
0305	0.7	23.5	1	22.07	1.3	25.11	1	24.28	1.00	94.96
0306	1.1	19.4	0.5	20.71	0.9	23.33	0.5	24.66	0.75	87.29
0307	2.1	21.5	0.6	22.25	0.5	25.35	<0.3	23.97	1.07 ³	92.01

¹mrem value is prorated to a 91-day exposure period.

²Data were unusable because radon cup had fallen on ground.

³One-half the detection limit was used to compute annual average radon concentration.

Table 5. Summary of Radioparticulate Air Monitoring Data for the Crescent Junction Site for Calendar Year 2006

Station Number	Isotope	1st Quarter 2006 ($\mu\text{Ci/mL}$) ⁵	2nd Quarter 2006 ($\mu\text{Ci/mL}$) ⁵	3rd Quarter 2006 ($\mu\text{Ci/mL}$) ⁵	4th Quarter 2006 ($\mu\text{Ci/mL}$)	Annual Average ($\mu\text{Ci/mL}$) ⁵
0306-RP	Uranium ¹	9.1E-18	1.8E-17	8.1E-18	8.80E-18	1.10E-17
	Thorium-230 ²	5.1E-17	5.4E-17	1.6E-16	7.50E-17	8.50E-17
	Radium-226 ³	1.4E-16	1.8E-16	1.3E-16	4.00E-16	2.10E-16
	Polonium-210 ⁴	4.0E-15	3.2E-15	4.4E-15	5.60E-15	4.30E-15
0307-RP	Uranium ¹	1.4E-17	4.1E-17	1.1E-17	1.10E-17	1.90E-17
	Thorium-230 ²	1.6E-16	9.1E-17	8.5E-17	1.00E-16	1.10E-16
	Radium-226 ³	2.0E-16	1.9E-16	9.8E-17	2.70E-16	1.90E-16
	Polonium-210 ⁴	3.3E-15	3.7E-15	4.3E-15	5.30E-15	4.20E-15

¹DOE DCG for Total Uranium = 2.E-12

²DOE DCG for Thorium-230 = 4.E-14

³DOE DCG for Radium-226 = 1.E-12

⁴DOE DCG for Polonium-210 = 1.E-12

⁵ $\mu\text{Ci/mL}$ = microCuries per milliliter

Moab Radioparticulate Concentration (Po-210)

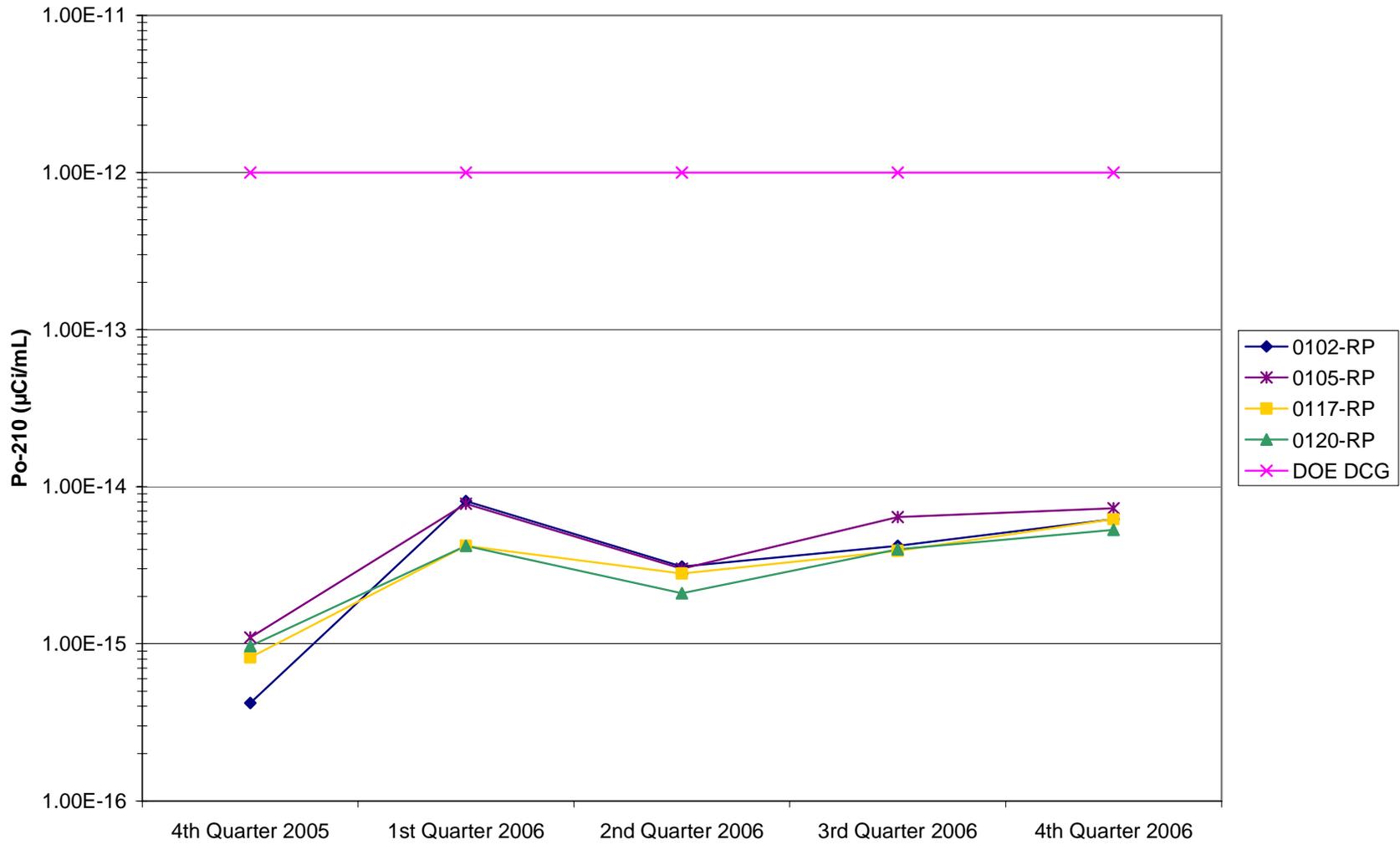


Figure 4. Moab Radioparticulate Concentration (Po-210)

Moab Radioparticulate Concentration (Th-230)

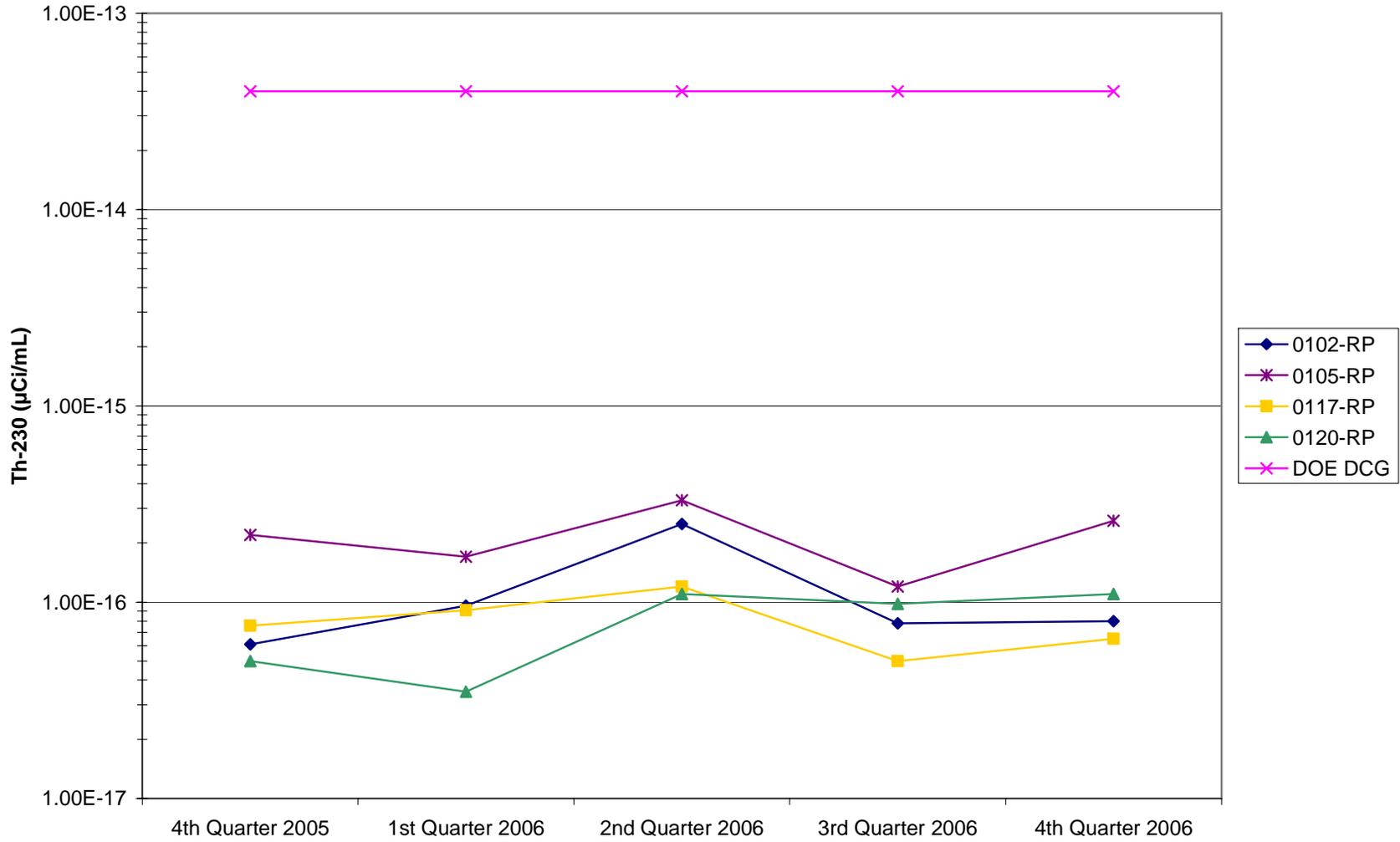


Figure 5. Moab Radioparticulate Concentration (Th-230)

Moab Radioparticulate Concentration (Ra-226)

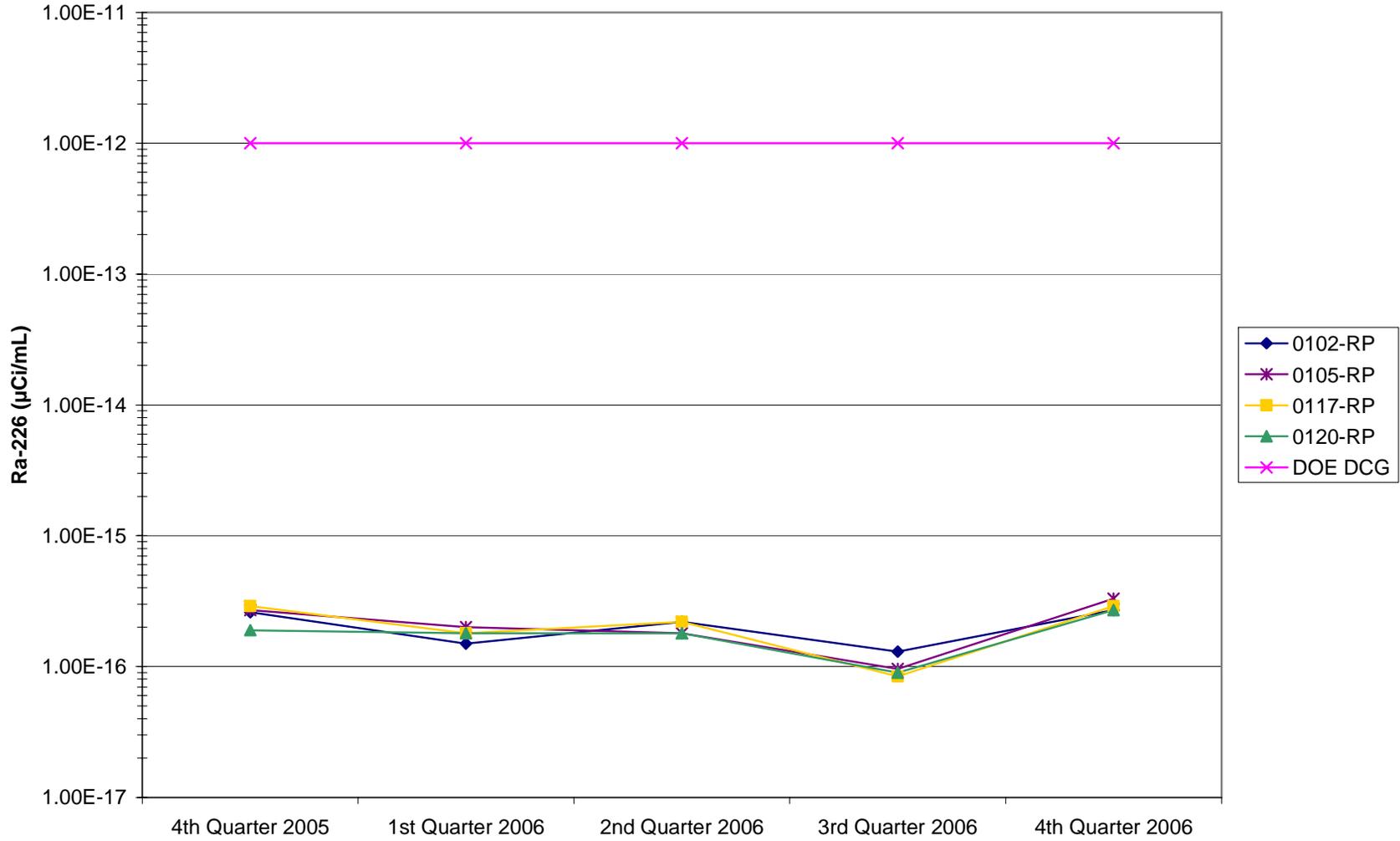


Figure 6. Moab Radioparticulate Concentration (Ra-226)

Moab Radioparticulate Concentration (Uranium)

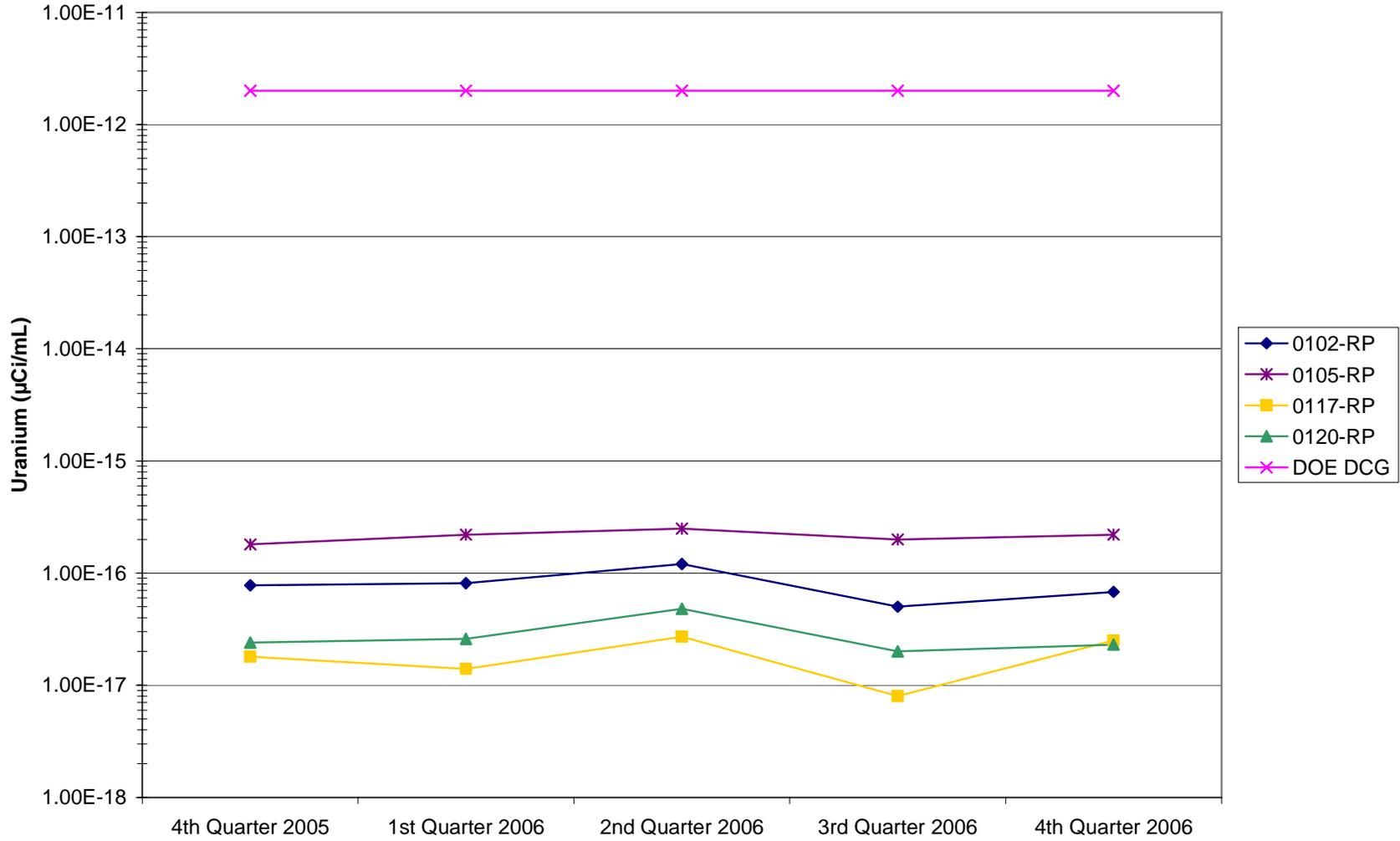


Figure 7. Moab Radioparticulate Concentration (Uranium)

Moab Atmospheric Radon-222 Concentration

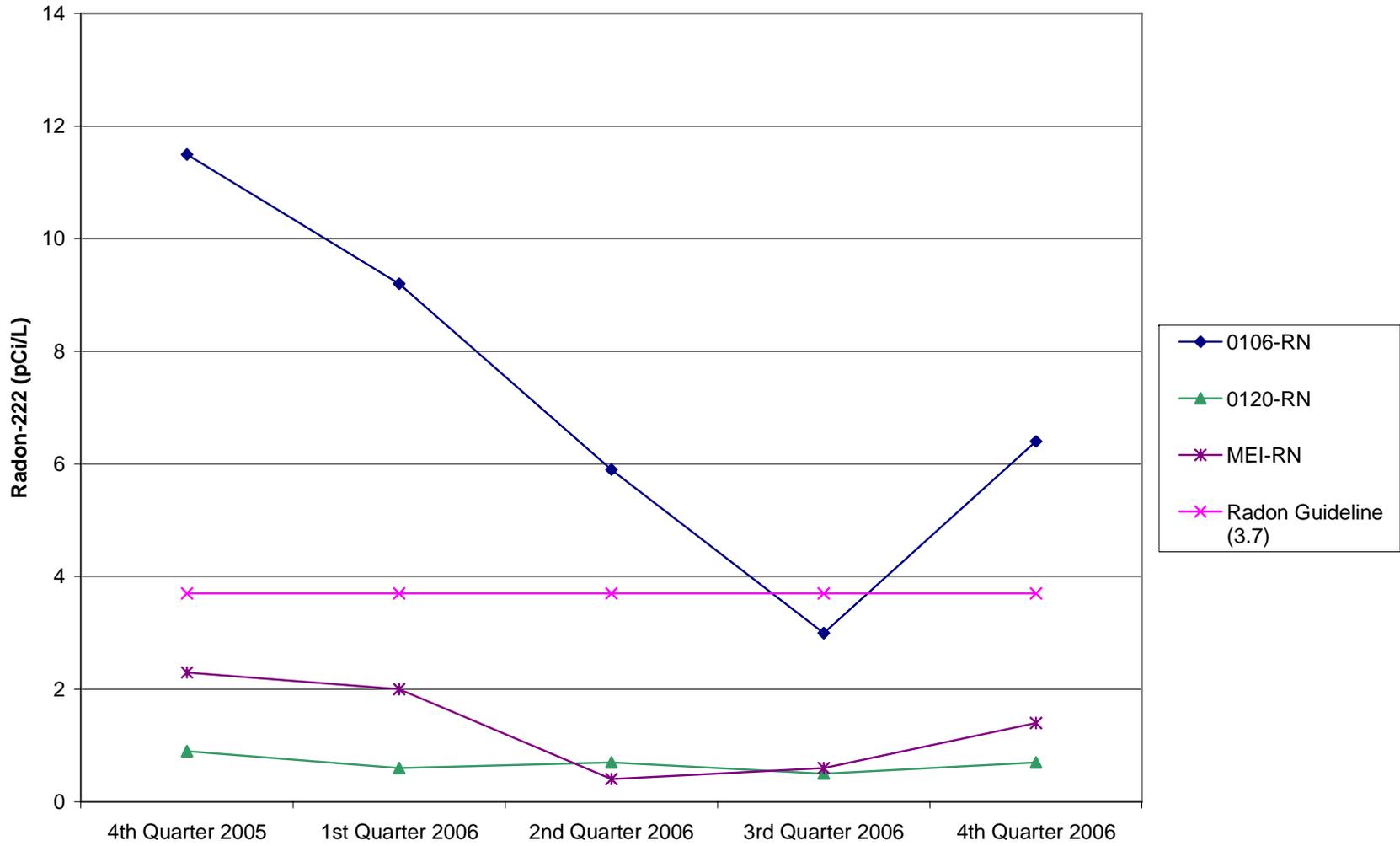


Figure 8. Moab Atmospheric Radon-222 Concentration

Moab Direct Gamma Radiation Dose

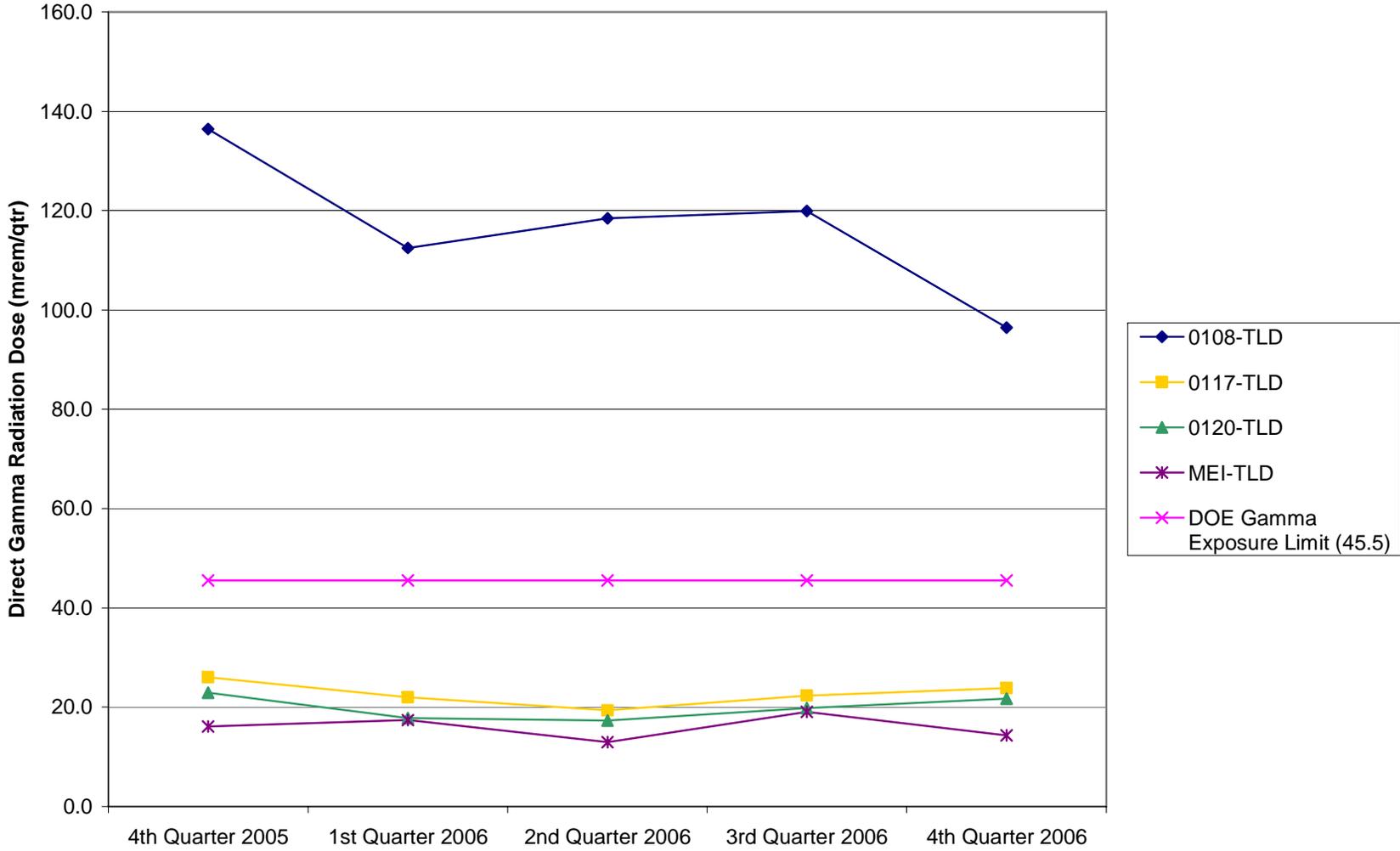


Figure 9. Moab Direct Gamma Radiation Dose