

Office of Environmental Management – Grand Junction



Environmental Air Monitoring Data
Quarterly Report for the Moab and
Crescent Junction, Utah, Sites
Second Quarter 2020
(April through June 2020)

Revision 0

October 2020



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
Environmental Air Monitoring Data Quarterly Report for the Moab and
Crescent Junction, Utah, Sites Second Quarter 2020 (April – June 2020)**

Revision 0

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1.0 Introduction

The purpose of this Report is to present the results of environmental air monitoring at the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project sites during the second quarter of 2020. The Project sites consist of the former uranium ore- processing mill located three miles north of Moab, Utah, and the disposal site located near Crescent Junction, Utah.

2.0 Regulatory Requirements

This Report demonstrates compliance with DOE Order (O) 458.1, Admin Chg 1, “Radiation Protection of the Public and the Environment,” which states DOE radiological activities must be conducted in a manner that does not cause total effective dose to the public to exceed 100 millirems (mrem) in a year, or an equivalent dose to the lens of the eye exceeding 1,500 mrem in a year, or an equivalent dose to the skin or extremities of 5,000 mrem in a year. This limit excludes doses from background radiation, radon gas and its decay products in air, occupational doses, and medical exposures.

For the Project, the total effective dose is the sum of the direct gamma radiation (less background) and radioactive particulate material (radioparticulate) exposure. DOE O 458.1 also specifies releases of radioactive material to the atmosphere from DOE activities shall not exceed an annual average concentration of 3 picocuries per liter (pCi/L) of radon or its decay products, excluding background, at the site boundary.

Compliance with DOE O 458.1 is demonstrated by calculating the total effective dose to the maximally exposed individual (MEI) or the representative person or group from the public likely to receive the highest radiation dose based on exposure pathways and parameters. The Project established an MEI for each of the Project sites.

3.0 Results for April through June 2020

Monitoring data are reported quarterly for radon, direct gamma radiation, and select radioparticulates. Off-site monitoring locations for the Moab site are shown on Figure 1, and on site and MEI locations are shown on Figure 2. Monitoring locations for the Crescent Junction site are shown on Figure 3. Based on results from the *Moab UMTRA Project Fourth Quarter 2019 Environmental Air Monitoring Report*, RapiDOS and Radtrack² detector comparison from 2019, the air program has moved forward with using RapiDOS radon monitors.

3.1 Moab Site

A total of 15 air monitoring stations were equipped with radon and gamma detectors located on site, and also at another 12 off-site stations. Of these 27 stations, three on-site and six off-site stations are also equipped with air sampling pumps to measure air radioparticulates.

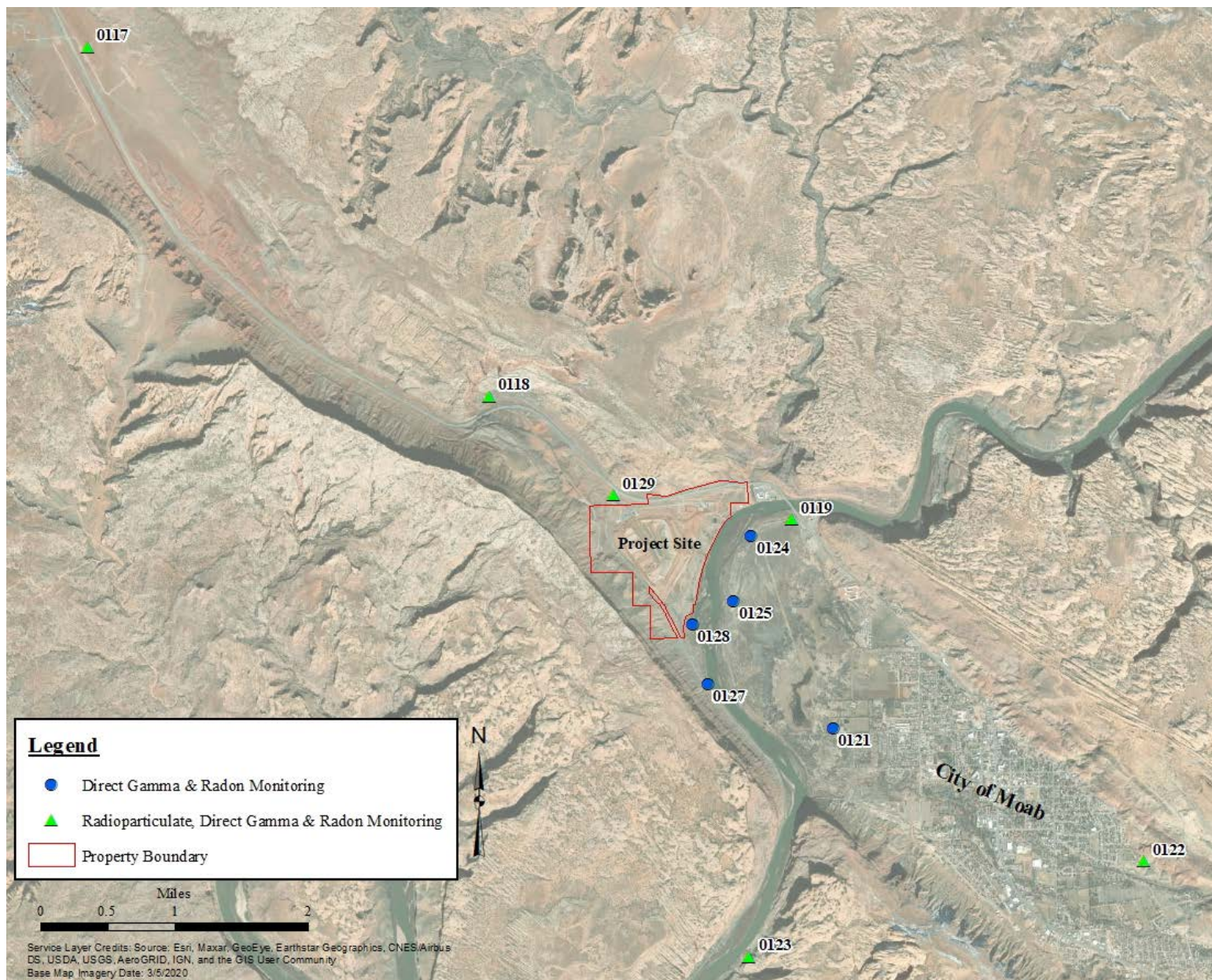


Figure 1. Moab Off-site Environmental Air Monitoring Locations

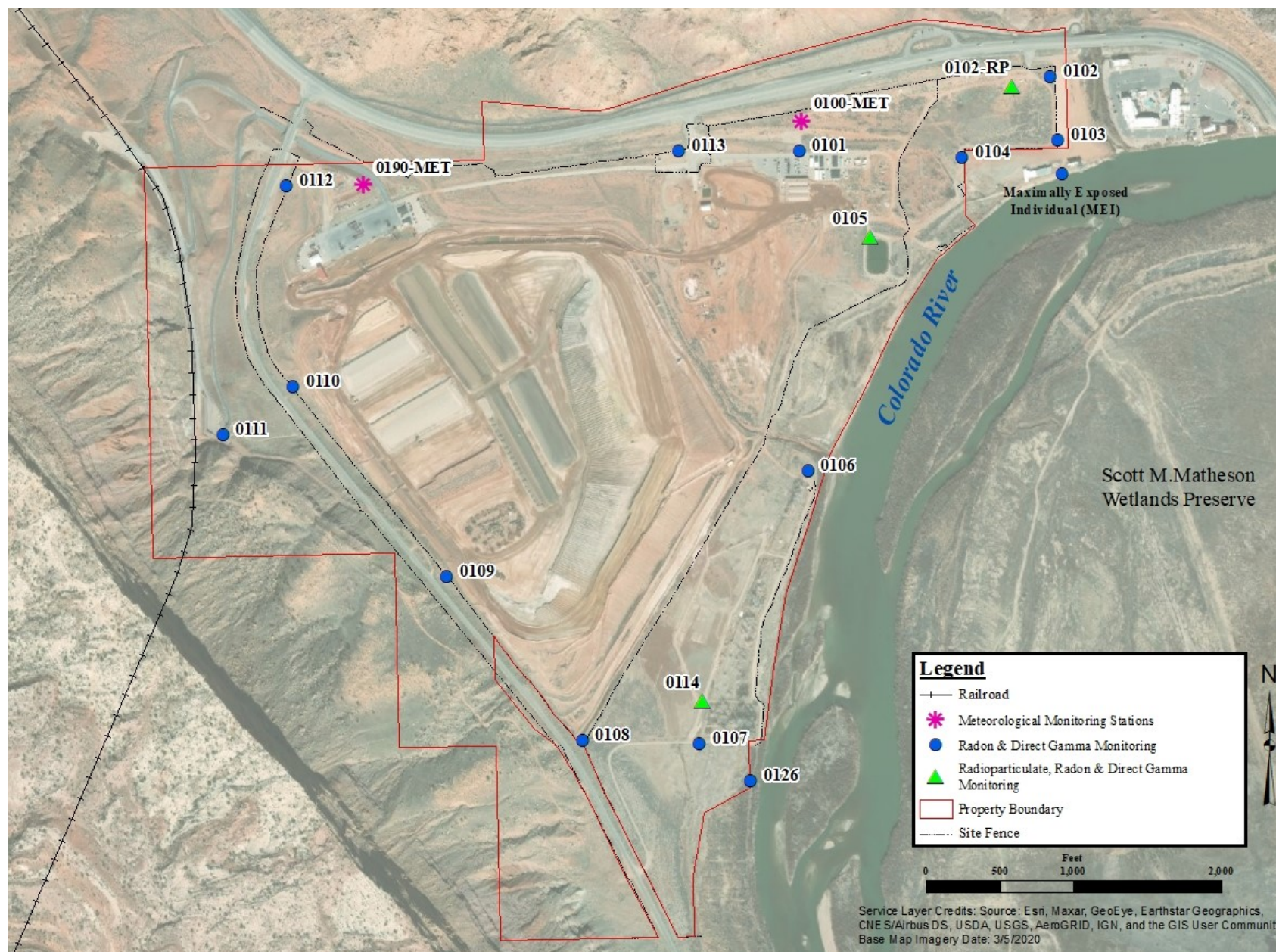


Figure 2. Moab On-site and Maximally Exposed Individual Environmental Air Monitoring Locations

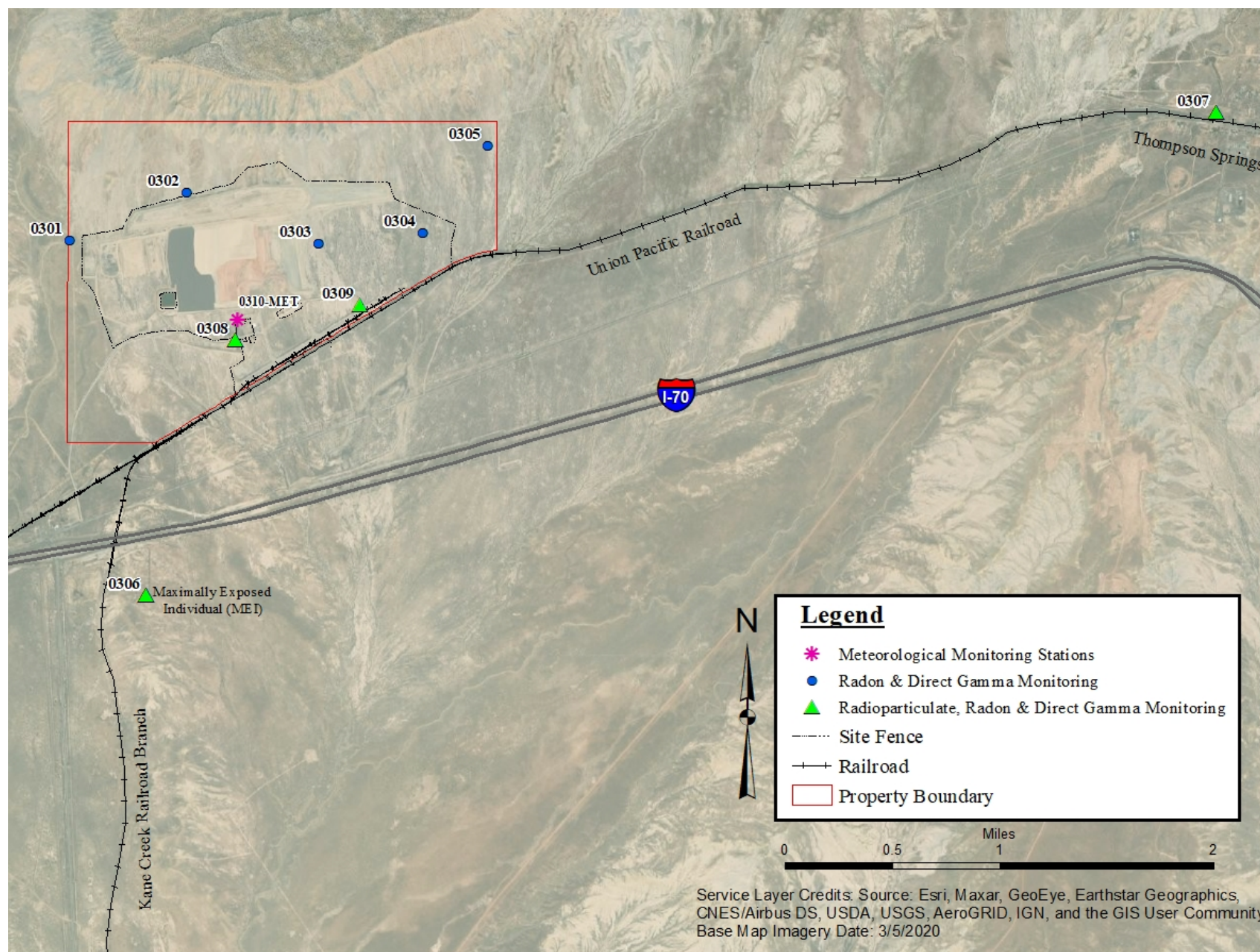


Figure 3. Crescent Junction Site Environmental Air Monitoring Locations

3.1.1 Meteorological Analysis

Meteorological data were collected from the on-site meteorological station (northwest portion of the site) and downloaded from the Vista Data Vision online database, where meteorological data are uploaded from the site. Hourly averages were analyzed. Figure 4 displays the wind rose for this quarter, with the wedges on the wind rose showing which direction the wind is coming from. In the second quarter 2020, the winds were primarily out of the north/northwest (37%) and south east (41%). The primary wind direction for winds 13 miles per hour (mph) or greater is from the southeast, making up 35 percent of the wind direction at that wind speed.

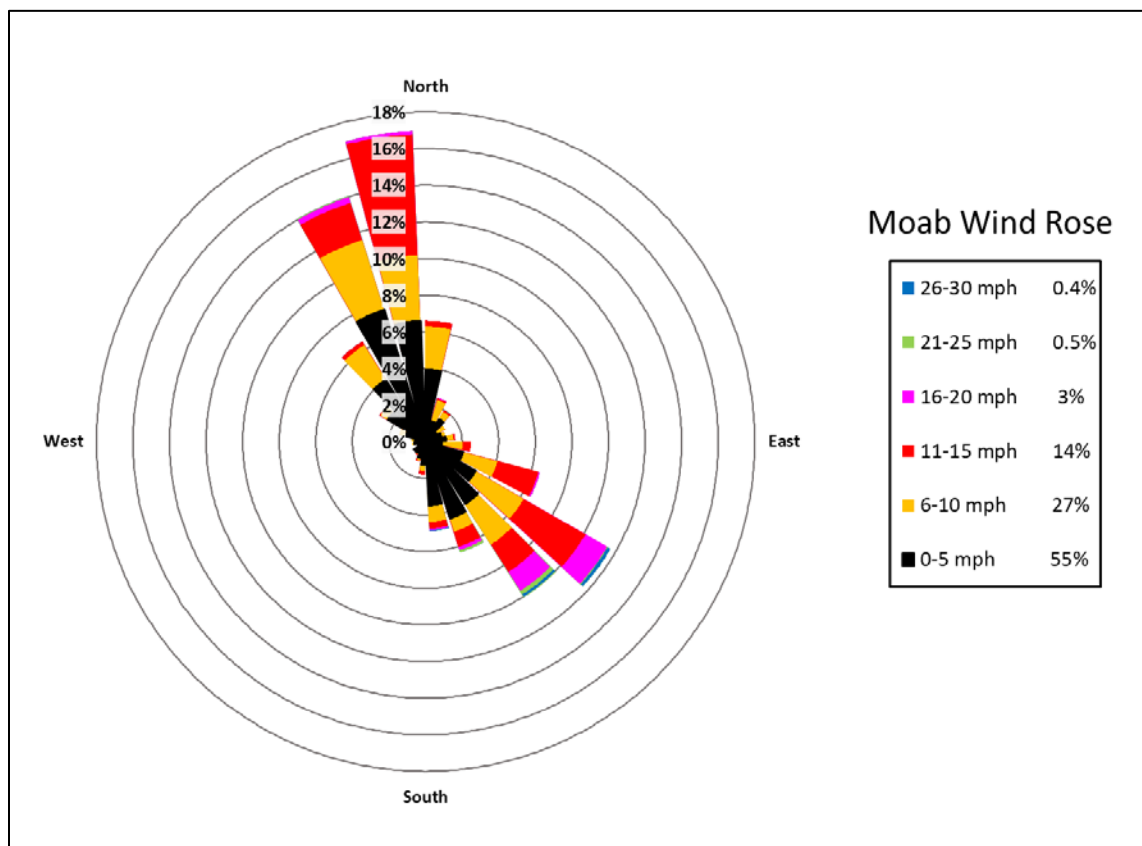


Figure 4. Moab Wind Rose for Second Quarter 2020

The site received 1.04 inches of precipitation during the second quarter 2020. Figure 5 presents the Moab average (from 2010 through 2019) and 2019 cumulative precipitation along with the 2020 second quarter. As this graph displays, the second quarter 2020 precipitation is below the site's nine-year average.

The average temperature for the quarter was 70°F. The lowest recorded temperature for the quarter was 32°F, and the highest was 101°F.

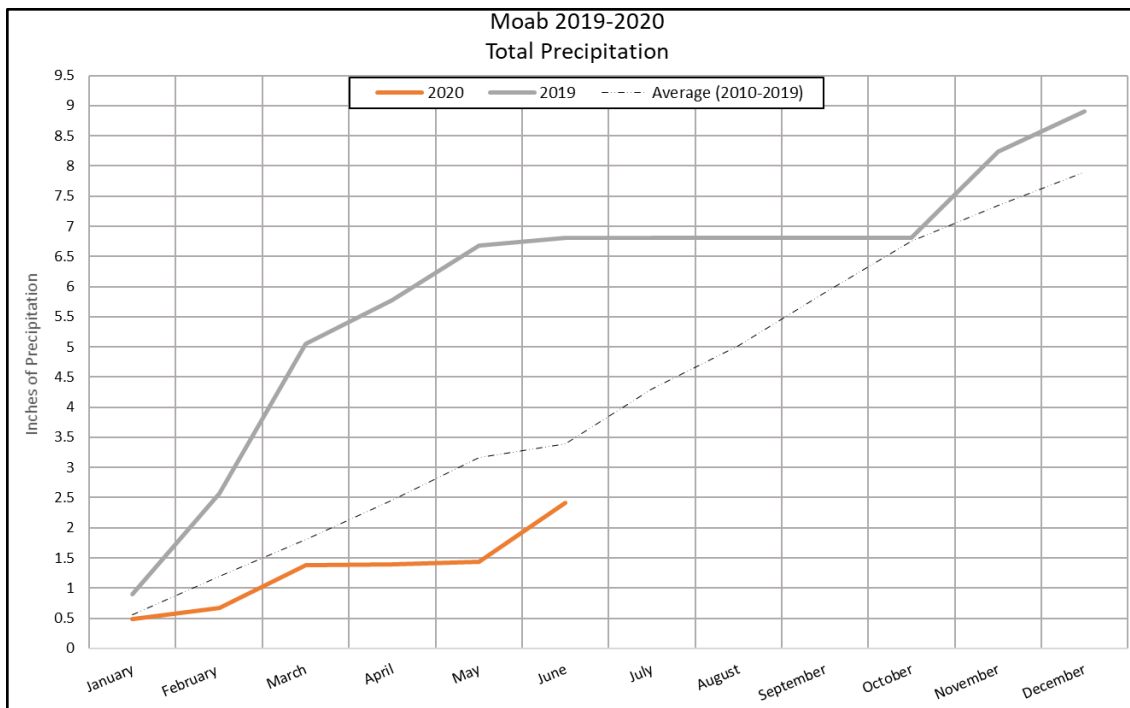


Figure 5. Moab Average, 2019, and Second Quarter 2020 Cumulative Precipitation

3.1.2 Radon

Based on five years of data between 2003 and 2008 from stations 0117 and 0123, the average background concentration of radon in the Moab area was established as 0.7 pCi/L. Therefore, the Project's annual average radon emission limit at the Moab site boundary is 3.7 pCi/L. On-site monitoring locations close to the site boundary or publicly accessible areas are used to demonstrate compliance at the boundary.

Table 1 shows quarterly and annual radon results for the past year (including background) for on- and off-site locations. Two stations exceeded the 3.7 pCi/L annual average limit. However, those stations are located on site, and no member of the public has access to or occupies any of those locations to receive a dose in excess of the annual limit.

The Moab locations with the highest annual average radon concentrations as of the second quarter of 2020 are displayed in Figure 6. Locations 0101, 0106, 0107, 0108, 0113, and 0114 continue to have the highest annual average from the last quarter. When compared to the previous quarter, the data indicate second quarter 2020 concentrations decreased at 11 of the on-site locations as much as 1.4 pCi/L and eight off-site locations as much as 0.5 pCi/L. Three on-site locations increased as much as 0.3 pCi/L and one off-site location increased 0.1 pCi/L. One on-site and two off-site locations saw no change from the previous quarter.

Table 1. Radon Concentrations for the Moab Site for the Past Year

Station Number	Third Quarter 2019 (pCi/L)	Fourth Quarter 2019 (pCi/L)	First Quarter 2020 (pCi/L)	Second Quarter 2020 (pCi/L)	Annual Average Concentration Based on Four Quarters (pCi/L)
On-site Locations					
0101	2.7	7.0	1.9	1.4	3.3
0102	1.0	3.9	1.0	0.8	1.7
0103	1.2	4.5	1.2	0.8	1.9
0104	1.7	5.4	1.7	1.1	2.5
0105	2.1	6.5	1.7	1.4	2.9
0106	2.5	7.6	3.2	1.8	3.8
0107	2.2	6.6	2.5	1.5	3.2
0108	3.4	7.4	2.3	1.9	3.8
0109	2.1	2.8	1.0	1.2	1.8
0110	1.9	2.6	1.0	1.2	1.7
0111	0.8	1.5	0.4	0.5	0.8
0112	2.3	3.1	1.0	1.3	1.9
0113	3.2	6.6	1.6	1.4	3.2
0114	2.4	6.4	3.3	1.9	3.5
0126	2.2	5.2	2.1	1.3	2.7
Off-site Locations					
0117	<0.4	1.0	0.3	0.2	0.5
0118	0.8	1.0	0.4	0.3	0.6
0119	0.9	1.8	0.6	0.4	0.9
0121	0.5	0.6	0.3	0.2	0.4
0122	<0.4	< 0.5	0.2	<0.1	0.3
0123	<0.4	0.5	0.2	0.2	0.3
0124	0.9	2.3	0.8	NS	NA
0125	0.9	2.3	1.0	0.7	1.2
0127	1.0	1.7	0.5	0.4	0.9
0128	2.0	4.5	1.7	1.3	2.4
0129	2.2	3.2	1.0	1.1	1.9
MEI	1.0	3.7	1.1	0.6	1.6

Background has not been subtracted from annual values

NS = No Sample collected from this location, detector missing upon collection (unknown cause)

NA = Not Applicable, insufficient data to calculate a representative annual average

3.1.3 Direct Gamma Radiation

The average annual background (based on five years of data between 2003 and 2008) direct gamma radiation effective dose for the Moab area was established as 82 mrem/year. Table 2 shows quarterly and annual gamma results for the past year, including background, at on- and off-site locations.

These readings represent the gamma dose an individual would receive from occupying a location for an entire year. Compared to the previous quarter, this quarter's analytical results indicated the dose increased up to 5 mrem at five of the on-site locations, while ten on-site locations decreased as much as 6 mrem. The off-site results indicate one station increased 1 mrem, and ten locations decreased a maximum of 4 mrem.

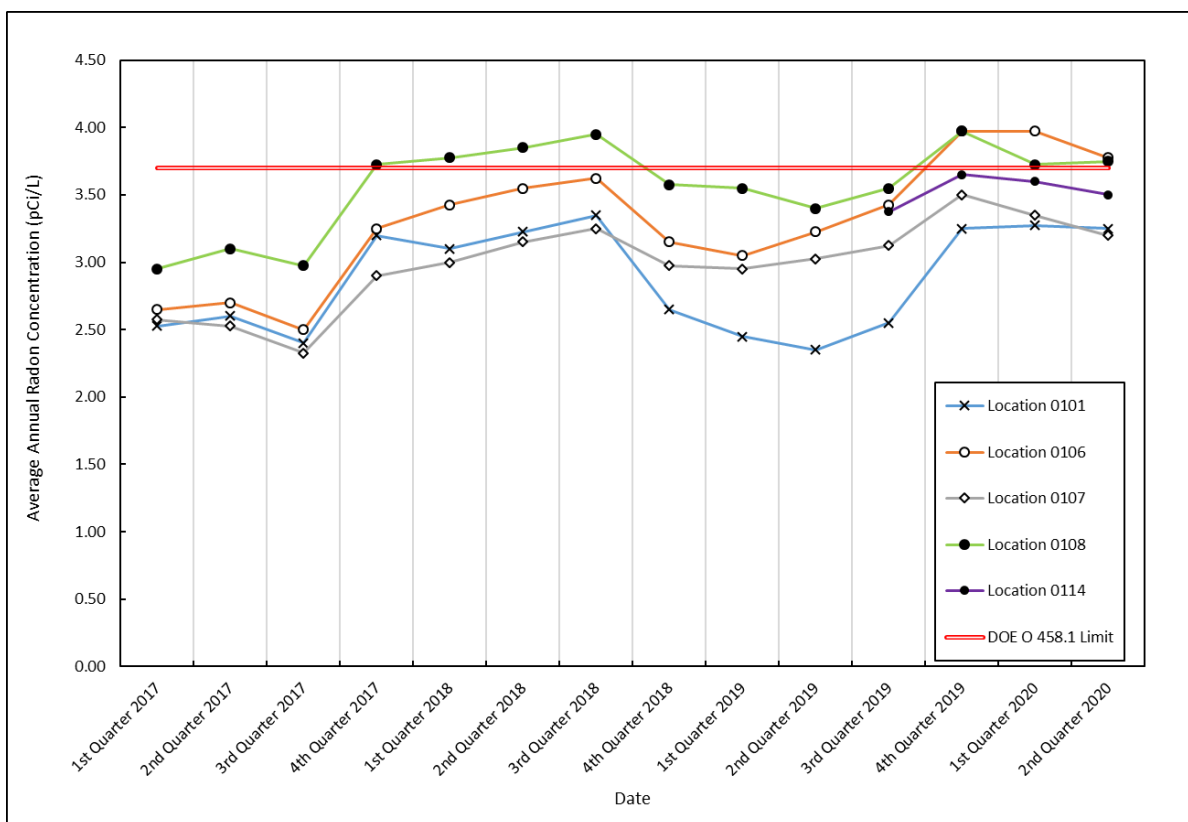


Figure 6. Moab Locations with Highest Second Quarter 2020 Average Annual Radon Concentrations

3.1.4 Radioparticulates

The effective background dose from inhalation of radioparticulates was not determined, so all effective dose from radioparticulates measured at the Project's monitoring stations are assumed to be from the Project.

Table 3 provides the calculated quarterly and annual effective dose from inhalation of radioparticulates for the past year for the Moab site. Samples were collected at or near the Moab site. Filters were analyzed for concentrations of total Uranium, Actinium-227, Thorium-230, Radium-226, and Polonium-210. Since Actinium-227 and Protactinium-231 are assumed to be in equilibrium, the concentration of Protactinium-231 is estimated by dividing the analyzed Actinium-227 concentration by a correction factor of 0.614, which is consistent with the *Moab UMTRA Project Health Physics Plan* (DOE-EM/GJ3003). These analytical results are used to calculate the effective dose from the inhalation of radioparticulates.

The annual dose associated with the stations closest to the site operations (0102, 0105, 0114, and 0129) is higher compared to the remaining stations. All stations except three saw an increase in annual dose (up to 1.07 mrem) compared to the previous quarter's annual dose. Stations 0105, 0119, and 0129 were the locations that showed a decrease (as much as 0.53 mrem).

Table 2. Gamma Radiation Effective Doses for the Moab Site for the Past Year

Station Number	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Dose Based on Four Quarters (mrem)
On-site Locations					
0101	49	43	43	45	180
0102	29	28	28	25	110
0103	29	28	28	25	110
0104	30	31	31	29	121
0105	32	28	29	27	116
0106	39	39	37	34	149
0107	36	32	35	31	134
0108	51	47	43	46	187
0109	132	118	111	112	473
0110	115	107	102	96	420
0111	47	41	41	38	167
0112	54	NS	49	52	NA
0113	52	45	41	46	184
0114	34	37	36	34	141
0126	31	33	33	29	126
Off-site Locations					
0117	29	29	30	27	115
0118	28	24	26	25	103
0119	28	28	28	26	110
0121	24	25	26	27	102
0122	25	24	25	23	97
0123	26	27	24	23	100
0124	30	29	30	NS	NA
0125	31	31	31	30	123
0127	30	29	29	28	116
0128	28	30	29	27	114
0129	37	35	34	33	139
MEI	28	28	28	24	108

Background has not been subtracted from annual values

NS = No Sample collected from this location, TLD missing upon collection (unknown cause)

NA = Not Applicable, insufficient data to calculate a representative annual dose

3.1.5 Total Effective Dose

The Project must ensure the annual effective dose to gamma radiation and radioparticulates from Project activities does not exceed 100 mrem above background. The MEI annual total effective dose was 29.70 mrem, which is well below the DOE limit. This value was calculated by subtracting the background dose of 82 mrem from the MEI annual gamma radiation dose of 108 mrem and then adding the radioparticulate total dose of 3.70 mrem from location 0102, the closest radioparticulate station to the MEI. Nearly all of the dose to the MEI is due to direct gamma radiation. The dose to the lens of the eye, skin, and extremities is the same as a full body dose and is below the regulatory limit of 1500 mrem in a year to the skin and 5000 mrem in a year to the skin or extremities. Figure 7 shows total effective dose measured at the Moab site since 2017.

Table 3. Radioparticulate Effective Doses for the Moab Site for the Past Year

Station Number	Isotope	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations						
0102-RP (MEI)	Total Uranium	0.003	0.004	0.002	0.003	3.70
	Thorium-230	0.061	0.091	0.008	0.032	
	Radium-226	0.092	0.110	0.022	0.034	
	Polonium-210	0.505	0.708	0.529	0.301	
	Actinium-227	0.280	0.303	0.105	0.280	
	Protactinium-231	0.064	0.070	0.024	0.064	
105-RP	Total Uranium	0.005	0.007	0.003	0.004	5.37
	Thorium-230	0.186	0.266	0.027	0.104	
	Radium-226	0.136	0.282	0.033	0.070	
	Polonium-210	0.594	0.977	0.708	0.350	
	Actinium-227	0.653	0.443	0.124	0.096	
	Protactinium-231	0.150	0.102	0.028	0.022	
0114-RP	Total Uranium	0.003**	0.008	0.003	0.005	6.98
	Thorium-230	0.133**	0.261	0.067	0.157	
	Radium-226	0.220**	0.290	0.088	0.037	
	Polonium-210	0.236**	0.895	0.635	0.358	
	Actinium-227	0.793**	0.490	ND	1.632	
	Protactinium-231	0.182**	0.113	ND	0.375	
Off-site Locations						
0117-RP	Total Uranium	0.003	0.003	0.002	0.003	2.44
	Thorium-230	0.026	0.017	0.014	0.017	
	Radium-226	0.017	0.008	0.021	0.011	
	Polonium-210	0.423	0.472	0.545	0.252	
	Actinium-227	0.147	ND	0.089	0.256	
	Protactinium-231	0.034	ND	0.020	0.059	
0118-RP	Total Uranium	0.004	0.003	0.004	0.004	3.23
	Thorium-230	0.117	0.069	0.021	0.064	
	Radium-226	0.136	0.041	0.029	0.066	
	Polonium-210	0.497	0.545	0.440	0.277	
	Actinium-227	0.490	ND	0.023	0.233	
	Protactinium-231	0.113	ND	0.005	0.054	
0119-RP	Total Uranium	0.003	0.003	0.002	0.003	2.68
	Thorium-230	0.035	0.056	0.014	0.026	
	Radium-226	0.030	0.034	ND	0.009	
	Polonium-210	0.456	0.545	0.513	0.244	
	Actinium-227	0.396	ND	0.023	0.154	
	Protactinium-231	0.091	ND	0.005	0.035	
0122-RP	Total Uranium	0.003	0.003	0.003	0.003	2.89
	Thorium-230	0.023	0.027	0.020	0.029	
	Radium-226	0.018	0.029	0.018	0.038	
	Polonium-210	0.383	0.464	0.578	0.277	
	Actinium-227	0.420	0.075	ND	0.303	
	Protactinium-231	0.097	0.017	ND	0.070	

Table 3. Radioparticulate Effective Doses for the Moab Site for the Past Year (continued)

Station Number	Isotope	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
Off-site Locations (continued)						
0123-RP	Total Uranium	0.003	0.003	0.002	0.003	3.08
	Thorium-230	0.029	0.025	0.004	0.029	
	Radium-226	0.012	0.024	0.022	0.018	
	Polonium-210	0.407	0.480	0.545	0.391	
	Actinium-227	0.466	0.172	0.028	0.212	
	Protactinium-231	0.107	0.040	0.006	0.049	
0129-RP	Total Uranium	0.010	0.006	0.003	0.006	11.35
	Thorium-230	0.613	0.373	0.048	0.266	
	Radium-226	0.572	0.308	0.053	0.207	
	Polonium-210	0.724	0.692	0.529	0.317	
	Actinium-227	2.797	1.235	0.280	1.072	
	Protactinium-231	0.644	0.284	0.064	0.247	

ND = not detected; analyte concentration below detection limit

**timeframe limited to 42 days

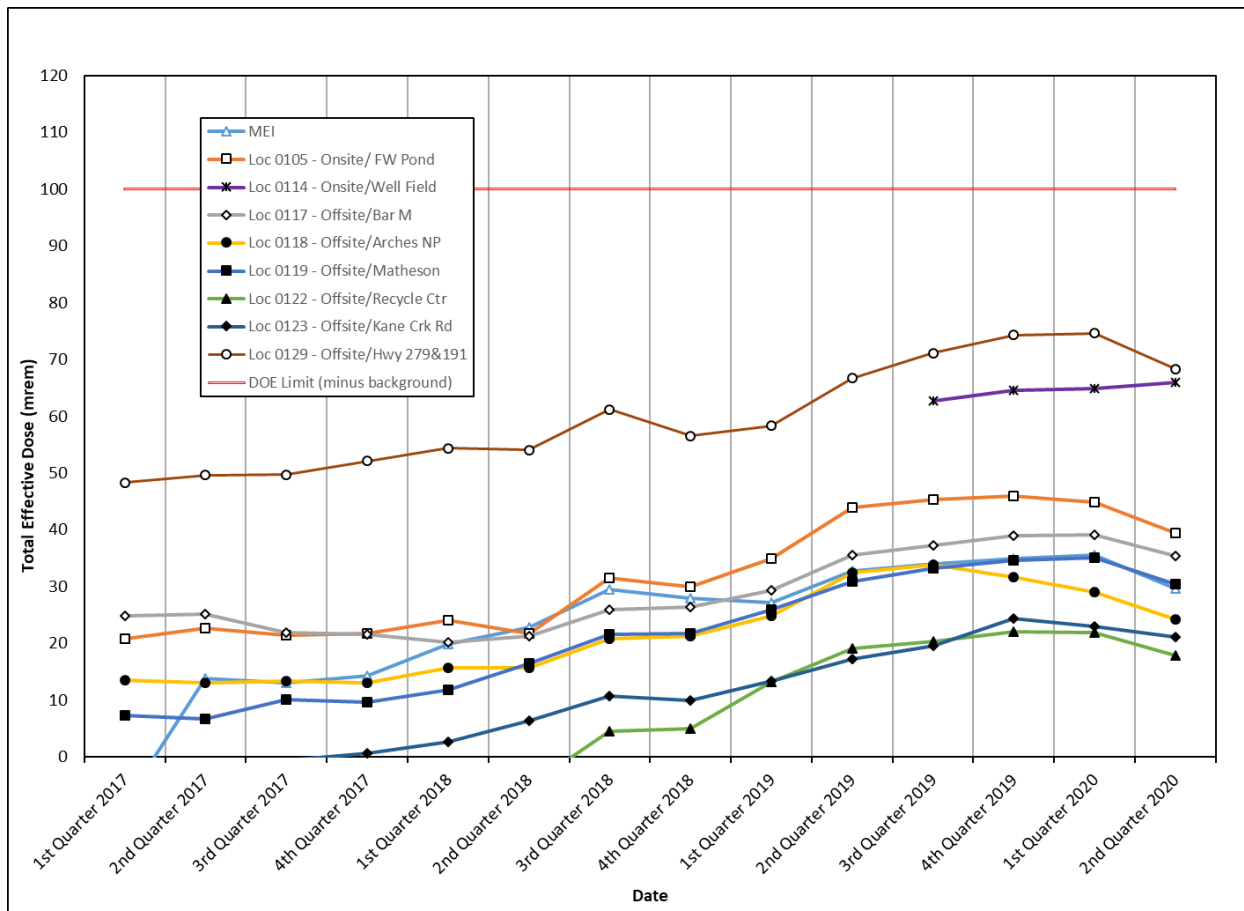


Figure 7. Total Effective Dose Measured at Moab Locations Since 2017

3.2 Crescent Junction Site

There are nine air monitoring stations associated with the Crescent Junction site, two located off site and seven on site. All nine are equipped with radon and gamma detectors. Two on-site and two off-site stations are equipped with air sampling pumps to measure air radioparticulates. After mill tailings disposal began in the second quarter of 2009, Crescent Junction monitoring location 0306 became the MEI.

3.2.1 Meteorological Analysis

Data were collected from the on-site meteorology station and downloaded from the Vista Data Vision online database, in which meteorological data are uploaded from the site, and hourly averages were analyzed. The average temperature for the quarter was 66°F. The lowest recorded temperature for the quarter was 23°F, and the highest was 97°F.

Figure 8 displays the wind rose for this quarter, with the wedges showing which direction the wind is coming from. For the second quarter 2020 in Crescent Junction, the primary wind direction was out of the west/southwest, making up 63 percent of the wind direction.

The Crescent Junction site received 1.08 inches of precipitation during second quarter 2020. Figure 9 presents the Crescent Junction average (from 2010 through 2019) and 2019 cumulative precipitation along with the 2020 second quarter. Similar to Moab, the Crescent Junction second quarter 2020 precipitation is below the site's nine-year average.

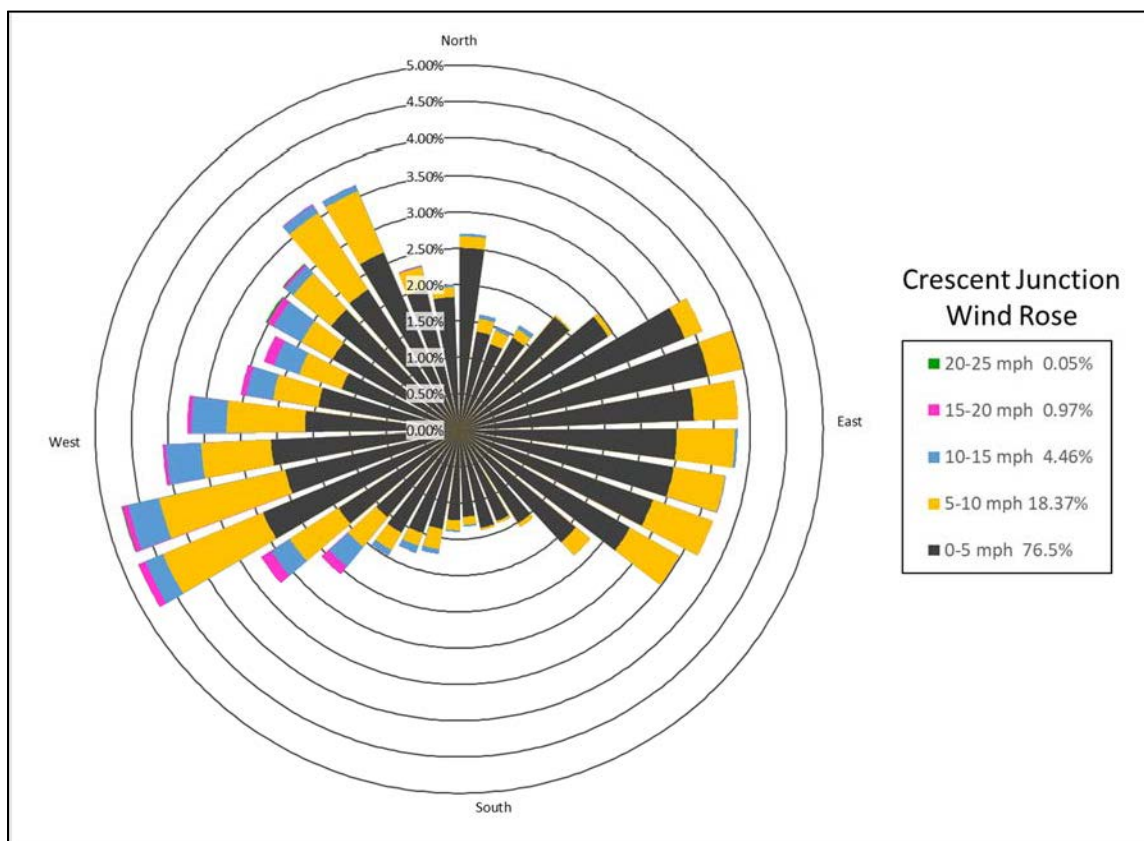


Figure 8. Crescent Junction Wind Rose for Second Quarter 2020

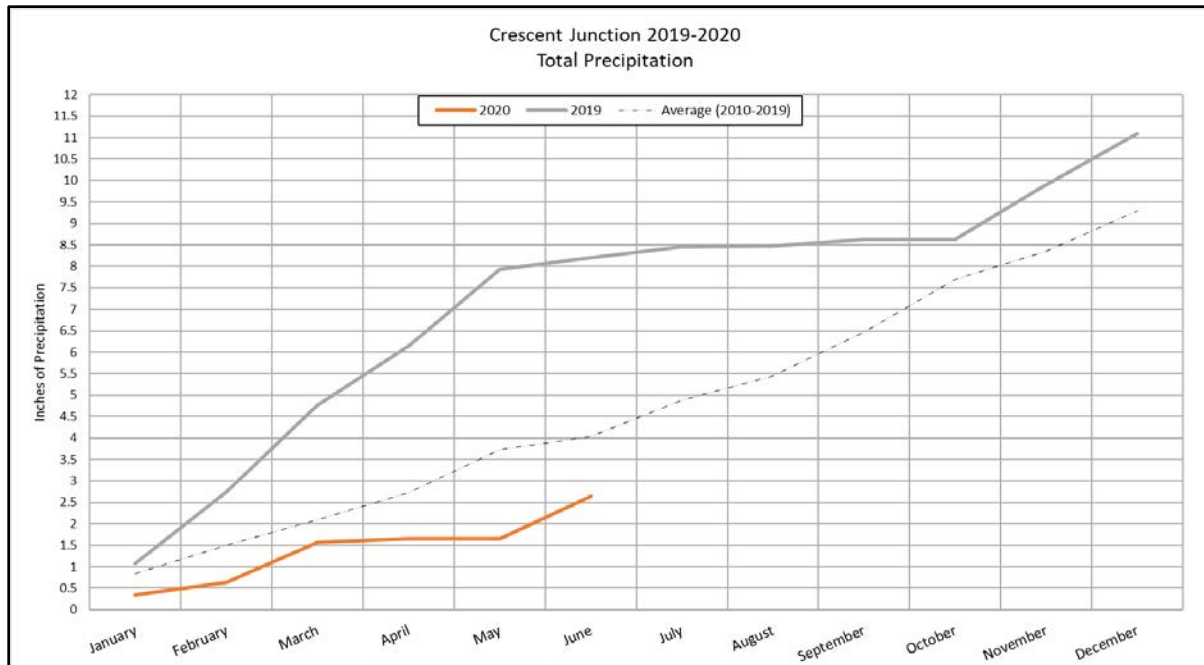


Figure 9. Crescent Junction Average, 2019, and Second Quarter 2020 Cumulative Precipitation

3.2.2 Radon

Based on three years of data from 2006 to 2009, the background concentration of radon in the Crescent Junction area was established as 0.9 pCi/L. Therefore, the Project must limit radon emissions at the Crescent Junction site boundary (withdrawal area) to 3.9 pCi/L. None of the on- or off-site stations exceeded the limit of 3.9 pCi/L in the second quarter 2020. Locations 0301 and 0305 are used to demonstrate compliance with the public dose limit in DOE O 458.1 at the site boundary.

Compared to the previous quarter, the radon concentrations at six on-site stations decreased as much as 0.3 pCi/L, while one on-site station saw an increase of 0.2 pCi/L. Both off-site stations saw a decrease from the previous quarter (0.1 pCi/L). Table 4 shows quarterly and annual radon results for the past year, including background, for on- and off-site locations. The five Crescent Junction locations with the highest annual average radon concentrations during the second quarter are shown on Figure 10, which displays the annual average concentrations for these locations since the first quarter of 2017.

3.2.3 Direct Gamma Radiation

The average annual background direct gamma radiation exposure dose for the Crescent Junction area was established as 92.5 mrem based on three years of data from 2006 to 2009. Table 5 shows quarterly and annual results for the past year, including background, for on- and off-site locations. These results represent the gamma dose an individual would receive from occupying a location for an entire year.

This quarter's analytical results compared to the previous quarter indicated the gamma radiation dose decreased at two of the nine Crescent Junction stations (up to 3.0 mrem). Four on-site stations increased as much as 10.0 mrem. Both off-site stations saw a decrease in gamma radiation (up to 2 mrem).

Table 4. Radon Concentrations for the Crescent Junction Site for the Past Year

Station Number	Third Quarter 2019 (pCi/L)	Fourth Quarter 2019 (pCi/L)	First Quarter 2020 (pCi/L)	Second Quarter 2020 (pCi/L)	Annual Average Concentration Based on Four Quarters (pCi/L)
On-site Locations					
0301	0.6	1.0	0.4	0.3	0.6
0302	0.9	1.1	0.6*	0.4	0.8
0303	1.0	2.0	1.1*	0.8	1.2
0304	0.6	1.4	0.4	0.4	0.7
0305	0.5	1.0	0.4	0.3	0.5
0308	2.0	4.0	1.5	1.2	2.1
0309	0.9	2.0	0.8	1.0	1.2
Off-site Locations					
0306 (MEI)	0.5	1.1	0.4	0.2	0.6
0307	0.4	0.8	0.3	0.2	0.4

Background has not been subtracted from annual values.

*-RadTrack² detector

3.2.4 Radioparticulates

The effective background dose from inhalation of radioparticulates at the Crescent Junction site was not determined. Therefore, all effective dose measured at the Project's monitoring stations is assumed to be from the Project. Samples were collected at the four monitoring locations at or near the Crescent Junction site to determine the air particulate concentrations of total Uranium, Thorium-230, Radium-226, Polonium-210, Actinium-227, and Protactinium-231 (based on the Actinium-227 concentration, as described in Section 3.1.4). Three stations saw a decrease in annual dose, as much as 0.34 mrem, while station 0307 saw a decrease in annual dose, 0.04 mrem. Table 6 shows radioparticulate effective doses for the Crescent Junction site for the past year.

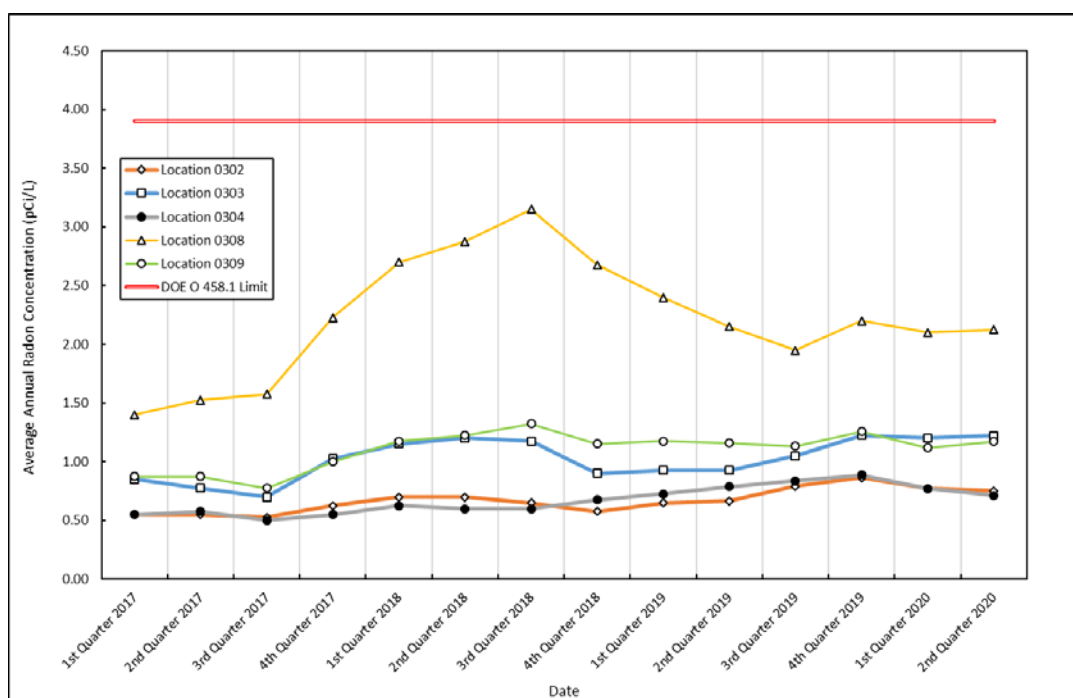


Figure 10. Crescent Junction Locations with Highest Second Quarter 2020 Average Annual Radon Concentrations

Table 5. Gamma Radiation Effective Doses for the Crescent Junction Site for the Past Year

Station Number	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations					
0301	30	25	27	28	110
0302	29	30	28	29	116
0303	43	44	44	54	185
0304	32	29	29	29	119
0305	33	30	31	30	124
0308	32	32	32	29	125
0309	30	29	28	29	116
Off-site Locations					
0306 (MEI)	32	32	28	27	113
0307	33	32	32	30	122

Background has not been subtracted from annual values

3.2.5 Total Effective Dose

The annual total effective dose to the Crescent Junction MEI was 23.26 mrem, which is well below the annual limit of 100 mrem. This is calculated by subtracting the background dose of 92.5 mrem from the MEI (location 0306) gamma radiation dose of 113 mrem, and then adding the radioparticulate dose of 2.76 mrem for the MEI.

Table 6. Radioparticulate Effective Doses for the Crescent Junction Site for the Past Year

Station Number	Isotope	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations						
0308-RP	Total Uranium	0.003	0.003	0.002	0.003	4.28
	Thorium-230	0.077	0.080	0.027	0.037	
	Radium-226	0.084	0.084	0.041	0.048	
	Polonium-210	0.480	0.537	0.529	0.309	
	Actinium-227	0.676	0.466	0.124	0.303	
	Protactinium-231	0.156	0.107	0.028	0.070	
0309-RP	Total Uranium	0.003	0.004	0.003	0.003	4.75
	Thorium-230	0.115	0.136	0.048	0.109	
	Radium-226	0.119	0.167	0.057	0.150	
	Polonium-210	0.464	0.497	0.456	0.293	
	Actinium-227	0.513	0.490	0.280	0.443	
	Protactinium-231	0.118	0.113	0.064	0.102	

Table 6. Radioparticulate Effective Doses for the Crescent Junction Site for the Past Year (continued)

Station Number	Isotope	Third Quarter 2019 (mrem)	Fourth Quarter 2019 (mrem)	First Quarter 2020 (mrem)	Second Quarter 2020 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
Off-site Locations						
306-RP MEI	Total Uranium	0.002	0.002	0.002	0.002	2.76
	Thorium-230	0.014	0.016	0.008	0.016	
	Radium-226	0.026	0.025	0.012	0.015	
	Polonium-210	0.448	0.488	0.448	0.244	
	Actinium-227	0.350	0.280	0.047	0.133	
	Protactinium-231	0.080	0.064	0.011	0.031	
0307-RP	Total Uranium	0.003	0.003	0.002	0.003	2.68
	Thorium-230	0.025	0.019	0.012	0.019	
	Radium-226	0.022	0.009	0.020	0.013	
	Polonium-210	0.448	0.423	0.464	0.277	
	Actinium-227	0.466	0.105	ND	0.179	
	Protactinium-231	0.107	0.024	ND	0.041	

ND = not detected; analyte concentration below detection limit

The MEI total effective dose decreased 5.07 mrem compared to the previous quarter. Figure 11 is a plot of the total effective dose from the four Crescent Junction locations since 2017. In Figure 11, the background was subtracted from the total effective dose calculations, therefore, the DOE Limit is shown as 100 mrem. The total effective dose decreased as much as 5.2 mrem since the last quarter at all locations. Nearly all of the dose to the MEI is due to direct gamma radiation. The dose to the lens of the eye, skin, and extremities is the same as a full body dose and is below the regulatory limit of 1500 mrem in a year to the skin and 5000 mrem in a year to the skin or extremities.

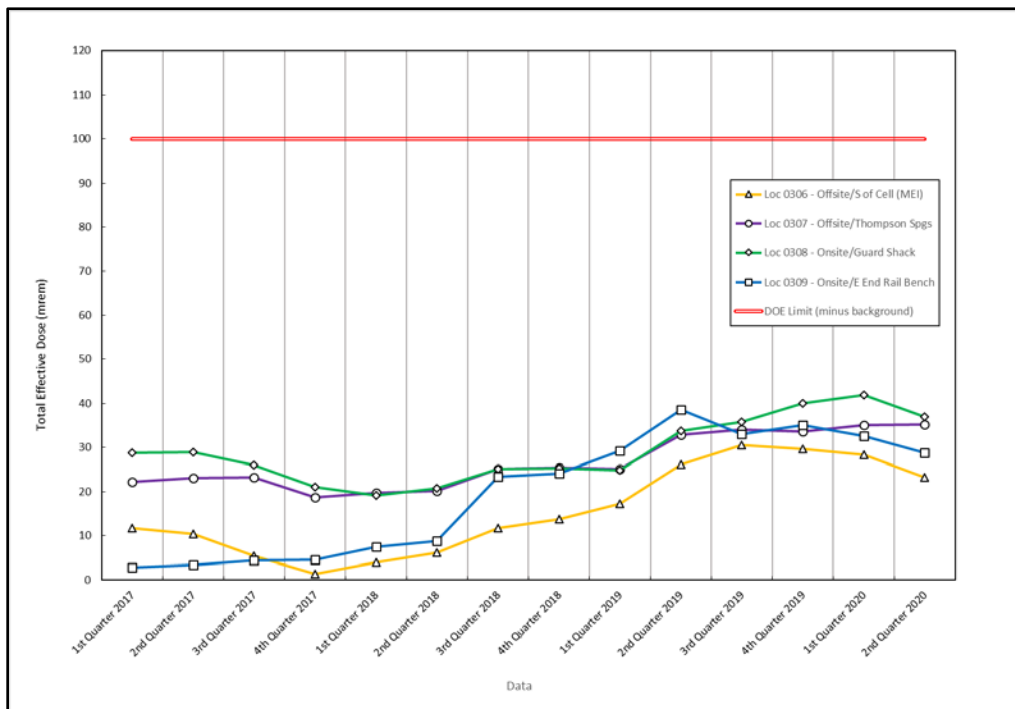


Figure 11. Total Effective Dose Measured at Crescent Junction Locations Since 2017

4.0 Data Assessment

Radon detectors, thermoluminescent dosimeters used for continuous dose measurements, and radioparticulate sample filters were sent to qualified off-site laboratories for analyses in accordance with the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (SAP) (DOE-EM/GJTAC2219). Qualified Project personnel evaluated the analytical data received for consistency with other data points and Quality Assurance/Quality Control samples.

Location 0105 radioparticulates only reflects 12 out of the 13 weeks during third quarter 2019. One filter was lost during the collection process.

Due to order discrepancies in first quarter 2020, four stations in Crescent Junction were equipped with the previous Radtrack² radon detectors. To account for the Radtrack² lower detection limit, those monitors were placed at locations that historically had elevated radon concentrations. The stations have been identified in the tables accordingly.

4.1 Quality Assurance/Quality Control Sampling

Duplicate samples for radon were collected at Moab locations 0102, 0108, and 0111, and at Crescent Junction locations 0303 and 0308. In addition, duplicate direct gamma samples were collected at Moab locations 0102, 0108, and 0129 and Crescent Junction locations 0301 and 0305. All results associated with the duplicate sampling are provided in Table 7. No duplicate samples were collected for radioparticulate samples, per the SAP.

As Table 7 displays, the five locations that included duplicate radon samples were within 0.13 pCi/L of each other. The five locations equipped with duplicate gamma detectors were all within 2.0 mrem of each other. These radon and gamma duplicate results are within the acceptable ranges, and the data are considered valid based on these results.

Table 7. Duplicate Results for Second Quarter 2020

Location	Result	Duplicate Result
Moab		
Radon:	pCi/L	pCi/L
0102	0.78	0.65
0108	1.9	1.8
0111	0.46	0.51
Gamma:	mrem	mrem
0102	25	26
0108	46	45
0129	33	34
Crescent Junction		
Radon:	pCi/L	pCi/L
0303	0.78	0.84
0308	1.2	1.1
Gamma:	mrem	mrem
0301	28	29
0305	30	28

Control samples measured the dose for gamma and radon while being shipped from the site to the respective analytical laboratories. Transit values were not subtracted from this quarter's data, as shown in Table 8.

Table 8. Shipment Control Sample Results for Second Quarter 2020

Sample	Result
Gamma:	mrem
In-transit 1	26
In-transit 2	23
Radon:	pCi/L
In-transit 1	0.22
In-transit 2	0.43
In-transit 3	0.76

4.2 Suspected Anomalies

All analytical data are reviewed for anomalous or outlying data points. Monitoring data are evaluated against historical and minimum/maximum values to determine if the reported data are within reasonable expected ranges. No anomalous data were noted for the second quarter of 2020.

4.3 Summary

Data collected during the second quarter of 2020 met the applicable laboratory control criteria for their respective analyses. The results were within the acceptable limits associated with each matrix. Data in this Report are considered validated and may be treated as final results.

5.0 References

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJTAC2219).

DOE (U.S. Department of Energy), *Moab UMTRA Project Fourth Quarter 2019 Environmental Air Monitoring Report* (DOE-EM/GJ3028).

DOE (U.S. Department of Energy), *Moab UMTRA Project Health Physics Plan* (DOE-EM/GJ3003).

DOE (U.S. Department of Energy) Order 458.1, Admin Chg 1, "Radiation Protection of the Public and the Environment."