Analytical Results for the Community Environmental Monitoring Program (CEMP) Air Sampling and TLD Network Fourth Quarter CY2017

The CEMP air-sampling network is designed to monitor and collect radioactive airborne particles from NNSS and non-NNSS related activities, as well as background environmental sources. This report is compiled by the Desert Research Institute (DRI) and summarizes the results from the analysis of the air samples collected by CEMP station managers as part of the community environmental monitoring program.

In general, the CEMP air-sampling network is comprised of 24 continuously operating environmental sampling stations. A total of 23 stations are equipped with a low volume air sampler/totalizer configuration to collect particulate radionuclides on glass fiber filter paper. Prior to October 1, 2013 all air samples were collected on a bi-weekly basis with a target collection time of 336 hours (two weeks). After October 1, 2013, approximately half of the stations were converted to 'stand by' status in which only one two-week sample was collected and analyzed every quarter year. Beginning October 1, 2017 all CEMP stations are again operating full time with samples being collected every two weeks. Now the procedure is to submit one sample set per quarter year for analysis. The remaining samples will be archived to be accessed if needed. This protocol will be followed unless an important event were to occur on or off the NNSS (major fires, transportation incident or an unusual result are a few examples). Archived samples would be used to assess conditions before and after an event. The samplers are calibrated on a quarterly basis by DRI to maintain a collection rate of 1.75 cfm (@ STP). All relevant information such as collection times, variations in flow rate, actual flow volumes, power outages, and other information documenting the integrity of the sample are recorded by the station managers. This allows for the proper interpretation of the analytical results. The air filters are analyzed by a commercial laboratory for gross alpha/beta activity as well as by high-resolution gamma spectrometry.

In the U.S., the principle reporting unit for the measurement of radioactivity in the atmospheric environment is pCi/m^3 (picocuries per cubic meter). DRI receives its data from the lab as picocuries per filter. DRI converts the laboratory data unit of measurement to pCi/m^3 for the ease in comparison of data.

A summary of the fourth quarter CY2017 analytical results for gross alpha and beta analyses are found in Table 1. Th,s tables documents the result of the quarterly result for each of the 23 air-sampling network stations. The average annual value from the previous year (CY2016) is provided for comparison purposes. Overall the gross alpha results for the fourth quarter of CY2017 reflect similar values to previous quarters. These data remain consistent with the average CY2016 analyses used for comparison, especially when analytical error is considered. The fourth quarter CY2017 beta results are also consistent with previous results.

The fourth quarter gamma results for CY2017 are shown in Table 2. All of the samples were gamma spectrum negligible (i.e. gamma emitting radionuclides were not detected) with the exception of beryllium (Be)-7 and lead (Pb)-210, naturally occurring

elements of the atmospheric and geologic environment respectively. Overall, these data are consistent with previous analytical results.

The TLD results for the fourth quarter of CY2017 are shown in Table 3. Data for the environmental thermoluminescent dosimeter (TLD) is reported in milliroentgens (mR). Overall, the results display similar values to the previous quarters of the last calendar year. The 2016 pressurized ion chamber, or PIC exposure rate and TLD data are also provided for comparison. As with historical data, TLD values are commonly lower than the PIC results. The overall estimated annual exposure based on the fourth quarter shows consistent agreement with CY2016.

DRI welcomes and encourages input from the station managers regarding the content of the CEMP quarterly reports. If there is anything you feel we could provide to help you interpret the data or enable you to explain the information to someone in your community not familiar with the program, please let us know.

Table 1. Gross Alpha/Beta Analytical Results for the Fourth Quarter of Calendar Year. 2017. (Data represents one analysis per quarter).

Station	Gross Alpha (pCi/m^3)	2016 Average	Gross Beta (pCi/m^3)	2016 Average
Alamo	0.0008	0.0018	0.021	0.020
Amargosa	0.0011	0.0013	0.020	0.020
Beatty	0.0011	0.0012	0.023	0.018
Boulder City	0.0012	0.0012	0.024	0.020
Caliente	0.0014	0.0014	0.024	0.020
Cedar City	0.0011	0.0009	0.017	0.015
Delta	0.0013	0.0009	0.029	0.019
Duckwater	0.0010	0.0010	0.014	0.018
Ely	0.0008	0.0010	0.014	0.012
Goldfield	0.0015	0.0011	0.024	0.017
Henderson	0.0010	0.0012	0.021	0.018
Indian Springs	0.0014	0.0011	0.019	0.018
Las Vegas	0.0009	0.0013	0.020	0.020
Mesquite	0.0010	0.0014	0.022	0.021
Milford	0.0015	0.0011	0.026	0.019
Overton	0.0036	0.0017	0.022	0.021
Pahrump	0.0006	0.0013	0.010	0.019
Pioche	0.0024	0.0013	0.018	0.016

Rachel	0.0015	0.0012	0.020	0.020
Sarcobatus	0.0021	0.0019	0.018	0.020
St. George/ Blooming Hills	0.0012	0.0013	0.022	0.022
Tecopa	0.0011	0.0015	0.023	0.023
Tonopah	0.0011	0.0010	0.019	0.016

Average analytical error gross alpha +/- 0.0007
Average analytical error gross beta +/-0.005

Table 2. Gamma Spectroscopy Results for the Fourth Quarter of Calendar Year 2017. (Data represents one analysis per quarter).

Station	Cs-137 (pCi/sample)	Cs-137 (MDC)	Be-7 (pCi/m^3)	Pb-210 (pCi/m^3)
Alamo	-5.4	18.2	0.017	N.D.
Amargosa	-5.0	17.1	0.015	N.D.
Beatty	-5.3	15.5	0.019	N.D.
Boulder City	-2.2	14.7	0.018	N.D.
Caliente	-3.9	15.6	N.D.	N.D.
Cedar City	4.9	15.6	N.D.	N.D.
Delta	-3.4	18.9	N.D.	N.D.
Duckwater	-3.4	18.0	0.010	N.D.
Ely	2.8	12.1	0.017	N.D.
Goldfield	-5.5	15.3	N.D.	N.D.
Henderson	2.3	8.3	0.015	N.D.
Indian Springs	0.0	9.1	0.020	N.D.
Las Vegas	0.0	17.8	0.016	N.D.
Mesquite	-4.1	17.7	0.022	N.D.
Milford	2.9	9.9	0.013	N.D.
Overton	-1.4	17.2	N.D.	N.D.
Pahrump	-7.3	18.8	0.011	N.D.
Pioche	3.6	10.4	0.016	N.D.

Rachel	-2.1	15.7	N.D.	N.D.
Sarcobatus	0.8	11.9	0.009	N.D.
St.George/ Bloomington Hills	-1.7	13.1	0.011	N.D.
Tecopa	2.6	3.5	0.019	N.D.
Tonopah	-0.4	18.1	0.015	N.D.

MDC (minimum detectable concentration)
MDC Be-7 = 0.022 pCi/m^3 Pb-210 = 0.006 pCi/m^3 N.D. = not detected

Table 3. TLD Analytical Results for the Fourth Quarter of Calendar Year 2017

Station	Fourth Quarter Exposure (mR)	Est. Annual Exposure (mR/yr)	2016 TLD Exposure (mR/yr)	2016 PIC Exposure (mR/yr)
Alamo	33	131	116	117
Amargosa	30	120	110	102
Beatty	39	158	145	148
Boulder City	30	117	107	143
Caliente	32	127	112	141
Cedar City	26	103	96	92
Delta	27	110	99	109
Duckwater	--	--	117	128
Ely	28	111	106	106
Goldfield	24	138	130	136
Henderson	32	124	122	120
Indian Springs	26	104	98	99
Las Vegas	27	107	100	91
Mesquite	29	115	106	103
Milford	39	158	145	176
Overton	27	105	102	106
Pahrump	24	96	85	72
Pioche	33	131	124	134

Rachel	25	139	126	130
Sarcobatus	38	154	138	145
St. George/ Bloomington Hills	31	123	No data	No data
Tecopa	30	120	112	115
Tonopah	36	145	136	139