Analytical Results for the Community Environmental Monitoring Program (CEMP) Air Sampling and TLD Network First Quarter CY2016

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 is collected every quarter year. The samplers are calibrated on a monthly 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. The filters are composited on a quarterly basis for gamma spectroscopy analysis after the gross alpha/beta analyses have been completed.

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 first quarter CY2016 analytical results for gross alpha and beta analyses are found in Tables 1 and 2. These tables document the minimum, maximum, and average values for each of the 23 air-sampling network stations. The last column shows the average annual value from the previous year (CY2015) for comparison purposes. Overall the gross alpha results for the first quarter of CY2016 reflect similar values to previous quarters. These data remain consistent with the average CY2015 analyses used for comparison, especially when analytical error is considered. The first quarter CY2016 beta results are also consistent with previous results.

The first quarter gamma results for CY2016 are shown in Table 3. 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 first quarter of CY2016 are shown in Table 4. 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 2015 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 first quarter shows consistent agreement with CY2015.

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 Analytical Results for the First Quarter of Calendar Year 2016
(Average analytical error, +/– 0.0007)

Station	Minimum (pCi/m^3)	Maximum (pCi/m^3)	Average (pCi/m^3)	2015 Average (pCi/m^3)
Alamo	0.0007	0.0025	0.0014	0.0018
Amargosa*	N.A.	N.A.	0.0008	0.0011
Beatty	0.0005	0.0016	0.0009	0.0011
Boulder City*	N.A.	N.A.	0.0005	0.0011
Caliente	0.0008	0.0026	0.0014	0.0016
Cedar City	0.0004	0.0010	0.0007	0.0008
Delta*	N.A.	N.A.	0.0007	0.0009
Duckwater*	N.A.	N.A.	0.0009	0.0010
Ely*	N.A.	N.A.	0.0005	0.0009
Goldfield	0.0006	0.0013	0.0009	0.0011
Henderson*	N.A.	N.A.	0.0008	0.0013
Indian Springs*	N.A.	N.A.	0.0007	0.0010
Las Vegas	0.0007	0.0020	0.0012	0.0011
Mesquite	0.0006	0.0022	0.0013	0.0011
Milford*	N.A.	N.A.	0.0010	0.0009
Overton*	N.A.	N.A.	0.0006	0.0012
Pahrump*	N.A.	N.A.	0.0008	0.0016
Pioche	0.0005	0.0031	0.0011	0.0011
Rachel	0.0009	0.0020	0.0013	0.0011
Sarcobatus	0.0009	0.0036	0.0018	0.0018

St. George	0.0006	0.0025	0.0013	0.0011
Tecopa*	N.A.	N.A.	0.0014	0.0017
Tonopah	0.0004	0.0016	0.0009	0.0010

*quarterly air sampling station (represents only one sample)

Table 2. Gross Beta Analytical Results for the First Quarter of Calendar Year 2016.
(Average analytical error, +/– 0.005)

Station	Minimum (pCi/m^3)	Maximum (pCi/m^3)	Average (pCi/m^3)	2015 Average (pCi/m^3)
Alamo	0.011	0.024	0.017	0.021
Amargosa*	N.A.	N.A.	0.017	0.022
Beatty	0.011	0.021	0.015	0.019
Boulder City*	N.A.	N.A.	0.012	0.021
Caliente	0.013	0.025	0.018	0.022
Cedar City	0.010	0.016	0.013	0.016
Delta*	N.A.	N.A.	0.020	0.019
Duckwater*	N.A.	N.A.	0.020	0.017
Ely*	N.A.	N.A.	0.010	0.017
Goldfield	0.012	0.018	0.015	0.019
Henderson*	N.A.	N.A.	0.015	0.020
Indian Springs*	N.A.	N.A.	0.015	0.020
Las Vegas	0.013	0.028	0.019	0.021
Mesquite	0.013	0.034	0.021	0.022
Milford*	N.A.	N.A.	0.021	0.018
Overton*	N.A.	N.A.	0.016	0.022
Pahrump*	N.A.	N.A.	0.015	0.020
Pioche	0.009	0.019	0.013	0.019
Rachel	0.011	0.040	0.021	0.019
Sarcobatus	0.012	0.025	0.017	0.021

St. George	0.015	0.032	0.022	0.023
Tecopa*	N.A.	N.A.	0.022	0.022
Tonopah	0.011	0.017	0.013	0.018

*quarterly air sampling station (represents only sample)

Table 3. Gamma Spectroscopy Results for the First Quarter of Calendar Year 2016.

Station	Cs-137 (pCi/sample)	Cs-137 (MDC)	Be-7 (pCi/m^3)	Pb-210 (pCi/m^3)
Alamo	1.8	12.8	0.034	N.D.
Amargosa*	4.7	14.9	N.D.	N.D.
Beatty	-0.2	15.5	0.035	N.D
Boulder City*	4.5	17.7	N.D.	N.D.
Caliente	2.7	10.6	0.032	N.D.
Cedar City	-1.7	15.4	0.032	0.016
Delta*	3.9	11.7	N.D.	N.D.
Duckwater*	0.0	14.0	N.D.	N.D.
Ely*	1.4	15.4	N.D.	N.D.
Goldfield	5.2	17.3	0.032	N.D.
Henderson*	-0.8	11.8	N.D.	N.D.
Indian Springs*	-4.5	13.6	N.D.	N.D.
Las Vegas	1.3	16.8	0.048	N.D.
Mesquite	2.0	8.7	0.046	0.018
Milford*	2.0	12.8	N.D.	N.D.
Overton*	-3.6	16.8	N.D.	N.D.
Pahrump*	0.3	12.3	N.D.	N.D.
Pioche	-3.0	14.6	0.058	N.D.
Rachel	-7.9	18.0	0.029	N.D.
Sarcobatus	3.9	12.2	0.024	N.D.

St.George	-7.4	17.2	0.035	0.020
Tecopa*	4.1	13.4	N.D.	N.D.
Tonopah	3.2	16.3	0.031	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
*quarterly air sample station (represents only one sample)

Table 4. TLD Analytical Results for the First Quarter of Calendar Year 2016

Station	First Quarter Exposure (mR)	Est. Annual Exposure (mR/yr)	2015 TLD Exposure (mR/yr)	2015 PIC Exposure (mR/yr)
Alamo	28	112	119	125
Amargosa	28	117	116	101
Beatty	36	145	150	145
Boulder City	28	114	107	143
Caliente	28	125	120	143
Cedar City	25	93	98	95
Delta	25	93	101	110
Duckwater	39	124	121	134
Ely	25	111	104	105
Goldfield	33	133	130	131
Henderson	31	126	113	119
Indian Springs	25	105	102	102
Las Vegas	26	105	103	101
Mesquite	27	101	108	104
Milford	37	138	145	152
Overton	26	106	101	107
Pahrump	22	92	85	73
Pioche	29	129	123	137
Rachel	31	124	131	146
Sarcobatus	35	141	143	144

St. George	22	82	89	94
Tecopa	27	113	115	117
Tonopah	32	128	140	141