

Aliso Canyon Radiation Survey Summary

On November 12, 2020, Los Angeles County Department of Public Health (DPH), Radiation Management (Rad Mgmt) performed radiation surveys of the sample bins collected by Southern California Gas Company's (SCGC) at the Aliso Canyon Natural Gas Storage Facility in Portor Ranch location. The bins surveyed were selected by both SCGC and DPH prior to Rad Mgmt's arrival. Additionally, SCGC acquired the services of a consulting company to compare and confirm the radiation survey results taken by Rad Mgmt.

The beta and gamma radiation data are consistent with background radiation and do not pose a health risk. Though not a health risk, the alpha particles are measurable and need additional consideration on how they compare with the average concentration in the United States. The minimum, maximum and average alpha survey readings of our data set are 0 (zero) disintegrations per minute (dpm), 120 dpm and 28 dpm, respectively. Our maximum alpha survey reading of 120 dpm corresponds with Lab Sample ID V327, which measured 2.86 picocuries per gram (pCi/g) of polonium-210 (Po-210) and 2.39 pCi/g of lead-210 (Pb-210).¹ The average U.S. concentrations of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) for Po-210 and Pb-210 are 2.7 pCi/g to 35,135 pCi/g and 0.108 pCi/g to 4,324 pCi/g, respectively.² Based on the average TENORM concentrations, the V327 lab results are within the average concentration ranges and are conservatively low.

Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) is defined by the United States Environmental Protection Agency (US EPA) as "naturally occurring radioactive materials that have been concentrated or exposed to the accessible environment as a result of human activities such as manufacturing, mineral extraction, or water processing." In other words, TENORM refers to naturally occurring radiation, but also accounts for human activities that change the patterns of redistribution and concentrations of radioactive materials in the environment. For more information on TENORM, please visit the [US EPA website](#).

The findings for the alpha particles in the sludge were measurable; and were further considered by comparing the corresponding lab radioisotope testing results to the average concentrations in the United States. The report indicates that the concentrations of lead and polonium found in the waste bin samples are on the lower end of the average range of U.S. concentrations of TENORM. The radiation readings from the material in the waste bins are consistent with background levels of radiation of TENORM such as lead-210 (Pb-210) and polonium-210 (Po-210) found in U.S. soils. Pb-210 and Po-210 are both heavy elements and do not become aerosolized and transported through the air. Both particles remain in the sludge and, therefore, do not pose inhalation or ingestion hazard to the public.

¹Eurofins Calscience LLC; "Analytical Report." Laboratory Job ID: 570-42384-2; December 30, 2020.

²Mohsen M.M. Ali, Hongtao Zhao, Zhongyu Li and Najeeb N.M. Maglas; "Concentrations of TENORMs in the petroleum industry and their environmental and health effects." RSC Adv., 2019, 9, 39212-39213.

EQUIPMENT AND SOURCE INFORMATION

Radiation Meters

Instrument #	Make & Model	Serial#	Probe Model #	Type	Serial#	Calibration Date
1	Ludlum 3	196890	44-90	Alpha	PR192442	May-20
2	Ludlum 3	217089	44-116	Beta	PR232639	May-20
3	Ludlum 3	196324	44-3	Low Energy Gamma	PR124307	May-20
4	Bicron	2053		Microrem Meter		May-20

Check Sources	Activity - μ Ci	Cal Date	Half Life	Activity (μ Ci) as of 11/12/2020
Po-210	0.1	Apr-18	138 days	0.001
Sr-90	0.1	Apr-18	28.8 years	0.09
Co-60	1.0	Apr-18	5.3 years	0.71
Th-232	Lantern Mantle		1.4E+10 years	

Background and Check Source Readings

Instrument	Background - Counts per minute (cpm)	Po-210 - Counts per minute (cpm)	Sr-90 - Counts per minute (cpm)	Co-60 - Counts per minute (cpm)	Th-232 Counts per minute (cpm)
#1	0	224			5264
	0	269			5104
	0	266			5326
Average	0	253			5231
#2	300		34768		20506
	323		34950		21786
	331		34718		21919
Average	318		34812		21404
#3	466			22717	4538
	421			22864	4462
	408			23713	4431
Average	432			23098	4477
	Background - microrem per hour (μrem/hr)				
#4	6-10				

DATA

Surveys

Date of Surveys: 11/12/2020

Count Time = 0.5 min
Conversion to cpm X= 2

Eff α 20% Pu-239
Eff β 30% Sr-90
Eff γ 18% I-129

Bkgd α 0 cpm
Bkgd β 318 cpm
Bkgd γ 432 cpm
Bkgd
Dose 6-10 μ rem/hr
Rate

SS-24 Site

UNIT NUMBER	APPROXIMATE START DATE	DESCRIPTION OF CONTENTS	α	α cpm	α dpm	β	β cpm	β dpm	γ	γ cpm	γ dpm	DOSE RATE (μ rem/hr)
R765	12/15/2015	Non SS-25 Debris from 39A Relief Pad	0	0	0	135	270	-160.0	173	346	-477.8	7
SF 1535	12/10/2015	Soil and Debris from SS-25	2	4	20	152	304	-46.7	202	404	-155.6	5
SF1518	10/5/2016	South Slope Evidence Soils (6")	1	2	10	144	288	-100.0	224	448	88.9	6
T245-Front	6/20/2016	SS-25 Pipe Trench Concrete	2	4	20	107	214	-346.7	176	352	-444.4	5
T245-Rear	6/20/2016	SS-25 Pipe Trench Concrete	4	8	40	102	204	-380.0	172	344	-488.9	6
PT1312	6/15/2016	Bridge cushions	0	0	0	77	154	-546.7	74	148	-1577.8	5
PT2948	6/15/2016	Bridge cushions	1	2	10	96	192	-420.0	99	198	-1300.0	5
VB27599	5/7/2016	25A/25B Geller/Pipe Trench Sludge	2	4	20	139	278	-133.3	108	216	-1200.0	5
V327	6/17/2016	SS-25 Earthen Sludge Outside Pipe Trench	12	24	120	175	350	106.7	114	228	-1133.3	5
V509	6/17/2016	SS-25 Earthen Sludge Outside Pipe Trench	5	10	50	167	334	53.3	109	218	-1188.9	5
SF764	5/14/2016	Concrete - Broken up slab from SS-25 Crater	0	0	0	177	354	120.0	153	306	-700.0	9
Drum 09042020-2	9/4/2020	55 Gallon Drum	2	4	20	150	300	-60.0	151	302	-722.2	6
Drum 09112020-1	9/11/2020	55 Gallon Drum	8	16	80	161	322	13.3	102	204	-1266.7	8
Drum 09042020-1	9/4/2020	55 Gallon Drum	0	0	0	135	270	-160.0	190	380	-288.9	7

PS-40 Site

UNIT NUMBER	APPROXIMATE START DATE	DESCRIPTION OF CONTENTS	α	α cpm	α dpm	β	β cpm	β dpm	γ	γ cpm	γ dpm	DOSE RATE (μ rem/hr)
CT817	6/13/2016	SS-25 Crater Sludge	2	4	20	160	320	6.7	141	282	-833.3	7

P-39 Site

UNIT NUMBER	APPROXIMATE START DATE	DESCRIPTION OF CONTENTS	α	α cpm	α dpm	β	β cpm	β dpm	γ	γ cpm	γ dpm	DOSE RATE (μ rem/hr)
20118	7/2/2016	Soils less than 50 PPM VOC from SS-25 Crater	1	2	10	213	426	360.0	229	458	144.4	10
SF1521/20328	7/23/2016	Concrete and Cables	2	4	20	156	312	-20.0	145	290	-788.9	7