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Half-Moon Bay, Radiation Survey Results, January 2014

February 27, 2014

In response to public concerns that radioactivity from Japan's Fukushima nuclear power plant was the source of elevated radiation levels observed on Miramar Beach at Half Moon Bay, the California Department of Public Health Radiologic Health Branch (RHB) conducted on-site radiation survey activities in January 2014.

Data collected by CDPH indicates that the source of the elevated radiation is due to naturally occurring radioactive materials, not Fukushima-related events. CDPH found that locations with elevated radiation levels corresponded to areas with black sand and specifically, where the black sand was thickest. An evaluation of the data indicates that there is no public health and safety threat from the naturally occurring radioactivity.

A CDPH survey team initially visited Miramar Beach on January 2, 2014, with a second visit on January 6. These surveys were conducted using a Canberra Industries Inspector (lanthanum bromide) gamma spectroscopy system and which identified the source of elevated radioactivity as naturally occurring radioactivity in the black sand, due mainly to the presence of uranium (and its progeny), thorium (and its progeny), and potassium. No radioactivity associated with the Fukushima nuclear power plant was identified at that time.

On January 14, 2014 another CDPH survey team visited the beach with equipment that was significantly more sensitive to radiation. A 2 inch by 2 inch portable sodium iodide (NaI) detector was used to scan the beach while a field high purity germanium (HPGe) gamma spectroscopy system was used to determine if radionuclides known to be associated with the Fukushima nuclear power plant were present at the beach. Three soil samples were also collected for laboratory analysis.

Table 1 shows radiation survey results for seven locations and where soil sampling was conducted. Field measurements indicated only naturally occurring radioactive materials were present at dose values ranging from 9 - 105 microrem per hour at ground level and 6 - 60 microrem per hour at waist level. The higher range values are above typical background radiation levels but below levels of health and safety concern.

Laboratory results indicate the presence of naturally occurring radioactive materials: thorium and its progeny, uranium and its progeny, and potassium. No nuclear power plant fission products were identified in the beach sand samples. A soil sample collected on the bank above

the beach (location G) indicated the presence of a low level of cesium-137(Cs-137) at a value consistent with typical background levels attributed to past nuclear weapons testing fallout. Since cesium-134 (Cs-134), a radionuclide used as an indicator of a nuclear power plant release, was not found, CDPH concludes that the Cs-137 result is due to past nuclear weapons fallout, not the Fukushima plant. See attached laboratory reports.

Table 1, Radiation Survey Results

<u>Point</u>	<u>Radiation Dose at Ground Level</u> <u>µrem/hr</u>	<u>Radiation Dose at Waist Level</u> <u>µrem/hr</u>	<u>Soil Sample Obtained</u>
A	10	N/A	No
B	50	40	Yes
C	65	45	No
D	50	45	No
E	70	60	No
*F	105	60	Yes
**G	9	6	Yes

Notes:

* is highest beach survey location

** is background location on bank above beach

Survey results obtained using portable sodium iodide (NaI) detector

1,000 microrems (µrem) = 1 millirem (mrem)

According to the National Council on Radiation Protection and Measurements (NCRP) Report No. 160, the average annual radiation dose per person in the U.S. is 620 millirem from natural and man-made sources which includes exposure from natural background sources and from medical diagnostic and therapeutic procedures.

Image 1, Survey Locations on Miramar Beach



Image 2, Initial View Overlooking Beach.

Note color of sand – elevated measurements correspond to black colored sand.





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Drinking Water and Radiation Laboratory Branch

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FINAL Analysis Results Report for Task ID. 14-0028

Investigator: Ephrime Mekuria	RHB	Requestor: Ephrime Mekuria	RHB
850 Marina Bay Pkwy, BLDG P, 1ST FL.		850 Marina Bay Parkway	
Richmond CA 94804-6403		Richmond CA 94804	
Phone Number:		Phone Number:	██████████
Site/Project Name: Miramar Beach			
System No:	Billing Agency: RHB	Samples Received by Lab: 1/15/2014	

Parameter	Method	Result +/- CE	MDA 95	Units
Lab No: 14-0028-01	Sample ID: R 98811	Time Collected: 1/14/2014 15:50	Sampling Point: Blutt top G	
	Sample Type: Soil/Sediment			
U-238 (Pm-234m, 1001 keV)	HASL Ga-01-R	1.33 +/- 0.747	3.45	pCi/g dry wt.
Dry Wt/Wet Wt		0.891		
U-235 (144 keV)	HASL Ga-01-R	0.152 +/- 0.0311	0.142	pCi/g dry wt
Th-228 (Tl-208, 583 keV)	HASL Ga-01-R	0.869 +/- 0.0272	0.0733	pCi/g dry wt
Th-232/Ra-228 (Ac-228, 911 keV)	HASL Ga-01-R	0.995 +/- 0.0355	0.114	pCi/g dry wt
Ra-226 (Bi-214, 609 keV)	HASL Ga-01-R	0.778 +/- 0.0218	0.0525	pCi/g dry wt
U-238 (Th-234, 63 keV)	HASL Ga-01-R	1.28 +/- 0.157	0.701	pCi/g dry wt
Cs-137	HASL Ga-01-R	0.0761 +/- 0.00391	0.0179	pCi/g dry wt
K-40	HASL Ga-01-R	12.1 +/- 0.292	0.350	pCi/g dry wt

** Activities reported are after ingrowth.

**The samples were sealed for 21 days (ingrowth) to accurately quantify radium using its progeny.



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FINAL Analysis Results Report for Task ID. 14-0029

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Richmond CA 94804-6403		Richmond CA 94804	
Phone Number:		Phone Number:	██████████
Site/Project Name: Miramar Beach			
System No:	Billing Agency: RHB	Samples Received by Lab: 1/15/2014	

Parameter	Method	Result +/- CE	MDA 95	Units
Lab No: 14-0029-01	Sample ID: R 94325	Time Collected: 1/14/2014 15:40	Sampling Point: Surfer's Beach B	
	Sample Type: Soil/Sediment			
U-238 (Pm-234m, 1001 keV)	HASL Ga-01-R	31.2 +/- 1.78	6.83	pCi/g dry wt.
U-235 (144 keV)	HASL Ga-01-R	1.90 +/- 0.181	0.652	pCi/g dry wt
Th-228 (Tl-208, 583 keV)	HASL Ga-01-R	18.2 +/- 0.795	0.142	pCi/g dry wt
Th-232/Ra-228 (Ac-228, 911 ke)	HASL Ga-01-R	20.4 +/- 0.584	0.162	pCi/g dry wt
Ra-226 (Bi-214, 609 keV)	HASL Ga-01-R	27.5 +/- 1.13	0.142	pCi/g dry wt
U-238 (Th-234, 63 keV)	HASL Ga-01-R	22.6 +/- 1.93	3.06	pCi/g dry wt
Cs-137	HASL Ga-01-R	0.000861 +/- 0.00748	0.0428	pCi/g dry wt
K-40	HASL Ga-01-R	1.91 +/- 0.131	0.537	pCi/g dry wt
Dry Wt/Wet Wt		0.897		

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FINAL Analysis Results Report for Task ID. 14-0030

Investigator: Ephrime Mekuria RHB 850 Marina Bay Pkwy, BLDG P, 1ST FL. Richmond CA 94804-6403 Phone Number:	Requestor: Ephrime Mekuria RHB 850 Marina Bay Parkway Richmond CA 94804 Phone Number: [REDACTED]
Site/Project Name: Miramar Beach	
System No:	Billing Agency: RHB Samples Received by Lab: 1/15/2014

Parameter	Method	Result +/- CE	MDA 95	Units
Lab No: 14-0030-01	Sample ID: R 94347	Time Collected: 1/14/2014 15:30	Sampling Point: Surfer's Beach F	
	Sample Type: Soil/Sediment			
U-238 (Pm-234m, 1001 keV)	HASL Ga-01-R	36.7 +/- 1.37	5.29	pCi/g dry wt.
U-235 (144 keV)	HASL Ga-01-R	1.89 +/- 0.141	0.574	pCi/g dry wt
Th-228 (Tl-208, 583 keV)	HASL Ga-01-R	44.2 +/- 1.93	0.267	pCi/g dry wt
Th-232/Ra-228 (Ac-228, 911 keV)	HASL Ga-01-R	48.6 +/- 1.39	0.189	pCi/g dry wt
Ra-226 (Bi-214, 609 keV)	HASL Ga-01-R	28.4 +/- 1.17	0.121	pCi/g dry wt
U-238 (Th-234, 63 keV)	HASL Ga-01-R	25.2 +/- 2.36	5.09	pCi/g dry wt
Cs-137	HASL Ga-01-R	-0.00534 +/- 0.0100	0.0570	pCi/g dry wt
K-40	HASL Ga-01-R	3.77 +/- 0.174	0.620	pCi/g dry wt
Dry Wt/Wet Wt		0.938		

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