

Cascade Radon, Inc. Testing, Mitigation, Systems Design CCB 180537 / CASCARI927C1 Fed ID 26-1809992 12839 NE Airport Way Bldg. 9 Portland, Oregon 97230 Phone: (503) 421-4813 Fax: (503) 281-6170 Office@CascadeRadon.com

Kelly Elementary School

(C-65388)

9030 SE Cooper Street, Portland, OR 97266

May 25, 2018



Cascade Radon, Inc. Testing, Mitigation, Systems Design CCB 180537 / CASCARI927C1 Fed ID 26-1809992 12839 NE Airport Way Bldg. 9 Portland, Oregon 97230 Phone: (503) 421-4813 Fax: (503) 281-6170

Office@CascadeRadon.com

Purpose

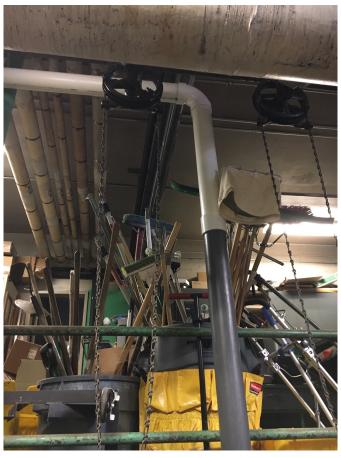
Initial testing was performed throughout the school on April 11, 2016 to April 14, 2016 by PBS Engineering and Environmental Inc. Testing indicated 5.6 pCi/L in the Boiler Room, 5.3 pCi/L in the Custodial Office and 6.3 pCi/L in the Cafeteria. PBS performed additional testing starting in October 2016 to May 2017 as a confirmation long-term test to determine if mitigation was needed. The result of this 7 month test was 2.2 pCi/L in the Boiler Room, 4.9 pCi/L in the Custodial Office and 4.6 pCi/L in the Cafeteria. Cascade Radon was hired to diagnose boiler room and develop a mitigation strategy to reduce the radon levels.

The installation of a sub-slab depressurization system was used to reduce the radon below the EPA action level of 4 pCi/L. See attached pages for a description of the system components and post-mitigation testing.





The top picture is the suction point located in the boiler room concrete slab, an additional suction point extends off and is drilled horizontally to under the concrete slab of the custodial office area. Schedule 80 vent piping was used in the boiler room in low lying areas to protect against accidental impacts. The lower picture is the third suction point installed from the boiler room to under the concrete slab of the Cafeteria. The vent piping from the suction points all converge into one main line, through the ceiling and then to fan location on the roof. The system includes a manometer (pressure gauge), which is a simple means of seeing the system is working mechanically. A manometer also shows how much negative pressure (depressurization) the system is creating. It is understood such a pressure gauge DOES NOT monitor radon levels.









Vent pipe routing in the Boiler room to the fan location on the roof.







This system required a Festa AMG Fury model fan, which is designed for the more porous rocky soil found beneath the concrete slab. If left to operate continuously the lifespan of this fan typically is 10 to 15 years.

Credentials

Cascade Radon, Inc. 12839 NE Airport Way Bldg. 9 Portland, OR 97230 (503)421-4813 office@cascaderadon.com CCB180537 CASCARI977C1 NEHA/NRPP# 104815RMT NRSB# 1G0008

Snyder Roofing of Oregon LLC 12650 SW Hall Blvd. Tigard, OR 97223 (503)620-5252 Snyder-builds.com CCB135987

Christensen Electric, Inc. 17201 NE Sacramento Street Portland, OR 97230 (503)419-3300 info@christenson.com CCB458



CASCADE RADON, INC.

Testing, Mitigation, Systems Design CCB 180537 / CASCARI927C1

May 25, 2018 C-65388

To: Portland Public Schools 501 N. Dixon Street Portland, OR 97227

RE: Kelly Elementary School 9030 SE Cooper St. Portland, OR 97266

Effective: February 2, 2018

Cascade Radon, Inc. warrants that all work has been performed in a workmanlike manner and according to the best standard practices. All materials and equipment are new, unless otherwise specified, and of first quality.

Cascade Radon, Inc. guarantees that the installation will maintain average, long-term, indoor radon levels, based upon approved 9 month duration Alpha-Track testing at or below 4 pCi/L for a period of 10 years.

With the exception of the exhaust fan unit(s), Cascade Radon, Inc. warrants that all labor, work, materials and equipment will be free from faults in material or workmanship for period of ten (10) years from the date of substantial completion.

Includes 5-year manufactures replacement warranty on exhaust fan unit(s), beginning at time of initial activation, with any related work and materials provided at no cost to the Client.

All warranties and guarantees are transferable to future owners of the same property.

Warranty or service inquires, please call (503) 421-4813

Sincerely, Wade Gervais Division Manager Cascade Radon, Inc. 12839 NE Airport Way Portland, OR 97230 Phone: (503) 421-4813 Fax: (503) 281-6170 Office@CascadeRadon.com

Phone: 503-421-4813 office@cascaderadon.com

503-281-6170 Fax:



TEST DETAILS:

Kelly Elementary 9030 SE Cooper St Portland, OR 97266 Portland Public Schools

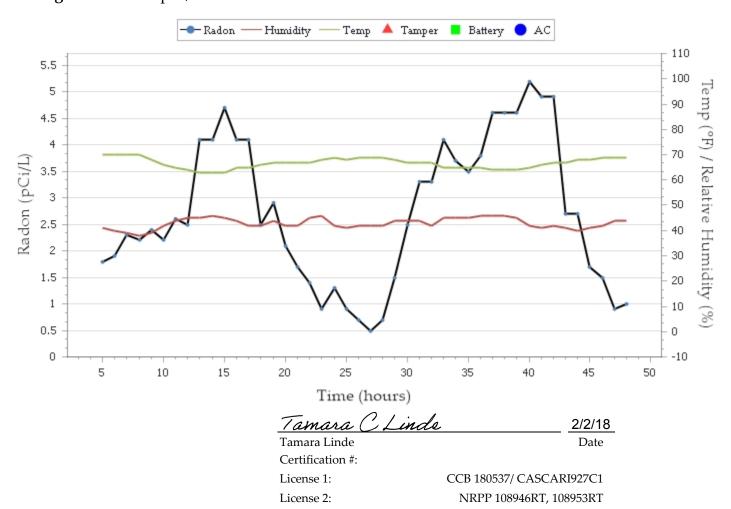
Test Start Date/Time: Tuesday, January 30, 2018 // 3:00 PM **Test End Date/Time:** Thursday, February 01, 2018 // 3:30 PM

Location of Instrument: Boiler Room/Custodial office

Notes:

TEST RESULTS:

2.7 pCi/L Test ID# Average: 80310



Version 1.6 RadStar RS800 Radon Detector/Monitor Serial#: 01752 Calib.#: 00334 Bkgnd16 Test ID#: 80310 Page 1 of 3

Phone: 503-421-4813

Fax: 503-281-6170

office@cascaderadon.com



INTERVAL REPORT:

1 0.7 67 45 22 2 0.5 70 40 16 3 0.4 70 39 13 4 0.6 70 40 20 5 1.8 70 41 56 6 1.9 70 40 61 7 2.3 70 39 73 8 2.2 70 38 70 9 2.4 68 39 75 10 2.2 66 42 70 11 2.6 65 44 82 12 2.5 64 45 79 13 41 63 45 126 14 4.1 63 45 126 15 4.7 63 45 146 16 4.1 65 42 128 18 2.5 66 42 78	Hour	T	В	AC	pCi/L	Temp	Humd	Alpha
3 0.4 70 39 13 4 0.6 70 40 20 5 1.8 70 41 56 6 1.9 70 40 61 7 2.3 70 39 73 8 2.2 70 38 70 9 2.4 68 39 75 10 2.2 66 42 70 11 2.6 65 44 82 12 2.5 64 45 79 13 4.1 63 45 126 14 4.1 63 46 128 15 4.7 63 45 146 16 4.1 65 42 128 18 2.5 66 42 78 19 2.9 67 44 89 20 2.1 67 42 65 21 1.7 67 42 53 22 1.4 6	1				0.7	67	45	22
5 1.8 70 41 56 6 1.9 70 40 40 31 7 2.3 70 39 73 8 2.2 70 38 70 9 2.4 68 39 75 10 2.2 66 42 70 11 2.6 65 44 82 12 2.5 64 45 79 13 4.1 63 45 126 14 4.1 63 45 126 14 4.1 63 45 126 15 4.7 63 45 146 16 4.1 65 42 128 18 2.5 66 42 78 18 2.5 66 42 78 18 2.5 66 42 78 19 2.9 67 44 89	2				0.5	70	40	16
5 1.8 70 41 56 6 1.9 70 40 40 31 7 2.3 70 39 73 8 2.2 70 38 70 9 2.4 68 39 75 10 2.2 66 42 70 11 2.6 65 44 82 12 2.5 64 45 79 13 4.1 63 45 126 14 4.1 63 45 126 14 4.1 63 45 126 15 4.7 63 45 146 16 4.1 65 42 128 18 2.5 66 42 78 18 2.5 66 42 78 18 2.5 66 42 78 19 2.9 67 44 89	3				0.4	70	39	13
9	4				0.6		40	20
9	5				1.8	70	41	56
9	6				1.9	70	40	61
9	7				2.3	70	39	
10 2.2 66 42 70 11 2.6 65 44 82 12 2.5 64 45 79 13 4.1 63 45 126 14 4.1 63 45 146 15 4.7 63 45 146 16 4.1 65 44 126 17 4.1 65 42 128 18 2.5 66 42 78 19 2.9 67 44 89 20 2.1 67 42 65 21 1.7 67 42 53 22 1.4 67 45 44 23 0.9 68 46 30 24 1.3 69 42 41 25 0.9 68 41 29 26 0.7 69 42 22 27 0.5 69 42 17 28 0.7	8				2.2			
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32 3.3 67 42 104 33 4.1 65 45 126 34 3.7 65 45 116 35 3.5 65 45 108 36 3.8 65 46 118 37 4.6 64 46 144 38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	31				3.3	67		102
33 4.1 65 45 126 34 3.7 65 45 116 35 3.5 65 45 108 36 3.8 65 46 118 37 4.6 64 46 144 38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	32					67	42	
34 3.7 65 45 116 35 3.5 65 45 108 36 3.8 65 46 118 37 4.6 64 46 144 38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	33				4.1	65	45	126
35 3.5 65 45 108 36 3.8 65 46 118 37 4.6 64 46 144 38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	34				3.7	65	45	116
37 4.6 64 46 144 38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	35				3.5	65	45	108
38 4.6 64 46 142 39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	36				3.8	65	46	118
39 4.6 64 45 143 40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	37				4.6	64	46	144
40 5.2 65 42 162 41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	38						46	
41 4.9 66 41 153 42 4.9 67 42 151 43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29					4.6			
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43 2.7 67 41 85 44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29					4.9	66		153
44 2.7 68 40 84 45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29	42				4.9	67		151
45 1.7 68 41 53 46 1.5 69 42 49 47 0.9 69 44 29					2.7	67		
46 1.5 69 42 49 47 0.9 69 44 29					2.7	68	40	84
47 0.9 69 44 29	45				1.7	68		
47 0.9 69 44 29 48 1.0 69 44 31	46				1.5	69		
1.0 69 44 31	47				0.9	69		29
	48				1.0	69	44	31

Maximum: 5.2 pCi/L Average: Minimum: 0.5 pCi/L 2.7 pCi/L

> Tamara C Linde 2/2/18 Tamara Linde Date

Certification #:

License 1: CCB 180537/ CASCARI927C1

Version 1.6 RadStar RS800 Radon Detector/Monitor Serial#: 01752 Calib.#: 00334 Bkgnd16 Test ID#: 80310 Page 2 of 3

Phone: 503-421-4813

office@cascaderadon.com

Fax: 503-281-6170



License 2:

NRPP 108946RT, 108953RT

RadStar RS800 Version 1.6 Radon Detector/Monitor 00334 Bkgnd16 Test ID#: Page 3 of 3 Serial#: 01752 Calib.#: 80310

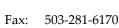


CERTIFICATE OF CALIBRATION RadStar RS800 Continuous Monitor

This instrument has been calibrated in accordance with the procedures set forth by the manufacturer. Please retain this certificate for your records

Cal Date: 10-20-(7 Last	Cal Date:	02/11/15	Next Cal Date:	10-20-18
Device Serial Number: 1752		Device Type:	RS800	
Device Status: Passed X	Failed		Radon Chamber:	TC 103 B
A CONTRACTOR OF THE PROPERTY O		Concentration:	19.4 pCi/l	
CRM Serial Numbers: 4183 217 Chamber Temperature: 70.1		0	la a ma la a m I I a ma i dita u	46.6 %RH
Chamber Temperature: 70.1 °: Start Chamber Exposure: 10/16/17 10:0			hamber Humidity: _ hamber Exposure:	46.6 %RH 10/18/17 08:00
Start Chamber Exposure. 10/10/17 10.0		Stop C	maniber Exposure.	10/16/17 08:00
Calibration Number (as found, if applicable)	334	Calib#=((10240/(Hourly Cou	nts/pCi/l))
Calibration Number (Final) 334	_	Calibra	ated By: Len Fr	st.
RadonAway 3 Saber Way	Ward Hill	, Massachuset	ts 01835 978-52	1-3703
provides for the following performance check System Function Battery Check Back Ground Coo Chamber Expose Adjustment to Coo Adjustment to Coo Verification Ch (As Tested Background is Integrated into Instrument Calculated The manufacturer, RadonAway performs quality	heck in Nitrogram, Dogward In Nitrogram In Recognition In Recognition In Recognition In Program, Dogward I	vn Radon Gas on Number, if necessary osure, if necessary osure, if necess	essary ary igs by Background)	16 cph
NRPP Device Code 476 Device group 18	USI	EPA Verified		
Radon Measurement Specialist: NRSB #6SS0002, NRPP #100	842RT		Glerondo	_

Phone: 503-421-4813 office@cascaderadon.com





TEST DETAILS:

Kelly Elementary 9030 SE Cooper St Portland, OR 97266 Portland Public Schools

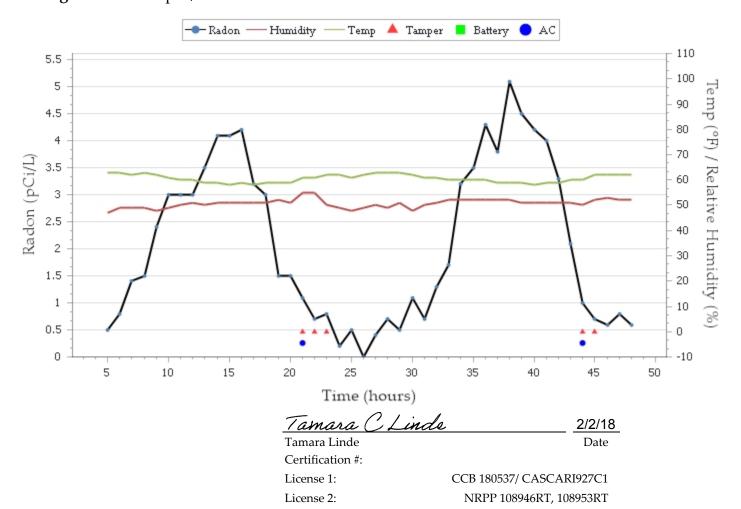
Test Start Date/Time: Tuesday, January 30, 2018 // 3:00 PM Test End Date/Time: Thursday, February 01, 2018 // 3:30 PM

Location of Instrument: Cafeteria

Notes:

TEST RESULTS:

Average: 2.0 pCi/L Test ID# 80050



Version 1.6 RadStar RS800 Radon Detector/Monitor Serial#: 02395 Calib.#: 00327 Bkgnd10 Test ID#: 80050 Page 1 of 3

Phone: 503-421-4813

Fax: 503-281-6170

office@cascaderadon.com



INTERVAL REPORT:

Hour	T	В	AC	pCi/L	Temp	Humd	Alpha
1				0.4	61	48	15
2 3 4				0.1	62 63	47	6 15
3				0.4	63	47	15
4				0.4	64	47	14
5 6				0.5	63	47	18
6				0.8	63	49	28
7				1.4	62	49	46
8				1.5	63	49	47
9				2.4	62	48	76
10				3.0	61	49	95
11				3.0	60	50	96
12				3.0	60	51	95
13				3.5	59	50	112
14				4.1	59	51	129
15				4.1	58	51	129
16				4.2	59	51	133
17				3.2	58	51	103
18				3.0	59	51	94
19				1.5	59	52	48
20				1.5	59	51	48
21	*		*	1.1	61	55	35
22	*			0.7	61	55	24
23	*			0.8	62	50	27
24				0.2	62	49	.7
25				0.5	61	48	17
26				0.0	62	49	3
27				0.4	63	50	13
28				0.7	63	49	24
29				0.5	63	51	17
30				1.1	62	48	35
31				0.7	61	50	23
32				1.3	61	51	42
33				1.7	60	52	54
34				3.2	60	52	103
35				3.5	60	52 52	111
36				4.3	60	52 52	135
37 38				3.8	59 50	52	122 162
				5.1	59 50	52 51	
39				4.5	59 50	51	143
40				4.2	58	51	134
41				4.0	59 50	51 51	128
42 43				3.3 2.1	59 60	51 51	106
$\begin{array}{c} 43 \\ 44 \end{array}$	*		*			51 50	67 24
44 45	*		••	1.0 0.7	60 62	50 52	34 24
45 46	-			0.7	62 62	52 53	24 19
46 47				0.8	62 62	53 52	19 27
48				0.6	62 62	52 52	27 19
48				0.6	62	52	19

Maximum: 5.1 pCi/L Average: Minimum: 0.0 pCi/L 2.0 pCi/L

> Tamara C Linde 2/2/18 Tamara Linde Date

Certification #:

License 1: CCB 180537/ CASCARI927C1

Version 1.6 RadStar RS800 Radon Detector/Monitor Serial#: 02395 Calib.#: 00327 Bkgnd10 Test ID#: 80050 Page 2 of 3

Phone: 503-421-4813 office@cascaderadon.com

Fax: 503-281-6170



License 2:

NRPP 108946RT, 108953RT

RadStar RS800Radon Detector/MonitorVersion 1.6Serial#:02395Calib.#:00327 Bkgnd10 Test ID#:80050Page 3 of 3



CERTIFICATE OF CALIBRATION RadStar RS800 Continuous Monitor

This instrument has been calibrated in accordance with the procedures set forth by the manufacturer. Please retain this certificate for your records

Cal Date: 5-12-17 Last Cal Date: Next Cal Date: 5-12-18 Device Serial Number: 2395 Device Type: RS800
Device Status: Passed X Failed Radon Chamber: TC 103 B
NRPP Chamber#TC103 Radon Gas Concentration: 16.6 pCi/l CRM Serial Numbers: 4183 2173 2178
Chamber Temperature: 69.0 °F Chamber Humidity: 31.7 %RH Start Chamber Exposure: 02/09/17 11:00 Stop Chamber Exposure: 02/13/17 08:00
Calibration Number (as found, if applicable) Calib#=(10240/(Hourly Counts/pCi/l))
Calibration Number (Final) 327 Calibrated By: San Futtly
RadonAway 3 Saber Way Ward Hill, Massachusetts 01835 978-521-3703
This RadStar Continuous Radon Monitor has been calibrated by the Manufacturer using a standard operating procedure for the calibration of the RS800, TP010 Rev E. This procedure provides for the following performance checks: System Functional Checks Battery Check Back Ground Check in Nitrogen Chamber Exposure in known Radon Gas Concentration Adjustment to Calibration Number, if necessary Adjustment to Background, if necessary Verification Chamber Exposure, if necessary Verification Chamber Exposure, if necessary (As Tested Background is Integrated into Instrument Calculation Program. Do Not Adjust Readings by Background) The manufacturer, RadonAway performs quarterly inter-comparisons with a Secondary Chamber
NRPP Device Code 476 Device group 18 USEPA Verified
Radon Measurement Specialist:
NRSB #6SS0002, NRPP #100842RT