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.
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## 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

12839 NE Airport Way
Portland, OR 97230
Phone: (503) 421-4813
Fax: (503) 281-6170
Office@CascadeRadon.com

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.

Tamara Linde
Cascade Radon
12839 NE Airport Way
Portland, OR 97230
Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

# TEST DETAILS:

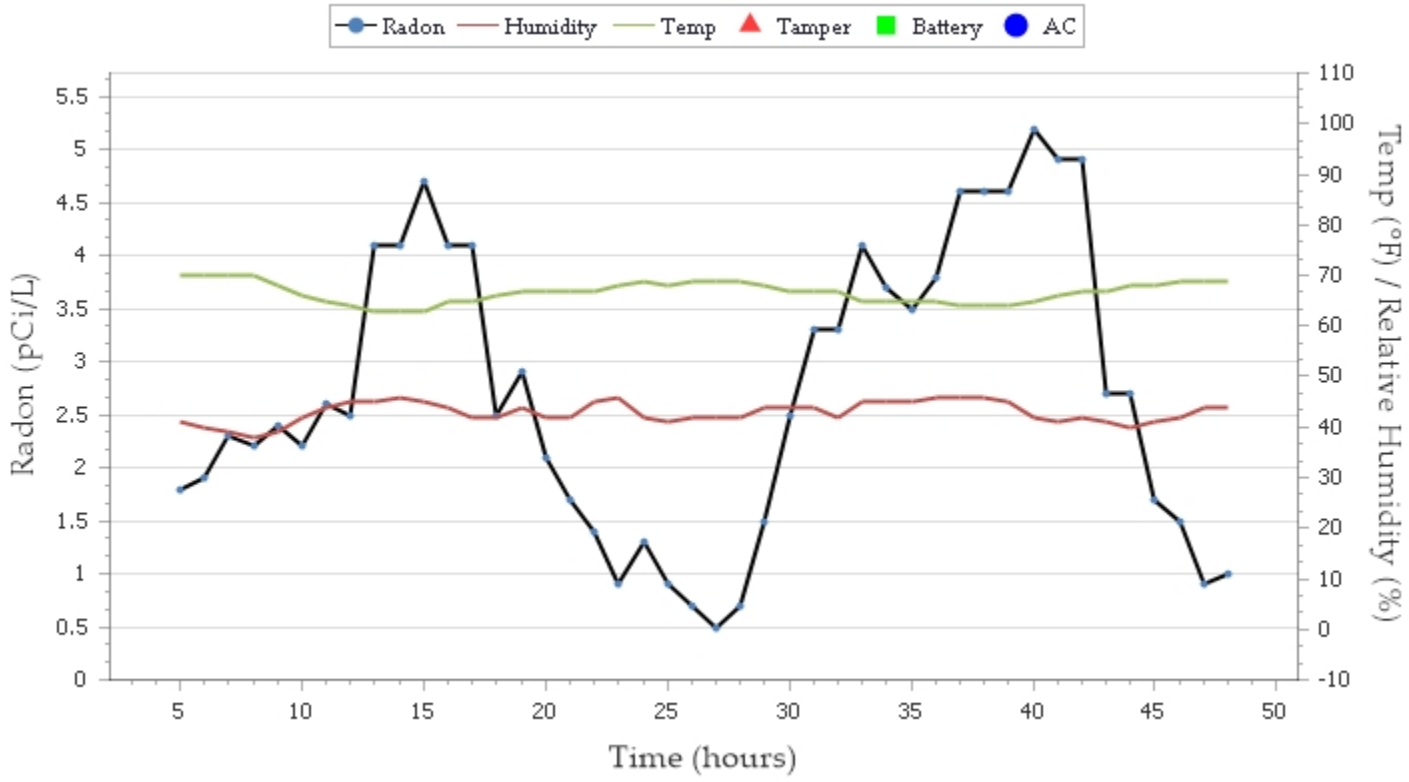
Kelly Elementary
9030 SE Cooper St
Portland, OR 97266

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:** Boiler Room/Custodial office
**Notes:**

# TEST RESULTS:

**Average:** 2.7 pCi/L **Test ID#** 80310




Tamara C Linde 2/2/18
Tamara Linde Date
Certification #:
License 1: CCB 180537/ CASCARI927C1
License 2: NRPP 108946RT, 108953RT

Tamara Linde
Cascade Radon
12839 NE Airport Way
Portland, OR 97230
Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

# INTERVAL REPORT:

| Hour | T | B | AC | pCi/L | Temp | Humd | Alpha |
|---|---|---|---|---|---|---|---|
| 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 | | | | 4.1 | 63 | 45 | 126 |
| 14 | | | | 4.1 | 63 | 46 | 128 |
| 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 | 69 | 42 | 24 |
| 29 | | | | 1.5 | 68 | 44 | 46 |
| 30 | | | | 2.5 | 67 | 44 | 79 |
| 31 | | | | 3.3 | 67 | 44 | 102 |
| 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 |
| 48 | | | | 1.0 | 69 | 44 | 31 |

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

Tamara C Linde 2/2/18

Tamara Linde Date

Certification #:

License 1: CCB 180537/ CASCARI927C1

Tamara Linde
Cascade Radon
12839 NE Airport Way
Portland, OR 97230
Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

License 2: NRPP 108946RT, 108953RT

RadonAway

# 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: 10-20-17 Last Cal Date: 02/11/15 Next Cal Date: 10-2018

Device Serial Number: 1752 Device Type: RS800

Device Status: Passed [X] Failed [ ] Radon Chamber: TC 103 B

NRPP Chamber#TC103 Radon Gas Concentration: 19.4 pCi/l

CRM Serial Numbers: 4183 2173 2178

Chamber Temperature: 70.1 °F Chamber Humidity: 46.6 %RH

Start Chamber Exposure: 10/16/17 10:00 Stop Chamber Exposure: 10/18/17 08:00

Calibration Number (as found, if applicable) 334 *Calib#=(10240/(Hourly Counts/pCi/l))*

Calibration Number (Final) 334 Calibrated By: Ken Smith

**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 F. This procedure provides for the following performance checks:

- System Functional Checks
- Battery Check
- Back Ground Check in Nitrogen 0.1 pCi/l 16 cph
- Chamber Exposure in known Radon Gas Concentration
- Adjustment to Calibration Number, if necessary
- Adjustment to Background, 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

***The RadStar RS800 is distributed by Accustar Labs 888-580-9596***

Tamara Linde
Cascade Radon
12839 NE Airport Way
Portland, OR 97230
Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

# TEST DETAILS:

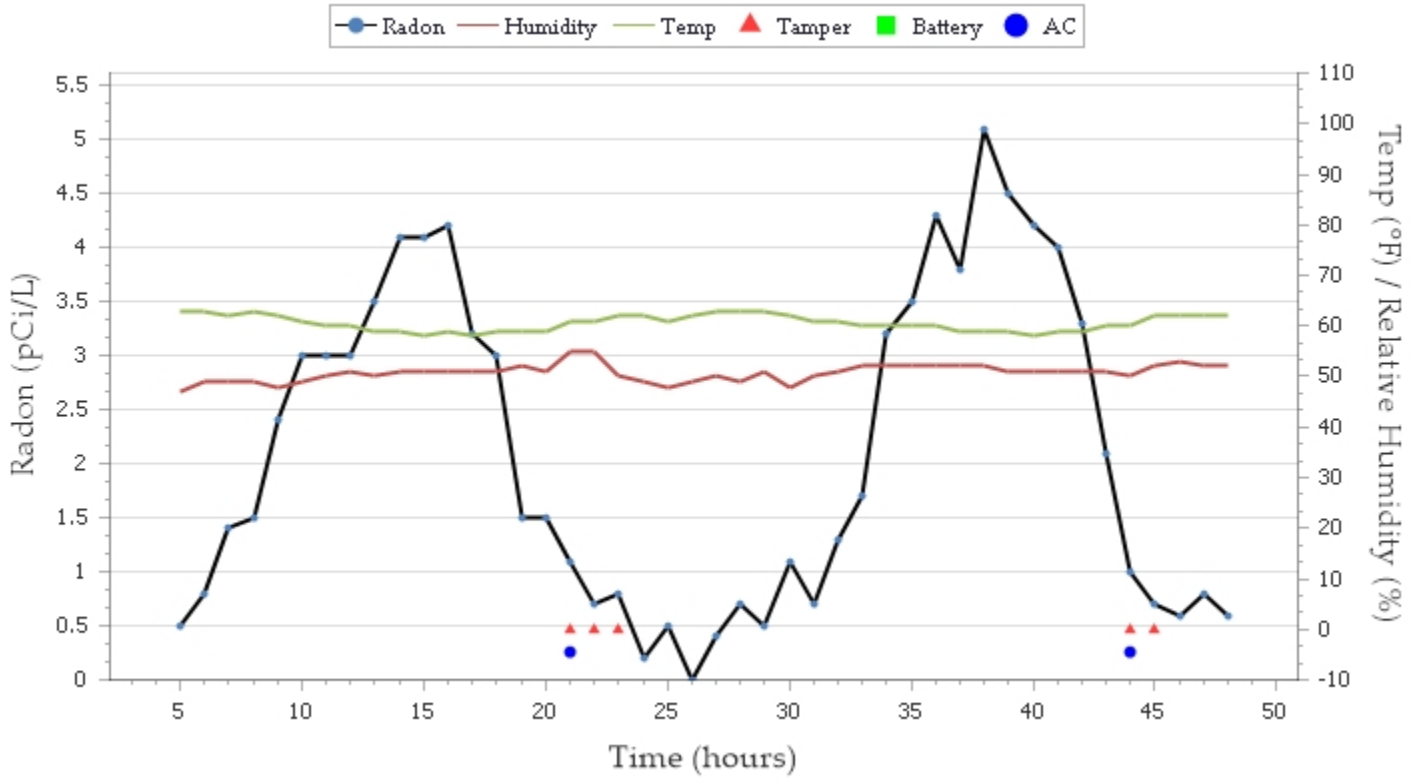
Kelly Elementary
9030 SE Cooper St
Portland, OR 97266

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




Tamara C Linde 2/2/18
Tamara Linde Date
Certification #:
License 1: CCB 180537/ CASCARI927C1
License 2: NRPP 108946RT, 108953RT

Tamara Linde
Cascade Radon
12839 NE Airport Way
Portland, OR 97230
Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

# INTERVAL REPORT:

| Hour | T | B | AC | pCi/L | Temp | Humd | Alpha |
|---|---|---|---|---|---|---|---|
| 1 | | | | 0.4 | 61 | 48 | 15 |
| 2 | | | | 0.1 | 62 | 47 | 6 |
| 3 | | | | 0.4 | 63 | 47 | 15 |
| 4 | | | | 0.4 | 64 | 47 | 14 |
| 5 | | | | 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 | 111 |
| 36 | | | | 4.3 | 60 | 52 | 135 |
| 37 | | | | 3.8 | 59 | 52 | 122 |
| 38 | | | | 5.1 | 59 | 52 | 162 |
| 39 | | | | 4.5 | 59 | 51 | 143 |
| 40 | | | | 4.2 | 58 | 51 | 134 |
| 41 | | | | 4.0 | 59 | 51 | 128 |
| 42 | | | | 3.3 | 59 | 51 | 106 |
| 43 | | | | 2.1 | 60 | 51 | 67 |
| 44 | * | | * | 1.0 | 60 | 50 | 34 |
| 45 | * | | | 0.7 | 62 | 52 | 24 |
| 46 | | | | 0.6 | 62 | 53 | 19 |
| 47 | | | | 0.8 | 62 | 52 | 27 |
| 48 | | | | 0.6 | 62 | 52 | 19 |

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

Tamara C Linde 2/2/18

Tamara Linde Date

Certification #:

License 1: CCB 180537/ CASCARI927C1

Tamara Linde
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Phone: 503-421-4813 Fax: 503-281-6170
office@cascaderadon.com

License 2: NRPP 108946RT, 108953RT

RadonAway

# 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: Ken Tuttle

**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 0.1 pCi/l 10 cph
- Chamber Exposure in known Radon Gas Concentration
- Adjustment to Calibration Number, if necessary
- Adjustment to Background, 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

***The RadStar RS800 is distributed by Accustar Labs 888-580-9596***