

Coleman Creek Consulting, Inc.

INITIAL RADON AIR SAMPLING OF FERGUSON ELEMENTARY SCHOOL FOR KLAMATH COUNTY SCHOOL DISTRICT 2845 GREENSPRINGS DRIVE, KLAMATH FALLS, OREGON

INTRODUCTION

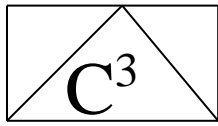
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCS D) to perform radon air sampling as required by State Statute ORS 332.166-167. KCS D is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose of the initial radon air sampling was to collect radon air samples from all regularly occupied rooms within school buildings, with the exception of storage, restrooms, kitchen, locker rooms, and compare analytical results with the EPA recommended “Action Level” concentration for radon. Short-term radon air sampling was selected for this project.

RADON INFORMATION AND HEALTH EFFECTS

Radon is a naturally occurring radioactive gas that is produced by natural deposits of uranium in soil, and is found world-wide. Uranium naturally decays into Radium, and Radium can produce Radon gas. Radon gas can travel up through soil and enter buildings in contact with soil. Radon gas entering a building may become concentrated in the lowest part of the building in areas with little fresh air mixing. If radon is inhaled into lungs, particle decay processes can release radiation, potentially damaging lung tissue, and over time leading to lung cancer. The Environmental Protection Agency (EPA) has estimated that Radon is the primary cause of lung cancer among non-smokers. EPA recommends reducing the concentration of Radon in indoor environments to below the Action Level of 4.0 pCi/L (pico-curies per Liter of air).

INITIAL RADON AIR SAMPLING

David W. Fawcett of CCC trained KCS D employees, including school custodians in radon sampling procedures December 4, 2020. Darin Martins, Maintenance Custodial Manager placed radon air test kits in the Ferguson Elementary School buildings (FES) at the beginning of the day, December 7, 2020. A total of 37 locations were sampled according to guidelines established in the Oregon Health Authority (OHA) “Testing for Elevated Radon in Oregon Schools, A Protocol and Plan”, dated 2016. Mr. Martins returned to FES December 10, 2020, at the beginning of the day, and collected all radon test kits placed for sampling. See Radon Air Sample Record Sheets (pages 4-5) for locations of all areas sampled. All samples collected were packaged by Mr. Fawcett, and sent overnight to Air Chek, Inc., in Mills River, North Carolina for analysis.



LABORATORY ANALYSIS RESULTS

The radon air test kit samples collected from FES buildings were reported ranging from <0.3 to 1.1 pCi/L (picocuries per liter of air). A complete listing of laboratory results and locations is found in the Air Chek, Inc. Laboratory Analysis Report in Appendix A.

QUALITY ASSURANCE

To ensure that test results are reliable and accurate, quality assurance samples, including duplicate test kits (placed in same room), blank test kits (not sampled at all), and spike sampling (exposing test kits to a measured amount of radon prior to laboratory submission) were all employed during Radon sampling. The number of duplicate, blank, and spike test kits utilized during sampling followed OHA testing protocol guidelines.

DUPLICATE TEST KITS

A total of four duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheets. The four duplicate test kit sets were all reported with <0.3 pCi/L. When compared with matched pair or “duplicate” test kits, all four were well within the expected range of 0-25% Relative Percent Difference, with identical reported <0.3 pCi/L Radon concentrations.

BLANK TEST KITS

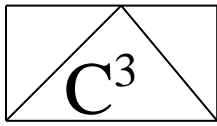
Two blank test kits were submitted to Air Chek with the other FES Radon test kits. Both blank test kits were reported with <0.3 pCi/L. All blank tests were reported none detected for Radon.

SPIKE TEST KIT ANALYSIS

One test kit was submitted to Bowser-Morner for Radon Spike processing. The test kit was exposed to 25.7 pCi/L for three days from December 4 through December 7, 2020. See Appendix B for the Bowser-Morner Radon Exposure test information. The “Spiked” test kit was submitted to Air Chek for analysis along with the other TES Radon test kits. The Spike sample was reported with 13.2 pCi/L. The relative percentage error was calculated to be -49%, in the out of control range (greater than -30%). The Spike lab Bowser-Moerner was contacted, and did not report any unusual occurrence during Spike activities. The analytical lab (Air Chek) was contacted, and no unusual occurrences were noted during test kit analysis. Spike test kits were shipped twice during cold temperatures, and that may have had an effect on the Spike sample results. In addition, the complete KCSD Spike sample results exhibit a rather uniform grouping, with results ranging from 13.0 to 17.3 pCi/L, all below the Spiked concentration of 25.7 pCi/L. The Spike sample is identified as Serial #9418163 on the Laboratory Analysis Report in Appendix A.

RADON RESULTS AND FUTURE ACTIONS

The 2016 OHA Testing of Elevated Radon in Oregon Schools Protocol and Plan describes future steps to take based on initial Radon sample results. The following is a description of recommended actions based on Radon concentrations reported.



Coleman Creek Consulting, Inc.

1. If <2.0 pCi/L Radon is reported, ORS 332.166-167 requires Radon re-test every 10 years.
2. If 2.0 pCi/L to 4.0 pCi/L Radon is reported, consider lowering the Radon concentration in the room.
3. If 4.0 pCi/L to 8.0 pCi/L Radon is reported, perform follow-up Radon measurement in the affected room(s) using a long-term test. Conduct over the school year as much as possible. If that result is equal to or greater than 4.0 pCi/L, Radon concentration in the room should be lowered.
4. If equal to or greater than 8.0 pCi/L Radon is reported, conduct a second short-term test and average the result with the initial Radon result. If the average result of the two short-term tests is equal to or greater than equal to or greater than 4.0 pCi/L, Radon concentration in the room should be lowered.

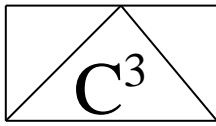
DISCUSSION OF INTIAL RADON SAMPLING RESULTS

The initial Radon short-term sampling in Ferguson Elementary School buildings were reported with Radon concentrations ranging from <0.3 to 1.1 pCi/L. All Radon test kit samples were reported < 2.0 pCi/L, indicating that a re-test should be performed in 10 years.

CCC appreciates the opportunity to provide initial radon air testing and consulting to Klamath County School District.

Sincerely,

David W. Fawcett
Director of Consulting Operations



Coleman Creek Consulting, Inc.

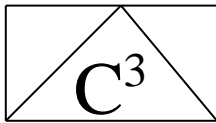
RADON AIR SAMPLE RECORD SHEET

SCHOOL: Ferguson Elementary School
ADDRESS: 2901 Homedale Road
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Darin Martins

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418119	Main		1 – Main Office	0730	0725
9418120	Main		2 – VP Office	0732	0725
9418121	Main		3 – Principal Office	0734	0726
9418122	Main		4 – Health Room	0736	0726
9418123	Main		5 – Break Room	0739	0728
9418124	Main		6 – Room 19	0742	0730
9418125	Main		7 – Room 20	0744	0731
9418126	Main		8 – Room 16	0746	0732
9418127	Main		9 – Room 15	0748	0733
9418128	Main		10 – Room 8	0749	0735
9418129	Main	Yes	10 – Room 8	0749	0735
9418130	Main		11 – Room 7	0751	0737
9418131	Main		12 – Library	0753	0738
9418132	Main		13 – Speech Room	0754	0742
9418133	Main		14 – Room 2	0758	0743
9418134	Main		15 – Room 1	0802	0744
9418135	Main		16 – Room 9	0803	0744
9418136	Main		17 – Room 10	0804	0745
9418137	Main		18 – Room 13	0806	0745
9418138	Main		19 – Room 14	0807	0746
9418139	Main		20 – Room 31 Stage	0810	0749
9418140	Main	Yes	20 – Room 31 Stage	0810	0749

Comments: **Spike Sample =**
Blank Sample = 9418141



Coleman Creek Consulting, Inc.

RADON AIR SAMPLE RECORD SHEET

SCHOOL: Ferguson Elementary School
ADDRESS: 2901 Homedale Road
Klamath Falls, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Darin Martins

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418142	Main		21 – Gym	0813	0750
9418143	Main		22 – Gym	0813	0750
9418144	Main		23 – Room	0816	0751
9418145	Main		24 – Room	0817	0751
9418146	Main		25 – Room	0819	0752
9418147	Main		26 – Room	0822	0754
9418148	Main		27 – Room	0825	0759
9418149	Main		28 – Cafeteria	0826	0759
9418150	Main		29 – Cafeteria	0826	0800
9418151	Main		30 – Room	0829	0803
9418152	Main	Yes	30 – Room	0829	0803
9418154	Main		31 – Room	0831	0804
9418155	Main		32 – Room	0834	0804
9418156	Main		33 – Room	0836	0806
9418157	Main		34 – Room	0837	0807
9418158	Main		35 – Room	0838	0807
9418159	Portable		36 – Portable South	0845	0820
9418160	Portable		37 – Portable North	0846	0820
9418161	Portable	Yes	37 – Portable North	0846	0820

Comments: **Spike Sample = 9418153**
Blank Sample = 9418162

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

Radon test result report for:**FERGUSON ES****20570300**

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418129	M. OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418130	V. PRINCIPAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418131	PRINCIPAL	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.7 ± 0.4	2020-12-15
9418132	HEALTH	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	0.6 ± 0.4	2020-12-15
9418133	BREAK	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418134	19	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418135	20	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418136	16	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418137	15	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418138	8	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418139	8	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418140	7	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418141	LIBRARY	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	1.0 ± 0.4	2020-12-15
9418142	SPEECH	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418143	2	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418144	1	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418145	9	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15
9418146	10	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418147	13	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	0.6 ± 0.4	2020-12-15
9418148	14	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	1.1 ± 0.4	2020-12-15
9418149	31 STAGE	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418150	31 STAGE	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418151	31 STAGE	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418152	GYM	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418153	GYM	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418154	25	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418155	33	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418156	26	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418157	27	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418158	42	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418159	CAFETERIA	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418160	CAFETERIA	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418161	39	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418162	39	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418163	39	2020-12-07 @ 8:00 am	2020-12-10 @ 8:00 am	13.2 ± 0.9	2020-12-15
9418164	28	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418165	40	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
FERGUSON ES
20570300

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418167	30	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418168	41	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15

Air Chek 1936 Butler Bridge Rd, Mills River, NC 28759-3892 Phone: (828) 684-0893 Fax: (828) 684-8498

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
FERGUSON ES
20570301

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418169	PORT S	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418170	PORT N	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418171	PORT N	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418172	PORT N	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15

Air Chek 1936 Butler Bridge Rd, Mills River, NC 28759-3892 Phone: (828) 684-0893 Fax: (828) 684-8498

APPENDIX B

BOWSER-MORNER RADON SPIKE EXPOSURE

EXPOSURE IN BOWSER-MORNER RADON CHAMBER

CLIENT Coleman Creek Consulting, Inc. Job Number 198582

NOMINAL Conditions: Radon Conc 25.7 pCi/L Rel. Hum 59.0 % Temp. 70.3 F

Date Start: 12/4/20 Date Stop: 12/7/20 Date Start: _____ Date Stop: _____

Time Start: 0923 Time Stop: 0923 Time Start: _____ Time Stop: _____

(Group 1)

Device No.'s: (12) Char Bags -

9417935, 9417970, 9418007,

9418060, 9418096, 9418127,

9418163, 9418190, 9418226,

9418250, 9418286, 9418321

Device No.'s: _____

R5 Left

Date Start: ^{rem} 12/4/20 Date Stop: 12/7/20 Date Start: _____ Date Stop: _____

Time Start: 0927 Time Stop: 0927 Time Start: _____ Time Stop: _____

(Group 2)

Device No.'s: (13) Char Bags -

9418370, 9418418, 9418465, 9418500,

9418566, 9418601, 9418660,

9418695, 9418771, 9418747,

9418806, 9418846, 9418875

Device No.'s: _____

R5 Right

Date Start: _____ Date Stop: _____ Date Start: _____ Date Stop: _____

Time Start: _____ Time Stop: _____ Time Start: _____ Time Stop: _____

Device No.'s: _____ Device No.'s: _____

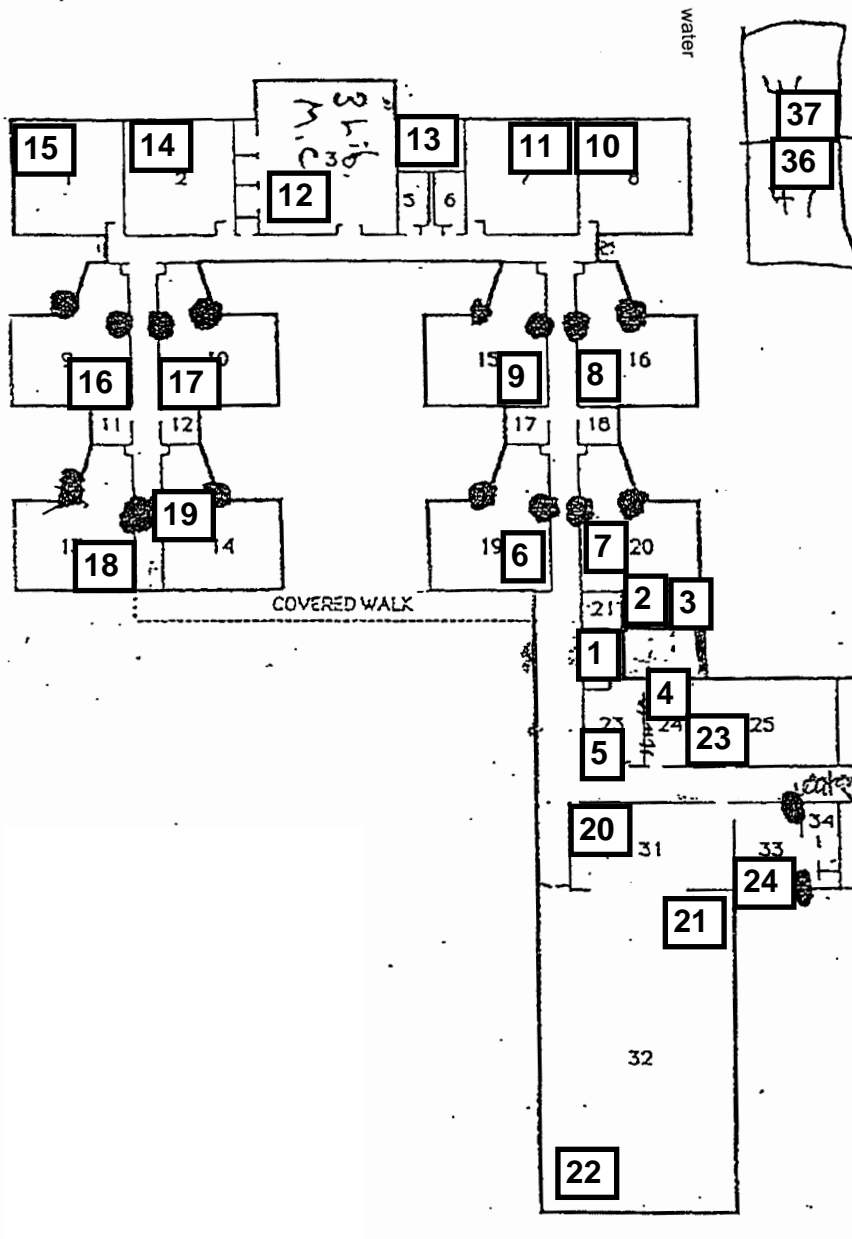
Note: All times are in 24-hour (military) notation, Eastern Standard Time (EST)
Background = 7 μ R/h Elevation = 820 ft

APPENDIX C

RADON SAMPLING LOCATION DIAGRAM

FERGUSON ELEMENTARY SCHOOL

Radon Sample Locations



NUMBER:	DESCRIPTION:	NUMBER:	DESCRIPTION:	NUMBER:	DESCRIPTION:
1	CLASSROOM	16	CLASSROOM	31	STAGE
2	CLASSROOM	17	GIRL'S RESTROOM	32	ALL PURPOSE ROOM
3	LIBRARY	18	BOY'S RESTROOM	33	KITCHEN
4	CLASSROOM	19	CLASSROOM	34	STORAGE
5	RESTROOM	20	CLASSROOM	35	BOILER ROOM
6	RESTROOM	21	PRINCIPAL	36	COAL ROOM
7	CLASSROOM	22	OFFICE	37	GIRL'S RESTROOM
8	CLASSROOM	23	WORK ROOM	38	BOY'S RESTROOM
9	CLASSROOM	24	HEALTH ROOM	39	CLASSROOM
10	CLASSROOM	25	CLASSROOM	40	CLASSROOM
11	GIRL'S RESTROOM	26	CLASSROOM	41	CLASSROOM
12	BOYS RESTROOM	27	CLASSROOM	42	CLASSROOM
13	CLASSROOM	28	CLASSROOM	43	KITCHEN
14	CLASSROOM	29	JAN. WORK ROOM	44	MULTIPURPOSE ROOM
15	CLASSROOM	30	CLASSROOM	45	STORAGE

46 Classroom
47 Classroom

12 = Radon Test Kit Location