

Coleman Creek Consulting, Inc.

INITIAL RADON AIR SAMPLING OF LOST RIVER JR./SR. HIGH SCHOOL FOR KLAMATH COUNTY SCHOOL DISTRICT 2845 GREENSPRINGS DRIVE, KLAMATH FALLS, OREGON

INTRODUCTION

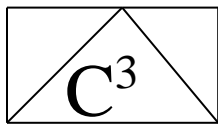
Coleman Creek Consulting, Inc. (CCC) was retained by Klamath County School District (KCS D) to perform radon air sampling as required by State Statute ORS 332.166-167. KCS D is required to perform complete radon air testing of District owned and occupied facility buildings by January 1, 2021. The purpose 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. Dale Miller, Lost River Jr./Sr. High School (LRHS) Custodian placed radon air test kits in the LRHS buildings at the beginning of the day, December 7, 2020. A total of 35 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. Miller returned to LRHS 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 LRHS buildings were reported ranging from <0.3 to 0.8 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 three duplicate test kits were placed during initial test kit sampling. See duplicate designation on the Radon Air Sample Record Sheets. The three 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

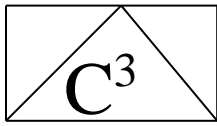
Two blank test kits were submitted to Air Chek with the other LRHS Radon test kits. Both blank test kits were reported with <0.3 pCi/L. All blank tests were reported none detected for Radon.

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 14.0 pCi/L. The relative percentage error was calculated to be -45%, 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 #9418500 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.

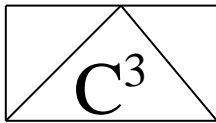
DISCUSSION OF INTIAL RADON SAMPLING RESULTS

The initial Radon short-term sampling in LRHS buildings were reported with Radon concentrations ranging from <0.3 to 0.8 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.

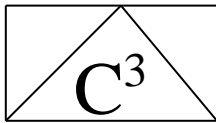
RADON AIR SAMPLE RECORD SHEET

SCHOOL: Lost River Jr./Sr. High School
ADDRESS: 23330 Hwy. 50
Merrill, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Dale Miller

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418466	Main		1 – Cafeteria North	0703	0633
9418467	Main		2 – Cafeteria South	0706	0635
9418468	Ag Trailer		3 – Bookcase	0710	0638
9418469	Shop		4 – Metal Rack	0713	0640
9418470	Shop		5 – South	0714	0641
9418471	Shop		6 – South	0716	06424
9418472	Main		7 – Gym SE	0720	0645
9418473	Main		8 – Gym Bleacher	0725	0646
9418474	Main		9 – Gym North	0727	0647
9418475	Main		10 – Gym North	0730	0649
9418476	Main	Yes	10 – Gym North	0735	0649
9418477	Main		11 – Gym North	0740	0650
9418478	Main		12 – Weight Room	0745	0651
9418479	Main		13 – Reception	07446	0653
9418480	Main		14 – Office	0748	0654
9418481	Main		15 – Office Hall	0750	0655
9418482	Main		16 – Office	0752	0656
9418483	Main		17 – Wallin Office	0755	0657
9418484	Main		18 – Health Room	0757	0658
9418485	Main		19 – Johnson Office	0758	0659
9418486	Main		20 – Salvati Office	0801	0700
9418487	Main	Yes	20 – Salvati Office	0802	0701

Comments: **Spike Sample =**
Blank Sample = 9418488



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RADON AIR SAMPLE RECORD SHEET

SCHOOL: Lost River Jr./Sr. High School
ADDRESS: 23330 Hwy. 50
Merrill, Oregon

DATE: 12-07-20/12-10-20
SAMPLER: Dale Miller

SERIAL #	BUILDING	Duplicate	LOCATION	START TIME	STOP TIME
9418489	Main		21 – Room 7	0804	0703
9418490	Main		22 – Room 6	0807	0704
9418491	Main		23 – Library Board	0814	0712
9418492	Main		24 – Library North	0816	0713
9418493	Main		25 – Chrome Lab	0821	0714
9418494	Main		26 – Room 10	0835	0718
9418495	Main		27 – Room 11	0839	0720
9418496	Main		28 – Room 12	0843	0725
9418497	Main		29 – Room 13	0845	0727
9418498	Main		30 – Room 14	0848	0728
9418499	Main	Yes	30 – Room 14	0849	0728
9418501	Main		31 – Room 15	0851	0729
9418502	Main		32 – Room 5	0855	0732
9418503	Main		33 – Room 3	0856	0734
9418504	Main		34 – Room 2	0858	0735
9418505	Main		35 – Room 1	0859	0736

Comments: **Spike Sample = 9418500**
Blank Sample = 9418506

APPENDIX A

AIR CHEK LABORATORY ANALYSIS REPORT

December 24, 2020

**** LABORATORY ANALYSIS REPORT ****

Radon test result report for:
LOST RIVER
20571900

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418466	CAFé N	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418467	CAFé S	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 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:

LOST RIVER

20571901

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418468	AGRI.	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 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:

LOST RIVER

20571902

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418469	SHOP N	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418470	SHOP S	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418471	SHOP S	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 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

Radon test result report for:**LOST RIVER
20571900**

Kit #	Room Id	Started	Ended	pCi/L	Analyzed
9418472	GYM SE	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418473	GYM	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418474	GYM N	2020-12-07 @ 7:00 am	2020-12-10 @ 7:00 am	0.8 ± 0.4	2020-12-15
9418475	GYM N	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418476	GYM N	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418477	GYM N	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418478	WEIGHT	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418479	RECEP	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418480	WAITING	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418481	OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418482	OFFICE	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418483	WALLIN	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418484	HEALTH	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418485	JOHNSON	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418486	9	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418487	9	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418488	9	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418489	8	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418490	6	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418491	LIBRARY	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418492	LIBRARY N	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418493	CHROME	2020-12-07 @ 8:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418494	10	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418495	11	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418496	12	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418497	13	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418498	14	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418499	14	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418500	14	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	14.0 ± 0.9	2020-12-15
9418501	15	2020-12-07 @ 9:00 am	2020-12-10 @ 7:00 am	< 0.3	2020-12-15
9418502	5	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.7 ± 0.4	2020-12-15
9418503	3	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418504	2	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	0.6 ± 0.4	2020-12-15
9418505	1	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15
9418506	1	2020-12-07 @ 9:00 am	2020-12-10 @ 8:00 am	< 0.3	2020-12-15

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: _____

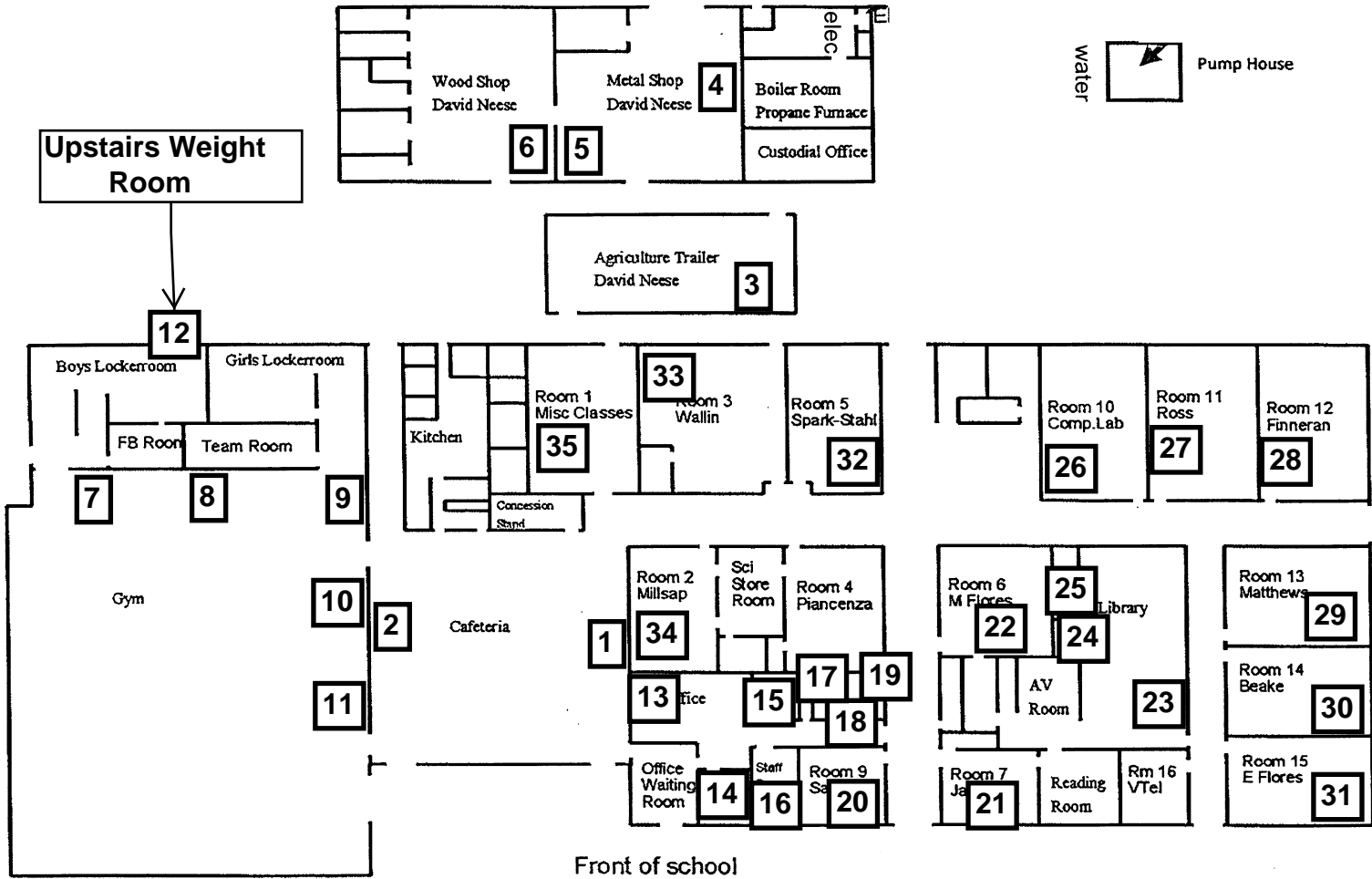
Device No.'s: _____ Device No.'s: _____

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

LOST RIVER JR./SR. HIGH SCHOOL Radon Sample Locations



12 = Radon Test Kit Location