Radon in Air Testing Report

2018/2019

Date of Reporting: June 2019

Prepared for:

Red Deer Catholic Regional Schools

Red Deer Catholic Regional Schools

Inspired by Christ. Aspiring to Excellence.

Prepared by:

RadonCare

Radon Measurement and Mitigation

Radon in Air Testing Report

Red Deer Catholic Regional Schools
2018/2019

Camille J LeRouge	St. Francis of Assisi
Holy Family	St. Joseph
Holy Trinity	St. Maurgeurite Bourgeoys
Maryview	St. Martin De Porres
Mother Teresa	St. Matthew
Notre Dame	St. Teresa of Avila
Our Lady of the Rosary	Montfort Centre
St. Dominic	Maintenance Building
St. Elizabeth Seton	Transportation Building

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Prepared for:
Ken Jaeger,
Red Deer Catholic Regional Schools

RadonCare
Radon Measurement and Mitigation

Prepared by:
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Airdrie, Alberta
June, 2019

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0.1 EXECUTIVE SUMMARY

In December 2018 Red Deer Catholic Regional Schools Long Term Radon Testing contracted Radon Care Inc. to complete indoor radon measurement testing on the following district schools/administrative buildings: Camille J LeRouge, Ecole Secondaire Notre Dame, Holy Family, Holy Trinity, Maintenance Shop, Maryview, Montfort Centre, Mother Teresa, Our Lady of the Rosary, St. Dominic, St. Elizabeth Seton, St. Francis of Assisi, St. Joseph, St. Maurgeurite Bourgeoys, St. Martin De Porres, St. Matthew, St. Teresa of Avila, St. Thomas Aquinas and Transportation.

The purpose of testing was to ensure compliance with Health Canada recommendations regarding radon exposure. The results of the testing indicated that the majority of rooms surveyed were well below Health Canada, as well as, World Health Organization guidelines for mitigation. One office within Ecole Secondaire Notre Dame High School measured results well above Health Canada's guideline of 200 Bq/m³ at 316 Bq/m³. Additional rooms adjacent or in close proximity to room 1109 measured above 100 Bq/m³ but below Health Canada's action level of 200 Bq/m³.

560 test dosimeters plus duplicates, field and trip blanks were used in the survey. Spikes were analysed by Accustar Labs, the partnered laboratory. 8 dosimeters, representing just over 1% of total deployed units went missing during measurement and were unrecoverable. 12 dosimeters, representing just over 1% of total deployed units went missing during measurement though retrieved, had indications of tampering and these locations are indicated in analysis and accompanying radon measurement result tables and maps. Tampering evidence is explained where detected in the analysis section. Results reported in the specific locations where there was evidence of tampering are not considered fully reliable and these locations should be considered priority testing locations in any subsequent surveys.

For quality control duplicates devices were hung in close proximity, in accordance with Health Canada testing guidelines and their Relative Percent Difference (RPD) in measurements were calculated between all duplicate device pairs. As indicated in **Table 4.2**, all duplicate device pairs are considered "In Control" meaning only small and acceptable level of variation between the devices measurements were found. Overall this indicates an accurate and in compliance survey result and lends strong credence to the overall testing quality of the survey. Additionally as a quality control metric, blank devices, meaning devices that remained sealed up until the time all dosimetric devices were sent to the lab, were deployed (field blank) or carried with field technnicians during transport to and from test locations (trip blank). As indicated in **Table 4.1**, all blank results were below the lower limit of detection (LLD) of alpha track radon measuring the devices used in this study, which is similar to the QC duplicate results, consistent with an in-compliance and reliable survey.

1.0 INTRODUCTION

1.1 General Remarks

Buildings included under the scope of this project and reviewed within this report are located in Red Deer, Innisfail, Olds, Rocky Mountain House and Sylvan Lake Alberta. The buildings include single and two-story construction, many with post construction portables.

The following buildings are included within this report;

- Camille J Lerouge, 5530 42A Ave N, Red Deer, Alberta T4N 3A8
- Ecole Secondaire Notre Dame High School, 50 Lees St, Red Deer, Alberta, T4R 2P6
- Holy Family, 69 Douglas Ave, Red Deer, Alberta, T4R 2L3
- Holy Trinity, 6610 57 St, Olds, Alberta, T4H 0E1
- Maintenance Shop, 4316 55 St, Red Deer, Alberta, T4N 2H1
- Maryview School, 3829 29 St, Red Deer, Alberta, T4N 0Y6
- Montfort Centre, 5210 61 St, Red Deer, Alberta, T4N 6N8
- Mother Teresa, 79 Old Boomer Road, Sylvan Lake, T4S 1Z4
- Our Lady of the Rosary School, 4520 Ryders Ridge Blvd, Sylvan Lake, Alberta, T4S 0E1
- St. Dominic, 5502 50 St, Rocky Mountain House, Alberta, T4T 1W6
- St. Elizabeth Seton, 35 Addinell Ave, Red Deer, Alberta, T4R 1V5
- St. Francis of Assisi Middle School, 321 Lindsay Ave, Red Deer, Alberta, T4R 3M1
- St. Joseph High School, 110 2700 67 Street, Red Deer, Alberta, T4P 1C2
- St. Margeurite Bourgeoys School, 4453 51 Ave, Innisfail, Alberta T4G 1A7
- St. Martin de Porres School, 3911 57a Ave, Red Deer, Alberta, T4N 4T1
- St. Matthew, 5738 58th St, Rocky Mountain House, Alberta, T4T 1S2
- St. Teresa of Avila, 190 Glendale Boulevard, Red Deer, Alberta, T4P 2P7
- St. Thomas Aquinas, 3821 39 St, Red Deer, Alberta, T4N 0Y6
- Transportation, 209 Clearskye Way, Red Deer, Alberta, T4E 0A1

1.2 Background

Radon gas is a naturally occurring radioactive byproduct of uranium decay which poses a significant health hazard to humans when allowed to concentrate to elevated levels in man made structures. Radon gas is present everywhere including outdoors, however, at the concentrations typically found outdoors, radon is not considered hazardous . The most widely acceptable risk models for radon gas exposure suggest risk is based on cumulative life time exposure, yet some suggest radon exposure may be of particular significance to children due to different breathing rates and lung sizes and shapes **[1]**,**[2]**.
Numerous pathways exist around buildings which can facilitate the entry of radon gas allowing it to concentrate indoors to hazardous levels, these include cracks in the foundation, floor to wall joints, windows, utilities, sump pits, basement drains, and at times, granite stonework and water.

1.3 Health Effects of Radon Gas

Radon is a decay product of uranium which emits alpha radiation. As radon decay particles are inhaled,alpha particles may be released inside the lungs which can damage DNA inside of sensitive lung tissue cells. Exposure to elevated levels of radon gas over a prolonged period and accumulation of irreparable DNA damage greatly increases the likelihood of lung cancer.

1.4 Current Guidelines

Health Canada recommends action be taken to lower radon levels for buildings measuring above 200 Bq/m^3 within two years and one year for buildings measuring over 600 Bq/m^3. World Health Organization has similarly recommended all countries develop action level between 100 Bq/m^3 and 300 Bq/m^3. Accepted risk models suggest that it is desirable to reduce radon levels to as low as is achievable to reduce potential health risk.

2.0 TESTING METHODOLOGY

Health Canada released updates recommendations regarding the measurement of public buildings for radon gas in the 2016 publication, *Guide for Radon Measurements in Public Buildings: Workplaces, Schools, Daycares, Hospitals, Care Facilties, Correctional Centres*. These guidelines, along with industry best practices from the Canadian National Radon Proficiency Program (C-NRPP), and RadonCare strict internal company testing protocols were used to guide the conductance of this study.

Architectural plans were provided by Red Deer Catholic Regional Schools for each of the buildings included within this report. Rooms that individuals may occupy more than four hours a day were identified by Red Deer Catholic Regional Schools and selected for inclusion in this survey. Although published guidelines are not in total agreement over the necessity of testing portables which are generally not in full contact with the soil, at RadonCare's recommendation these were included in the survey.

Measurements were completed using Accustar Long Term Alpha Track AT-100 dosimeters. These devices were deployed in test locations for a minimum of 91 days as recommended by Health Canada to obtain accurate measurements of radon concentrations within the sampled areas. Sampling was completed by C-NRPP measurement certified RadonCare employees.

All tests were deployed between December 21-27 2018, with the exception of the dosimeters of the large field house at St. Joseph High School which were deployed January 7th 2019 and which were retrieved between April 13 and 14th 2019. Devices were retrieved between April 13 and 14th 2019, for a total time of exposure between 97 and 114 days for all test devices.

Following measurement completion, dosimeters were priority shipped to Accustar Laboratories, a C-NRPP recognized laboratory, for analysis.

Radon concentrations were calculated by Accustar based on individual test device exposure times, as reported to the laboratory by RadonCare.

Results were then analyzed by RadonCare's proprietary rcMLBS software and charted for review.Resulting measurements for this report were reported in units of Becquerels per cubic meter of sampled air (Bq/m^3). The highest measurement across the survey was 313 Bq/m^3. Measurement reports were interpreted and reviewed by both Andrew Arshinoff, a C-NRPP certified measurement and mitigation professional, and Bradley Arshinoff, Msc., Quality Assurance/Quality Control Manager.

LEGEND

- Rooms not measured
- <100 Bq/m³
- 100 - 199 Bq/m³
- >200 Bq/m³
- ? Unrecoverable/tampered

Scale: Not to Scale

HOLY TRINITY SCHOOL

RED DEER CATHOLIC REGIONAL DIVISION NO. 39

HOLY TRINITY SCHOOL

FACILITY MASTER PLAN

JULY 2018

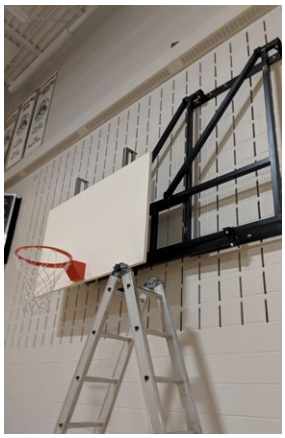
RadonCare
Radon Measurement and Mitigation

Table 3.4 Holy Trinity

Map	Room Number	Room Type	Device ID	Result (Bq/m³)	Notes
1	186	ClassRoom (Portable)	3912544	< 15	
10	149	ECS	3912550	26	
11	151	ClassRoom	3912678	37	
12	148	ClassRoom	3912675	26	
13	147	ClassRoom	3912676	26	
14	146	ClassRoom	3912677	26	
15	139	ClassRoom	3912538	26	
16	138	ClassRoom	3912679	22	
17	144	RR	3912539	26	
18	171	ClassRoom (Portable)	3912536	< 15	
19	173	ClassRoom (Portable)	3912574	< 15	
2	188	ClassRoom (Portable)	3912533	< 15	
20	175	ClassRoom (Portable)	3912572	< 15	
21	177	ClassRoom (Portable)	3912570	15	
22	179	ClassRoom (Portable)	3912571	< 15	
23	181	ClassRoom (Portable)	3912565	< 15	
24A	123	Gym	3912566	41	SW Basketball net
24B	123	Gym	3912568	41	NW Basketball net
24C	123	Gym	3912569	0	Missing - NE Basketball Net
25	131	RR	3912537, 3912567	28*	
26	121	Library	3912535	33	
3	157	HEC	3912549	37	
4	161	ClassRoom (Portable)	3912534	41	
5	118	CNS	3912548	30	
6	103	Administrative	3912545, 3912547	44.5*	
7	108	CNS	3912546	48	
8	104	OF	3912551	37	
9	106	OF	3912552	48	

***Indicates average of two duplicate dosimeters.**

Notes:
Dosimeter 24-C-123-3912569 unrecoverable, missing from NE corner basketball net.



Dosimeter unrecoverable

Results:
Long term radon sampling of selected rooms in Holy Trinity were well below both Health Canada and World Health Organization action level guidelines.

Sampling completed from December 21 2018 to April 13 2019 indicate measured levels are below guidelines and no corrective action is necessary at this time.

RadonCare recommends re-sampling if extensive construction or significant HVAC system changes are completed are completed and after a period not exceeding 5 years from the completion of this survey.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

4.1 General Remarks

RadonCare adheres to strict quality control standards Testing data is collected by C-NRPP Measurement certified technicians and entered into our proprietary RcLMBS software. Data and analysis is reviewed by an additional C-NRPP certified team member.

Quality control measures in this project include field blank, trip blank, and duplicate dosimeters.

Analysis of all dosimeters completed by Accustar Labs, both a C-NRPP Radon Analytical Lab - CAL201657 and NELAP accredited laboratory.

4.2 QA/QC Notes

Laboratory notes indicated device 3912670 was unable to be analyzed. Foil was damaged during etch.

4.3 Unrecoverable Dosimeters

- 3912087 - **St. Matthew**
- 3912139 - **Our Lady of the Rosary**
- 3912168 - **St. Margeurite Bourgeoys**
- 3912169 - **St. Margeurite Bourgeoys**
- 3912170 - **St. Margeurite Bourgeoys**
- 3912569 - **Holy Trinity**
- 3912523 - **St. Elizabeth Seton**
- 3912524 - **St. Elizabeth Seton**

4.4 Tampered Dosimeters

- 3912108 - **St. Matthew:** Background paper and bulletin paper on board obscuring test
- 3912140 - **Our Lady of the Rosary:** located immediately outside room in hallway on projection cart.
- 3912301 - **Ecole Secondaire Notre Dame:** retrieved from segmented dividing wall buried within alcove.
- 3912303 - **Ecole Secondaire Notre Dame:** retrieved from segmented dividing wall buried within alcove.
- 3912341 - **Ecole Secondaire Notre Dame:** retrieved from outside cage.
- 3912374 - **Holy Family:** dosimeter extremely dusty.
- 3912639 - **St. Thomas Aquinas:** dosimeter covered in fine sawdust.
- 3912268 - **Maryview:** located taped to placard on east end.
- 3912525: **St. Elizabeth Seton:** Moved to lower position in room.
- 3912580 - **St. Francis of Assisi:** Not attached to fire light cage.
- 3912584 - **Camille J Lerouge:** Covered in paper on billboard.

- 3912556 - **Camille J Lerouge:** moved but recovered.
- 3912443 - **St. Teresa of Avila:** moved on wall
- 3912413 - **St. Joseph:** Located on top of light cage.

Table 4.1 **Blank Dosimeters QA/QC**

Blank dosimeters were sealed during the test period and only opened after all test devices were collected from survey locations, such that they were in an active state during shipment to analysis laboratory. Blanks were tracked by RadonCare RcLMBS software but were not identified to analysis laboratory to guarantee an unprejudiced result.All blank dosimeters, both deployed (field blank) and not deployed (trip blanks) were determined to be below the lower limit of detection of the devices, meaning no alpha radiation damage was found by the analysis laboratory. These results are consistent with a in-compliance and reliable overall survey.

Building	Map Number	Room Number	Room Type	Type	Device ID	Result Bq/m³
Holy Trinity School	2	188	ClassRoom (Portable)	Trip Blank	3912767	<LLD
Mother Teresa Catholic School	19	200	Administrative	Field Blank	3912553	<LLD
Our Lady of the Rosary School	4	190	ClassRoom	Trip Blank	3912731	<LLD
Our Lady of the Rosary School	10	155	BSE	Field Blank	3912140	<LLD
Maryview school	13	109	ClassRoom	Field Blank	3912261	<LLD
St. Thomas Aquinas School	26	1065	Science	Field Blank	3912654	<LLD
St. Elizabeth Seton School	14	125	ClassRoom	Field Blank	3912528	<LLD
St. Matthew School	11	126	ClassRoom	Field Blank	3912184	<LLD
St. Matthew School	27	151	BSE	Field Blank	3912103	<LLD
Ecole Secondaire Notre Dame High School	17	1707	ClassRoom	Field Blank	3912303	<LLD
Ecole Secondaire Notre Dame High School	42	1910	ClassRoom (Portable)	Trip Blank	3912719	<LLD
Ecole Secondaire Notre Dame High School	43	1912	ClassRoom (Portable)	Field Blank	3912333	<LLD
St. Marguerite Bourgeoys School	16	2613	ClassRoom	Field Blank	3912252	<LLD
Holy Family School	12	106	ClassRoom	Field Blank	3912356	<LLD
Holy Family School	16	159	Classroom	Trip Blank	3912819	<LLD
Holy Trinity School	8	104	OF	Field Blank	3912554	<LLD
St. Dominic High School	16	3207	VP	Field Blank	3912122	<LLD
St. Francis of Assisi Middle School	18	1221	VP	Field Blank	3912624	<LLD
Ecole Camille J. Lerouge School	24	1025	COMP	Field Blank	3912495	<LLD
Ecole Camille J. Lerouge School	27	1016	VP	Field Blank	3912499	<LLD
St. Joseph High School	1	1105	Office	Trip Blank	3912825	<LLD
St. Joseph High School	22	1417	CNF	Field Blank	3912400	<LLD
St. Teresa of Avila School	20	161	ClassRoom	Field Blank	3912433	<LLD
Montfort Centre	6	149	OF	Field Blank	3912460	<LLD
Maintenance Shop	3	100	Administrative	Trip Blank	3912744	<LLD
Transportation	10a	BAY5	BAY	Trip Blank	3912729	<LLD
St. Martin De Porres School	13	115	VP	Field Blank	3912662	<LLD

LLD: Lower level of detection of measuring device. The Accustar Long Term Alpha Track AT-100 dosimeters used in this study are able to detect radon concentrations at or above 15 Bq/m∏over the time of exposure used in this survey.

Table 4.2 QA/QC Duplicate Tests

Two test devices were deployed adjacently at select locations for the purpose of obtaining a single site survey result and to test the precision of the measuring devices. Relative Percent Error (RPE) between the measurement of the two devices was calculated between all device pairs. Allowable levels of variation based on Health Canada's 2016 publication, *Guide for Radon Measurements in Public Buildings* **[3]** were used for the purpose of determining Acceptable (or "In-Control") RPD levels. These variations are described in **Table 4.6.** All duplicates device pairs were found to have an acceptable level of variation based on these testing standards. These results are consistent with a in-compliance and reliable overall survey.

Building	Map Number	Room Number	Room Type	Device ID	Result	RPD	Control Status
Mother Teresa Catholic School	18	201	PRI	3912217, 3912218	52,52	0	In Control
Mother Teresa Catholic School	22	225	Science	3912222, 3912223	44, 44	0	In Control
Our Lady of the Rosary School	13	166	ClassRoom	3912143, 3912144	59, 67	12.7	In Control
Our Lady of the Rosary School	16	106	VP	3912147, 3912148	59, 59	0	In Control
Maryview school	4	124	ClassRoom	3912174, 3912175	37, 33	11.43	In Control
Maryview school	11	117	Administrative	3912257, 3912258	52, 52	0	In Control
St. Thomas Aquinas School	5	1006	VP	3912274, 3912275	30, 22	30.77	In Control
St. Thomas Aquinas School	15	1053	CMPT	3912642, 3912643	41, 44	7.06	In Control
St. Thomas Aquinas School	28	1069	Ancillary	3912507, 3912508	56, 52	7.41	In Control
St. Elizabeth Seton School	11	139	VP	3912523, 3912524	Missing, Missing	Both Test Devices Missing	N/A
St. Elizabeth Seton School	22	162	Library	3912486, 3912487	33, 37	11.43	In Control
Ecole Camille J. Lerouge School	12	1048	ClassRoom	3912593, 3912594	30, 22	30.77	In Control
St. Teresa of Avila School	11	101	ClassRoom	3912422, 3912423	44, 41	7.06	In Control
St. Matthew School	4	118	Administrative	3912081, 3912531	33, 33	0	In Control
St. Matthew School	14	129	ClassRoom	3912187, 3912188	30, 30	0	In Control
St. Matthew School	23	135	OF	3912097, 3912098	33, 26	23.73	In Control
St. Matthew School	35	165	ClassRoom	3912191, 3912193	37, 56	40.86	In Control
Ecole Secondaire Notre Dame High School	10	1805	CMPT	3912293, 3912294	18, 22	20	In Control
Ecole Secondaire Notre Dame High School	16	1708	ClassRoom	3912301, 3912302	52, 48	8	In Control
Ecole Secondaire Notre Dame High School	26	1109	OF	3912313, 3912314	329, 303	8.23	In Control
Ecole Secondaire Notre Dame High School	35	1111	CTS	3912323, 3912324	85, 81	4.82	In Control
St. Marguerite Bourgeoys School	1	2656	ClassRoom	3912236, 3912167	48, 44	8.7	In Control
St. Marguerite Bourgeoys School	9	2644	HEC	3912243, 3912244	41, 37	10.26	In Control
St. Marguerite Bourgeoys School	19	2601	Administrative	3912155, 3912156	37, 52	33.71	In Control
Holy Family School	8	116	REM	3912350, 3912351	26, 18	36.36	In Control
Holy Family School	11	144	Library	3912353, 3912354	18, 26	36.36	In Control
Holy Family School	23	137	Administrative	3912367, 3912368	30, 30	0	In Control
Holy Trinity School	6	103	Administrative	3912545, 3912547	48, 41	15.73	In Control
Holy Trinity School	25	131	RR	3912537, 3912567	26, 30	14.29	In Control
St. Dominic High School	9	3304	Science	3912113, 3912120	26, 30	14.29	In Control
St. Francis of Assisi Middle School	9	1202	ClassRoom	3912613, 3912612	Missing, 44	One Test Device Missing	N/A
St. Francis of Assisi Middle School	15	1216	CTS	3912619, 3912620	37, 44	17.28	In Control
St. Francis of Assisi Middle School	26	1014	VP	3912577, 3912578	59, 56	5.22	In Control
Ecole Camille J. Lerouge School	17	1031	ClassRoom	3912599, 3912600	22, 30	30.77	In Control
Ecole Camille J. Lerouge School	28	1010	ClassRoom	3912500, 3912501	22, 26	16.67	In Control
Ecole Camille J. Lerouge School	40	1098	Science	3912557, 3912558	18, 26	36.36	In Control

Table 4.2 Cont'd

Building	Map Number	Room Number	Room Type	Device ID	Result	RPD	Control Status
St. Joseph High School	11	1706	FAB	3912386, 3912387	26, 26	0	In Control
St. Joseph High School	15	1401	Administrative	3912391, 3912392	41, 44	7.06	In Control
St. Joseph High School	26	1501	LAB	3912404, 3912405	59, 52	12.61	In Control
St. Joseph High School	28H	1102	Gym	3912703, 3912704	<LLD, <LLD	N/A	In Control
St. Teresa of Avila School	13	107	Administrative	3912424, 3912425	37, 48	25.88	In Control
St. Teresa of Avila School	34	151	Office	3912447, 3912448	41, 52	23.66	In Control
Montfort Centre	1	129	OF	3912453, 3912454	15, 18	18.18	In Control
Montfort Centre	8	106	Administrative	3912462, 3912463	18, 18	0	In Control
Maintenance Shop	3A	216	Administrative	3912658, 3912659	26, 22	16.67	In Control
Transportation	3	105	Administrative	3912685, 3912695	<LLD, 15	N/A	In Control
Transportation	5	110	OF	3912856, 3912687	18, 18	0	In Control
St. Martin De Porres School	6	103	COMP	3912669, 3912670	48, Missing	One Test Device Missing	N/A

LLD: Lower limit of detection of device

Table 4.3 **Relative Percent Error (RPE)**

Average Test Measurement	Acceptable RPD	Warning Level	Above Acceptable
<75 Bq/m³	No Limits	No Limits	No Limits
75-149 Bq/m³	25%	50%	67%
Over 150 Bq/m³	14%	28%	36%

5.0 RESULTS AND RECOMMENDATIONS

5.1 General Remarks

The purpose of this project and report was to measure radon concentrations in Red Deer Catholic Regional Schools and identify any risks these concentrations may pose to human health and document compliance to recommendations as stated by Health Canada's *Guide for Radon Measurements in Public Buildings, 2016.*

Of the 18 schools and buildings which were tested for radon gas from December 2018 - April 2019, over 99% of selected rooms measured below Health Canada and World Health Organization radon action level guidelines. Two schools, Ecole Secondaire Notre Dame High School and Our Lady of the Rosary each had selected rooms which measured above 100 Bq/m³, with the highest concentration found across all sampled areas being 312 Bq/m³. Importantly for parents, not a single student occupied room in the entire survey was found to have rado levels exceeding Health Canada's action level.

Table 5.1 School Averages

Table 5.1 summarizes the average radon level across all surveyed for each school along with extremes (highest and lowest) and standard deviation.

Location	Count	Average Bq/m³	Standard Deviation Bq/m³	Lowest Bq/m³	Highest Bq/m³
Ecole Camille J. Lerouge School	48	< 27.04	7.82	< LLD	44.00
Ecole Secondaire Notre Dame High School	53	< 46.53	48.33	< LLD	316.00
Holy Family School	30	< 20.80	6.56	< LLD	37.00
Holy Trinity School	27	< 28.02	11.31	< LLD	48.00
Maintenance Shop	4	32.00	5.43	24.00	37.00
Maryview school	21	< 45.10	15.32	< LLD	78.00
Montfort Centre	27	23.20	6.22	15.00	41.00
Mother Teresa Catholic School	28	34.21	10.50	15.00	56.00
Our Lady of the Rosary School	27	< 52.63	27.39	< LLD	148.00
St. Dominic High School	19	26.58	6.98	15.00	41.00
St. Elizabeth Seton School	26	< 33.54	10.71	< LLD	59.00
St. Francis of Assisi Middle School	29	42.09	11.92	22.00	81.00
St. Joseph High School	41	< 31.15	14.42	< LLD	59.00
St. Marguerite Bourgeoys School	28	40.66	10.92	22.00	74.00
St. Martin De Porres School	18	< 53.41	20.34	< LLD	92.00
St. Matthew School	43	34.56	14.98	15.00	89.00
St. Teresa of Avila School	37	< 38.09	12.73	< LLD	63.00
St. Thomas Aquinas School	35	38.79	10.13	22.00	59.00
Transportation	12	< 15.62	2.37	< LLD	22.00

LLD: Lower limit of detection of device

5.2 Recommendations

Follow up radon measurement and/or mitigation is recommended for the indicated classrooms testing above 100 Bq/m³, and especially for those rooms indicated which measured above 200 Bq/m³. There is no immediate short term risk at the levels measured. Students and faculty may continue to utilize the space while follow-up measurements are performed.

Table 5.2

Survey Wide Room Average

Rooms across all 18 surveyed buildings were grouped based on the room type and average radon concentration for these groupings, as well as lower and upper limits and standard deviations are displayed. The greatest range as well as variation occurs between office locations, which also represent all but one of the rooms across the entire survey determined to have a radon level exceeding 100 Bq/m³.

Room Type	Count	Average Bq/m³	Standard Deviation Bq/m³	Lowest Bq/m³	Highest Bq/m³
1028 sensory, extra	1	37.00	0.00	37.00	37.00
Administrative	19	39.39	15.00	14.50	81.00
Ancillary	15	41.33	31.49	15.00	148.00
BAY	4	< 14.50	0.50	< LLD	15.00
BSE	5	41.60	10.13	26.00	56.00
BUS	1	30.00	0.00	30.00	30.00
ClassRoom	204	< 37.47	14.39	< LLD	89.00
ClassRoom (Portable)	30	< 16.13	5.37	< LLD	41.00
CMF	1	37.00	0.00	37.00	37.00
CMPT	7	29.07	8.10	18.00	42.50
CNF	2	48.00	15.00	33.00	63.00
CNS	10	35.90	12.02	15.00	56.00
COMP	3	27.50	9.50	18.00	37.00
CONF	3	36.00	16.75	15.00	56.00
CTS	15	< 33.83	15.23	< LLD	83.00
CTS/CON	3	44.33	31.75	18.00	89.00
DRA	2	28.00	2.00	26.00	30.00
Early Childhood Services	7	37.43	16.62	15.00	59.00
Early Childhood Services (Portable)	1	59.00	0.00	59.00	59.00
FAB	1	26.00	0.00	26.00	26.00
Gym	56	< 28.25	12.63	< LLD	74.00
HEC	6	32.50	8.64	15.00	41.00
IA	1	15.00	0.00	15.00	15.00
IOP	1	37.00	0.00	37.00	37.00
KIT	4	25.75	7.66	15.00	33.00
LAB	4	48.12	5.86	41.00	55.50
Library	15	31.87	10.29	18.00	59.00
LS	1	15.00	0.00	15.00	15.00

LLD: Lower limit of detection of device

Table 5.2 Cont'd

Room Type	Count	Average Bq/m³	Standard Deviation Bq/m³	Lowest Bq/m³	Highest Bq/m³
M	1	37.00	0.00	37.00	37.00
MUS	1	44.00	0.00	44.00	44.00
OF	55	< 41.22	47.34	< LLD	316.00
Office	4	35.62	6.40	30.00	46.50
PEO	1	30.00	0.00	30.00	30.00
PRI	15	41.60	18.15	15.00	92.00
REM	1	22.00	0.00	22.00	22.00
RR	13	34.08	17.41	18.00	89.00
S	1	22.00	0.00	22.00	22.00
Science	11	< 33.50	13.52	< LLD	59.00
SDA	1	59.00	0.00	59.00	59.00
SED	4	47.00	21.69	22.00	81.00
SEM	2	51.50	7.50	44.00	59.00
STG	1	44.00	0.00	44.00	44.00
VP	17	43.56	14.13	15.00	63.00

LLD: Lower limit of detection of device

DISCLAIMER

1. MEASUREMENT GENERAL CONDITIONS STATEMENT

This measurement and report have been created in accordance with current radon measurement standards and best practices. Testing methodology meets or exceeds recommendations by the certifying body, Canadian National Radon Proficiency Program and current Health Canada guidelines for large building sampling and measurement. Sampling for this study was limited to rooms selected for testing by Red Deer Catholic Regional Schools based on their occupancy analysis. No other warranty is expressed or implied.

2. BASIS OF REPORT

This report has been created by RadonCare (Radon Care Inc.) based on all available information provided by Red Deer Catholic Regional Schools. Accuracy and validity of reporting, results, opinions and recommendations are valid only as specified and do not apply to variations unreported to RadonCare unless a request is made by Red Deer Catholic Regional Schools to revise current report and findings based on newly available information.

3. REPORT USAGE AND INTERPRETATION

Recommendations and opinions expressed in this document have been created specifically for Red Deer Catholic Regional Schools. No other client is granted usage permission, in part or in whole, without written consent by RadonCare. Reasonable requests for usage by additional parties may be granted as "Approved User" at RadonCare's discretion. This report remains copyright to RadonCare, who authorizes Red Deer Catholic Regional Schools and any deemed "Approved User" to distribute and make copies of the report as necessary. This document may not be distributed, copied,given, lent, sold or borrowed from to users other than Red Deer Catholic Regional Schools and any"Approved User" without prior written consent by RadonCare.

This report is a summarization of all procedures, documentation, measurement data and findings by RadonCare in response to instructions, documents and communications provided by Red Deer Catholic Regional School to RadonCare. This report is site specific to the buildings described herein, and is not intended for application solely as an independent document without reference to supporting documentation and communication.

4. REPORT APPLICATION

Identification and measurement of radon gas has been completed in accordance with best known practices of environmental consulting and radon gas measurement in adherence to current guidelines. Application of risk based on these measurements is subjective. RadonCare recommendations have been based on the most current scientific research. All attempts have been made by RadonCare to minimize human and computational data error through rigorous training and quality control. Despite these controls there remains risk that certain traits or conditions may have

failed to have been observed. Measurements obtained through sampling are an indication of the average over the given period of measurement, and does not indicate that radon concentrations are an absolute value or will not fluctuate in response to changing conditions. Conditions relevant to measurement sampling are liable to change. Reports and summaries have been created in consideration of these measurements and are based on assumptions of the recorded data. Actual conditions may vary. Interpretation of this report by the reader must be cognizant of this risk.

5. ACCURACY OF SUPPLIED INFORMATION

RadonCare is in no way liable for the accuracy of provided information and representations and cannot accept responsibility for possible misrepresentation, misstatements, omissions, fraudulent or illegal actions of the person/persons providing.

6. RISK LIMITATION

No contaminants were introduced by RadonCare in part or in whole, while completing measurement testing for this project. The nature of alpha track sampling does not capture, nor introduce radioactive material at any point. In consideration of the services provided by RadonCare, Red Deer Catholic Regional Schools holds harmless RadonCare from any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defense, regardless of any action or omission. This indemnification shall extend to all third parties in such a case which may extend accusations, brought or threatened, onto Red Deer Catholic Regional Schools under federal or provincial statute as a result of this herein described project. Red Deer Catholic Regional Schools agrees not to pursue any such claims against RadonCare.

7. PROFESSIONAL ANALYSIS OF DATA

RadonCare is not held liable for any misrepresentation by the accredited laboratory for this project, Accustar Laboratories. RadonCare has made every effort to verify all claims reports of the laboratory but is not liable in the event of errors, omissions, negligence or damages caused on the part of, in the completion of their work.

8. INTERPRETATION OF FINDINGS

Radon Care Inc. is not responsible for independent and individual conclusions, interpolations and interpretations on part of the person or persons reviewing this report, whether in part or in whole. This indemnification extends to all persons who may acquire this document, whether expressly given or not. RadonCare has made all attempts to offer educated conclusions based on limited observation during sampling conducted over a particular time period with a specific set of conditions and is not liable for any variance. The purpose of this report is not to encourage purchase, sale or significant modification of any property.

6.0 REFERENCES

[1] Health Canada (2017, November 07). Government of Canada. Retrieved June 20, 2019, from https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/radon-your-home-health-canada-2009.html

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