Radon Survey at Selected Sites Across Prince Edward Island

PEIGOV – RFP #526

Project No. 7108

Prepared for:

PEI Department of Health
P.O. Box 2000
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Final Report

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EXECUTIVE SUMMARY

ALL-TECH Environmental Services Limited was contracted by Prince Edward Island's Department of Health to conduct a radon study at selected sites across Prince Edward Island.

The purpose of the survey was to provide statistically relevant province -wide data for radon concentrations and geographical regions within the province of Prince Edward Island.

The monitoring period commenced on January 18 and was completed on April 29, 2008 at predetermined sites across Prince Edward Island.

The following is a summary of the findings for this report:

The survey included predetermined test locations as selected by the provincial Department of Health. In total, five hundred and six (506) samples were deployed and collected to determine radon concentrations in eighty-seven (87) provincially owned buildings across Prince Edward Island. Samples which exceeded Health Canada guidelines ranged from 200 – 527 Bq/m^3.

Number of Samples Deployed for study	Number of Void Samples	Number of Buildings Identified exceeding Health Canada Guidelines	Number of Samples identified exceeding Health Canada Guidelines
506	2	20	39

Mitigation decisions should always be based upon 2 tests.

Based on the survey results, the following remedial action is recommended for buildings identified with radon levels above Health Canada guidelines:

Building ID	Highest Recorded Radon Concentration (Bq/m^3)	Recommended remedial action
Beach Grove Home	**220**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Bloomfield School	**239**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Bluefield High School	**230**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Cantwell Cres (2) Seniors	**217**	1. Follow-up Test

		2. If results remain consistent – Remedial action In less than 2 years
Colville Manor	**254**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Deblois School	**221**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Englewood School	**205**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Gulf Shore School	**209**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Kensington Int. School	**215**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
O'Leary School	**242**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Prince Edward Home	**204**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Queen St (501) Seniors	**205**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Riverview Manor	**281**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Rollo Bay School	**419**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
St. Louis School	**416**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
St. Theresa School	**229**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Sherwood Home	**272**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Souris Consolidated School	**527**	1. Follow-up Test

		2. If results remain consistent – Remedial action In less than 2 years
Western Hospital	**248**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Westwood School	**201**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years

This summary should not be used alone. The report must be read in its entirety.

Larry G. Koughan, CET, CRSP
Branch Manager / Senior Project Consultant

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1.0 INTRODUCTION

ALL-TECH Environmental Services Limited was contracted by Prince Edward Island's Department of Health to conduct a radon study at selected sites across Prince Edward Island.

The purpose of the survey was to provide statistically relevant province -wide data for radon concentrations and geographical regions within the province of Prince Edward Island.

The monitoring period commenced on January 18 and was completed on April 29, 2008 at predetermined sites across Prince Edward Island.

1.1 Background / Objectives

Radon is a radioactive colorless, odorless gas produced by the natural breakdown of uranium in the soil. Radon will seep into structures through cracks in foundation walls or floors. Radon is heavier than air and therefore tends to accumulate in the lower areas of buildings such as basements and crawl spaces. The gas will dissipate in upper building levels so the survey will concentrate on the lowest occupied levels of all test locations. Radon gas is of public health concern as it may be responsible for up to 10% of all lung cancers. The gas decays into radioactive products when inhaled and becomes trapped in the lungs. An individual's risk of getting cancer will depend on radon concentrations and the length of exposure.

Health Canada has recently lowered the indoor air quality radon guideline from 800 Becquerels per cubic metre (Bq/m^3) of air to 200 Bq/m^3. Prince Edward Island is not known to have large concentrations of uranium in the soil. However uranium does exist in all soil and is not uniformly distributed. Therefore, this study shall be used to provide statistically relevant province -wide data for radon concentrations and geographical regions within the province of Prince Edward Island.

2.0 METHODOLOGY

Survey methodology included deploying and collecting 506 long term samples (3 months) from eight-seven (87) provincially owned properties across Prince Edward Island including schools, hospitals, manors and seniors housing (see Table 1 summary below).
Properties and number of samples per building were predetermined by Prince Edward Island's Department of Health as outlined in their request for proposal PEIGOV – RFP#526.

Table 1 Summary of Buildings

Schools (Eastern)	Schools (Western)	Schools (French)	Hospitals	Manors	Seniors Housing	Other	Total
26	15	5	8	8	24	1	87

For the purposes of Quality Assurance / Quality Control (QA/QC) for the survey, a total of forty-eight (48) field duplicates and twenty-seven (27) field blanks were included as well. This represents approximately 10% and 5% respectively for the samples collected.

Sample deployment commenced on January 18, 2008 and was completed on January 25, 2008. The collection of the samples was from April 21 to April 29, 2008.

For each site location, summary reports have been developed describing the building ID, address, sample bar code number, deployment date, retrieval date, room, floor and site sample photo.

Summary reports have been divided into separate tabs under the following headings and are found in Appendix A:

Schools (Eastern)
Schools (Western)
Schools (French)
Hospitals
Manors
Seniors Housing & Other

Buildings are listed in alphabetical order within their respective sections.

2.1 Type of Detectors

The survey included 351 E-Perm Ion (ST) Chamber with long term electret sampling discs supplied by Health Canada and placed by the consultant at predetermined test locations, retrieved and shipped to Health Canada for analysis using an E-Perm Reader.
In addition, 155 E-Perm Ion (LT) Chamber with short term electrets sampling discs were deployed by the consultant at predetermined locations and sent to Lex Scientific in Guelph, Ontario for analysis using an E-Perm Reader (see Table 2 summary below).

The E-Perm devices consist of a special plastic canister (ion chamber) containing an electrostatically charged disk detector (electret). The detector is exposed during the measurement period, allowing radon to diffuse through a filter-covered opening into the chamber. Ionization resulting from the decay of radon produces a reduction in the charge on the electret. The drop in voltage on the electret is related to the radon concentration.

Table 2 Summary of Samples Deployed

	Health Canada	Independent Samples	Survey Totals
Samples	351	155	506
Duplicates	30	18	48
Blanks	25	2	27

2.2 Measurement Locations

The E-Perm Ion (ST) Chambers operate on a spring loaded device within the chamber housing. Once at each test location, these devices were fully deployed and the following information recorded:

- The electrets unique bar code
- If the sample was a field duplicate or field blank
- Start date & time
- Sample Location
- Floor Level
- Sample Location Photo
- Sample location plotted on site drawing (where supplied).

Upon collection of the devices, the chamber was closed and the sample time and date were recorded and sent to Health Canada for analysis.

The E-Perm Ion (LT) Chambers are protected by a hard plastic shell while in transit. Once at each test location, these devices were deployed by removing the protective shell and the electret loaded (screwed) into the chamber just at the start of the test. Care was taken to prevent touching the surface of the electret which could result in a voided test.
Upon placement of the devices, the same information was recorded as for the ST chambers.

Upon collection of the devices, the chamber was removed and the protective shell screwed back on to protect the sample while in transit to the laboratory. The stop time and date were recorded at this time.

ALL-TECH used the sampling approaches established by Health Canada from *Guide for Radon Measurements in Public Buildings* (*Schools, Hospitals, Care Facilities, Detention Centers)* as amended November 13, 2007 and best judgement based on experience.

Measurement locations were primarily based on “lowest occupied room” sites where practical.
To provide a defensible radon concentration estimate, measurements were taken in the lowest-level occupied rooms of the building.
Special attention was made to avoid measurements in bathrooms, closets, cupboards, sumps, crawl space, or nooks within any foundation. In addition, the presence of air currents caused by heating, ventilating and air conditioning vents, doors, fans, and windows were avoided where practical.

3.0 SURVEY FINDINGS

The survey included predetermined test locations as selected by the provincial Department of Health. In total, five hundred and six (506) samples were deployed and collected to determine radon concentrations in eighty-seven (87) provincially owned buildings across Prince Edward Island. Samples which exceeded Health Canada guidelines ranged from 200 – 527 Bq/m^3.

Table 3 illustrates a summary of the number of buildings affected.

Table 3 Summary of Results

Number of Samples Deployed for study	Number of Void Samples	Number of Buildings Identified exceeding Health Canada Guidelines	Number of Samples identified exceeding Health Canada Guidelines
506	2	20	39

4.0 CONCLUSIONS AND RECOMMENDATIONS

Health Canada has established a *Timeframe to Remediate* based on radon measurements exceeding the guideline of 200 Bq/m^3.

Table 4 Health Canada Timeframe to Remediate

Radon Concentration	Recommended remedial action time
Greater than 600 Bq/m^3	In less than 1 year
Between 200 Bq/m^3 and 600 Bq/m^3	In less than 2 years
Less than 200 Bq/m^3	No action required

Mitigation decisions should always be based upon 2 tests.

Based on the survey results, the following remedial action listed in Table 5 is recommended for buildings identified with radon levels above Health Canada guidelines:

Table 5 Remedial Action for Buildings with elevated Radon Concentrations

Building ID	Highest Recorded Radon Concentration (Bq/m^3)	Recommended remedial action
Beach Grove Home	**220**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
Bloomfield School	**239**	1. Follow-up Test 2. If results remain consistent –

		Remedial action In less than 2 years
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Western Hospital	**248**	1. Follow-up Test 2. If results remain consistent – Remedial action In less than 2 years
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Radon Reduction Techniques

There are several methods to lower radon levels in dwellings. Some techniques prevent radon from entering your home while others reduce radon levels after it has entered.

Soil suction prevents radon from entering the dwelling by drawing the radon from below the structure and venting it through a pipe, or pipes, to the air above the dwelling where it is quickly diluted.

Any information available about the construction of the dwelling could assist a contractor in choosing the best system.

Other Types of Radon Reduction Methods

Other radon reduction techniques that can be used in any type of dwelling include: sealing, house/room pressurization, heat recovery ventilation, and natural ventilation.

Sealing cracks and other openings in the foundation is a basic part of most approaches to radon reduction. Sealing the cracks limits the flow of radon into your home thereby making other radon reduction techniques more effective and cost-efficient. It also reduces the loss of conditioned air.

Building/room pressurization uses a fan to blow air into the basement or a living area from either upstairs or outdoors. It attempts to create enough pressure at the lowest level indoors (in a basement for example) to prevent radon from entering into the building. The effectiveness of this technique is limited by construction, climate and occupant lifestyle. In order to maintain enough pressure to keep radon out, the doors and windows at the lowest level must not be left opened, except for normal entry and exit. This approach generally results in more outdoor air being introduced into the home, which can cause moisture intrusion and energy penalties. *Consequently, this technique should only be considered after the other, more-common techniques have not sufficiently reduced radon.*

A **heat recovery ventilator (HRV)**, also called an **air-to-air heat exchanger**, can be installed to increase ventilation which will help reduce the radon levels in dwellings. An HRV will increase ventilation by introducing outdoor air while using the heated or cooled air being exhausted to warm or cool the incoming air. HRVs can be designed to ventilate all or part of a dwelling, although they are more effective in reducing radon levels when used to ventilate only the basement. If properly balanced and maintained, they ensure a constant degree of ventilation throughout the year. HRVs also can improve air quality in houses that have other indoor pollutants. There could be

significant increase in the heating and cooling costs with an HRV, but not as great as ventilation without heat recovery.

Some **natural ventilation** occurs in all dwellings. By opening windows, doors, and vents on the lower floors you increase the ventilation. This increase in ventilation mixes outdoor air with the indoor air containing radon, and can result in reduced radon levels. However, once windows, doors and vents are closed, radon concentrations most often return to previous values within about 12 hours. *Natural ventilation in any type of dwelling should normally be regarded as only a temporary radon reduction approach because of the following disadvantages: loss of conditioned air and related discomfort, greatly increased costs of conditioning additional outside air, and security concerns.*

Once any of these reduction techniques have been applied, follow up testing should be carried out to verify the effectiveness.

5.0 LIMITATIONS

The findings contained in this report are based upon conditions as they were observed at the time of the survey. No assurance is made regarding changes in conditions subsequent to the time of the survey.

This report was prepared by ALL-TECH Environmental Services Limited for the sole benefit of our client *PEI Department of Health*. The documentation in the report is based on information provided or obtained by ALL-TECH. The report is based on ALL-TECH's best judgment of the information provided at the time of the survey. Any use of this report by a third party, is the responsibility of that third party. ALL-TECH accepts no liability and/or damages occurred by any third party which uses information obtained in this report.

6.0 CLOSURE

We trust this survey and report meet your requirements.
Should you have any questions or concerns please contact the undersigned directly.

Thank you,

Larry Koughan, CET, CRSP
Branch Manager / Senior Environmental Consultant
ALL-TECH Environmental Services Limited

APPENDIX A

Summary Reports

APPENDIX B

Health Canada Laboratory Analysis Report

APPENDIX C

Lex Scientific Laboratory Analysis Report
Kinkora School retest report
E-Perm Calibration Certificate & ISO Certification