Mould & Moisture Assessment
Kinkora Regional High School

Project No. 12620

Prepared for:

PEI Dept. Transportation & Infrastructure Renewal
P.O. Box 2000
Charlottetown, PE
C1A 7N7

May 19, 2011

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

92 Queen Street, Suite 201
Charlottetown, PE C1A 4B1
www.alltechenvironmental.com

EXECUTIVE SUMMARY

ALL-TECH Environmental Services Limited was retained by the PEI Department of Transportation & Infrastructure Renewal (TIR) to conduct a mould and moisture assessment at Kinkora Regional High School located at 54 Anderson Road, Kinkora, Prince Edward Island.

The assessment was carried out on April 12, 2011 to evaluate building components for potential water intrusion and the possibility of hidden mould contamination as well as signs of visible mould within the school.

The findings were then used to provide recommendations for appropriate remedial actions and/or to recommend further investigative strategies, if necessary

Based on the assessment findings, the following conclusions and recommendations have been summarized:

Conclusions & Recommendations

Results of our mould and moisture assessment conducted on April 12, 2011 indicate that overall, the extent of visible and potential mould growth throughout the school is relatively minor in each location identified (i.e. <10ft^2 of visible/anticipated mould growth).

One area (Rm 106) was noted with minor visible mould on mechanical pipe insulation as well as on the porcelain tank cover.

Some areas, as noted in Table III, were noted with visible moisture damage to wall and ceilings surfaces. Some areas were reported as having elevated moisture detected in these building materials. Other areas where no elevated moisture was detected exhibited significant moisture / water damage. Therefore, these areas should be inspected for the potential of hidden mould once the affected materials are removed.
It should be noted that due to renovations to school in 2002, some wall and ceiling are finished with drywall. However, some areas were reported as having drywall over original plaster finishes. Building materials from the original design, including, but not limited to, plaster finishes; mechanical / pipe insulations should be considered presumed asbestos containing material (PACM). Therefore, any PACM's must be tested prior to any disturbance work in accordance to the applicable provincial asbestos regulations.

There were evident signs of water stains on in lay ceiling tiles in various areas in the school. Areas assessed had no visual signs of mould above the ceiling where accessible. All ceiling tiles exhibiting evidence of water damage are recommended to be removed and replaced as a precautionary measure and also to detect any further leaks which may re-occur. These areas are noted in Table III and are identified on the site floor plan (Appendix 1). Areas above ceiling, where accessible, were noted as having both condensation / moisture issues from mechanical systems.

All work should be performed by workers who are properly trained in the hazards of mould remediation. The removal of water-damaged building materials and mould-contaminated building materials should be completed following Level 1, 2, and 3 mould remediation procedures as outlined the CCA Mould Guidelines for the Canadian Construction Industry, 2004, or equivalent.

If you have any questions concerning this report, please contact the undersigned directly.

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

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REFERENCES

1.0 INTRODUCTION

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2.0 BACKGROUND

Constructed buildings must attain many goals to meet its intended purpose. The building must provide a comfortable, healthy environment for its occupants, it must be structurally sound, it must keep out elements such as rain, wind, snow, cold and heat, and it must provide these functions over an extended period of time.

All of these functions are affected by moisture in one way or another. Uncontrolled moisture in buildings can cause adverse health effects to its occupants due to the growth of microorganisms, such as mould. Uncontrolled moisture can reduce the life span of buildings through premature degradation of building components. The building structure itself can become unsound due to uncontrolled moisture causing structural damage to wood and steel. In summary, uncontrolled moisture will virtually negate the goals of building designs. According to ASTM Practices for Increasing Durability of Building Constructions Against Water-Induced Damage (E241), except for structural errors, about 90 percent of all building construction problems are associated with water in some way.

However, it will be impossible to completely eliminate moisture from buildings. In fact, moisture is necessary to prevent wood products from drying out and to alleviate upper respiratory discomfort, up to a point. The issue then is not to eliminate moisture from buildings but to properly control moisture as it cycles through the building.

Indoor and outdoor environments naturally harbour a great variety of microscopic organisms such as mould. Prolonged exposure to excessive moisture enables microbes to flourish. If conditions are such that moisture is limited, then these microbes have a stable relationship with the built environment. However, when moisture accumulates more rapidly than the natural drying process, the ecology changes and favours the rapid amplification of mould.[1]

When dealing with mould/water damaged materials, the remediation will usually involve the removal of some building materials (e.g. drywall, wood, etc.).

3.0 MOULD IN INDOOR ENVIRONMENTS

Mould is a naturally occurring and essential part of our environment as they act as decomposers, breaking down dead organic material (such as leaves, wood and other plant debris) which they use as a food source. Mould spores are brought into indoor environments through ventilation systems, open windows or doors, or tracked in on footwear. Therefore, mould is found in almost every indoor environment and a normal background population of mould spores on indoor surfaces and within indoor air should be expected.

If conditions exist that allow mould to grow indoors, concentrations will increase to levels that are typically not found in buildings. Indoor mould growth occurs primarily as a result of water damage to cellulose-containing building materials and/or furnishings (such as wood, drywall, wallpaper, ceiling tiles, etc.) during catastrophic or chronic events such as leaks, floods, condensation (associated with high humidity or cold spots), improper design or operation of humidification systems, and building envelope failures. Under these conditions, mould growth may present a risk to the building structure itself (through decomposition of building materials) as well as to occupants in the building (through potentially adverse health effects).

4.0 MOULD ASSESSMENT & REMEDIATION GUIDELINES

Regardless of the type or severity of health effects that may be caused by exposure to mould, mould growth inside a building should be considered unacceptable from a building operations and maintenance standpoint as well as from a health risk standpoint.
Several government agencies and special interest groups have developed guidelines for the proper assessment and remediation of mould-contaminated buildings. In Canada, recent guidelines have been published by the Canadian Construction Association (CCA) entitled "*Mould Guidelines for the Canadian Construction Industry*" (March 2004)[2].

The CCA guideline is similar in nature and incorporates elements common to several other guidelines issued by groups such as the Environmental Abatement Council of Ontario[3], Health Canada[4], the Manitoba Department of Labour[7], the New York City Department of Health[8], the Institute of Inspection, Cleaning and Restoration Certification (IICRC)[6], and the U.S. Environmental Protection Agency (EPA)[9]. Common to all is the need to remediate contaminated building materials under controlled conditions, with the extent of safety measures employed based partially on the extent of contamination. In general, more stringent remediation methods, engineering controls and worker protection is required the more extensive the mould contamination. These requirements have generally been distinguished in the guidelines by employing different Levels of Remediation (e.g., Level 1, 2 or 3).

ALL-TECH recognizes and follows the practices and procedures outlined in the most current mould remediation guidelines available. General recommendations for remediation procedures, engineering controls and work practices that are common to several of the above-mentioned guidelines and used by ALL-TECH are summarized below in Table I.

TABLE I
Summary of Mould Remediation Requirements by Level of Remediation

Level of Remediation	Level 1	Level 2	Level 3
Estimated Area of Mould Growth	<10 ft^2 (<1 m^2)	10-100 ft^2 (1-10 m^2)	>100 ft^2 (>10 m^2)
Level of Containment	Polyethylene drop sheet	Polyethylene enclosure	Polyethylene enclosure and two-chambered worker/waste decontamination facilities
Engineering Controls	Turn off HVAC system and seal over openings, use dust suppression methods	Isolate/seal the HVAC system, use dust suppression methods, maintain negative pressure through use of HEPA vacuum or HEPA-filtered negative air unit	Isolate/seal the HVAC system, use dust suppression methods, maintain negative pressure (that is to be continually measured and recorded) through use of HEPA-filtered negative air unit
Worker Protection	Dust impermeable gloves, half-face air purifying respirator (N95 minimum), full body dust-impervious coveralls	Dust impermeable gloves, half-face air purifying respirator (100 Series), full body dust-impervious coveralls and boot covers or separate work boots	Dust impermeable gloves, full-face PAPRs or full face non-powered air purifying respirator (100 Series), full body dust-impervious coveralls and boot covers or separate work boots
Clean Up Procedures	Double-bag waste in 6-mil polyethylene bags, HEPA-vacuum and/or wet wipe exposed surfaces with a detergent solution	Double-bag waste in 6-mil polyethylene bags, HEPA-vacuum and wet wipe exposed surfaces with a detergent solution	Bag waste in 6-mil polyethylene bag within work area and then within double bagging room of waste decontamination facility, HEPA-vacuum and wet wipe exposed surfaces with a detergent solution
Project Quality Assurance	Project authority should consider whether removal of occupants adjacent to the work area is necessary.	Project authority should consider whether removal of occupants adjacent to the work area is necessary. Consult with qualified Health & Safety professional prior to remediation work and for monitoring of compliance with guidelines. A competent supervisor to be present during all contaminated work and a competent person should inspect the work area for enclosure defects on a regular basis.	Project should be conducted following a site-specific work plan or specification. Project authority should consider whether removal of occupants adjacent to the work area is necessary. Consult with qualified Health & Safety professional prior to remediation work and for monitoring of compliance with guidelines. A competent supervisor to be present during all contaminated work and a competent person should inspect the work area for enclosure defects on a regular basis. Project authority or representative should periodically inspect work activities and inspect the work area for acceptable completion via visual inspection and have clearance testing (air and/or surface sampling) conducted.

It should be noted that the remediation procedures summarized in Table I are not meant to be comprehensive. The summary is general in nature only, as specific recommended requirements vary slightly from guideline to guideline. Each applicable guideline should be consulted for a full description of their recommended remedial procedures. In addition, the procedures outlined above may not necessarily reflect procedures to be employed on every project, as specific procedures to be followed should be determined on a project by project basis, based on professional judgment. The general procedures outlined above also do not account for specific conditions that may be encountered, such as remediation in locations where immuno-compromised or other susceptible occupants may be present (e.g., hospitals or other health care facilities) or remediation of biohazards other than mould that may be present due to sewer backups, environmental floods or bird and bat droppings. Under these conditions, additional precautions may apply.

There are no specific regulations in P.E.I. addressing mould contamination. However, according to Health Canada and the Canadian Construction Association (CCA) guidelines on assessment and remediation of fungi in indoor environments, building materials supporting mould growth should be remediated *as rapidly as possible* in order to ensure a healthy environment. Remediation of mould growth is based on an approximation of the extent of visible mould growth including the estimated extent of any hidden mould growth.

5.0 MOULD ASSESSMENT METHODOLOGY

Our assessment determination of the presence of mould growth and the extent included initial discussions with administration and / or safety chair about concerns and specific issues. A school background mould investigation form was sent to the school to complete and review with the on-site assessor.
A site floor plan was provided for the school to visually assess each room as it related to the drawing.
In order to assess the potential for and extent of mould growth (if any), our assessment consisted of a visual inspection of accessible areas and moisture content readings of representative building materials. If visible mould is observed, it is documented and noted based on the location and extent. If conditions are observed as extensive and categorized as high risk, than the Department of Education and TIR would be consulted for immediate action.

In areas noted with cracked surfaces, blistering, water stains, etc., moisture content readings are taken from these surfaces to evaluate if conditions are conducive to potential hidden mould sources. In areas where no elevated moisture readings are encountered they are noted but no further action is reported. In areas where elevated moisture is present and there is no access, further investigation is required and intrusive testing of wall cavities is carried out.

5.1 Visual Assessment & Moisture Content Readings

The focus of our visual assessment was to identify and quantify locations within the areas assessed that may be affected by water damage and/or mould growth. Evidence of water damage may include water staining and/or discolouration to building material surfaces and deterioration to building surface components (such as cracking or peeling paint or plaster, delamination of wallpaper, efflorescence to plaster and concrete surfaces, etc.). Degraded building materials (such as soft or crumbling drywall and plaster) also provide an indication of potential chronic water infiltration.

Mould growth was visually identified as spotty discolouration to surfaces or as a mass of fuzzy discolouration, depending on the extent of growth. The colour of mould growth will vary depending on the mould species present and the material that it is growing on. It is commonly found to be black, greyish, white, brown or green. Differentiation between mould growth and other staining or discolouration was made based on past experience and/or by confirmation of mould growth on similar surfaces through surface sampling.

Special attention was paid to building materials and furnishings that are typically conducive to mould growth due to their cellulose content. This included materials such as drywall, cardboard, lay-in ceiling tiles, carpeting, wallpaper, wood framing, plywood, particleboard, oriented strand board (OSB), etc., if present.

Our visual assessment was non-destructive in nature as classrooms were occupied at the time of the assessment. If locations were encountered where there was visual evidence of water damage and/or elevated moisture content readings, then the potential for “hidden” mould growth could exist between building elements, underneath the surface of the affected material or within wall/ceiling cavities, etc. In this case, further investigation would be required and intrusive investigation would follow to open up areas to inspect them.

In order to determine the moisture content of building materials present within the areas assessed, moisture content (MC) readings were taken using a Drieaz non-penetrating moisture meter. This unit is able to detect moisture content within wood, drywall and plaster/brick surfaces.

Measurements are reported in the range of 0 - 100% as an investigative tool. Values less than 30% are relative readings. From 30 – 70% indicates above normal moisture and greater than 70% indicates saturation of a material and further investigation.

Results of MC readings were used in conjunction with our visual assessment results to further define the extent of water damage. Elevated readings indicate recent or chronic water damage. In addition, elevated MC readings indicate the potential for hidden mould growth on the unexposed side of the material being measured. It should be noted that even if normal MC readings are obtained, areas that have been subjected to water damage in the past and have since dried out may have hidden mould growth.

Under these conditions, further assessment activities (such as intrusive investigation) would have to be performed to rule out the presence of mould growth.

6.0 OBSERVATIONS & FINDINGS

Results of our mould and moisture assessment are summarized in Tables II and III. Areas with visible or concealed mould are noted and an estimated Level of Remediation has been provided based on our findings.
Room numbers identified correspond to Site Floor Plans (Appendix 1) and not necessarily on site room numbers.

Table II
Summary of Visible Mould affected areas

Room No. / Description	Comments / Observations	Level of Remediation
Rm 106	Visible mould on mechanical pipe insulation and porcelain tank cover.	Have suspect materials tested for asbestos and treated accordingly. Level 1 Mould Remediation <10 ft^2 (<1 m^2) (removal of affected pipe insulation; surface cleaning of tank and surrounding areas)

Table III
Summary of Moisture affected areas

Room No. / Description	Comments / Observations	Action required
Rms 130; 132	Visible moisture damage to drywall / plaster wall surfaces. No leaks or moisture detected at time of inspection.	Have suspect materials (i.e. plasters) tested for asbestos and treated accordingly. Then conduct further investigation into addressing water / moisture issues and possible hidden mould.
Rm 129	Visible moisture damage to drywall ceiling surfaces. No leaks or moisture detected at time of inspection.	Further investigation into addressing water / moisture issues and possible hidden mould.
Rm 116	Visible moisture damage (minor) to drywall ceiling. Contributed to high humidity area.	Allow additional air circulation during high humidity periods. No further action required.

Rms 135; 213	Elevated moisture detected on wall surface under windows. Some visible moisture damage to drywall in Rm 213	Further investigation into addressing water / moisture issues and possible hidden mould.
Rms 107; 125 entry; 128; 206B; 218	Stained ceiling tiles observed and reported in noted locations (see site floor plan - Appendix I for location markings).	Replace ceiling tiles as precautionary measure and to assist in detecting further water leaks. Mechanical condensation reported in various locations at the time of assessment.

7.0 CONCLUSIONS & RECOMMENDATIONS

Results of our mould and moisture assessment conducted on April 12, 2011 indicate that overall, the extent of visible and potential mould growth throughout the school is relatively minor in each location identified (i.e. <10ft^2 of visible/anticipated mould growth).

One area (Rm 106) was noted with minor visible mould on mechanical pipe insulation as well as on the porcelain tank cover.

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All work should be performed by workers who are properly trained in the hazards of mould remediation. The removal of water-damaged building materials and mould-contaminated building materials should be completed following Level 1, 2, and 3 mould

remediation procedures as outlined the CCA Mould Guidelines for the Canadian Construction Industry, 2004, or equivalent.

8.0 LIMITATIONS

The investigations, assessments and recommendations detailed in this report were carried out in a manner consistent with the level of care and skill normally exercised by reasonable members of the environmental and industrial hygiene consulting profession currently practicing under similar conditions in the area. There are no other warranties, expressed or implied, that apply to the professional services provided under the terms of our assignment and included in this report.

In preparing this report, ALL-TECH relied on information supplied by others. Except as expressly set out in this report, we have not made any independent verification of such information.

The investigation, assessments and recommendations in this report have been made based on conditions observed at the time of the assessment and are limited to the areas investigated. Mould growth conditions can change with time and mould growth additional to that noted in this report may occur if water infiltration/humidity conditions persist or reoccur. Unaccounted mould growth may also be present in the areas assessed due to concealed or subsurface conditions that can vary from those encountered (if accessed).

The investigation, assessments and recommendations in this report have been made in the context of existing industry accepted guidelines which were in place at the date of this report. The investigation did not take account of any government regulations not in effect or not generally promulgated at the date of this report.

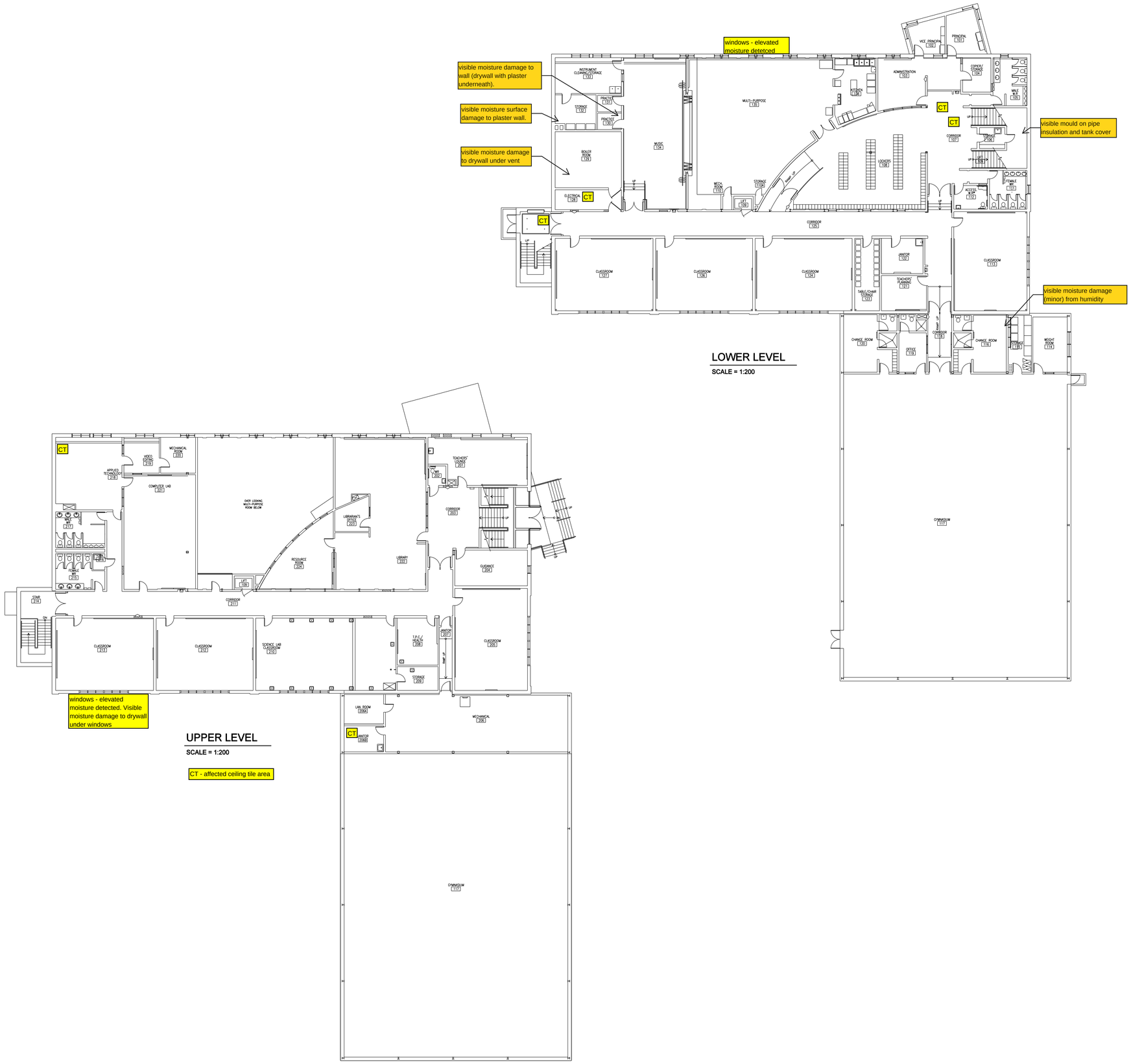
This report is for the sole use of the person or entity to whom it is addressed. No other person or entity is entitled to use or rely upon this report.

Larry G. Koughan, CET, CRSP
Branch Manager

References:
1. American Industrial Hygiene Association: *Report of Microbial Growth Task Force*, ISBN 1-931504-26-1. May 2001.
2. Canadian Construction Association: *Mould Guidelines for the Canadian Construction Industry*, Standard Construction Document CCA 82. March 2004.

3. Environmental Abatement Council of Ontario: *EACO Mould Abatement Guidelines*. 2010.
4. Health Canada: *Fungal Contamination in Public Buildings: A Guide to Recognition and Management*. June 1995.
5. Institute of Inspection, Cleaning and Restoration Certification: *S500-2006, Standard and Reference Guide for Professional Water Damage Restoration*, 3rd Edition. 2006.
6. Institute of Inspection, Cleaning and Restoration Certification: *S520-2008, Standard and Reference Guide for Professional Mold Remediation*. 2nd Edition. 2008.
7. Manitoba Department of Labour, Workplace Safety and Health Division: *Guidelines for the Investigation, Assessment, & Remediation of Mould in Workplaces*. March 2001.
8. New York City Department of Health & Mental Hygiene, Bureau of Environmental & Occupational Disease Epidemiology: *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*. November 2008.
9. United States Environmental Protection Agency: *Mould Remediation in Schools and Commercial Buildings*, EPA 402-K-01-001. March 2001.

APPENDIX I
Site Floor Plans



PRELIMINARY
NOT FOR CONSTRUCTION

Prince Edward Island CANADA
Transportation and Infrastructure Renewal
Tel 902 368 5100
Fax 902 569 0590
http://www.gov.pe.ca/
PO Box 2000
Charlottetown
Prince Edward Island
Canada C1A 7N8

A = Detail #
BB = Sheet # (Where Detail Required)
CC = Sheet # (Where Detailed)

Project Title :
Kinkora Regional High School

Drawing Title :

Scale : 1:200	Design By : -
Drawn By : -	Date : Jan 2011
Project No.: 330	Drawing # : A1 of 0

APPENDIX II
School Background Mould Investigation Form

SCHOOL BACKGROUND MOULD INVESTIGATION

ALL-TECH ENVIRONMENTAL SERVICES LIMITED

School Name: Kinkora Regional High

Age (approx) 48 years

Interview(s) names: _____

No. of staff (approx) 22 **No. of students (approx)** 187

Building Construction – Exterior Brick **Interior perimeter walls** Concrete

Have there been complaints about air quality? Sometimes oil fumes. Mostly good.

Have there been any complaints about musty or mouldy smells? Where? No

If so, what areas in particular? No

Has there been any history of flooding? Yes - Room 101 Office Area Front door when it rains hard.

Have there been any roof leaks reported? Snow in vents.

Have there been other water leaks or excess condensation from pipes reported recently or chronic problems?

Front doors during driving rains.

Have there been any additions or major renovations? When? Yes 2003

Have there been any windows replaced recently? No (last replaced 2002)

Is there a problem of excess condensation on windows? No

Is there a ventilation system in the school? Yes

Are there any areas where reported visible mould exists? No (Mould in washrooms in summer downstairs)

Has there been any mould remediation within the past 2 years? Where?

Mould in office area from flooding, Wood ~~base~~ baseboard. replaced along

Other comments / notes or observations:

Foundation work in summer of 2010 has stopped flooding to this point.