VanDriel OHS Consulting

Building A Healthy Workplace

“Parkview Elementary Indoor Air Quality Report Part 4: Cultured Fungi”

PREPARED FOR	School District 83
PREPARED BY	Anna Rybczynski B.Sc., CRSP
REVIEWED BY	Robin Van Driel M.Sc., CIH, ROH, CRSP
SITE LOCATION	605 Parksville Street, Sicamous, BC
REPORT DATE	October 28, 2019

1. Introduction

VanDriel OHS Consulting ("VOHS") was retained by School District 83 to perform an indoor air quality investigation at Parkview Elementary (605 Parksville Street, Sicamous, BC). Due to a recent odour complaint by students and staff. The odour was described as musty and similar to a wet basement smell or spoiled food. This was clarified once the maintenance staff and Manager of Facilities and Grounds conducted a walkthrough to identify any remaining source of the odour found on the day of the odour complaint. After all cleaning efforts, the school district found traces of the odour remaining in the supply closet of the west wing and in the single-stall washroom in Room 2 (Kindergarten) with a broken toilet. The odour was also found on the new mops used to clean the school after the old mops were disposed of. Reported symptoms believed to have been caused by this odour included headaches and upper respiratory tract irritation.

Efforts to remove the source of the odour by the school district and remediation contractors included removal of all contents from classroom 4, isolating of the main entryway into the corridor of the west wing using polyethylene sheeting, and installation of humidifiers in the crawlspace under classroom 3, classroom 4, classroom 5 and the west corridor. By October 2, 2019, efforts also included the use of biocides to clean known areas with suspected fungi growth.

This report covers the culturable samples of fungi collected at the school on October 2, 2019.

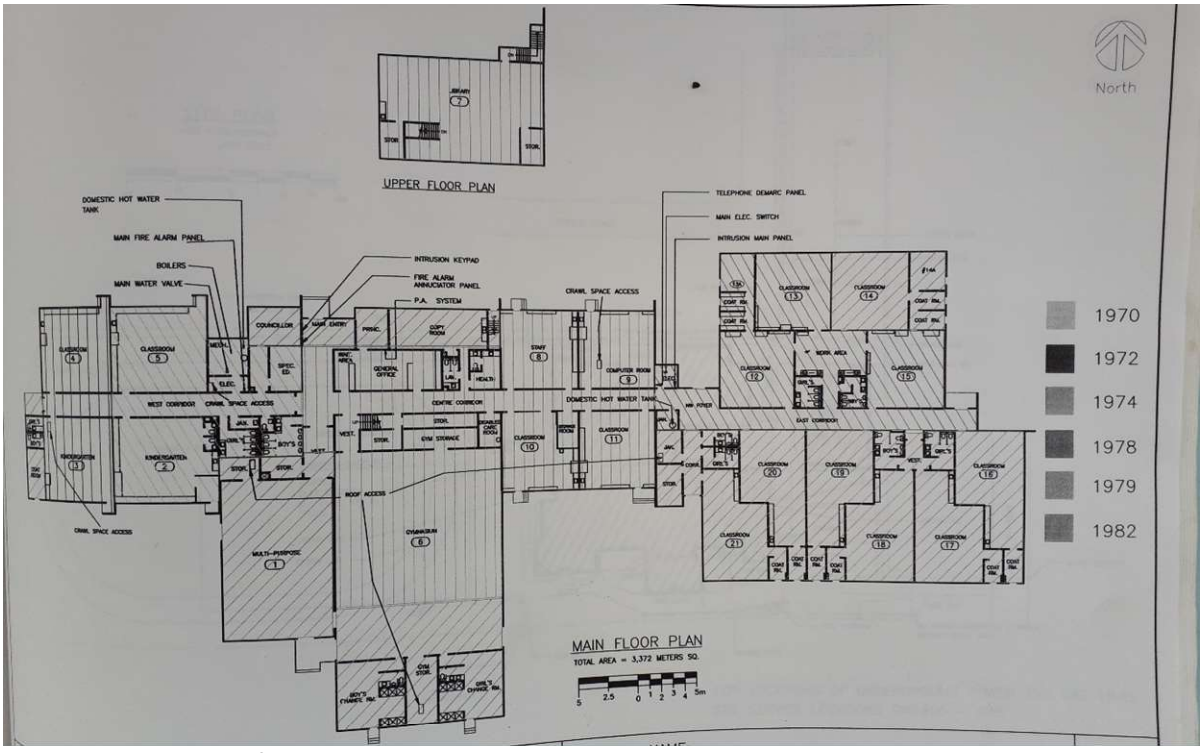

Figure 1: Floor plan of Parkview Elementary. Not to scale.

2. Investigation Method

2.1 Air Samples

On October 2, 2019, culturable samples of fungi were collected to aid in assessing the indoor air quality of the school.

Eight samples were collected throughout the building to determine the amount of culturable fungi in the air. These samples were collected from the following locations:

1. Outdoor – East Entrance
2. Outdoor – Main Entrance
3. Ceiling – Central
4. Ceiling – West
5. Classroom 20
6. Supply Closet – West
7. Supply Closet – East
8. Crawlspace – under Stockroom

Air was drawn through an Andersen n-stage sampler and collected onto a malt extract agar (MEA) plate at 28.3 L/min for 7 to 15 minutes depending on the location. At this flow rate, particles above 0.65 µm diameter will go through one of the 400 evenly spaced holes and make contact with the agar plate, and spores that make it onto the agar will grow on the MEA. The flow rate was measured before sample collection using a primary flow calibrator, Defender 510 (Mesa Laboratory Inc., Butler, NJ). Appendix A has the calibration certificate for the flow calibrator.

The samples were incubated at room temperature for 2 weeks such that colony forming units of fungi (CFU) are visible under a microscope and identifiable based on their morphology. An additional correction must be done to account for the loss in the number of viable CFU should there be more than one CFU that landed through the same hole based on Monte Carlo simulations for up to 400 CFU on the agar (Macher, 1989).

2.2 Swab Samples

A swab sample was collected from the soil sample in the crawlspace underneath Room 3 from September 18, 2019. Another swab sample was collected from the soil in the crawlspace underneath the stockroom from October 2, 2019. As it was reported by the Manager of Facilities and Grounds that the odour was strongest in the single-stall washroom in Room 2 and the supply closet in the west wing, swab samples for culturable fungi was collected from the dirt in the crawlspace.

The swab contents are collected into a liquid media so that it can be transferred onto several MEA plates. The sample was incubated at room temperature for 2 weeks such that colony forming units of fungi (CFU) are visible under a microscope and identifiable based on their morphology. This method includes speciation of *Penicillium*, *Aspergillus*, *Cladosporium*, and *Stachybotrys* species. Several plates at different dilution levels to determine the relative concentration of CFU in the swab.

3. Analysis of Culturable Samples

3.1 Air Samples

For the air samples, the indoor culturable samples are compared with the outdoor culturable samples by counts and genus to evaluate whether there is a source of fungi that is not typical of the outdoor environment and is growing indoors.

To compare the results with those of previous culturable airborne samples, a chi-squared test was done to show the difference between the outdoor samples and the indoor samples. A chi-squared test involves comparing two groups of discrete values (such as counts of CFU) to determine whether the two groups differ based on what is observed (or measured) and what is expected (i.e. the proportion of values between the two groups). As per statistical convention, a p-value (the probability that the results observed is random given that the trend being observed is truly random) below 5% (or $\alpha = 0.05$) means that there is a significant difference between the proportion of the two groups of samples. As there are only two groups for comparison of the proportion of fungi, the comparison can only change with one degree of freedom (df), that is, the result of one fungal genus leaves only one possible result for the other.

3.2 Swab Samples

The swab culturable sample was used to indicate if any fungi were growing in the dirt of the crawlspace and to identify anything that may be associated with a source of the fungi.

4. Results and Interpretation

Appendix B contains the laboratory results. Appendix C contains the laboratory chain of custody form.

4.1 Air Samples

Results from the air samples collected in Room 20, from the ceiling spaces the two supply closets showed lower fungal concentration than the outdoor samples (Table 1). The sample collected from the crawlspace showed almost equal concentration of fungal CFU, double the concentration of *Penicillium* and four times the concentration of *Cladosporium* as ccompared to the outdoor samples. This suggests that the crawlspace is a likely source of fungal growth at the school. The chi-squared test shows a trend that the crawlspace may have a different community of fungi that can grow there than the outdoor environment (Table 2). This trend is not statistically significant, which is likely due to the low CFU detected. When the conditions in the crawlspace allow more spores to be generated (such as the period after a rainfall), there may be a trend showing that there is a difference between the community in the crawlspace and the outdoor environment. Due to the lack of recent rainfall, other locations may also show positive result due to the low counts, which may not have captured all the possible fungi community that exists in the space, thus skewing the results.

Results from the west supply closet showed *Aureobasidium* sp., indicating that there had been damp soil in the area. The source of the damp soil is most likely from the floor drain, where there may be damp soil that have collected in the drain.

Aureobasidium sp. was also detected in the swab sample of dirt collected in the crawlspace in the west wing during the investigation (Table 3). This suggest that the crawlspace area was recently wet.

The swabs in the west and east supply closet drains found *Fusarium* sp. (Table 3), which grows abundantly in soils and near plants. It suggests that there is a lot of dirt that may have ended up in the drains. This is typical of a space meant for collecting the wastewater from cleaning the school's interior. However, some drains collected more dust than others, thus increasing the fungal spores that were collected on the swab.

Table 1: Counts of Colony Forming Unit (CFU) and Relative Amount of Culturable Fungi (%) of Air Samples at Parkview Elementary.

	Outdoor East Entrance	Outdoor Main Entrance	Ceiling Central	Ceiling West	Classroom 20	West Supply Closet	East Supply Closet	Crawlspace under Stockroom
Actual Total Count (CFU)	17	8	8	10	10	9	11	18
Corrected Total Count (CFU)	17.4	8.1	8.1	10.1	10.1	9.1	11.1	18.4
Concentration (CFU/m^3)	61.5	30.3	27.5	35.6	23.7	21.2	24.7	60.3
Aureobasidium sp. (%)	0	0	0	0	0	22.2%	0	0
Alternaria sp. (%)	0	12.5%	0	0	0	0	0	0
Arthrinium sp. (%)	0	37.5%	0	0	0	0	0	0
Aspergillus sp. (%)	0	0	0	0	0	0	0	5.6%
Botrytis sp. (%)	38.5%	0	0	20%	0	0	0	0
Cladosporium sp. (%)	5.9%	12.5%	0	10%	10%	0	18.2%	22.2%
Geotrichum sp. (%)	0	0	0	30%	0	0	0	0
Gliocladium sp.(%)	0	37.5%	0	0	0	0	0	0
Paecilomyces sp. (%)	0	0	0	0	0	0	9.1%	0
Penicillium sp. (%)	47.1%	0	50%	40%	40%	0	27.3%	72.2%
Rhodotorula sp. (%)	0	0	0	0	0	0	45.5%	0
Sterile colony (%)	17.6%	0	50%	0	50%	77.8%	0	0

Rounding may lead to a total percent of CFUs slightly above or below 100%.

Table 2: Chi-squared test of Penicillium sp. and Cladosporium sp. CFU from samples collected at Parkview Elementary.

Comparison groups	Chi-squared (χ^2)	p-value (df = 1)
Crawlspace (Stockroom) to Outside East Entrance	0.58	0.44
Crawlspace (Stockroom) to Outside Main Entrance	2.75	**0.09**
West Supply Closet to Outside East Entrance	N/A	N/A
West Supply Closet to Outside Main Entrance	N/A	N/A
East Supply Closet to Outside East Entrance	1.59	0.21
East Supply Closet to Outside Main Entrance	1.2	0.27
Room 20 to Outside East Entrance	0.2	0.65
Room 20 to Outside Main Entrance	2.4	0.12
Central Ceiling to Outside East Entrance	0.48	0.49
Central Ceiling to Outside Main Entrance	5*	0.02*
West Ceiling to Outside East Entrance	0.21	0.65
West Ceiling to Outside Main Entrance	2.4	0.12

N/A: Indoor sample did not contain *Cladosporium* sp. and *Penicillium* sp. *skewed result from low CFU.

Orange bold suggests a trend of significant difference

Table 3: Total Colony Forming Unit (CFU) per swab and Relative Amount of Culturable Fungi (%) of Swab Samples at Parkview Elementary.

Location	*CFU per swab*	*Penicillium*	*Cladosporium*	*Fusarium*	Other
Crawlspace (Room 3)	320	0	0	62.5	*Aureobasidium pullalans* = 31.25 *Trichoderma koningii* = 6.25
Crawlspace (Stockroom)	90	11.1	0	0	*Engyodontium* sp. = 11.1% Sterile mycelia = 77.8
Drain - West Supply Closet	1700	0	58.8	41.2	0
Drain cover - West Supply Closet	30	0	33.3	66.7	0
Drain – By water boiler in West Supply Closet	190000	10.5	10.5	0	*Acremonium* sp. = 15.8 *Paecilomyces* sp. = 63.2
Drain - East Supply Closet	600	0	0	100	0
Toilet sink - Room 2	300	0	0	0	Exophiala sp. = 100

It was reported that there was a heavy rainfall the day before the odour was detected in the school. Since the crawlspace may have a different fungal community than the outdoor environment, it may generate an odour that would differ from the outdoor environment when the crawlspace becomes wet. As *Penicillium* sp. is what is most associate with bread fungi, it is possible that the odour of rotten food detected by those who arrived first at the school came from the *Penicillium* growth in the crawlspace when the crawlspace became wet or damp.

5. Recommendations

The crawlspace must be kept dry to prevent further odour complaints due to the crawlspace becoming wet. A long-term recommendation is to finish the crawlspace floor surface with concrete removing the potential for soil/sand from harvesting mould growth and preventing water penetration into the crawl space.

6. Reference

Macher, J. M. (1989). Positive-hole correction of multiple-jet impactors for collecting viable microorganisms. *American Industrial Hygiene Association Journal, 50*(11), 561-568.

Report Completed By

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Appendix A: Certificate of Calibration

MesaLabs

NVLAP

NVLAP Lab Code 200661-0
Calibration

As Shipped Calibration Data

Certificate No	296704	**Lab. Pressure**	738 mmHg
Technician	Sonia Otero	**Lab. Temperature**	22.6 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
25001 ccm	25066 ccm	-0.26%	1.00%	In Tolerance
5018.1 ccm	5015.6 ccm	0.05%	1.00%	In Tolerance
1512.4 ccm	1508.05 ccm	0.29%	1.00%	In Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML 500-44	113761	21-Feb-2019	21-Feb-2020

Calibration Notes

The expanded uncertainty of flow has a coverage factor of k = 2 for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number PR17-13 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

Technician Notes:

Mohammed Aziz
Director of Engineering
Mesa Laboratories, Inc., Butler, NJ

Mesa Laboratories Inc. 10 Park Place Butler, NJ 07405 USA
(973) 492-8400 FAX (973) 492-8270 www.mesalabs.com Symbol "MLAB" on the NAS

2 of 2

CAL02-49 Rev C05

Appendix B: Laboratory Result

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CustomerID: 55VAND29
CustomerPO: IAQ 2
ProjectID:

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Phone: (778) 879-8009
Fax:
Received: 10/04/19 12:15 PM
Analysis Date: 10/16/2019
Collected: 10/2/2019

Project: **IAQ 2**

Test Report: Viable Fungi Identification and Enumeration (Genus Level ID from Plate and Strip Impactors (EMSL Method MICRO-SOP-202))

Sample Description	Location	Volume (L)	Media	Incubation Temp (C)	Sensitivity (CFU/m³)	Fungal Identification	Colony Count	CFU/m³
M10	Supply Closet - Wesy	424.5	MEA	25	2	*Aureobasidium sp.*	2	4
551912069-0001						*Sterile(white)*	7	14
						Total	**9**	**18**
M11	Room 20	426.9	MEA	25	2	*Cladosporium sp.*	1	2
551912069-0002						*Penicillium sp.*	4	8
						Sterile(white)	5	10
						Total	**10**	**20**
M12	Outside - East entrance	283	MEA	25	4	*Botrytis sp.*	5	20
551912069-0003						*Cladosporium sp.*	1	4
Background						*Penicillium sp.*	8	32
						Sterile(white)	3	12
						Total	**17**	**68**
M13	Supply Closet - East	449.5	MEA	25	2	*Cladosporium sp.*	2	4
551912069-0004						*Paecilomyces sp.*	1	2
						Penicillium sp.	3	6
						Sterile(white)	5	10
						Total	**11**	**22**
M14	Crawlspace - Stockroom	305.2	MEA	25	3	*Aspergillus sp.*	1	3
551912069-0005						*Cladosporium sp.*	4	12
						Penicillium sp.	13	39
						Total	**18**	**54**
M15	Ceiling - Central	294.3	MEA	25	3	*Penicillium sp.*	4	12
551912069-0006						*Sterile(white)*	4	12
						Total	**8**	**24**

Analyst(s)
Sneha Panchal (9)

Sneha Panchal, M.Sc.,RMCCM Laboratory Manager
or other approved signatory

Positive hole correction factors have not been applied to the reported data. The detection limit is equal to 1 colony forming unit (CFU) per agar plate. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. When the information supplied by the customer can affect the validity of the result, it will be noted on the report.
Samples analyzed by EMSL Canada Inc. Mississauga, ON

Initial report from 10/17/2019 14:07:38

Test Report ViableFungi-7.26.0 Printed: 10/17/2019 2:07:25 PM 1

For information on the fungi listed in this report please visit the Resources section at www.emsl.com

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Collected:	10/2/2019

Project: **IAQ 2**

Test Report: Viable Fungi Identification and Enumeration
(Genus Level ID from Plate and Strip Impactors (EMSL Method MICRO-SOP-202))

Sample Description	Location	Volume (L)	Media	Incubation Temp (C)	Sensitivity (CFU/m³)	Fungal Identification	Colony Count	CFU/m³
M16	Outside - Main Entrance	267.4	MEA	25	4	*Alternaria sp.*	1	4
551912069-0007						*Arthrinium sp.*	3	12
Background						*Cladosporium sp.*	1	4
						Gliocladium sp.	3	12
						Total	**8**	**32**
M17	Ceiling - West	283.6	MEA	25	4	*Botrytis sp.*	2	8
551912069-0008						*Cladosporium sp.*	1	4
						Geotrichum sp.	3	12
						Penicillium sp.	4	16
						Total	**10**	**40**
M18	Blank		MEA	25		**None Detected**		
551912069-0009								
Blank								

Analyst(s)

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Analysis Date:	10/16/2019
Collected:	10/2/2019

Test Report: Identification and Enumeration of Culturable Fungi by Swab (Genus Level ID (EMSL Method MICRO-SOP-202))

Sample Description	Sample Location	Temp (C)	Sample Measure (Swab)	Analytical Sensitivity (CFU/Swab)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/Swab)	Percent of Total
C04	Drain cover and surface - supply closet west	25	1	10	10	*Cladosporium sp.*	1	10	33.3
				10	10	*Fusarium sp.*	2	20	66.7
551912069-0010	***Media:*** MEA					**Total**	**3**	**30**	
Customer Sample									
C05	Toilet sink - Room 2	25	1	100	100	*Exophiala sp.*	3	300	100.0
551912069-0011	***Media:*** MEA					**Total**	**3**	**300**	
Customer Sample									
C06	Interior of drain - supply closet east	25	1	100	100	*Fusarium sp.*	6	600	100.0
551912069-0012	***Media:*** MEA					**Total**	**6**	**600**	
Customer Sample									
C07	Soil - west crawlspace	25	1	10	10	*Engyodontium sp.*	1	10	11.1
				10	10	*Penicillium sp.*	1	10	11.1
551912069-0013	***Media:*** MEA			10	10	*Sterile(white)*	7	70	77.8
						Total	**9**	**90**	
Customer Sample									
C08	Interior of drain - supply closet west	25	1	100	100	*Cladosporium sp.*	10	1000	58.8
				100	100	*Fusarium sp.*	7	700	41.2
551912069-0014	***Media:*** MEA					**Total**	**17**	**1,700**	
Customer Sample									

Analyst(s)

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or other approved signatory

The detection limit is equal to 1 colony forming unit (CFU) per agar plate. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. When the information supplied by the customer can affect the validity of the result, it will be noted on the report.

Samples analyzed by EMSL Canada Inc. Mississauga, ON

Initial report from 10/17/2019 14:07:25

Test Report CultFung_7.35.9 Printed: 10/17/2019 2:07:25 PM 1

For information on the fungi lisited in this report please visit the Resources section at www.emsl.com

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Collected: 10/2/2019

Project: **IAQ 2**

Test Report: Identification and Enumeration of Culturable Fungi by Swab (Genus Level ID (EMSL Method MICRO-SOP-202))

Sample Description	Sample Location	Temp (C)	Sample Measure (Swab)	Analytical Sensitivity (CFU/Swab)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/Swab)	Percent of Total
C10	Interior of drain - next to water boiler	25	1	10,000	10000	*Acremonium sp.*	3	30,000	15.8
				10,000	10000	*Cladosporium sp.*	2	20,000	10.5
551912069-0015	**Media:** MEA			10,000	10000	*Paecilomyces sp.*	12	120,000	63.2
				10,000	10000	*Penicillium sp.*	2	20,000	10.5
						Total	**19**	**190,000**	

Customer Sample

No discernable blank was submitted with this group of samples

Analyst(s)

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or other approved signatory

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Received: 10/03/19 11:40 AM
Analysis Date: 10/16/2019
Collected:

Project: **SD83**

Test Report: Identification and Enumeration of Culturable Fungi by Swab (Including Speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys (EMSL Method MICRO-SOP-202))

Sample Description	Sample Location	Temp (C)	Sample Measure (Swab)	Analytical Sensitivity (CFU/Swab)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/Swab)	Percent of Total
SW2	Crawl Space Dirt	25	1	100	100	*Aureobasidium pullulans*	1	100	31.3
551911979-0001	**Media:** MEA			100	100	*Fusarium sp.*	2	200	62.5
				10	10	*Trichoderma koningii*	2	20	6.3
						Total	**5**	**320**	

No discernable blank was submitted with this group of samples

Analyst(s)

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1

Appendix C: Chain of Custody Form

OrderID: 551912069

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*): 551912069

PHONE:
FAX:

Company Name: VanDriel OHS Consulting		**EMSL-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments**	
Street:		*Third Party Billing requires written authorization from third party*	
City:	**State/Province:**	**Zip/Postal Code:**	**Country:**
Report To (Name): Robin Van Driel, Anna Rybczynski, Ivan Cheung		**Telephone #:**	
Email Address: robin@vohsgroup.com, anna@vohsgroup.com, ivan@vohsgroup.com		**Fax #:**	**Purchase Order:**
Project Name/Number: IAQ 2		**Please Provide Results:** ☐ Fax ☒ Email	

U.S. State Samples Taken: **Zip Code Sample Taken:** **Connecticut Samples:** ☐ Commercial ☐ Residential

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide. TATs are subject to methodology requirements*

Sterile, Sodium Thiosulfate Preserved Bottle Used: ☐ **Biocide Used in Source (specify):** ☐

Public Water Supply Samples: ☐ **Note: All results may automatically be reported to DOH if required by state.**

Turnaround Time (TAT) Options * - Please Check

☐ 3 Hour	☐ 6 Hour	☐ 24 Hour	☐ 48 Hour	☐ 72 Hour	☐ 96 Hour	☐ 1 Week	☒ 2 Week

Microbiology Test Codes

M001 Air-O-Cell
M030 Micro 5
M041 Fungal Direct Examination
M168 Pollen ID & Enumeration
M280 Dust Characterization Level-1
M281 Dust Characterization Level-2
M005 Viable Fungi- Air Samples (Genus ID & Count)
M006 Viable Fungi- Air Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M007 Culturable fungi - Surface Samples (Genus ID & Count)
M008 Culturable fungi - Surface Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M009 Bacteria Culture Gram Stain & Count
M010 Bacteria Count & ID - 3 Most Prominent
M011 Bacteria Count & ID - 5 Most Prominent
M012 Pseudomonas aeruginosa (P/A***)
M174 MoldSnap
M032 Allergenco-D
M024 Pseudomonas aeruginosa (MFT*)
M015 Heterotrophic Plate Count
M017 Total Coliform & E. coli (Colilert P/A***)
M018 Total Coliform & E. coli (MFT*)
M114 Total Coliform & E. coli Enumeration (Colilert MPN**)
M019 Fecal Coliform (MFT*)
M020 Fecal Streptococcus (MFT*)
M029 Enterococci (MFT*)
M129 Enterococci (Enterolert P/A***)
M180 Real Time qPCR-ERMI 36 Panel
M025 Sewage Screen –Water (MFT*)
M115 Sewage Screen - Water (P/A***)
M116 Sewage Screen - Water (MPN**)
M117 Sewage Screen - Swab (P/A***)
M013 Sewage Screen - Swab (MFT*)
M133 Methicillin-resistant Staph. aureus (MRSA)
M031 Rapid-growing non-TB Mycobacteria Detection & Enumeration
M014 Endotoxin Analysis
M044 Group Allergen (Cat, Dog, Cockroach, Dust Mite)
Other See Analytical Price Guide
Legionella Analysis Please use EMSL Legionella COC

*MFT= Membrane Filtration Technique
**MPN= Most Probable Number
***P/A= Presence/Absence

Name of Sampler: Ivan Cheung **Signature of Sampler:** [signature]

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (only for waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
Example A1	Kitchen Sink/Tap	Water	☒ P ☐ NP	M017	100 mL	9/1/13 4:00 PM	
M10	Supply Closet - West	Air	☐ P ☐ NP	M005	424.5 L	19/10/02	
M11	Room 20	Air	☐ P ☐ NP	M005	426.9 L	19/10/02	
M12	Outside - East entrance	Air	☐ P ☐ NP	M005	283 L	19/10/02	
M13	Supply Closet - East	Air	☐ P ☐ NP	M005	449.5 L	19/10/02	
M14	Crawlspace - Stockroom	Air	☐ P ☐ NP	M005	305.2 L	19/10/02	
M15	Ceiling - Central	Air	☐ P ☐ NP	M005	294.3 L	19/10/02	

Client Sample # (s): - **Total # of Samples:** 15 **Samples Received Chilled?** (Yes) / No

Relinquished (Client): Ivan Cheung **Date:** 2019/10/03 **Time:** 9:00 am

Received (Lab): Christian **Date:** 10/4/19 **Time:** 12:15pm

Comments/Special Instructions:

*6 hours for tape lifts and Air-o-cell samples. 2 weeks for agar plate samples and swab samples.

Page 1 of 2 pages

Controlled Document – COC-34 Microbiology R7 11/23/2016

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Page 1 Of 3

OrderID: 551912069

EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

Microbiology Chain of Custody

EMSL Order Number *(Lab Use Only)*:

PHONE:
FAX:

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
M16	Outside - Main Entrance	Air	☐P ☐NP	M005	267.4 L	19/10/02	
M17	Ceiling - West	Air	☐P ☐NP	M005	283.6 L	19/10/02	
M18	Blank	Air	☐P ☐NP	M005	N/A	19/10/02	
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
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			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
			☐P ☐NP				
C04	Drain cover and surface - supply closet west	Swab	☐P ☐NP	M007		19/10/02	
C05	Toilet sink - Room 2	Swab	☐P ☐NP	M007		19/10/02	
C06	Interior of drain - supply closet east	Swab	☐P ☐NP	M007		19/10/02	
C07	Soil - wet crawlspace	Swab	☐P ☐NP	M007		19/10/02	
C08	Interior of drain - supply closet west	Swab	☐P ☐NP	M007		19/10/02	
C10	interior of drain - next to water boiler	Swab	☐P ☐NP	M007		19/10/02	
			☐P ☐NP				
			☐P ☐NP				

Comments/Special Instructions:

Page 2 of 2 pages

Controlled Document – COC-34 Microbiology R7 11/23/2016

Page 2 Of 3

OrderID: 551912069

GEN-FM-10-1: Sample Transfer-One Time
Revision 4.2
Revision Date: 1/05/2016
Effective Date: 1/05/2016

EMSL Analytical, Inc.
Sample Transfer Form

Receiving Lab:	EMSL- Vancouver	**Phone Number:**	604-757-3158
		Fax Number:	
Relinquished to:	EMSL- Toronto	**Phone Number:**	289-997-462
		Fax Number:	
Does new lab hold equivalent or additional accreditation? *		☒ Yes ☐ No	
EMSL Customer ID # (if known):	55VAND29		
Client Name:	VANDRIEL OHS		
Client Project:	IAQ 2		
Tests to be Performed:	M005 + M007		
Date Received:	10/3/19		
Date Relinquished:	10/3/19		
Date Due:	2 WEEK TAT		
Special Instructions: (e.g. Work Order # , required qualifications, project specific procedures/modifications)	Transfer only		

Relinquished by (Signature):	**Date:** 10/3/19	**Received by (Signature):**	**Date:** 10/4/19
Relinquished by (Signature):	**Date:**	**Received by (Signature):**	**Date:**

Customer Agreement- Please sign form and send to the receiving laboratory. By signing below, you agree to permit the above named receiving lab to transfer samples to a separate EMSL lab with equivalent qualifications* for analysis. The final report will be issued from the analyzing laboratory. Ensure any requirements are listed in special instructions.

Name (please print):	**Signature:**	**Agent of:**	**Date:**
As per client			

If this is a recurring project or sample type that may require samples to be relinquished on a regular basis, a Standing Agreement form must be completed.

* Receiving and analyzing labs shall be aware of required qualifications of project prior to transfer of samples.
Note: If customer has been notified and approved this transfer verbally or by e-mail, the receiving lab must sign for the customer above. EMSL employee filling out form on behalf of customer shall print name of person to whom they spoke, date agreement was received, and then sign under Signature.

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Page 3 Of 3

Page 1 of 1

OrderID: 551911979

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Microbiology Chain of Custody

EMSL Order Number (*Lab Use Only*): 551911979

PHONE:
FAX:

Company Name: VOHS	**EMSL-Bill to:** ☒ Same ☐ Different If Bill to is Different note instructions in Comments**
Street:	*Third Party Billing requires written authorization from third party*
City: / **State/Province:**	**Zip/Postal Code:** / **Country:**
Report To (Name): Robin Van Driel, Ivan Cheung	**Telephone #:**
Email Address: robin@vohsgroup.com, ivan@vohsgroup.com	**Fax #:** / **Purchase Order:**
Project Name/Number: SD83	**Please Provide Results:** ☐ Fax ☒ Email

U.S. State Samples Taken: **Zip Code Sample Taken:** **Connecticut Samples:** ☐ Commercial ☐ Residential

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide. TATs are subject to methodology requirements*

Sterile, Sodium Thiosulfate Preserved Bottle Used: ☐ **Biocide Used in Source (specify):** ☐

Public Water Supply Samples: ☐ **Note: All results may automatically be reported to DOH if required by state.**

Turnaround Time (TAT) Options * - Please Check

☐ 3 Hour | ~~☒ 6 Hour~~ | ☐ 24 Hour | ☐ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☐ 1 Week | ☒ 2 Week

Microbiology Test Codes

M001 Air-O-Cell
M030 Micro 5
M041 Fungal Direct Examination
M168 Pollen ID & Enumeration
M280 Dust Characterization Level-1
M281 Dust Characterization Level-2
M005 Viable Fungi- Air Samples (Genus ID & Count)
M006 Viable Fungi- Air Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M007 Culturable fungi - Surface Samples (Genus ID & Count)
M008 Culturable fungi - Surface Samples (Includes *Penicillium, Aspergillus, Cladosporium, Stachybotrys* Species ID & Count)
M009 Bacteria Culture Gram Stain & Count
M010 Bacteria Count & ID - 3 Most Prominent
M011 Bacteria Count & ID - 5 Most Prominent
M012 Pseudomonas aeruginosa (P/A***)
M174 MoldSnap
M032 Allergenco-D
M024 Pseudomonas aeruginosa (MFT*)
M015 Heterotrophic Plate Count
M017 Total Coliform & E. coli (Colilert P/A***)
M018 Total Coliform & E. coli (MFT*)
M114 Total Coliform & E. coli Enumeration (Colilert MPN**)
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M020 Fecal Streptococcus (MFT*)
M029 Enterococci (MFT*)
M129 Enterococci (Enterolert P/A***)
M180 Real Time qPCR-ERMI 36 Panel
M025 Sewage Screen –Water (MFT*)
M115 Sewage Screen - Water (P/A***)
M116 Sewage Screen - Water (MPN**)
M117 Sewage Screen - Swab (P/A***)
M013 Sewage Screen - Swab (MFT*)
M133 Methicillin-resistant Staph. aureus (MRSA)
M031 Rapid-growing non-TB Mycobacteria Detection & Enumeration
M014 Endotoxin Analysis
M044 Group Allergen (Cat, Dog, Cockroach, Dust Mite)
Other See Analytical Price Guide
Legionella Analysis Please use EMSL Legionella COC

*MFT= Membrane Filtration Technique
**MPN= Most Probable Number
***P/A= Presence/Absence

Name of Sampler: Robin Van Driel **Signature of Sampler:** R.V.D.

Sample #	Sample Location/Description	Sample Type	Potable/ NonPotable (only for waters)	Test Code	Volume/ Area	Date/Time Collected	Temperature (°C) (Lab Use Only)
Example A1	Kitchen Sink/Tap	Water	☒ P ☐ NP	M017	100 mL	9/1/13 4:00 PM	
~~SW1~~	~~Crawl space dirt~~	~~swab~~	☐ P ☐ NP	~~M041~~		~~10.01~~	
SW2	Crawl space dirt	swab	☐ P ☐ NP	M008		10.01	
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				
			☐ P ☐ NP				

Client Sample # (s): - **Total # of Samples:** 2 **Samples Received Chilled? Yes / No**

Relinquished (Client): Robin Van Driel **Date:** oct 2 2019 **Time:** 11:00am

Received (Lab): YUKEES **Date:** 10/3/19 **Time:** 11:40AM

Comments/Special Instructions:

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Page 1 of 1 pages

Controlled Document – COC-34 Microbiology R7 11/23/2016

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Page 1 Of 2

OrderID: 551911979

GEN-FM-10-1: Sample Transfer-One Time
Revision 4.2
Revision Date: 1/05/2016
Effective Date: 1/05/2016

EMSL Analytical, Inc.
Sample Transfer Form

Receiving Lab:	EMSL- Vancouver	**Phone Number:**	604-757-3158
		Fax Number:	
Relinquished to:	EMSL- Toronto	**Phone Number:**	289-997-462
		Fax Number:	
Does new lab hold equivalent or additional accreditation? *		☒ Yes ☐ No	

EMSL Customer ID # (if known):	55VAND29
Client Name:	VANDRIEL OHS
Client Project:	SD83
Tests to be Performed:	M008
Date Received:	10/2/19
Date Relinquished:	10/2/19
Date Due:	2 WEEK TAT
Special Instructions: (e.g. Work Order # , required qualifications, project specific procedures/modifications)	Transfer only

Relinquished by (Signature):	**Date:** 10/2/19	**Received by (Signature):**	**Date:** 10/3/19
Relinquished by (Signature):	**Date:**	**Received by (Signature):**	**Date:** 11:40AM

Customer Agreement- Please sign form and send to the receiving laboratory. By signing below, you agree to permit the above named receiving lab to transfer samples to a separate EMSL lab with equivalent qualifications* for analysis. The final report will be issued from the analyzing laboratory. Ensure any requirements are listed in special instructions.

Name (please print):	**Signature:**	**Agent of:**	**Date:**
As per client			

If this is a recurring project or sample type that may require samples to be relinquished on a regular basis, a Standing Agreement form must be completed.

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Note: If customer has been notified and approved this transfer verbally or by e-mail, the receiving lab must sign for the customer above. EMSL employee filling out form on behalf of customer shall print name of person to whom they spoke, date agreement was received, and then sign under Signature.

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Page 2 Of 2

Page 1 of 1