RPF Environmental
TESTING & CONSULTING SERVICES
Hazardous Materials Inspection & Assessment
Asbestos, Mold, Lead Paint, Radon, PCBs
Air Quality Testing and Investigations
Industrial Hygiene, Safety & Training

June 4, 2019

Mr. John Robichaud
SAU 39, Amherst School District
Facilities Director
PO Box 849
1 School Street
Amherst, NH 03031-0849

Re: Indoor Air Quality Testing
Wilkins School, Amherst, NH
RPF File No. 199253

Dear Mr. Robichaud,

In accordance with our scope of work dated April 22, 2019, RPF Environmental, Inc. (RPF) completed indoor air quality (IAQ) testing at the Wilkins School located on Boston Post Road in Amherst, New Hampshire. As part of this preliminary survey, testing was completed for several common IAQ parameters and airborne fungal spores. The survey was completed by Dennis N. Francoeur Jr., CIH, CSP, CMI, an RPF Certified Microbial Investigator, on April 29, 2019.

The Wilkins School building has multiple ages of construction and wings. The portions of the building that were included as areas of focus for the survey included the wing with rooms 11 through 15, where staff has expressed concerns regarding poor IAQ. The library and gym were used as indoor control locations. No obvious sources for any negative IAQ components were identified. The building was occupied on the day of the survey. RPF understands the HVAC system for the wing in question was recently inspected and serviced.

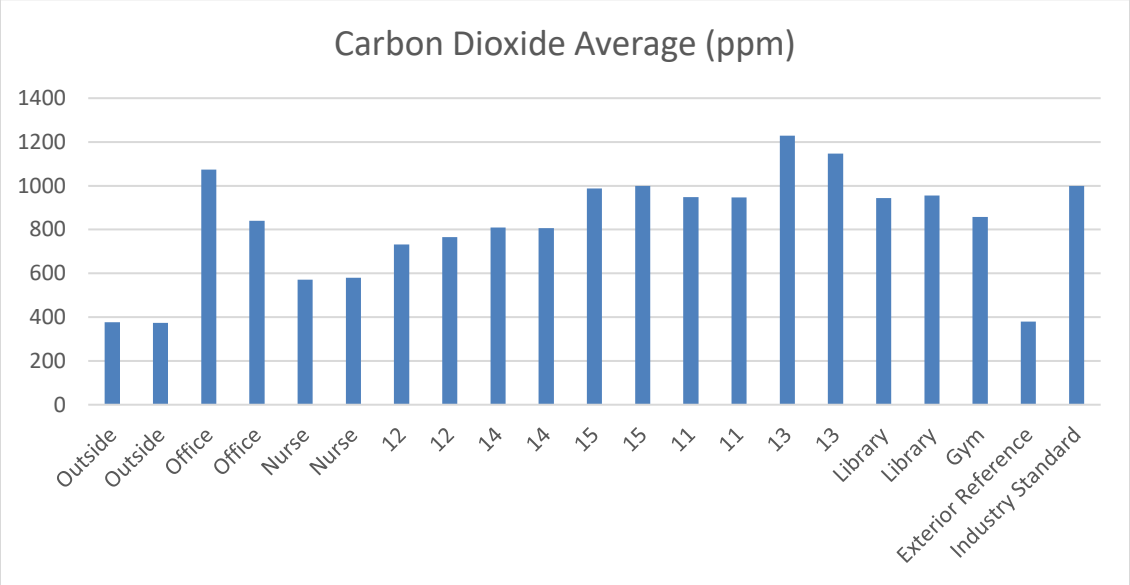
TEST RESULTS

Carbon Dioxide

Carbon Dioxide (CO_2) gas is found in the atmosphere as a normal constituent at background levels of approximately 350 to 450 parts per million (ppm). CO_2 is also a by-product of human respiration. Typically, in building spaces with inadequate amounts of fresh air introduced and circulated, CO_2 levels and other building and occupant generated air contaminants will accumulate and increase over the course of a day. It is likely that the CO_2 levels will increase in any building space while occupied and fresh outside air is not brought into the space. CO_2 is typically not a problem in and of itself in general indoor environments; however, it is used as an indicator of the adequacy of the fresh air ventilation. CO_2 levels, in general, can be used as an indicator of sufficient ventilation in a space.

The primary purpose of introducing fresh tempered outside air into buildings is to dilute the building of occupant generated air contaminants, which would improve the perceived IAQ and occupant comfort and productivity. Inadequate ventilation (and/or elevated temperatures) are frequently causes of complaints, such as respiratory, eye, nose and throat irritation, lethargy, and headaches.

The CO_2 results and testing locations are presented in Table 1 of Appendix A. CO_2 levels at all indoor locations tested were documented in the range of approximately 571 to 1,220 ppm, which is well below the Occupational Safety and Health Administration Permissible Exposure Limit (OSHA PEL) of 5,000 ppm. These concentration ranges are also within the generally accepted guideline limit of 800 to 1,000 ppm for acceptable IAQ for four rooms, however several rooms were just at or above the 1,000-ppm guideline.



The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) recommends a guideline in their Standard 62-2001 for Ventilation for Acceptable Indoor Air Quality for a maximum of 700 ppm CO_2 above outside air concentrations as a value under which employee complaints are minimized. On the day of this testing, the outdoor ambient concentration of CO_2 was recorded at 380 ppm with a corresponding value of 1.080 ppm**,** for a maximum CO_2 for perceived acceptable air quality. The ASHRAE standard also calls for a minimum of 20 cubic feet of outside air (FOA) per minute per occupant be introduced into office spaces, and 15 cfm per occupant of classrooms in order to maintain dilution of contaminants and perceived indoor air quality. The feasibility of adjusting the HVAC system to bring in more outside air while the classrooms that were at or above 1,000 ppm when occupied should be investigated.

According to the USEPA, pollutant or contaminant source control is usually the most effective way to improve indoor air quality. If source control efforts are not sufficient,

increasing the amount of outdoor air coming indoors may prove to be helpful.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless, and toxic gas, and is a by-product of incomplete combustion. Exposure to CO can produce immediate and acute health effects. Transient low levels of CO in building spaces can sometimes be attributed to vehicle exhaust, cigarette smoke, or other sources of combustion in the actual space or adjacent to the air handlers for the space. Minor transient meter readings may also be due to changes in temperature and humidity depending on the test equipment used.

Carbon monoxide concentrations at the tested locations were documented to be less than 1 ppm, which is below the OSHA PEL of 50 ppm. These results and testing locations are presented in Table 1 of Appendix A.

RPF recommends use of carbon monoxide monitors/alarms. Other than proper installation and maintenance of monitors/alarms and furnace heating systems, no action is recommended as it relates to CO.

Relative Humidity

The amount of water vapor that can be contained in the air varies by the temperature and pressure of the air. The ratio of water vapor in the air to the maximum amount of water vapor the air can hold at a given temperature is expressed as relative humidity (RH). The recommended RH comfort range is 35 to 55%. In general, for buildings, the presence of excessive moisture can lead to mold growth and other biological contaminants. Low RH, common for buildings in New England during colder months, may contribute to irritated mucous membranes, dry eyes and sinus discomfort. High relative humidity may cause discomfort, as it hinders the body's use of perspiration as a cooling mechanism.

RH levels at the indoor locations tested during this survey were in the range of 24 to 34% and is common in NH for this time of year. The results and testing locations are presented in Table 1 of Appendix A.

Temperature

Temperature will affect the occupant's perception of IAQ based on employee comfort levels, effect of drafts or airflow, and humidity levels in a building. In most cases, simple adjustments to thermostats and direction of airflow from registers can improve perceived IAQ. As a reference, the temperatures recommended by ASHRAE for general office space ranges from approximately 68° to 75° Fahrenheit in the winter, and from approximately 75° to 80° Fahrenheit in the summer. Temperature readings at all indoor locations tested were documented in the range of 68° to 71° Fahrenheit. The results and testing locations are presented in Table 1 of Appendix A.

Volatile Organic Compounds

Volatile Organic Compounds (VOCs) include a variety of chemicals that are emitted by a wide array of products used in building construction, maintenance and consumer materials. Just a few examples of materials that commonly have VOC off-gassing include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, carpets, upholstery, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, air fresheners, and photographic solutions. Exposure to VOCs may have short-term and long-term adverse health effects. Studies suggest that the irritant potency of these VOC mixtures can vary.

Using total VOC levels as practical overall standard are not complete and require further epidemiological research. Even so, total VOCs are emerging as a more direct approach of surveying indoor environments for contamination. Field experience also suggests the following guide for the use of PID test equipment (RAE Systems by Honeywell) such as used during this survey to assess indoor environments:

- <0.1 ppm isobutylene units: normal outdoor air
- 0.1 to 0.4 ppm isobutylene units: normal indoor air
- ≥0.5 ppm isobutylene units: indicates the potential of IAQ contaminants

As with other pollutants, the extent and nature of the health effects will depend on many factors, including level of exposure and length of time exposed. Among the immediate symptoms that some people have experienced soon after exposure to some organics include:

- Eye and respiratory tract irritation
- Headaches
- Dizziness
- Visual disorders and memory impairment

Based on past IAQ testing of similar settings, in general, total VOC readings of up to 1 ppm are not atypical for occupied buildings However, exposure to some specific compounds (such as formaldehyde) can result in health issues for some individuals, at even lower concentrations and levels exceeding 0.1 ppm. Therefore, the total VOC readings must be considered in that light. According to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), there is insufficient evidence that TVOC measurements can be used to predict health or comfort effects. In addition, odor and irritation responses to organic compounds are highly variable. If TVOC concerns arise or persist, further testing using specific VOC targeting or screens is available.

The scope of this survey includes a total VOCs screening, and not specific chemical testing for the makeup of the overall VOCs detected. During this testing, total VOCs were

measured at 0.32 ppm or less for all locations. The outside air was measured at 0.09 ppm. These results are summarized below and presented in Table 1 of Appendix A.

The US EPA recommends step be taken to minimize TVOCs in indoor air from product usage including the following:

- Increase ventilation when using products that emit VOCs. Meet or exceed any label precautions.
- Do not store opened containers of unused paints or similar materials.
- Try to substitute products with low-VOC emissions
- Make sure you provide plenty of fresh air when using these products.
- Throw away unused or little-used containers safely; buy in quantities that you will use soon.
- Keep them out of reach of children and pets.
- Never mix household care products unless directed on the label.

No further action is recommended at this time as it relates to VOC.

Particulate Matter (PM_{10})

Particulate matter (PM) is a complex mixture of solid and/or liquid particulates suspended in air. Exposure to inhalable particulates, especially those at 10 microns and smaller are a health concern. Concern of adverse effects to the heart and lungs is well established, especially in children, older adults, and those with existing heart or lung conditions. Outdoor concentrations of PM are of great concern to the EPA, but less is known about the health impacts of indoor PM. Some indoor sources of PM include cooking, combustion activities, some hobbies, outdoor sources introduced indoors, and biological sources.

Direct reading determinations for $PM_{10,}$ inhalable particles with diameters that are generally 10 micrometers and smaller, all indoor locations tested were in the range of approximately 7.4 to 95.2 micrograms per cubic meter of air ($\mu g/m^3$) and are not uncommon for occupied school buildings. The results at most of the interior locations tested were elevated above the values found outside, which was approximately 11.9 $\mu g/m^3$.

These results indicate that the HVAC filters are not reducing the overall particle loading inside the building when compared to the outside air. If additional testing performed later indicate that interior PM_{10} quantities continue to be elevated above the exterior quantities, the feasibility to use HVAC filters with a higher efficiency rating should be considered. The US EPA does have a National Ambient Air Quality Standard at 150 $\mu g/m^3$ which was not exceeded during the testing. The World Health Organization (WHO) has set a standard of 50 $\mu g/m^3$ as a 24-hour average and 25 $\mu g/m^3$ as an annual average exposure. These results and testing locations are presented in Table 1 of the Appendix A.

For a building that implements the use of an HVAC system, it is typical to see a 25% to 35% reduction in total particulates inside a building compared to the outside concentration of particulates while the HVAC units are operational. The feasibility of upgrading the HVAC systems' filter efficiency rating could be investigated if complaints were to increase at this building. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) has recommended filter minimum efficiency reporting value (MERV) of not less than six (6) for filters in HVAC systems supplying air to occupied office space (ASHRAE Standard 62.1-2004-5.9). Follow the manufacturer's recommendations for a filter change out schedule.

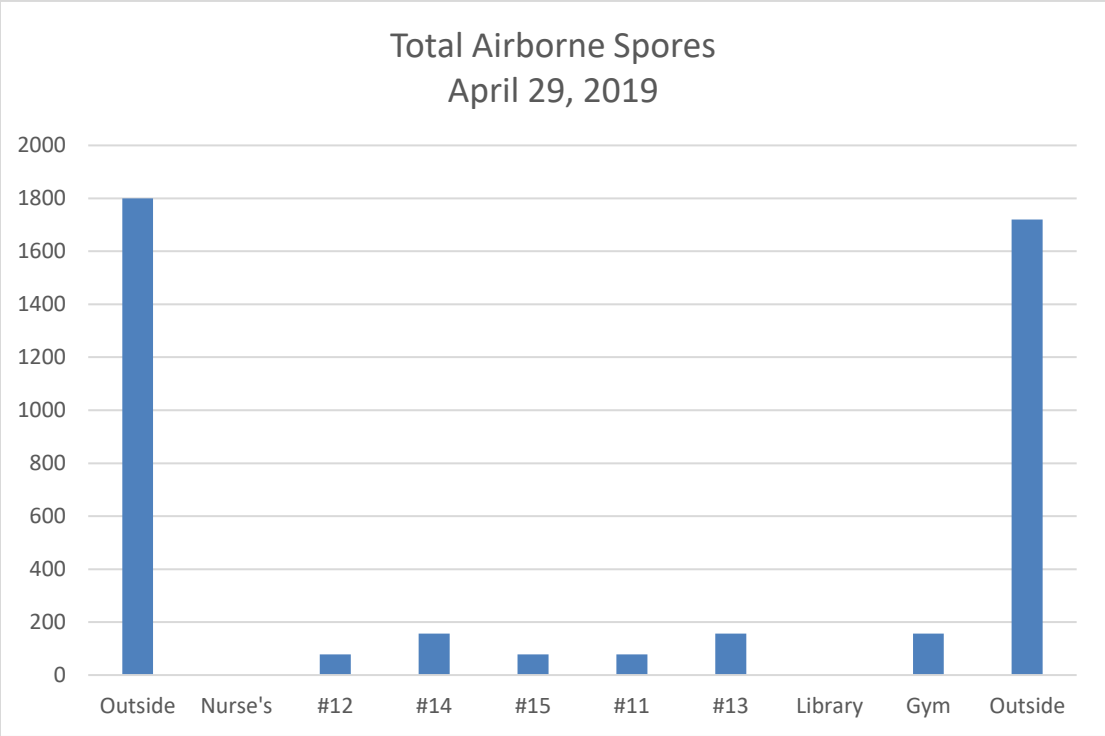
Visual Observations for Water Damage and Suspect Fungal Growth

For accessible areas, visual observations for overt signs of water damage and mold growth were completed by RPF during the survey. Water damaged porous building materials which have at any time been wet for 24 to 72 hours should be removed to prevent fungal growth. After addressing and eliminating the source of moisture, materials with water damage/fungal growth should be removed by a qualified professional. No areas of concern were noted during the survey.

Microscopic Screen and Fungal Identification-Airborne Fungal Spores

There are currently no regulatory methods or exposure limits for airborne spores or fungal metabolites for indoor air quality. General guidelines indicate that the indoor and outdoor concentrations should be similar for unaffected buildings. However, elevated concentrations of fungi and their various metabolic by-products can lead to allergic or sensitization reactions, toxic reactions to metabolites, and infections in susceptible populations of people. For those buildings with symptoms, inside airborne concentrations are typically elevated above the outdoor concentrations. In addition, the species documented inside and outside of the structure should be similar and the identification of species found in the indoor air sample(s) and not found in the outdoor air sample(s) would be indicative of the building as a likely source of contamination.

One area air sample each was collected from Room's 11, 12, 13, 14, 15, and Nurse's Office. Two area air samples were also collected outside as controls as well as the gym and library as unaffected areas. The requisite analytical field blank was also submitted, for a total of ten (10) area air samples. These results are presented in Appendix B.



Total airborne spores per cubic meter of air.

The concentration of total airborne fungal spores in each indoor sample was significantly less than the concentration of total airborne fungal spores in the outdoor control samples. The concentrations found in the affected classrooms were similar to the indoor control locations. The indoor samples' total spore concentrations were also well below 5,000 counts per meter cubed, which based upon sampling in similar conditions, indicates a low potential for indoor amplification of fungal growth.

Continual inspections for water damaged building materials and fungal growth are recommended as part of routine maintenance. RPF recommends removing water damaged building materials which, at any point, were wet for greater than 24 to 72 hours. RPF observed limited water damaged materials during the survey. For example, water damage ceiling panels were observed in the hallway outside Room 2317.

PRELIMINARY OBSERVATIONS AND COMMENTS

In addition to the findings and recommendations provided above, RPF opinions related to the IAQ within the areas of the facility tested based on the results and our observations are presented below.

- RPF recommends that building occupants document and track concerns of indoor air quality issues. Occupants should be encouraged to record perceived IAQ discomforts in an effort to track potential concerns and aid in diagnosing future problems. RPF also

recommends periodic inspection of areas in and around occupant concern areas throughout the year.

- Heating and HVAC systems should be inspected on an annual basis or more frequently as required by the manufacturer. RPF recommends maintaining a preventative maintenance and inspection program for the HVAC system including air filter change-out schedule on a quarterly basis and inspecting for the proper seating of air filters within the filter housing of each air handling unit in order to help eliminate potential air bypass of air filters.

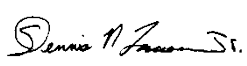
- Ongoing housekeeping and preventative maintenance of the space and building envelope should continue.

- Visible fungal growth, if identified in the future, should be removed by qualified personnel using appropriate methods in accordance with current industry standards and guidelines. Although no visible indicators of moisture intrusion were observed at the time of the RPF testing, all sources of water or moisture incursion onto building materials must be addressed, controlled and/or rectified or fungal growth will occur. Work plan development and post remediation verification by a third party industrial hygiene firm, independent from the remediation contractor is also recommended as standard of care. Regardless of the level of effort expended to remediate fungal growth, the potential for fungal growth to return exists if the building materials were to become wet again, or be subject to elevated humidity levels.

- Prior to any demolition or renovation of building materials, the areas of impact must be inspected for presence of asbestos by a qualified asbestos inspector pursuant to various state and federal regulation. AHERA records are often times not representative of all asbestos within or on the building. This inspection should also address other items that could be impacted by work resulting in contamination or health risks, including but not limited to lead paint, mercury containing products, and other common hazardous building materials.

If you have any questions or require additional information on any sample results or recommendations, please feel free to contact our office. Thank you for utilizing the services of RPF for this important project.

Sincerely,
RPF Environmental, Inc.



Dennis N. Francoeur Jr., CIH, CSP, CMI
Principal

Enclosures: Appendix A: Testing Results
Appendix B: General Fungal Descriptions
Appendix C: Limitations and Methodologies

199253 042919 Wilkins School IAQ Report

APPENDIX A

TABLE 1

SAU 39
Wilkins School

Preliminary IAQ Testing

Samples Collected: April 29, 2019

Location/ Room	Time	Carbon Dioxide (ppm)	Temp (ºF)	Relative Humidity (%)	VOC (ppm)	Carbon Monoxide (ppm)	PM 10 Dust (ug/m^3)	Occupants in Room	Windows Operable	Ventilation Supply & Exhaust
Outside Control	0938	376	46	25	0.08	<1	5.56	--	--	--
Front Office	0954	1,074	46	24	0.07	<1	70.2	Multiple	N	Y
Front Office	0955	840	70	34	0.06	<1	100	Multiple	N	Y
Nurse's Office	0956	571	68	25	0.02	<1	7.4	2	Y	Y
Nurse's Office	0958	580	68	25	0.02	<1	15.7	2	Y	Y
Room 12	1005	732	69	26	0.04	<1	35.1	5	N	Y and fan
Room 12	1008	765	69	26	0.04	<1	39.8	5	N	Y and fan
Room 14	1013	809	70	27	0.03	<1	63.1	Multiple	Y	Y
Room 14	1015	806	70	27	0.03	<1	95.2	Multiple	Y	Y
Room 15	1020	998	70	28	0.04	<1	41.6	Multiple	Y	Y
Room 15	1022	999	70	28	0.04	<1	31.4	Multiple	Y	Y
Room 11	1030	948	71	26	0.03	<1	83.2	Multiple	Y	Y
Room 11	1032	1,067	71	26	0.03	<1	61.0	Multiple	Y	Y

TABLE 1
(continued)

Location/ Room	Time	Carbon Dioxide (ppm)	Temp (ºF)	Relative Humidity (%)	VOC (ppm)	Carbon Monoxide (ppm)	PM 10 Dust (ug/m^3)	Occupants in Room	Windows Operable	Ventilation Supply & Exhaust
Room 13	1040	1,220	72	25	0.32	<1	66.5	Yes	Y	Y
Room 13	1042	1,147	72	24	0.28	<1	66.2	Yes	Y	Y
Library	1048	944	72	25	0.08	<1	42.5	Yes	Y	Y
Library	1052	955	72	25	0.07	<1	21.2	Yes	Y	Y
Gym	1057	858	72	24	0.04	<1	36.0	Yes	N	Y
Outside	1106	380	51	13	0.09	<1	11.9	--	--	--
NH State Office Limit (ENV A 2200)	--	1,000	--	--	--	5	--	--	--	--
ACGIH TLV	--	5,000	--	--	--	25	--	--	--	--
OSHA PEL	--	5,000	--	--	--	50	--	--	--	--
ASHRAE recommended	--	1,080	--	35-55	--	2.5	--	--	--	--
EPA Reference Level Indicator	--	1,000	--	--	--	--	--	--	--	--

Notes: -ppm – parts per million in air, - ppb – parts per billion in air
-pt/cc-approximate particle count per cubic centimeter of air.
-OSHA PEL – Occupational Safety and Health Administration Permissible Exposure Limit for eight-hour time weighted average (8hr-TWA).
-ACGIH TLV – American Conference of Governmental Industrial Hygienist Threshold Limit Value for eight-hour time weighted average (8hr-TWA.
-ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers, 62-2001 standard.
-EPA – Environmental Protection Agency.
-Gray Wolf IAQ monitor has a sensitivity of +/- 1 ppm for carbon monoxide and +/- 0.01 ppm for volatile organic compounds. Results of less than 1 ppm carbon monoxide or 0.01 ppm volatile organic compounds can be considered "non-detect" or zero.
-Gray Wolf Dust meter senses particles of less than 10 microns diameter.
-VS – ventilation supply. VE – ventilation exhaust.
Please refer to the full text of the report for additional information and limitations on the results presented above.

Direct Exam: Spore Trap Analysis

SAI Method B-SOP-003

Client: RPF Environmental Inc.
320 1st NH Turnpike
Northwood, NH 03261

Attn: Dennis Francoeur

Project: 9253 - SA039

Lab Order ID: 71911507
Analysis ID: 71911507_STA
Date Received: 04/30/2019
Date Reported: 05/03/2019

Sample ID	042919-A01			042919-A02			042919-A03			**EXTERIOR**		
Lab Sample ID	71911507_STA_001			71911507_STA_002			71911507_STA_003			**AVERAGE**		
Description	Outside Control			Nurses Office			#12			**N/A**		
Lab Notes										**N/A**		
Volume(L)	75			75			75			**N/A**		
Analytical Sensitivity (counts/m³)	78			78			78			**N/A**		
IDENTIFICATION	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**
Alternaria												
Ascospores	18	1410	78.3%				1	78.0	100.%	18	1450	81.8%
Aspergillus/ Penicillium-like												
Basidiospores	5	392	21.7%							4	314	18.2%
Cladosporium												
				No Spores Detected								
TOTAL	**23**	**1800**	**100.%**	**<1**	**<78.4**	**N/A**	**1**	**78.0**	**100.%**	**22**	**1760**	**100.%**
Non-Cellulosic Fibers	-	-	-	-	-	-	-	-	-	-	-	-
Hyphal Fragments	-	-	-	-	-	-	-	-	-	-	-	-
Insect Parts	-	-	-	-	-	-	-	-	-	-	-	-
Pollen	1	78.0	-	-	-	-	-	-	-	0	39.0	-
Skin Cell % of Total Debris		**0-20%**			**80-100%**			**60-80%**			**N/A**	
Total Debris in Background		**0-20%**			**20-40%**			**40-60%**			**N/A**	

Disclaimer: This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. Unless otherwise noted blank sample correction was not performed on analytical results. Scientific Analytical Institute participates in the AIHA EMPAT program for fungi. EMPAT Laboratory ID: 173190. Reporting Limit equals Analytical Sensitivity.

Palmer Hines (10)

Analyst

Approved Signatory

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Client: RPF Environmental Inc.
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Attn: Dennis Francoeur

Project: 9253 - SA039

Lab Order ID: 71911507
Analysis ID: 71911507_STA
Date Received: 04/30/2019
Date Reported: 05/03/2019

Sample ID	042919-A04			042919-A05			042919-A06			**EXTERIOR**		
Lab Sample ID	71911507_STA_004			71911507_STA_005			71911507_STA_006			**AVERAGE**		
Description	#14			#15			#11			**N/A**		
Lab Notes										**N/A**		
Volume(L)	75			75			75			**N/A**		
Analytical Sensitivity (counts/m³)	78			78			78			**N/A**		
IDENTIFICATION	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**
Alternaria							1	78.0	100.%			
Ascospores	1	78.0	50.0%							18	1450	81.8%
Aspergillus/ Penicillium-like												
Basidiospores	1	78.0	50.0%							4	314	18.2%
Cladosporium				1	78.0	100.%						
TOTAL	**2**	**156**	**100.%**	**1**	**78.0**	**100.%**	**1**	**78.0**	**100.%**	**22**	**1760**	**100.%**
Non-Cellulosic Fibers	-	-	-	-	-	-	-	-	-	-	-	-
Hyphal Fragments	-	-	-	-	-	-	-	-	-	-	-	-
Insect Parts	-	-	-	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-	0	39.0	-
Skin Cell % of Total Debris	**80-100%**			**80-100%**			**60-80%**			**N/A**		
Total Debris in Background	**60-80%**			**40-60%**			**60-80%**			**N/A**		

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Analysis ID: 71911507_STA
Date Received: 04/30/2019
Date Reported: 05/03/2019

Sample ID	042919-A07			042919-A08			042919-A09			**EXTERIOR**		
Lab Sample ID	71911507_STA_007			71911507_STA_008			71911507_STA_009			**AVERAGE**		
Description	#13			Library			Gym			**N/A**		
Lab Notes										**N/A**		
Volume(L)	75			75			75			**N/A**		
Analytical Sensitivity (counts/m³)	78			78			78			**N/A**		
IDENTIFICATION	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**
Alternaria												
Ascospores	1	78.0	50.0%							18	1450	81.8%
Aspergillus/ Penicillium-like							2	157	100.%			
Basidiospores										4	314	18.2%
Cladosporium	1	78.0	50.0%									
				No Spores Detected								
TOTAL	**2**	**156**	**100.%**	**<1**	**<78.4**	**N/A**	**2**	**157**	**100.%**	**22**	**1760**	**100.%**
Non-Cellulosic Fibers	-	-	-	-	-	-	-	-	-	-	-	-
Hyphal Fragments	-	-	-	-	-	-	1	78.0	-	-	-	-
Insect Parts	-	-	-	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-	0	39.0	-
Skin Cell % of Total Debris	**80-100%**			**80-100%**			**80-100%**			**N/A**		
Total Debris in Background	**80-100%**			**40-60%**			**40-60%**			**N/A**		

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Lab Order ID: 71911507
Analysis ID: 71911507_STA
Date Received: 04/30/2019
Date Reported: 05/03/2019

Sample ID	042919-A10			**EXTERIOR**		
Lab Sample ID	71911507_STA_010			**AVERAGE**		
Description	Outside Control			**N/A**		
Lab Notes				**N/A**		
Volume(L)	75			**N/A**		
Analytical Sensitivity (counts/m³)	78			**N/A**		
IDENTIFICATION	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**	**Raw Count**	**Concentration (counts/m³)**	**% Of Total**
Alternaria						
Ascospores	19	1490	86.4%	18	1450	81.8%
Aspergillus/ Penicillium-like						
Basidiospores	3	235	13.6%	4	314	18.2%
Cladosporium						
TOTAL	**22**	**1720**	**100.%**	**22**	**1760**	**100.%**
Non-Cellulosic Fibers	-	-	-	-	-	-
Hyphal Fragments	-	-	-	-	-	-
Insect Parts	-	-	-	-	-	-
Pollen	-	-	-	0	39.0	-
Skin Cell % of Total Debris		**0-20%**			**N/A**	
Total Debris in Background		**0-20%**			**N/A**	

Palmer Hines (10)

Analyst

Approved Signatory

APPENDIX B

Regulatory standards for the testing for and exposure limits for airborne mold, and fungal spores have not been established. The presence of fungi and mold is common in many environments with over 1,000 fairly common species of mold, many we are routinely in contact with are not hazardous under normal conditions.

Alternaria

Alternaria is a large and widespread genus, the conidia of which are easily carried by the wind, with peak concentrations in the summer and early fall. *Alternaria* is commonly found in house dust, carpets, textiles, on horizontal surfaces in building interiors, and window frames. It is one of the main fungal causes of allergy, being a common type I & III allergen. Outdoors, it may be isolated from samples of soil, seeds and plants, and is frequently reported in air. The large spore size suggests that this fungus will deposit in the nose, mouth and upper respiratory tract causing nasal septum infections. It has also been associated with hypersensitivity pneumonitis. It is a common cause of extrinsic asthma. Acute symptoms include edema and bronchiospasms; chronic cases may develop pulmonary emphysema. Baker's asthma is associated with inhalation of *Alternaria* conidia present in flour. Other diseases caused by *Alternaria* include: Farmer's lung, mycotic keratitis, skin infections, and osteomyelitis. Also, the species *A. alternata* is capable of producing tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Several species are pathogenic to plants and contribute to the spoilage of agricultural products. *Alternaria* has been isolated from substrates such as sewage, leather, stone monuments, optical instruments, cosmetics, computer disks, and jet fuel

Ascospore

Ascospores are a general category of spores that have been produced by means of sexual reproduction (in a sack-like structure called an ascus). These are ubiquitous saprobes and plant pathogens, many of which are easily identifiable (i.e. *Chaetomium*). This group contains potential opportunistic pathogens, toxin producers, and allergens depending on the genus and species. A rupture in the top portion of the ascus disperses the spores during rain or in times of high humidity. Some asexual fungi, such as *Aspergillus* and *Penicillium* can become sexual under specific conditions, these are then considered ascomycetes and are given distinct names. The presence of these sports normally is associated with indoor air infiltration.

***Aspergillus/Penicillium* –like**

Aspergillus and *Penicillium* spores are indistinguishable via direct microscopic examination. *Aspergillus* tends to colonize continuously damp materials such as damp wallboard and fabrics. *Penicillium* is commonly found in house dust, on water-damaged wallpaper, behind paint and in decaying fabrics.

Aspergillus sp.

Aspergillus is a common type I & III allergen. They are frequently isolated from forest products, soils, grains, nuts, cotton, organic debris, and water damaged building materials. Spores can also be found in moist ventilation systems and house dust. There are more than 160 different species of *Aspergillus*, sixteen of which have been documented as etiological agents of human disease but rarely occur in individuals with normally functioning immune systems. However, due to the substantial increase in populations of individuals with HIV, chemotherapy patients and those on corticosteroid treatment, contamination of building substrates with fungi, particularly *Aspergillus* is of concern. Aspergillosis is now the second most common fungal infection requiring hospitalization in the United States. Many *Aspergillus* species produce mycotoxins that may be

associated with diseases in humans and other animals. Toxin production is dependent on the species or strain within the species and on the food source for the fungus. Some of these toxins are carcinogenic including aflatoxins and ochratoxin. *Aspergillus* is a common cause of extrinsic asthma with symptoms including edema and bronchiospasms, and chronic cases may develop pulmonary emphysema. These fungi are frequently secondary opportunistic pathogens in patients with bronchiectasis, carcinoma, other mycosis, sarcoid, and tuberculosis. Some species can also cause onychomycosis (infection of the nail).

Basidiospore

Basidiospores are a general category of sexual spores that have been released from the basidium of a fungus. A ubiquitous type I & III allergen, saprobe and plant pathogen, mainly found in gardens, forests, and woodlands. Spores disseminate during rain or in times of high humidity. Rarely opportunistic pathogens, Basidiospores may produce toxins, including amanitins, monomethyl-hydrazine, muscarine, ibotenic acid, and psilocybin. Basidiospores are an agent of dry wood rot, which may destroy the structure wood of buildings.

Cladosporium

Cladosporium is widely distributed in air and rotten organic material. *C. herbarum* is the most frequently found species in outdoor air in temperate climates. It is often found indoors, usually in lesser numbers than outdoors. The dry conidia become easily airborne and are transported over long distances. This fungus is often encountered in dirty refrigerators, especially in reservoirs where condensation is collected. It can easily be seen on moist window frames covering the whole painted area with a velvety olive-green layer. *Cladosporium* often discolors interior paint, paper, or textiles stored under humid conditions. Houses with poor ventilation, houses with thatched straw roofs and houses situated in damp environments may have heavy concentrations of *Cladosporium*, which will be easily expressed when domestic mold is analyzed. It is commonly found on the surface of fiberglass duct liner in the interior of supply ducts. It is also found naturally on dead & woody plants, food, straw, soils, paint, and textiles. The ability to sporulate heavily, ease of dispersal, and buoyant spores makes this fungus the most important fungal airway allergen; and together with *Alternaria*, it commonly causes asthma and hay fever in the Western hemisphere. More than 500 species have been identified. A few species of this genus cause disease, which range from phaeohyphomycosis, a group of mycotic infections characterized by the presence of dematacеous septate hyphae. Infections of the eyes and skin by black fungi (also classified as phaeohyphomycosis), and chromoblastomycosis, chronic localized infection of the skin and subcutaneous tissue that follows the traumatic implantation of the etiologic agent are also caused by this fungus. Chromoblastomycosis lesions are verrucoid, ulcerated, and crusted. Skin abscesses, mycotic keratitis and pulmonary fungus ball have been recorded in immunocompromised patients. It may also cause corneal infections and mycetoma, characterized by localized infections that involve cutaneous and subcutaneous tissue, fascia, and bone consisting of abscesses, granulomata, and draining sinuses, usually in immunocompromised hosts. *Cladosporium* produces the toxins cladosporin and emodin, but neither of these is very toxic. Fungal colonies are powdery or velvety olive-green to olive-brown.

Penicillium sp.

Penicillium sp. - A wide number of organisms belong to this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose, paint, grains, and compost piles. It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Although this fungus is less allergy-provoking than the other molds, Penicillium is

reported to be allergenic (skin) and it may cause hypersensitivity pneumonitis and allergic alveolitis in susceptible individuals. It can cause other infections such as keratitis, penicilliosis, and otomycosis. Some species can produce mycotoxins including 1). Ochratoxin which is damaging to the kidneys and liver and is also a suspected carcinogen; there is also evidence that impairs the immune system. 2). Citrinin that can cause renal damage, vasodilatation, and bronchial constriction. 3). Gliotoxin which is an immunosuppressive toxin, and 4). Patulin that is believed to cause hemorrhaging in the brain and lungs and is usually associated with apple and grape spoilage. It can also cause extrinsic asthma. P. camemberti has been responsible for inducing occupational allergies among those who work with soft white cheeses on which the fungus grows. P. chrysogenum has been found on building materials, including paints, chip boards, and wallpaper.

Unidentifiable Spores

Unidentifiable spores are not classified as any of the recognized spores. They have a definite edge making it look "spore-like". Some commonly seen unidentifiable spores are spores that resemble an octopus with a large body and tentacle-like arms radiating from one side of the spore or a brown to black spore that resembles a four-leaf clover. Generally these spores can be cultured for definitive identification.

Information Source: Aerotech Laboratories Inc., 1501 W. Knudsen Drive, Phoenix, AZ, 85027; Microbial Fungi Glossary; www.aerotechlabs.com and EMSL Analytical, 107 Haddon Avenue, Westmont, NJ 08108; Fungi Summary; www.emsl.com

APPENDIX C

LIMITATIONS

1. The observations and conclusions presented in the Report were based solely upon the services described herein, and not on scientific tasks or procedures beyond the RPF Environmental, Inc. Scope of Work (SOW) as discussed in the proposal and/or agreement. The conclusions and recommendations are based on visual observations and testing, limited as indicated in the Report, and were arrived at in accordance with generally accepted standards of industrial hygiene practice and asbestos professionals. The nature of this survey or monitoring service was limited as indicated herein and in the report or letter of findings. Further testing, survey, and analysis is required to provide more definitive results and findings.

2. For site survey work, observations were made of the designated accessible areas of the site as indicated in the Report. While it was the intent of RPF to conduct a survey to the degree indicated, it is important to note that not all suspect ACBM material in the designated areas were specifically assessed and visibility was limited, as indicated, due to the presence of furnishings, equipment, solid walls and solid or suspended ceilings throughout the facility and/or other site conditions. Asbestos or hazardous material may have been used and may be present in areas where detection and assessment is difficult until renovation and/or demolition proceeds. Access and observations relating to electrical and mechanical systems within the building were restricted or not feasible to prevent damage to the systems and minimize safety hazards to the survey team.

3. Although assumptions may have been stated regarding the potential presence of inaccessible or concealed asbestos and other hazardous material, full inspection findings for all asbestos and other hazardous material requires the use of full destructive survey methods to identify possible inaccessible suspect material and this level of survey was not included in the SOW for this project. For preliminary survey work, sampling and analysis as applicable was limited and a full survey throughout the site was not performed. Only the specific areas and /or materials indicated in the report were included in the SOW. This inspection did not include a full hazard assessment survey, full testing or bulk material, or testing to determine current dust concentrations of asbestos in and around the building. Inspection results should not be used for compliance with current EPA and State asbestos in renovation/demolition requirements unless specifically stated as intended for this use in the RPF report and considering the limitations as stated therein and within this limitations document.

4. Where access to portions of the surveyed area was unavailable or limited, RPF renders no opinion of the condition and assessment of these areas. The survey results only apply to areas specifically accessed by RPF during the survey. Interiors of mechanical equipment and other building or process equipment may also have asbestos and other hazardous material present and were not included in this inspection. For renovation and demolition work, further inspection by qualified personnel will be required during the course of construction activity to identify suspect material not previously documented at the site or in this survey report. Bordering properties were not investigated and comprehensive file review and research was not performed.

5. For lead in paint, observations were made of the designated accessible areas of the site as indicated in the Report. Limited testing may have been performed to the extent indicated in the text of the report. In order to conduct thorough hazard assessments for lead exposures, representative surface dust testing, air monitoring and other related testing throughout the building, should be completed. This type of in depth testing and analysis was beyond the scope of services for the initial inspection. For lead surveys with XRF readings, it is recommended that surfaces found to have LBP or trace amount of lead detected with readings of less than 4 mg/cm^2 be confirmed using laboratory analysis if more definitive results are required. Substrate corrections involving destructive sampling or damage to existing surfaces (to minimize XRF read-through) were not completed. In some instances, destructive testing may be required for more accurate results. In addition, depending on the specific thickness of the paint films on different areas of a building component, differing amounts of wear, and other factors, XRF readings can vary slightly, even on the same building component. Unless otherwise specifically stated in the scope of services and final report, lead testing performed is not intended to comply with other state and federal regulations pertaining to childhood lead poisoning regulations.

6. Air testing is to be considered a "snap shot" of conditions present on the day of the survey with the understanding that conditions may differ at other times or dates or operational conditions for the facility. Results are also limited based on the specific analytical methods utilized. For phase contrast microscopy (PCM) total airborne fiber testing, more sensitive asbestos-specific analysis using transmission electron microscopy (TEM) can be performed upon request.

7. For asbestos bulk and dust testing, although polarize light microscopy (PLM) is the method currently recognized in State and federal regulations for asbestos identification in bulk samples, some industry studies have found that PLM may not be sensitive enough to detect all of the asbestos fibers in certain nonfriable material, vermiculate type insulation, soils, surface dust, and other materials requiring more sensitive analysis to identify possible asbestos fibers. In the event that more definitive results are requested, RPF recommends that confirmation testing be completed using TEM methods or other analytical methods as may be applicable to the material. Detection of possible asbestos fibers may be made more difficult by the presence of other non-asbestos fibrous components such as cellulose, fiber glass, etc., by binder/matrix materials which may mask or obscure fibrous components, and/or by exposure to conditions capable of altering or transforming asbestos. PLM can show significant bias leading to false negatives and false positives for certain types of materials. PLM is limited by the visibility of the asbestos fibers. In some samples the fibers may be reduced to a diameter so small or masked by coatings to such an extent that they cannot be reliably observed or identified using PLM.

8. For hazardous building material inspection or survey work, RPF followed applicable industry standards; however, RPF does not warrant or certify that all asbestos or other hazardous materials in or on the building has been identified and included in this report. Various assumptions and limitations of the methods can result in missed materials or misidentification of materials due to several factors including but not limited to: inaccessible space due to physical or safety constraints, space that is difficult to reach to fully inspect, assumptions regarding the determination of homogenous groups of suspect material, assumptions regarding attempts to conduct representative sampling, and potential for varying mixtures and layers of material sampled not being representative of all areas of similar material.

9. Full assessments often requires multiple rounds of sampling over a period of time for air, bulk material, surface dust and water. Such comprehensive testing was beyond the scope of RPF services. In addition clearance testing for abatement, as applicable, was based on the visual observations and limited ambient area air testing as indicated in the report and in accordance with applicable state and federal regulations. The potential exists that microscopic surface dust remains with contaminant present even in the event that the clearance testing meets the state and federal requirements. Likewise for building surveys, visual observations are not sufficient alone to detect possible contaminant in settled dust. Unless otherwise specifically indicated in the report, surface dust testing was not included in the scope of the RPF services.

10. For abatement or remediation monitoring services: RPF is not responsible for observations and test for specific periods of work that RPF did not perform full shift monitoring of construction, abatement or remediation activity. In the event that problems occurred or concerns arouse regarding contamination, safety or health hazards during periods RPF was not onsite, RPF is not responsible to provide documentation or assurances regarding conditions, safety, air testing results and other compliance issues. RPF may have provided recommendations to the Client, as needed, pertaining to the Client's Contractor compliance with the technical specifications, schedules, and other project related issues as agreed and based on results of RPF monitoring work. However, actual enforcement, or waiving of, contract provisions and requirements as well as regulatory liabilities shall be the responsibility of Client and Client's Contractor(s). Off-site abatement activities, such as waste transportation and disposal, were not monitored or inspected by RPF.

11. For services limited to clearance testing following abatement or remediation work by other parties: The testing was limited to clearance testing only and as indicated in the report and a site assessment for possible environmental health and safety hazards was not performed as part of the scope of this testing. Client, or Client's abatement contractor as applicable, was responsible for performing visual inspections

of the work area to determine completeness of work prior to air clearance testing by RPF.

12. For site work, including but not limited to air clearance testing services, in which RPF did not provide full site safety and health oversight, abatement design, full shift monitoring of all site activity, RPF expresses no warranties, guarantees or certifications of the abatement work conducted by the Client or other employers at the job site(s), conditions during the work, or regulatory compliance, with the exception of the specific airborne concentrations as indicated by the air clearance test performed by RPF during the conditions present for the clearance testing. Unless otherwise specifically noted in the RPF Report, visual inspections and air clearance testing results apply only to the specific work area and conditions present during the testing. RPF did not perform visual inspections of surfaces not accessible in the work area due to the presence of containment barriers or other obstructions. In these instances, some contamination may be present following RPF clearance testing and such contamination may be exposed during and after removal of the containment barriers or other obstructions following RPF testing services. Client or Client's Contractor is responsible for using appropriate care and inspection to identify potential hazards and to remediate such hazards as necessary to ensure compliance and a safe environment.

13. The survey was limited to the material and/or areas as specifically designated in the report and a site assessment for other possible environmental health and safety hazards or subsurface pollution was not performed as part of the scope of this site inspection. Typically, hazardous building materials such as asbestos, lead paint, PCBs, mercury, refrigerants, hydraulic fluids and other hazardous product and materials may be present in buildings. The survey performed by RPF only addresses the specific items as indicated in the Report.

14. For mold and moisture survey services, RPF services did not include design or remediation of moisture intrusion. Some level of mold will remain at the site regardless of RPF testing and Contractor or Client cleaning efforts. RPF testing associated with mold remediation and assessments is limited and may or may not be representative of other surfaces and locations at the site. Mold growth will occur if moisture intrusion deficiencies have not been fully remedied and if the site or work areas are not maintained in a sufficiently dry state. Porous surfaces in mold contaminated areas which are not removed and disposed of will likely result in future spore release, allergen sources, or mold contamination.

15. Existing reports, drawings, and analytical results provided by the Client to RPF, as applicable, were not verified and, as such, RPF has relied upon the data provided as indicated, and has not conducted an independent evaluation of the reliability of these data.

16. Where sample analyses were conducted by an outside laboratory, RPF has relied upon the data provided, and has not conducted an independent evaluation of the reliability of this data.

17. All hazard communication and notification requirements, as required by U.S. OSHA regulation 29 CFR Part 1926, 29 CFR Part 1910, and other applicable rules and regulations, by and between the Client, general contractors, subcontractors, building occupants, employees and other affected persons were the responsibility of the Client and are not part of the RPF SOW.

18. The applicability of the observations and recommendations presented in this report to other portions of the site was not determined. Many accidents, injuries and exposures and environmental conditions are a result of individual employee/employer actions and behaviors, which will vary from day to day, and with operations being conducted. Changes to the site and work conditions that occur subsequent to the RPF inspection may result in conditions which differ from those present during the survey and presented in the findings of the report.

METHODOLOGY

The results of the air quality testing are representative of the conditions present on the day of the testing and should be considered a snap shot of conditions within the facility. Additional rounds of testing may be required to obtain a statistically valid set of data representative of a variety of conditions which may be present within the facility.

Each of the methods used is discussed separately below.

Carbon Dioxide, Carbon Monoxide, Relative Humidity, Temperature, Dew Point, and Volatile Organic Compounds

Direct reading determinations for carbon dioxide (CO_2), carbon monoxide (CO), relative humidity (RH), temperature (T), dew point, and total volatile organic compounds (VOCs) were completed using a Greywolf Indoor Air Quality Monitor. The Greywolf was calibrated for CO_2 and CO with a span gas of known concentration prior to the start of the testing program.

Airborne Particulates

Direct reading determinations for airborne particulates at the size range of 10 microns and lower were measured using a Greywolf Handheld 3016-IAQ Airborne Particulate Meter. Ten second samples were collected at each sampling location.

Microscopic Screen and Fungal Identification-Airborne Fungal Spores and Particulates

Sampling for airborne fungal spores and particulates was completed using a hi-volume air-sampling pump calibrated at a rate of approximately 15 liters of air per minute (lpm) using Zefon Air-O-Cell spore trap cassettes. All samples were collected at approximately three to five feet above the ground for a period of ten minutes per cassette per location. The Air-O-Cell cassette sampling and analysis method provides for the identification and quantification of many, but not all, genus of fungal spores that may be present in the air on the day of the testing and does not determine the viability of fungi spores but rather a total count of spores, both viable and non-viable. At the completion of the sampling, the samples were sealed, labeled, and shipped under chain of custody to Scientific Analytical Institute (SAI) of Greensboro, NC for microscopic analysis. This method will detect many but not all fungal spores present in the air on the day of the testing. SAI is accredited by the AIHA for analysis of microbiological samples. Additional rounds of testing may be required to fully document fungal ecology due to high variability of spore concentrations.