

**ADDENDUM 2 TO THE
INDOOR ENVIRONMENTAL QUALITY INVESTIGATION
FOR
GLENWOOD MIDDLE SCHOOL**

PREPARED FOR:

**HOWARD COUNTY PUBLIC SCHOOL SYSTEM
10910 ROUTE 108
ELLCOTT CITY, MD 21043**

PREPARED BY:

**ARIA ENVIRONMENTAL, INC.
PO BOX 286
WOODBINE, MD 21797**


APRIL 10, 2014 ✓

130767



**ADDENDUM 2 TO THE
INDOOR ENVIRONMENTAL QUALITY INVESTIGATION
FOR
GLENWOOD MIDDLE SCHOOL**

Reviewed by:



Michele M. Twilley, DrPH, CIH
Aria Environmental, Inc.



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FOR
GLENWOOD MIDDLE SCHOOL**

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EXECUTIVE SUMMARY

Aria Environmental, Inc. (AEI) was contracted by Howard County Public School System to perform an indoor environmental quality investigation of the Glenwood Middle School at the end of August 2013. A complaint was lodged by one of the teachers about high humidity, mold and adverse health effects experienced while she is in the school. AEI conducted interviews with Glenwood Middle School faculty, staff and administrators, Howard County Public School System facilities and building services personnel and Global Facilities Solutions (a mechanical engineering consultant). AEI also performed visual inspections of the classrooms, boiler room and crawlspace; made measurements for temperature, humidity, carbon monoxide, carbon dioxide, particulate matter and fungal identification and counting; and has attended meetings with HCPSS and Global Facilities Solutions. AEI performed additional air monitoring for the presence of mold spores at Glenwood Middle School on December 17, 2013 and those results are reported in Addendum 1. HCPSS requested additional air monitoring for the presence of mold spores after changes were made in the crawlspaces to reduce potential microbiological food sources and to seal potential obscured pathways to spaces above. Abandoned intact and loose paper-wrapped fiberglass insulation and other organic debris were removed from the crawlspaces and open-ended pipes and voids in cement walls were sealed as much as possible. Also, damaged pipe insulation above ceiling tiles were removed and replaced with new insulation throughout the school. This addendum report presents the results of air sampling for fungi and indoor air quality measurements for temperature, relative humidity, carbon monoxide, carbon dioxide and particulate matter made on March 20, 2014. Methods used in the investigation and background information are presented in the November 1, 2013 report.



I. BACKGROUND

A representative from Aria Environmental, Inc. (AEI) visited Glenwood Middle School on March 20, 2014 to perform additional air monitoring in response to an ongoing indoor air quality complaint at the school. Indoor air samples were collected from classrooms 7, 11, 15, 20, 26, 29, Art Room 38 and in the crawlspace accessed from Classroom 31. One outdoor air sample was also collected for comparison purposes. The background associated with the complaint is detailed in the Indoor Environmental Quality Investigation report dated November 1, 2013. We understand that changes have been made to the crawlspaces to reduce organic material and to seal potential pathways to the spaces above since the November 1, 2013 report. Abandoned intact and loose paper-wrapped fiberglass insulation and other organic debris were removed and open-ended pipes and voids in cement walls were sealed as much as possible in the crawlspaces. Also, damaged pipe insulation above ceiling tiles were removed and replaced with new insulation throughout the school.

The school did not appear to be under the influence of strong negative pressure as evidenced by the ease of opening and closing doors to the outside. No measurements were made to determine pressurization of the school or air flow patterns. There was no evidence of mold growth observed in the classrooms. Weather on the day of monitoring was cold and windy.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on March 20, 2014

The room air temperature measured between 3:02 pm and 5:12 pm ranged from 70.3 and 74.5°F with an average of 72.3°F. The temperatures are considered acceptable for winter thermal comfort. The indoor relative humidity ranged between 16.8 and 23.0 percent. Dry conditions can lead to increased static electricity and health problems, such as skin, eye, nose and throat irritation, the relative humidity should be greater than 30% to prevent these problems. Results of temperature, relative humidity, carbon dioxide and carbon monoxide monitoring are presented in Table 2.

Table 1- Acceptable Ranges of Temperature and Relative Humidity in Summer and Winter^a

Relative Humidity	Winter Temperature	Summer Temperature
30%	68.5°F – 76.0°F	74.0°F – 80°F
40%	68.5°F - 75.5°F	73.5°F – 79.5°F
50%	68.5°F - 74.5°F	73.0°F – 79.0°F
60%	68.0°F - 74.0°F	72.5°F – 78.0°F

^aadapted from ASHRAE Standard 55-2010

The outside temperature at 5:12 pm was 55.8°F and the outdoor relative humidity was 22.7%. No windows or doors were observed to be open during the monitoring period. The U.S. Environmental Protection Agency (EPA) recommends maintaining indoor relative humidity below 60% and ideally between 30 and 50% to prevent mold growth. The indoor humidity measurements were below the range for comfort.

Carbon dioxide and carbon monoxide measurements are used to assess ventilation system performance. The exhaled breath of building occupants is the main indoor source of carbon dioxide; therefore, the build-up of carbon dioxide indicates inadequate ventilation. Air



monitoring was performed after school hours when the rooms were unoccupied. Carbon dioxide concentrations ranged from 400 to 628 ppm. The concentration of concern for carbon dioxide is set by ASHRAE standard 62.1–2013 as 700 ppm above outdoor air. On the day of monitoring, the outdoor air concentration of carbon dioxide was 400 ppm. Carbon dioxide concentrations were within the comfort parameters established by ASHRAE. Carbon monoxide is mainly attributed to incomplete combustion and was not detected in the school. Carbon monoxide concentrations were below the ASHRAE concentration of concern of 9 ppm.

Particulate matter or PM is the term for a mixture of solid particles and liquid droplets found in the air. It does not distinguish between the types of particles in the air (e.g., pollen, skin cells, mold spores, soil, etc.). Particulate matter includes "inhalable coarse particles," with diameters larger than 2.5 micrometers and smaller than 10 micrometers (PM 10) and "fine particles," with diameters that are 2.5 micrometers and smaller (PM 2.5). Particle loads expected to be a part of the school environment include carpet and clothing fiber, soil tracked from outside, paper dust, chalk dust, and dust and fibers from building materials. ASHRAE Standard 62.1–2013 suggests target indoor concentrations for PM 2.5 and PM 10 of 15 $\mu\text{g}/\text{m}^3$ and 50 $\mu\text{g}/\text{m}^3$, respectively. These concentrations are taken from the EPA's National Ambient Air Quality Standards (NAAQS) based on annual arithmetic means deemed acceptable for outdoor air quality. Occupational standards and guidelines for particles are nearly an order of magnitude higher than concentrations typically found in non-occupational settings and are not appropriate for comparison.

Particle measurements were taken with an Aerocet 531 particulate monitor. The particle monitor takes a two minute averaged sample of particle concentrations in 5 size fractions (PM 1, PM 2.5, PM 7, PM 10 and total suspended particles (TSP)). Results of particulate monitoring, presented in Table 2, revealed that PM 2.5 and PM 10 particle concentrations were well below the ASHRAE target concentrations in all areas monitored except for classroom 11 where a custodian was sweeping prior to air sampling. PM 10 concentrations in classroom 11 were 50 and 51 $\mu\text{g}/\text{m}^3$ which is at and slightly above the recommended target concentration.

The visual inspection of the rooms visited on March 20, 2014 did not reveal any obvious sources of water damage, moisture or mold growth. One stained ceiling tile was observed in classroom 38 near a window. A stale slightly chemical type odor was observed in classroom 15. There was no obvious source of this odor. HCPSS reports they noticed this odor immediately following installation of a new ventilator coil. Ventilators were operating in the heating mode in all classrooms.



Table 2: Particle, Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide Measurements Collected on March 20, 2014 In Select Classrooms at Glenwood Middle School

Location	March 20, 2014									
	Time	PM1 (mg/m ³)	PM2.5 (mg/m ³)	PM7 (mg/m ³)	PM10 (mg/m ³)	TSP (mg/m ³)	Temp (°F)	Rh (%)	CO (ppm)	CO2 (ppm)
Classroom 29	3:02	0.000	0.001	0.003	0.004	0.006	71.9	19.2	0.0	458
Classroom 29	3:13	0.000	0.001	0.002	0.002	0.004	72.5	18.3	0.0	454
Classroom 26	3:19	0.000	0.000	0.001	0.001	0.005	72.9	22.9	0.0	628
Classroom 26	3:27	0.000	0.000	0.003	0.003	0.007	72.9	22.6	0.0	627
Classroom 15	3:37	0.000	0.000	0.003	0.004	0.008	72.9	21.4	0.0	594
Classroom 15	3:42	0.000	0.000	0.003	0.004	0.006	72.9	21.1	0.0	582
Classroom 20	3:49	0.000	0.000	0.003	0.004	0.006	74.5	20.2	0.0	540
Classroom 20	3:58	0.000	0.000	0.001	0.001	0.004	74.5	19.5	0.0	480
Art Room 38	4:05	0.000	0.000	0.001	0.002	0.011	71.2	16.8	0.0	501
Art Room 38	4:11	0.000	0.000	0.001	0.001	0.004	70.3	17.0	0.0	400
Classroom 11	4:30	0.000	0.002	0.020	0.051	0.111	70.6	22.8	0.0	503
Classroom 11	4:36	0.000	0.001	0.027	0.050	0.081	70.3	23.0	0.0	505
Classroom 7	4:42	0.000	0.001	0.012	0.020	0.031	72.0	21.7	0.0	479
Classroom 7	4:45	0.000	0.001	0.013	0.020	0.030	72.3	20.3	0.0	439
Crawlspace in Classroom 31	5:00	0.000	0.000	0.026	0.036	0.057	63.4	29.2	0.0	463
Outside	5:12	0.000	0.001	0.003	0.003	0.028	55.8	22.7	0.0	400



B. Air Monitoring for Fungal Identification and Counting on March 20, 2014

In the absence of visual sources of mold amplification and growth in the classrooms, non-viable spore trap samples were collected from seven classrooms (classrooms 7, 11, 15, 20, 26, 29 and 38), one crawlspace and one outdoor location to determine whether there was a difference between mold spore loads inside the building versus outside. Classrooms 7, 15, 26, and 29 are complaint areas and classrooms 11, 20 and 38 are non-complaint areas.

The spore trap samples were collected using AllergenCo-D cassettes attached to a sampling pump calibrated to 15 liter per minute (LPM) air flow. The samples were collected for a period of 10 minutes, the time period recommended for spore trap sampling in a clean indoor environment. The spore trap samples were submitted to Aerobiology Laboratory for analysis. The sample results are reported as the spores per cubic meter of air (spores per m³) of hyphal fragments and total fungal spores. Depending upon the morphology of the spores, they were counted by their unique genus or were grouped into spores exhibiting common characteristics (e.g., *Penicillium*/*Aspergillus* group). Table 3 presents the results of the spore trap samples collected at Glenwood Middle School on March 20, 2014.

**Table 3 - Results of Spore Trap Sampling in Selected Classrooms in
Glenwood Middle School on March 20, 2014**

Location	Outside (140320- 09)	Room 29 (140320- 01)	Room 26 (140320- 02)	Room 15 (140320- 03)	Room 20 (140320- 04)	Room 38 (140320- 05)	Room 11 (140320- 06)	Room 7 (140320- 07)	Crawlspace Room 31 (140320-08)
Spore Type	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³
Ascospores	80	7	-	7	-	-	20	-	40
Basidiospores	2,107	173	53	20	53	300	93	147	167
Cladosporium	127	20	13	20	40	80	133	20	80
Epicoccum	7	-	-	-	-	-	-	-	-
Hyphal Elements	-	-	-	-	-	-	67	13	27
Penicillium/ Aspergillus	53	53	27	40	13	27	1,973	127	667
Smuts, Periconia, myxomycetes	7	-	-	-	7	-	20	7	-
Stachybotrys	-	-	-	-	-	-	-	-	7
Unknown	7	-	-	-	-	-	-	-	-
Total Fungi	2,388	253	93	87	113	407	2,306	314	988

Bold numbers represent spore concentrations above the outdoor counts. Dashes designate none detected.



Indoor spore counts ranged from 87 to 2,306 total spores per cubic meter of air (m^3), the crawlspace sample was 988 total spores per m^3 , and all samples had total spore counts lower than the outdoor sample.

The presence of Penicillium/Aspergillus group spores was higher in three samples than outdoors: classrooms 7 and 11 and the crawlspace sample. The custodian had just been sweeping in classrooms 7 and 11 when the spore trap sampling was conducted. Cladosporium and smuts, Periconia and Myxomycetes spores were also higher in the Classroom 11 sample than the outdoor sample.

No secondary colonizers including Chaetomium or Stachybotrys were detected in the classrooms, but 7 spores per m^3 of Stachybotrys were detected in the crawlspace sample. Hyphal fragments were also detected in classrooms 7 and 11 and in the crawlspace but were not detected in the other classrooms or in the outdoor air sample. Certificates of analysis are included as Attachment B.

Tables 4a-4d present the spores per cubic meter of air measured in classrooms 11, 15, 26 and 29 on October 18th, 28th, 2013, December 17, 2013 and March 20, 2014. The tables show natural variability in the spore counts within in the building.

Table 4a: Spore Concentrations on October 18, 2013, December 17, 2013 and March 20, 2014 At Glenwood Middle School in Classroom 11

Spores/ m^3	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types		
	CR11 10/18/13	CR11 12/17/13	CR11 03/20/14
Ascospores	7	33	20
Basidiospores	4,480	260	93
Cladosporium	333	73	133*
Penicillium/Aspergillus group	27	53	1,973*
Total	4,947	426	2,306

Bold represents spore concentrations that were higher indoors than outdoors on the day of monitoring.

*Sampling occurred after custodian swept this classroom.

Table 4b: Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013 and March 20, 2014 At Glenwood Middle School in Classroom 15

Spores/ m^3	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types			
	CR15 10/18/13	CR15 10/28/13	CR15 12/17/13	CR15 03/20/14
Ascospores	47	33	-	7
Basidiospores	12,373	620	127	20
Cladosporium	1,067	33	107	20
Penicillium/Aspergillus group	1,440	287	4,153	40
Total	15,055	1,013	4,413	87

Bold represents spore concentrations that were higher indoors than outdoors on the day of monitoring.



Table 4c: Spore Concentrations on October 18, 2013, December 17, 2013 and March 20, 2014 At Glenwood Middle School in Classroom 26

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types		
	CR26 10/18/13	CR26 12/17/13	CR26 03/20/14
Ascospores	20	67	-
Basidiospores	22,062	3,200	53
Cladosporium	720	4,267	13
Penicillium/Aspergillus group	80	1,600	27
Total	22,942	9,134	93

Bold represents spore concentrations that were higher indoors than outdoors on the day of monitoring.

Table 4d: Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013 and March 20, 2014 At Glenwood Middle School in Classroom 29

Spores/m ³	Classroom (CR) Number and Date of Spore Trap Sampling for Selected Spore Types			
	CR26 12/17/13	CR29 10/18/13	CR29 12/17/13	CR29 03/20/14
Ascospores	67	73	---	7
Basidiospores	3,200	3,627	67	173
Cladosporium	4,267	513	7	20
Penicillium/Aspergillus group	1,600	187	5,973	53
Total	9,134	4,447	6,054	253

Bold represents spore concentrations that were higher indoors than outdoors on the day of monitoring.

Table 5 presents a comparison of the outdoor spore concentrations for three days of monitoring for select spore types. The outdoor spore concentrations were within the range of expected concentrations for Maryland as reported by EMLab in their MoldRANGE tables. Variations in outdoor spore concentrations are a function of diurnal rhythms of spore release, weather-related factors (e.g., wind, rain, snow cover, temperature), and physical spatial factors.

Table 5: Outdoor Spore Concentrations on October 18, 2013, October 28, 2013, December 17, 2013 and March 20, 2014 at Glenwood Middle School

Spores/m ³	10/18/13	10/28/13	12/17/13	03/20/14
Ascospores	173	507	13	80
Basidiospores	13,845	2,880	3,413	2,107
Cladosporium	5,120	107	40	127
Penicillium/Aspergillus group	80	140	313	53
Total	20,204	3,834	3,786	2,388

III. CONCLUSIONS AND RECOMMENDATIONS

Thermal comfort parameters of temperature and humidity were measured on March 20, 2014. The temperature was within the comfort range established by ASHRAE but the relative humidity was below 30% and is considered dry. Dry conditions can lead to increased static electricity and health problems, such as skin, eye, nose and throat irritation, the relative humidity should be



greater than 30% to prevent these problems. Carbon monoxide, carbon dioxide and particulate matter measurements were within acceptable ranges for good indoor air quality except in classroom 11 (50 and 51 $\mu\text{g}/\text{m}^3$) where a custodian was sweeping.

In general fewer types of spores were identified on March 20, 2014 than on December 17, 2013. No new spore types were identified in March than were identified in December except stachybotrys in the crawlspace sample. Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts exceeding indoors. Spore measurements made in classrooms 7, 11 and the crawlspace revealed increased *Penicillium/Aspergillus* group spore concentrations over outdoors on March 20, 2014. A custodian was sweeping in classroom 11 immediately prior to sampling and had been sweeping in classroom 7 minutes prior to sampling.

Changes were made in the crawlspaces to reduce potential microbiological food sources and to seal potential pathways to spaces above. Abandoned intact and loose paper-wrapped fiberglass insulation and other organic debris was removed and open ended pipes and voids in cement walls were sealed approximately one month prior to the air sampling on March 20, 2013. Also, damaged pipe insulation above ceiling tiles were removed and replaced with new insulation throughout the school. No other modifications to building systems or the crawl spaces have occurred since November 1, 2013. Follow up air sampling should occur approximately quarterly in order to monitor changes in conditions that may be related to seasonal variations.

IV. LIMITATIONS

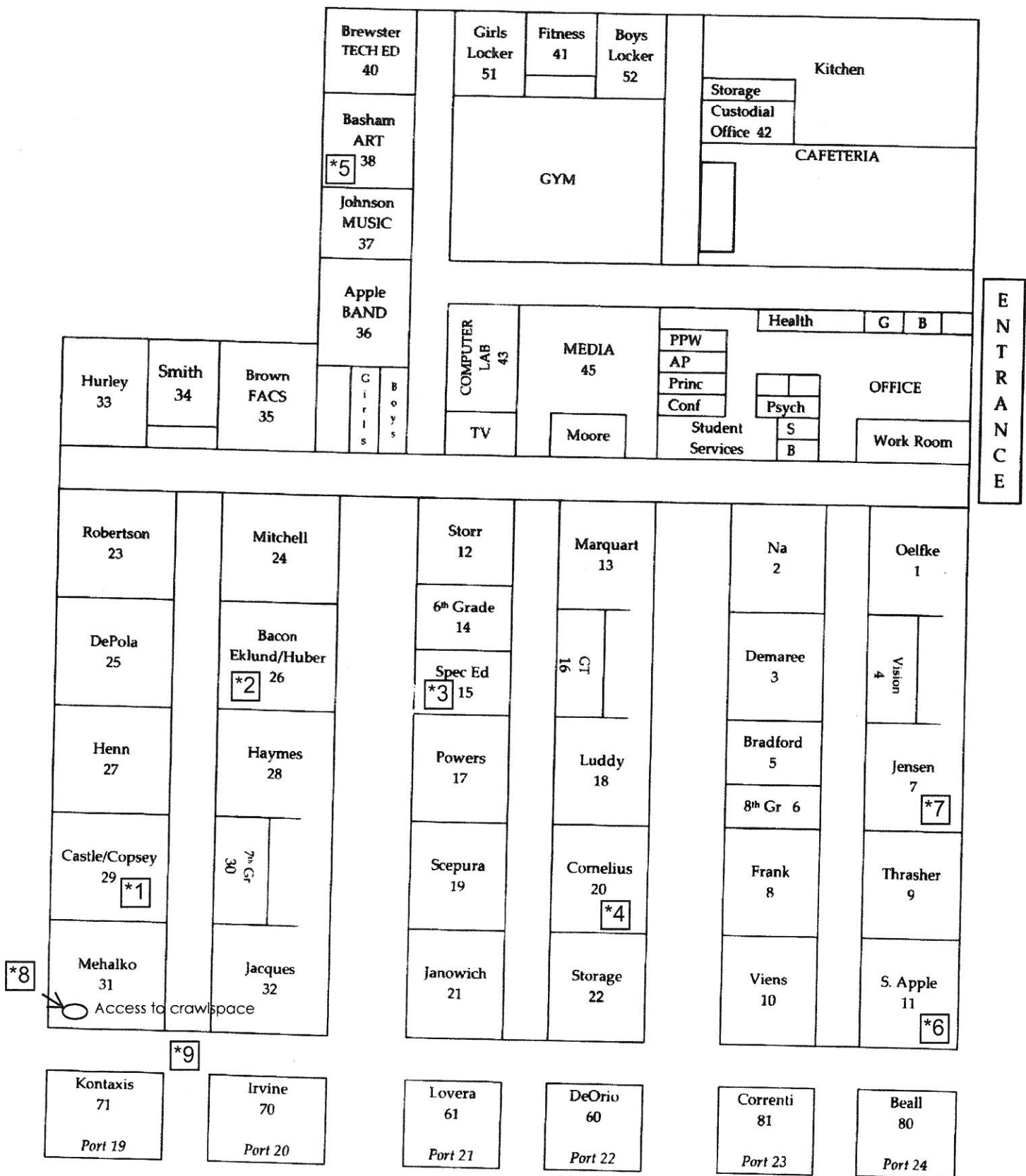
This report has been prepared for the exclusive use of the Howard County Public School System and/or their agents. This service has been performed in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based, in part, upon information provided to us by others and our site observations. We have not verified the completeness or accuracy of the information provided to us by others, unless otherwise noted. Our observations and recommendations are based upon conditions readily visible at the site at the time of our site visit, and upon current industry standards. Destructive sampling was not performed as part of this survey. No observations were made behind solid walls, ceilings or in pipe chases that weren't already openly visible.

By virtue of providing the services described in this report, the preparer does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies any conditions at the site that may present a potential danger to public health, safety, or the environment. It is the Client's responsibility to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, any information that may be necessary to prevent any danger to public health, safety, or the environment. Under this scope of services, the preparer assumes no responsibility regarding response actions (e.g. abatement, removal, etc.) initiated as a result of these findings. Response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements, and should be performed by appropriately licensed personnel as warranted.



Attachment A:

Building Layout and Sample Location Plan for March 20, 2014



As of 8/02/13

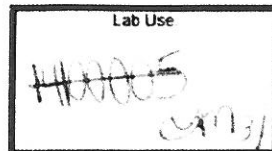
Glenwood Middle School Floor Plan

Sample Location Plan
March 20, 2014



Attachment B:

**Report of Analysis and Chain of Custody Forms
March 20, 2014**



14100005

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NVLAP Lab Code 200860-D (CO)
NVLAP Lab Code 200829-D (VA)



LAB #192683 (CO)
LAB #102977 (GA)
LAB #163063 (VA)

Aerobiology Client Aria Environmental		Collected By/Date: Julie Barth/ 3/20/14		Relinquished By/Date: Taylor Kingston/ 3/21/2014	
Field Contact	Julie Barth	Relinquished By/Date:		Received By/Date: TH 3/21/14	
Address	PO Box 286	Sampler Type		Sample Aire	Other
Address	Woodbine, MD 21797	Andersen SAS		Aero Trap <input checked="" type="checkbox"/>	BioCulture
Phone/Fax	410-549-5774/ 410-549-4488	PO#Job#Project Name:			
Email	jbarth@ariaenviro.com	13-767/ Glenwood Middle School			
Routine <input checked="" type="radio"/>	24 Hour <input type="radio"/>	Same Day <input type="radio"/>	4 Hour <input type="radio"/>	2 Hour <input type="radio"/>	5 Day <input type="radio"/> (Asbestos Only)
					Notes/CC Info.
Zip Code Where Work Is Performed		21738			

Sample No.	Test Code	Sample Location	Total Volume/Area
140320-01	1054	Classroom 29	150L
140320-02	1054	Classroom 26	150L
140320-03	1054	Classroom 15	150L
140320-04	1054	Classroom 20	150L
140320-05	1054	Art Room 38	150L
140320-06	1054	Classroom 11	150L
140320-07	1054	Classroom 7	150L
140320-08	1054	Crawlspace in Classroom 31	150L
140320-09	1054	Outside Near Classroom 31	150L

1054	Direct, Non-viable Spore Trap	1015	Culture - WATER Legionella
1051	Direct, Qualitative- Swab/Tape	1017	Culture - SWAB Legionella
1050	Direct, Qualitative- Bulk	1010	WATER - Potable - E. coli/total coliforms
1005	AIR Culture - Bacterial Count w/ ID's	1012	SWAB - E. coli/total coliforms
1030	AIR Culture - Fungal Count w/ ID's	1028	Sewage Screen (E. coli/Enterococcus/fecal coliforms)
1006	SWAB Culture - Bacterial Count w/ ID's	2056	Heterotrophic Plate Count
1031	SWAB Culture - Fungal Count w/ ID's	3001	ASBESTOS - Point count
1008	BULK Culture - Bacterial Count w/ ID's	3002	ASBESTOS - PLM Analysis
1033	BULK Culture - Fungal Count w/ ID's	3003	ASBESTOS - Particle characterization
1007	WATER Culture - Bacterial Count w/ID's	3004	ASBESTOS - PCM Analysis

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **13-767/ Glenwood Middle School**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 03/20/2014
Date Received: 03/24/2014
Date Analyzed: 03/25/2014
Date Reported: 03/27/2014
Project ID: 14006762
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1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	140320-01				140320-09			
Sample Location	Classroom 29				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-001				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	1	7	3	1/11.4	12	80	3	-
Basidiospores	26	173	68	1/12.2	79	2107	88	-
Cladosporium	3	20	8	1/6.4	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	-	-	-	-	-	-	-	-
Penicillium/Aspergillus group	8	53	21	1.0/1	8	53	2	-
Smuts, Periconia, Myxomycetes	-	-	-	-	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m³				Analytical Sensitivity: 6.7 spr/m³			
Comments								
Total	38	253	~100%	1/9.4	121	2388	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **13-767/ Glenwood Middle School**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 03/20/2014
Date Received: 03/24/2014
Date Analyzed: 03/25/2014
Date Reported: 03/27/2014
Project ID: 14006762

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Client Sample Number	140320-02				140320-09			
Sample Location	Classroom 26				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-002				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	-	-	-	-	12	80	3	-
Basidiospores	8	53	57	1/39.8	79	2107	88	-
Cladosporium	2	13	14	1/9.8	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	-	-	-	-	-	-	-	-
Penicillium/Aspergillus group	4	27	29	1/2.0	8	53	2	-
Smuts, Periconia, Myxomycetes	-	-	-	-	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m ³				Analytical Sensitivity: 6.7 spr/m ³			
Comments								
Total	14	93	~100%	1/25.7	121	2388	~100%	-

Aria Environmental
P.O. Box 286
Woodbine, Maryland 21797
Attn: Julie Barth
Project: **13-767/ Glenwood Middle School**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 03/20/2014
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Client Sample Number	140320-03				140320-09			
Sample Location	Classroom 15				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-003				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	1	7	8	1/11.4	12	80	3	-
Basidiospores	3	20	23	1/105.4	79	2107	88	-
Cladosporium	3	20	23	1/6.4	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	-	-	-	-	-	-	-	-
Penicillium/Aspergillus group	6	40	46	1/1.3	8	53	2	-
Smuts, Periconia, Myxomycetes	-	-	-	-	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m ³				Analytical Sensitivity: 6.7 spr/m ³			
Comments								
Total	13	87	~100%	1/27.4	121	2388	~100%	-

Aria Environmental
P.O. Box 286
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Client Sample Number	140320-04				140320-09			
Sample Location	Classroom 20				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-004				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	-	-	-	-	12	80	3	-
Basidiospores	8	53	47	1/39.8	79	2107	88	-
Cladosporium	6	40	35	1/3.2	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	-	-	-	-	-	-	-	-
Penicillium/Aspergillus group	2	13	12	1/4.1	8	53	2	-
Smuts,Periconia,Myxomycetes	1	7	6	1.0/1	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m ³				Analytical Sensitivity: 6.7 spr/m ³			
Comments								
Total	17	113	~100%	1/21.1	121	2388	~100%	-

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Client Sample Number	140320-05				140320-09			
Sample Location	Art Room 38				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-005				14100005-009			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Ascospores	-	-	-	-	12	80	3	-
Basidiospores	45	300	74	1/7.0	79	2107	88	-
Cladosporium	12	80	20	1/1.6	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	-	-	-	-	-	-	-	-
Penicillium/Aspergillus group	4	27	7	1/2.0	8	53	2	-
Smuts,Periconia,Myxomycetes	-	-	-	-	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m³				Analytical Sensitivity: 6.7 spr/m³			
Comments								
Total	61	407	~100%	1/5.9	121	2388	~100%	-

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Client Sample Number	140320-06				140320-09			
Sample Location	Classroom 11				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-006				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	3	20	1	1/4.0	12	80	3	-
Basidiospores	14	93	4	1/22.7	79	2107	88	-
Cladosporium	20	133	6	1.0/1	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	10	67	3	-	-	-	-	-
Penicillium/Aspergillus group	74	1973	86	-	8	53	2	-
Smuts, Periconia, Myxomycetes	3	20	1	2.5/1	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 4				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m ³				Analytical Sensitivity: 6.7 spr/m ³			
Comments	Spore count may be underestimated due to heavy particulate.							
Total	124	2306	~100%	1.0/1	121	2388	~100%	-

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Client Sample Number	140320-07				140320-09			
Sample Location	Classroom 7				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-007				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	-	-	-	-	12	80	3	-
Basidiospores	22	147	47	1/14.3	79	2107	88	-
Cladosporium	3	20	6	1/6.4	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	2	13	4	-	-	-	-	-
Penicillium/Aspergillus group	19	127	40	2.5/1	8	53	2	-
Smuts, Periconia, Myxomycetes	1	7	2	1.0/1	1	7	0	-
Stachybotrys	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
	Debris Rating 3				Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m³				Analytical Sensitivity: 6.7 spr/m³			
Comments								
Total	47	314	~100%	1/7.6	121	2388	~100%	-

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Client Sample Number	140320-08				140320-09			
Sample Location	Crawlspace in Classroom 31				Outside Near Classroom 31			
Sample Volume (L)	150				150			
Lab Sample Number	14100005-008				14100005-009			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Ascospores	6	40	4	1/2.0	12	80	3	-
Basidiospores	25	167	17	1/12.6	79	2107	88	-
Cladosporium	12	80	8	1/1.6	19	127	5	-
Epicoccum	-	-	-	-	1	7	0	-
Hyphal elements	4	27	3	-	-	-	-	-
Penicillium/Aspergillus group	25	667	68	10.0/1	8	53	2	-
Smuts, Periconia, Myxomycetes	-	-	-	-	1	7	0	-
Stachybotrys	1	7	1	-	-	-	-	-
Unknown	-	-	-	-	1	7	0	-
				Debris Rating 3	Debris Rating 2			
Analytical Sensitivity	Analytical Sensitivity: 6.7 spr/m ³				Analytical Sensitivity: 6.7 spr/m ³			
Comments								
Total	73	988	~100%	1/2.4	121	2388	~100%	-

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Footnotes and Additional Report Information

Debris Rating Table

1	Minimal (<5%) particulate present	Reported values are minimally affected by particulate load.
2	5% to 25% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
3	26% to 75% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
4	75% to 90% of the trace occluded with particulate	Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded.
5	Greater than 90% of the trace occluded with particulate	Quantification not possible due to large negative bias. A new outSample should be collected at a shorter time interval or other measures taken to reduce particulate load.

1. Penicillium/Aspergillus group spores are characterized by their small size, round to ovoid shape, being unicellular, and usually colorless to lightly pigmented. There are numerous genera of fungi whose spore morphology is similar to that of the Penicillium/Aspergillus type. Two common examples would be Paecilomyces and Acremonium. Although the majority of spores placed in this group are Penicillium, Aspergillus, or a combination of both. Keep in mind that these are not the only two possibilities.

2. Ascospores are sexually produced fungal spores formed within an ascus. An ascus is a sac-like structure designed to discharge the ascospores into the environment, e.g. Ascobolus.

3. Basidiospores are typically blown indoors from outdoors and rarely have an indoor source. However, in certain situations a high basidiospore count indoors may be indicative of a wood decay problem or wet soil.

4. The Smut, Periconia, Myxomycete group is composed of three different groups whose spores have similar morphologies. Smuts are plant pathogens, Periconia is a relatively uncommon mold indoors, and Myxomycetes are not fungi but slime molds. Although these organisms do not typically proliferate indoors, their spores are potentially allergenic.

5. The colorless group contains colorless spores which were unidentifiable to a specific genus. Examples of this group include Acremonium, Aphanocladium, Beauveria, Chrysosporium, Engyodontium microconidia, yeast, some arthrospores, as well as many others.

6. Hyphae are the vegetative mode of fungi. Hyphal elements are fragments of individual Hyphae. They can break apart and become airborne much like spores and are potentially allergenic. A mass of hyphal elements is termed the mycelium. Hyphae in high concentration may be indicative of colonization.

7. Dash (-) in this report, under raw count column means 'not detected (ND)'; otherwise 'not applicable' (NA).

8. The positive-hole correction factor is a statistical tool which calculates a probable count from the raw count, taking into consideration that multiple particles can impact on the same hole; for this reason the sum of the calculated counts may be less than the positive hole corrected total.

9. Due to rounding totals may not equal 100%.

10. Minimum Reporting Limits (MRL) for BULKS, DUSTS, SWABS, and WATER samples are a calculation based on the outSample size and the dilution plate on which the organism was counted. Results are a compilation of counts taken from multiple dilutions and multiple medias. This means that every genus of fungi or bacteria recovered can be counted on the plate on which it is best represented.

11. If the final quantitative result is corrected for contamination based on the blank, the blank correction is stated in the outSample comments section of the report.

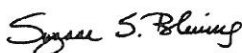
12. Analysis conducted on non-viable spore traps is completed using Indoor Environmental Standards Organization (IESO) Standard 2210.

13. The results in this report are related to this project and these samples only.

14. For samples with an air volume of < 100L, the number of significant figures in the result should be considered (2) two. For samples with air volumes between 100-999L, the number of significant figures in the result should be considered (3) three. For example, a outSample with a result of 55,443 spr/m³ from a 75L outSample using significant figures should be considered 55,000. The same result of 55,443 from a 150L outSample using significant figures should be considered 55,400 spr/m³.

Terminology Used in Direct Exam Reporting

Conidiophores are a type of modified hyphae from which spores are born. When seen on a surface outSample in moderate to numerous concentrations they may be indicative of fungal growth.



Suzanne S. Blevins, B.S., SM (ASCP)
Laboratory Director