

**SPORE SAMPLING REPORT
FOR
GLENWOOD MIDDLE SCHOOL
2680 ROUTE 97
GLENWOOD, MD 21738**

PREPARED FOR:

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

PREPARED BY:



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

NOVEMBER 11, 2015

150876

**SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
OCTOBER 27, 2015**

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**SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
OCTOBER 27, 2015**

EXECUTIVE SUMMARY

Aria Environmental, Inc. (AE) was contracted by Howard County Public School System to perform spore trap sampling at the Glenwood Middle School at the end of August 2015 due to air quality concerns expressed by staff and parents and to monitor the school after a recent heating, ventilation and air-conditioning (HVAC) system upgrade. AE made measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and collected microbial spore trap sampling for fungal spore identification and counting on October 27, 2015 as part of a series of spore sampling events that will occur in the first month of the 2015 - 2016 school year and less frequently throughout the school year. This report presents the results of air sampling made on October 27, 2015.

**Spore Trap Sampling Report
For Glenwood Middle School
October 27, 2015**

I. BACKGROUND

Representatives from Aria Environmental, Inc. (AE) visited Glenwood Middle School on October 27, 2015 to perform air monitoring in response to an ongoing indoor air quality complaint at the school. Measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and microbial spore trap sampling were collected from classrooms 3, 4, 14, 16, 25, 26, 33 and 35 and portable classrooms 80 and 81. Outdoor air samples were also collected for comparison purposes in one courtyard and outside near portable classroom 81. This monitoring was performed in response to employee and parental complaints and as a follow up to HVAC improvements.

There was no visible evidence of mold growth nor observed odors consistent with mildew in the classrooms sampled. Weather on the day of monitoring was cool and sunny.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on October 27, 2015

Industry guidelines or standards for seasonal temperature and humidity ranges for thermal comfort are established by the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) standard 55-2013. These ranges are presented in Table 1. The U.S. Environmental Protection Agency (EPA) recommends maintaining indoor relative humidity below 60% and ideally between 30 and 50%. The room air temperature measured between 3:20 PM and 4:46 PM ranged from 59.4 to 73.8° F with an average of 70.0° F. The indoor relative humidity ranged from 37.0 to 57.0 percent. The temperature and relative humidity measurements are considered acceptable for summer thermal comfort in all rooms except for classrooms 3, 25, 26 and 33 and portable classrooms 80 and 81 where temperatures were below 72.5° F. Portable Classroom 80 is a storage room with a low heat setting. The comfort ranges are only set for the Summer and Winter seasons when temperatures are usually consistent. There are no Fall or Spring ranges because these seasons can include both heating and cooling modes of HVAC operation. The outside temperature at 4:50 PM was 58.0° F and the outdoor relative humidity was 63.0% outside near Portable Classroom 81, and the outside temperature at 4:53 PM was 58.3° F and the relative humidity was 63.7% in the courtyard outside Classroom 8. No windows or doors were observed to be open during the monitoring period. 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 55-2013

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 mostly unoccupied. Carbon

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dioxide concentrations ranged from 437 to 641 ppm indoors. 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 ranged from 410 to 417 ppm. Carbon dioxide concentrations were within the comfort parameters established by ASHRAE in all areas monitored. There were no students in the rooms at the time of monitoring, but the monitoring took place soon after school ended for the day.

Carbon monoxide is mainly attributed to incomplete combustion. Concentrations of CO ranged from 0.1 to 0.4 ppm indoors and the outdoor concentrations ranged from 0.4 to 0.5 ppm in the two outdoor locations measured. CO 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.

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**Table 2: Particle, Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide
Measurements Collected on October 27, 2015 at Glenwood Middle School**

Location	Time	PM1 ($\mu\text{g}/\text{m}^3$)	PM2.5 ($\mu\text{g}/\text{m}^3$)	PM7 ($\mu\text{g}/\text{m}^3$)	PM10 ($\mu\text{g}/\text{m}^3$)	TSP ($\mu\text{g}/\text{m}^3$)	Temp ($^{\circ}\text{F}$)	Rh (%)	CO (ppm)	CO ₂ (ppm)
CR 03	4:18 PM	0	0	3	3	7	72.4	41.0	0.2	641
CR 04	3:20 PM	0	1	3	4	6	73.1	39.8	0.4	594
CR 14	3:34 PM	0	0	1	1	4	73.0	38.2	0.3	513
CR 16	3:45 PM	0	0	1	1	1	73.0	37.0	0.2	471
CR 25	3:48 PM	0	0	1	1	1	71.8	38.8	0.3	467
CR 26	3:52 PM	0	0	1	2	2	72.3	38.2	0.2	474
CR 33	4:05 PM	0	0	1	1	2	71.7	40.7	0.3	641
CR 35	4:08 PM	0	0	1	1	2	73.8	37.2	0.2	490
PCR 80	4:38 PM	0	0	2	2	2	59.4	42.3	0.2	437
PCR 81	4:46 PM	0	0	1	2	3	64.4	57.0	0.1	631
Out 1	4:50 PM	0	0	12	16	18	58.0	63.0	0.5	410
Out 2 CY	4:53 PM	0	0	14	18	21	58.3	63.7	0.4	417

CR = Classroom; PCR = Portable Classroom; CY = Courtyard; Bold type indicates measurements above the guidelines

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B. Air Monitoring for Fungal Identification and Counting on October 27, 2015

In the absence of visual sources of mold amplification and growth in the classrooms, non-viable spore trap samples were collected from eight classrooms within the main school building (Classrooms 3, 4, 14, 16, 25, 26, 33 and 35), two portable classrooms (80 and 81) and two outdoor locations to determine whether there was a difference between mold spore loads inside the building versus outside.

The spore trap samples were collected using AllergenCo-D cassettes attached to a Buck BioAire™ sampling pump calibrated to 15 liter per minute (LPM) air flow. The samples were collected for a period of ten 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). Tables 3 and 4 present the results of the spore trap samples collected at Glenwood Middle School on October 27, 2015.

Indoor spore counts ranged from 87 to 567 total spores per cubic meter of air (m³) in the main school building and from 673 to 680 in the portable classrooms on October 27, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 8,827 to 9,427 spores per m³. All individual spore types detected indoors had counts lower than the outdoor sample counts except for clear brown spores found in the Classroom 26 sample but not in the outdoor samples. The spore concentration in Classroom 26 (7 spores/m³) is the equivalent to one spore detected in the sample. Windows were not open during sampling.

No secondary colonizers including Chaetomium or Stachybotrys were detected in the indoor air samples. Hyphal elements were detected in six of the 10 indoor samples. Indoor samples ranged from 7 to 20 hyphal elements per m³, and all detected indoor hyphal elements were lower than the outdoor sample hyphal element counts ranging from 100 to 147 elements per m³. 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. Certificates of analysis are included as Attachment B.

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Table 3: Results of Spore Trap Sampling in Selected Classrooms in Glenwood Middle School on October 27, 2015

Location	Outside near PCR 81 (Out 1)	Outside in Courtyard (Out 2)	Room 3 (GM 03)	Room 4 (GM 04)	Room 14 (GM 14)	Room 16 (GM 16)	Room 25 (GM 25)	Room 26 (GM 26)	Room 33 (GM 33)	Room 35 (GM 35)
Spore Type	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³	Spores/ m³
Alternaria	13	80	-	-	-	-	-	-	-	-
Ascospores	240	267	7	7	13	-	13	-	13	7
Basidiospores	7,787	6,613	160	160	80	47	60	427	113	93
Cercospora	13	27	-	-	-	-	-	-	-	-
Cladosporium	880	933	27	13	20	20	40	87	180	27
Clear brown	-	-	-	-	-	-	-	7	-	-
Curvularia	-	13	-	-	-	-	-	-	-	-
Epicoccum	-	67	7	-	-	-	-	-	-	-
Gliomastix	-	7	-	-	-	-	-	-	-	-
Hyphal Elements	100	147	13	13	20	-	-	7	-	20
Penicillium/ Aspergillus	140	127	7	7	7	13	13	27	7	7
Pestalotiopsis	-	20	-	-	-	-	-	-	-	-
Pithomyces	20	40	7	-	7	-	7	-	-	-
Rusts	-	20	-	-	-	-	-	-	-	-
Smuts, Periconia, myxomycetes	213	440	-	7	13	7	-	13	-	13
Spegazzinia	-	7	-	-	-	-	-	-	-	-
Torula	7	13	-	-	-	-	-	-	-	-
Unknown	13	7	-	-	-	-	-	-	-	-
Total Fungi	9,427	8,827	227	207	160	87	133	567	313	167

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

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**Table 4: Results of Spore Trap Sampling in Portable Classrooms
at Glenwood Middle School on October 27, 2015**

Location	Outside near Room 81 (Out 1)	Outside in Courtyard (Out 2)	Room 80 (GM 80)	Room 81 (GM 81)
Spore Type	Spores/ m ³	Spores/ m ³	Spores/ m ³	Spores/ m ³
Alternaria	13	80	7	-
Ascospores	240	267	-	13
Basidiospores	7,787	6,613	480	533
Cercospora	13	27	-	-
Cladosporium	880	933	140	20
Clear brown	-	-	-	-
Curvularia	-	13	-	-
Epicoccum	-	67	-	-
Gliomastix	-	7	-	-
Hyphal Elements	100	147	7	-
Penicillium/ Aspergillus	140	127	13	93
Pestalotiopsis	-	20	-	-
Pithomyces	20	40	7	-
Rusts	-	20	-	-
Smuts, Periconia, myxomycetes	213	440	20	20
Spegazzinia	-	7	-	-
Torula	7	13	-	-
Unknown	13	7	-	-
Total Fungi	9,427	8,827	673	680

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

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For Glenwood Middle School
October 27, 2015**

III. CONCLUSIONS AND RECOMMENDATIONS

Aria Environmental, Inc. (AE) was contracted by Howard County Public School System to perform spore trap sampling at the Glenwood Middle School at the end of August 2015 due to air quality concerns expressed by staff and parents and to monitor the school after a recent heating, ventilation and air-conditioning (HVAC) system upgrade. AE made measurements for temperature, humidity, carbon monoxide, carbon dioxide and particulate matter and collected microbial spore trap samples on October 27, 2015.

Thermal comfort parameters of temperature and humidity were measured and found to be mostly within the comfort ranges established by ASHRAE. Carbon dioxide, carbon monoxide and particulate matter measurements were within acceptable ranges for good indoor air quality in all areas.

Indoor spore counts ranged from 87 to 567 total spores per cubic meter of air (m³) in the main school building classrooms and from 673 to 680 in the portable classrooms on October 27, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 8,827 to 9,427 spores/ m³. All individual spore types detected indoors had counts lower than the outdoor sample counts except for 7 clear brown spores/m³ found in the Room 26 sample but not found in the outdoor samples. Indoor hyphal elements ranged from 7 to 20 elements/m³. All indoor hyphal element counts were lower than the outdoor samples ranging from 100 to 147 elements per m³. Windows were not open during sampling.

Table 5 presents a summary of spore sampling results to date in the 2015 - 2016 school year. The indoor and outdoor ranges demonstrate the variable nature of spore counts.

Table 5 – Summary of Spore Sampling Results to Date at GMS in the 2015-2016 School Year

Date	Indoor Spore Count Range Spores per m³	Outdoor Spore Count Range Spores per m³
August 25, 2015	1,787 to 8,807	34,001 to 37,316
August 27, 2015	400 to 747	9,433 to 10,960
September 2, 2015	1,860 to 7,960	33,294 to 37,306
September 9, 2015	1,053 to 3,173	21,890 to 31,876
September 16, 2015	447 to 3,493	17,543 to 20,287
September 24, 2015	273 to 2,480	24,680 to 25,020
September 30, 2015	1,267 to 12,767	55,396 to 69,421
October 7, 2015	213 to 14,120	49,146 to 51,759
October 14, 2015	140 to 2,700	8,807 to 10,153
October 21, 2015	307 to 2,367	11,447 to 20,560
October 27, 2015	87 to 680	8,827 to 9,427

Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts over 28 times higher than the indoor counts on average. Indoor sample total spore counts and individual spore counts were all lower than the outdoor sample counts with one exception described above. Follow up air sampling is scheduled for November 4, 2015 and will be performed regularly in order to monitor changes in conditions affected by seasonal variations and the new HVAC system.

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For Glenwood Middle School
October 27, 2015**

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 October 27, 2015

Spore sampling locations for October 27, 2015



Glenwood Middle School Floor Plan

As of 8/02/13



Attachment B:

**Report of Analysis and Chain of Custody Forms
October 27, 2015**

Aria Environmental
 P.O. Box 286
 Woodbine, Maryland 21797
 Attn: Julie Barth
 Project: **PO# J15-876 GMS Glenwood MS**
 Condition of Sample(s) Upon Receipt: Acceptable

 Date Collected: 10/27/2015
 Date Received: 11/02/2015
 Date Analyzed: 11/05/2015
 Date Reported: 11/05/2015
 Project ID: 15028400
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1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	GM-03				Out 2 CY			
Sample Location	Classroom 3				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-001				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	1	7	3	1/40	10	267	3	-
basidiospores	6	160	71	1/41	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	4	27	12	1/35	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	1	7	3	1/10	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	2	13	6	1/11	22	147	2	-
Penicillium/Aspergillus group	1	7	3	1/19	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	1	7	3	1/6	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m ³				Analytical Sensitivity: 7 spr/m ³			
Comments								
Total *See Footnotes	16	227	~100%	1/39	259	8827	~100%	-

Aria Environmental
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Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/27/2015
Date Received: 11/02/2015
Date Analyzed: 11/05/2015
Date Reported: 11/05/2015
Project ID: 15028400
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Client Sample Number	GM-04				Out 2 CY			
Sample Location	Classroom 4				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-002				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	1	7	3	1/40	10	267	3	-
basidiospores	6	160	77	1/41	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	2	13	6	1/70	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	2	13	6	1/11	22	147	2	-
Penicillium/Aspergillus group	1	7	3	1/19	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	1	7	3	1/66	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	13	207	~100%	1/43	259	8827	~100%	-

Aria Environmental
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 Woodbine, Maryland 21797
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 Project: **PO# J15-876 GMS Glenwood MS**
 Condition of Sample(s) Upon Receipt: Acceptable

 Date Collected: 10/27/2015
 Date Received: 11/02/2015
 Date Analyzed: 11/05/2015
 Date Reported: 11/05/2015
 Project ID: 15028400

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Client Sample Number	GM-14				Out 2 CY			
Sample Location	Room 14				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-003				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	2	13	8	1/20	10	267	3	-
basidiospores	12	80	50	1/83	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	3	20	13	1/47	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	3	20	13	1/7	22	147	2	-
Penicillium/Aspergillus group	1	7	4	1/19	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	1	7	4	1/6	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	2	13	8	1/33	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	24	160	~100%	1/55	259	8827	~100%	-

Aria Environmental
 P.O. Box 286
 Woodbine, Maryland 21797
 Attn: Julie Barth
 Project: **PO# J15-876 GMS Glenwood MS**
 Condition of Sample(s) Upon Receipt: Acceptable

 Date Collected: 10/27/2015
 Date Received: 11/02/2015
 Date Analyzed: 11/05/2015
 Date Reported: 11/05/2015
 Project ID: 15028400

Client Sample Number	GM-16				Out 2 CY			
Sample Location	Room 16				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-004				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	-	-	-	-	10	267	3	-
basidiospores	7	47	54	1/142	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	3	20	23	1/47	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	22	147	2	-
Penicillium/Aspergillus group	2	13	15	1/10	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	1	7	8	1/66	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	13	87	~100%	1/102	259	8827	~100%	-

Aria Environmental
 P.O. Box 286
 Woodbine, Maryland 21797
 Attn: Julie Barth
 Project: **PO# J15-876 GMS Glenwood MS**
 Condition of Sample(s) Upon Receipt: Acceptable

 Date Collected: 10/27/2015
 Date Received: 11/02/2015
 Date Analyzed: 11/05/2015
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 Project ID: 15028400

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Client Sample Number	GM-25				Out 2 CY			
Sample Location	Classroom 25				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-005				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	2	13	10	1/20	10	267	3	-
basidiospores	9	60	45	1/110	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	6	40	30	1/23	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	22	147	2	-
Penicillium/Aspergillus group	2	13	10	1/10	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	1	7	5	1/6	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	20	133	~100%	1/66	259	8827	~100%	-

Aria Environmental
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Client Sample Number	GM-26				Out 2 CY			
Sample Location	Classroom 26				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-006				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	-	-	-	-	10	267	3	-
basidiospores	16	427	75	1/16	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	13	87	15	1/11	35	933	11	-
Clear brown	1	7	1	-	-	-	-	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	1	7	1	1/22	22	147	2	-
Penicillium/Aspergillus group	4	27	5	1/5	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	2	13	2	1/33	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	37	567	~100%	1/16	259	8827	~100%	-

Aria Environmental
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Client Sample Number	GM-33				Out 2 CY			
Sample Location	Classroom 33				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-007				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	2	13	4	1/20	10	267	3	-
basidiospores	17	113	36	1/58	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	27	180	57	1/5	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	22	147	2	-
Penicillium/Aspergillus group	1	7	2	1/19	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	47	313	~100%	1/28	259	8827	~100%	-

Aria Environmental
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 Date Received: 11/02/2015
 Date Analyzed: 11/05/2015
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 Project ID: 15028400

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Client Sample Number	GM-35				Out 2 CY			
Sample Location	Classroom 35 (FACS)				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-008				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	1	7	4	1/40	10	267	3	-
basidiospores	14	93	56	1/71	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	4	27	16	1/35	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	3	20	12	1/7	22	147	2	-
Penicillium/Aspergillus group	1	7	4	1/19	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	2	13	8	1/33	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	25	167	~100%	1/53	259	8827	~100%	-

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Client Sample Number	GM-80				Out 2 CY			
Sample Location	Portable Classroom 80				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-009				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	1	7	1	1/12	12	80	1	-
ascospores	-	-	-	-	10	267	3	-
basidiospores	18	480	71	1/14	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	21	140	21	1/7	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	1	7	1	1/22	22	147	2	-
Penicillium/Aspergillus group	2	13	2	1/10	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	1	7	1	1/6	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	3	20	3	1/22	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	47	673	~100%	1/13	259	8827	~100%	-

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Project: **PO# J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 10/27/2015
Date Received: 11/02/2015
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Client Sample Number	GM-81				Out 2 CY			
Sample Location	Portable Classroom 81				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-010				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	-	-	-	-	12	80	1	-
ascospores	2	13	2	1/20	10	267	3	-
basidiospores	20	533	78	1/12	62	6613	75	-
Cercospora	-	-	-	-	4	27	<1	-
Cladosporium	3	20	3	1/47	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	22	147	2	-
Penicillium/Aspergillus group	14	93	14	1/1	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	-	-	-	-	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	3	20	3	1/22	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	-	-	-	-	2	13	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	42	680	~100%	1/13	259	8827	~100%	-

Aria Environmental
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Date Collected: 10/27/2015
Date Received: 11/02/2015
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Client Sample Number	Out 1				Out 2 CY			
Sample Location	Outside Near PCR 81				Outside Courtyard			
Sample Volume (L)	150				150			
Lab Sample Number	15028400-011				15028400-012			
Spore Identification	Raw Ct	spr/m ³	% Ttl	In/Out	Raw Ct	spr/m ³	% Ttl	In/Out
Alternaria	2	13	<1	1/6	12	80	1	-
ascospores	9	240	3	1/1	10	267	3	-
basidiospores	73	7787	83	1/1	62	6613	75	-
Cercospora	2	13	<1	1/2	4	27	<1	-
Cladosporium	33	880	9	1/1	35	933	11	-
Curvularia	-	-	-	-	2	13	<1	-
Epicoccum	-	-	-	-	10	67	1	-
Gliomastix	-	-	-	-	1	7	<1	-
hyphal elements	15	100	1	1/1	22	147	2	-
Penicillium/Aspergillus group	21	140	1	1/1	19	127	1	-
Pestalotiopsis	-	-	-	-	3	20	<1	-
Pithomyces	3	20	<1	1/2	6	40	<1	-
Rusts	-	-	-	-	3	20	<1	-
Smuts,Periconia,Myxomycetes	32	213	2	1/2	66	440	5	-
Spegazzinia	-	-	-	-	1	7	<1	-
Torula	1	7	<1	1/2	2	13	<1	-
Unknown	2	13	<1	2/1	1	7	<1	-
	Debris Rating 3				Debris Rating 3			
Analytical Sensitivity	Analytical Sensitivity: 7 spr/m³				Analytical Sensitivity: 7 spr/m³			
Comments								
Total *See Footnotes	193	9427	~100%	1/1	259	8827	~100%	-

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Footnotes and Additional Report Information

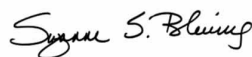
Debris Rating Table

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 sample 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 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.
5. 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.
6. Dash (-) in this report, under raw count column means 'not detected (ND)'; otherwise 'not applicable' (NA).
7. 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.
8. Due to rounding totals may not equal 100%.
9. Analytical Sensitivity for each spores is different for Non-viable sample when the spores are read at different percentage.
10. Minimum Reporting Limits (MRL) for BULKs, DUSTS, SWABS, and WATER samples are a calculation based on the sample 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 sample 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 considered (3) three. For example, a sample with a result of 55,443 spr/m³ from a 75L sample using significant figures should be considered 55,000. The same result of 55,443 from a 150L sample using significant figures should be considered 55,400 spr/m³.
15. If the In/Out ratio is greater than 100 times it is indicated >100/1, rather than showing the real value.

Terminology Used in Direct Exam Reporting

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



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

15 028400
 15028400



LAB #192683 (CO)
 LAB #102977 (GA)
 LAB #163063 (VA)
 LAB #210229 (AZ)

AZ, CO, GA, VA, NJ

NVLAP Lab Code 200860-0 (CO)
 NVLAP Lab Code 200829-0 (VA)
 NVLAP Lab Code 500097-0 (AZ)

Aerobiology Client Aria Environmental, Inc.		Collected By/Date: 10/27/15		Relinquished By/Date: 10/28/15	
Field Contact	Julie Barth	Relinquished By/Date:	10/28/15	Received By/Date:	PJ 11/2/15
Reporting Address	PO Box 286, Woodbine, MD 21797	Sampler Type	Andersen SAS	Sample Aire	Aero Trap
Billing Address	SAME	Other	AllergencoD	BioCulture	
Phone/Fax	410-549-5774/410-549-4488	PO#/Job#: J15-876 GMS			
Reporting Email (s)	jbarth@ariaenviro.com	Project Name: Glenwood MS			
Routine	<input checked="" type="radio"/> 24 Hour <input type="radio"/> Same Day <input type="radio"/> 4 Hou <input type="radio"/> 2 Hou <input type="radio"/> 5 Day (Asbestos Only)	Notes:			
SAMPLING LOCATION ZIP CODE 21738		CC Info:			

Sample No.	Test Code	Sample Location	Total Volume/Area
1 GM-03	1054	Classroom 3	150 L
2 GM-04	1054	Classroom 4	150 L
3 GM-14	1054	Room 14	150 L
4 GM-16	1054	Room 16	150 L
5 GM-25	1054	Classroom 25	150 L
6 GM-26	1054	Classroom 26	150 L
7 GM-33	1054	Classroom 33	150 L
8 GM-35	1054	Classroom 35 (FACS)	150 L
9 GM-80	1054	Portable Classroom 80	150 L
10 GM-81	1054	Portable Classroom 81	150 L
11 Out 1	1054	Outside near PCR 81	150 L
12 Out 2 CY	1054	Outside Courtyard	150 L
13			
14			

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

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