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:

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WOODBINE, MD 21797

JANUARY 8, 2016

150876

SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
DECEMBER 28, 2015

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SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
DECEMBER 28, 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 heating, ventilation and air-conditioning (HVAC) system upgrade performed in summer, 2015. 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 December 28, 2015 as part of a series of spore sampling events that will occur regularly during the 2015 - 2016 school year. This report presents the results of air sampling made on December 28, 2015.

Spore Trap Sampling Report
For Glenwood Middle School
December 28, 2015

I. BACKGROUND

Representatives from Aria Environmental, Inc. (AE) visited Glenwood Middle School on December 28, 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 1, 2, 3, 4, 12, 13, 23, 24 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. Monitoring was performed after school during the holiday break when students and most faculty and staff had the day off. A contractor was performing maintenance on the HVAC system and the first two wings of the school had the systems turned off starting at 6 AM. The HVAC systems, where operational, were set to energy saver mode with lower heat settings. Weather on the day of monitoring was cold with a light breeze. The weather was unseasonably warm and wet for three days prior to the day of monitoring.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on December 28, 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 2:10 PM and 3:08 PM ranged from 57.9 to 70.3° F with an average of 68.0° F. The indoor relative humidity ranged from 34.5 to 42.7 percent. The temperature and relative humidity measurements are considered acceptable for winter thermal comfort in all rooms except Classroom 3 and Portable Classrooms 80 and 81 where the temperature measurements were lower than the comfort range. 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 3:10 PM was 43.7° F and the outdoor relative humidity was 44.9% outside near Portable Classroom 81, and the outside temperature at 3:18 PM was 42.8° F and the relative humidity was 60.1% in the courtyard outside Classroom 20. 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 – 80.0°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

[a]adapted 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 with the rooms unoccupied during sampling. Carbon dioxide concentrations ranged from 454 to 487 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 468 to 489 ppm. Carbon dioxide concentrations were within the comfort parameters established by ASHRAE in all areas monitored.

Carbon monoxide is mainly attributed to incomplete combustion. Concentrations of CO ranged from 0.1 to 0.4 ppm indoors and the outdoor concentration ranged from 0.5 to 1.1 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 $\mu g/m^3$ and 50 $\mu g/m^3$, 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 December 28, 2015 at Glenwood Middle School

Location	Time	PM1 (µg/m³)	PM2.5 (µg/m³)	PM7 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)	Temp (°F)	Rh (%)	CO (ppm)	CO_2 (ppm)
CR 01	2:10 PM	0	0	0	0	0	68.8	40.4	0.4	459
CR 02	2:12 PM	0	0	2	3	3	68.5	41.9	0.2	455
CR 03	2:20 PM	0	0	0	0	1	**68.4**	42.7	0.3	459
CR 04	2:22 PM	0	0	2	2	3	70.3	39.4	0.3	487
CR 12	2:36 PM	0	0	0	0	3	69.9	40.8	0.2	487
CR 13	2:40 PM	0	0	0	0	0	69.3	41.8	0.3	465
CR 23	2:50 PM	0	0	0	0	0	69.4	42.6	0.2	454
CR 24	2:52 PM	0	0	0	0	1	70.1	42.7	0.3	466
PCR 80	3:06 PM	0	0	0	0	0	**65.0**	34.5	0.1	470
PCR 81	3:08 PM	0	0	0	0	2	**57.9**	41.4	0.1	471
Out 1	3:10 PM	0	0	1	1	2	43.7	44.9	1.1	468
Out 2 CY	3:18 PM	0	0	1	1	1	42.8	60.1	0.5	489

CR = Classroom; PCR = Portable Classroom; CY = Courtyard; Bold type indicates measurements outside of guidelines

B. Air Monitoring for Fungal Identification and Counting on December 28, 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 1, 2, 3, 4, 12, 13, 23, 24 and 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 m^3) 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 December 28, 2015.

Indoor spore counts ranged from 160 to 373 total spores per cubic meter of air (m^3) in the main school building and from 420 to 1,513 in the portable classrooms on December 28, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 9,253 to 15,073 spores per m^3. All individual spore types detected indoors had counts lower than the outdoor sample counts except for Penicillium/Aspergillus group spores found in Portable Classrooms 80 and 81 at 113 and 100 spores/m^3, respectively. These spore counts were above the range of spores detected in the outdoor samples (20 – 53 Penicillium/Aspergillus group spores/m^3). 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 three of the ten indoor samples and ranged from 7 to 13 elements per m^3. The outdoor sample hyphal element counts ranged from 13 to 33 elements per m^3. 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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December 28, 2015

Table 3: Results of Spore Trap Sampling in Selected Classrooms in Glenwood Middle School on December 28, 2015

Location	Outside near PCR 81 (Out 1)	Outside in Courtyard (Out 2)	Room 01 (GM 01)	Room 02 (GM 02)	Room 03 (GM 03)	Room 04 (GM 04)	Room 12 (GM 12)	Room 13 (GM 13)	Room 23 (GM 23)	Room 24 (GM 24)
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**	**Spores/ m^3**
Ascospores	853	853	13	27	27	7	20	7	20	7
Basidiospores	13,973	8,213	207	287	267	247	213	180	167	140
Cladosporium	73	40	-	7	20	-	7	60	7	-
Colorless	7	7	-	7	-	-	-	7	-	-
Drechslera/Bipolaris group	7	-	-	-	-	-	-	-	-	-
Epicoccum	33	33	-	-	-	-	-	-	-	-
Hyphal Elements	33	13	-	-	13	-	7	-	-	-
Oidium	7	-	-	-	-	-	-	-	-	-
Penicillium/ Aspergillus	53	20	40	33	7	20	33	27	13	13
Polythrincium	7	-	-	-	-	-	-	-	-	-
Rusts	-	7	-	-	-	-	-	-	-	-
Smuts, Periconia, myxomycetes	27	60	-	13	-	13	20	13	-	-
Unknown	-	7	-	-	-	-	-	-	-	-
Total Fungi	15,073	9,253	260	373	333	287	300	293	207	160

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

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For Glenwood Middle School
December 28, 2015

Table 4: Results of Spore Trap Sampling in Portable Classrooms at Glenwood Middle School on December 28, 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**
Ascospores	853	853	13	87
Basidiospores	13,973	8,213	227	1,187
Cladosporium	73	40	53	127
Colorless	7	7	-	7
Drechslera/Bipolaris group	7	-	-	-
Epicoccum	33	33	-	-
Hyphal Elements	33	13	-	7
Oidium	7	-	-	-
Penicillium/ Aspergillus	53	20	**113**	**100**
Polythrincium	7	-	-	-
Rusts	-	7	-	-
Smuts, Periconia, myxomycetes	27	60	13	-
Unknown	-	7	-	-
Total Fungi	15,073	9,253	420	1,513

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

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 December 28, 2015.

Thermal comfort parameters of temperature and humidity were measured. Temperature and relative humidity measurements were within the comfort ranges established by ASHRAE except for temperature measurements in Classroom 3 and Portable Classrooms 80 and 81 where the temperature measurements were below the comfort range. Carbon dioxide, carbon monoxide and particulate matter measurements were within acceptable ranges for good indoor air quality in all areas monitored.

Indoor spore counts ranged from 160 to 373 total spores per cubic meter of air (m^3) in the main school building classrooms and from 420 to 1,513 in the portable classrooms on December 28, 2015. All indoor samples had total spore counts lower than the outdoor samples which ranged from 9,253 to 15,073 spores/ m^3. All individual spore types detected indoors had counts lower than the outdoor sample counts except for Penicillium/Aspergillus group spores found in the Portable Classrooms 80 and 81 samples above the outdoor counts. Hyphal elements were detected in three of the ten indoor samples below the outdoor hyphal element counts. 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 m^3	Outdoor Spore Count Range Spores per m^3
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
November 4, 2015	73 to 780	26,592 to 27,484
November 11, 2015	133 to 6,427	23,808 to 28,018
November 18, 2015	40 to 673	3,080 to 3,553
November 25, 2015	53 to 333	4,827 to 5,747
December 3, 2015	100 to 4,900	5,340 to 6,207
December 9, 2015	40 to 187	10,940 to 11,087
December 16, 2015	33 to 1,320	5,920 to 11,995
December 21, 2015	33 to 373	5,673 to 6,600

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December 28, 2015

Date	Indoor Spore Count Range Spores per m^3	Outdoor Spore Count Range Spores per m^3
December 28, 2015	160 to 1,513	9,253 to 15,073

Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts over 29 times higher on average than the indoor counts. Indoor sample total spore counts and individual spore counts were all lower than the outdoor sample counts with two exceptions described above. Follow up air sampling has not yet been rescheduled for January 2016 due to a fire at the school. Air sampling will be performed regularly in order to monitor changes in conditions affected by seasonal variations and the new HVAC system.

IV. LIMITATIONS

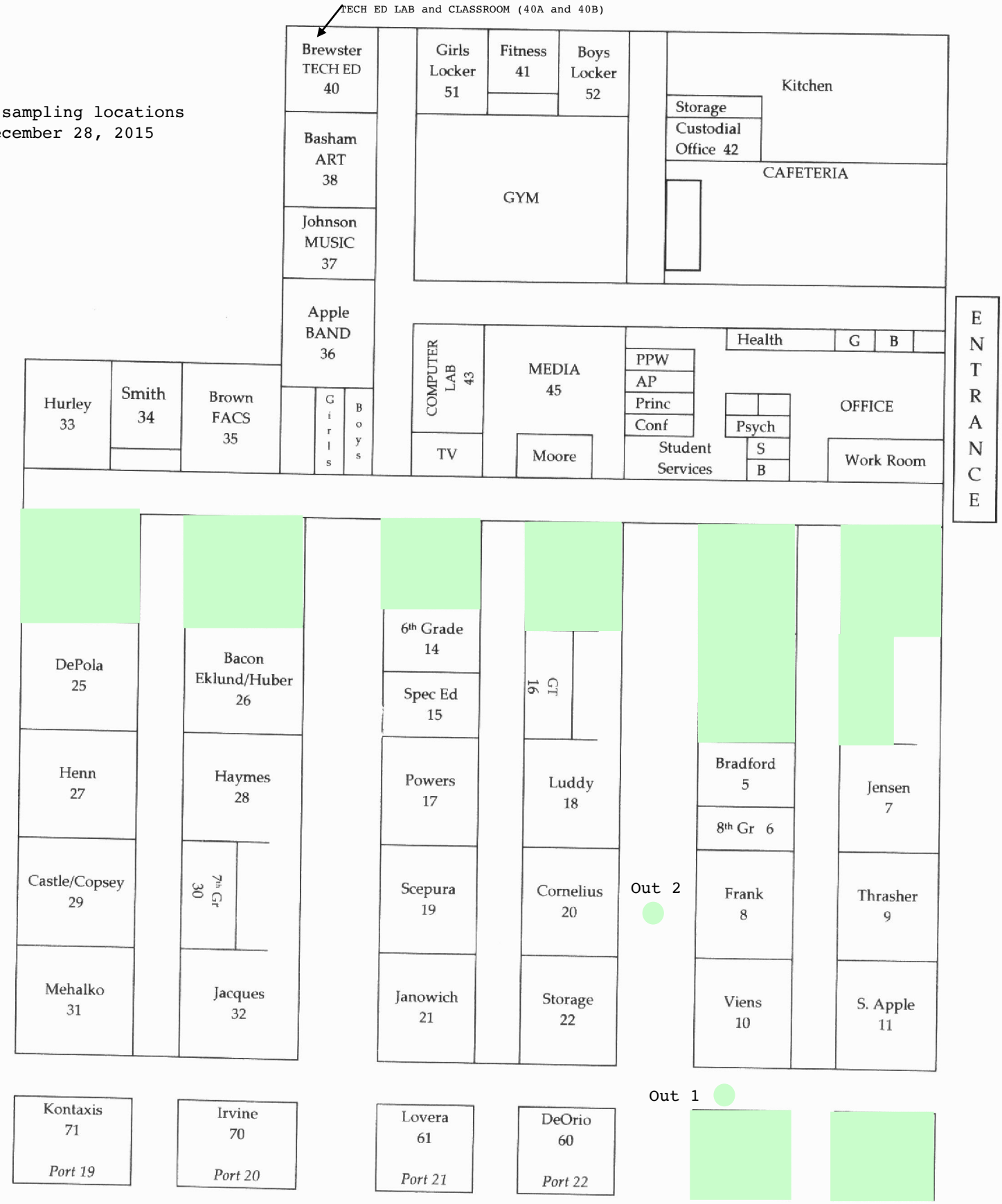
This report has been prepared for the exclusive use of the Howard County Public School System and/or their agents. This service has been performed in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based, 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 my 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 December 28, 2015

Spore sampling locations
for December 28, 2015



Glenwood Middle School Floor Plan

As of 8/02/13

Attachment B:

Report of Analysis and Chain of Custody Forms
December 28, 2015

Aerobiology Laboratory Associates, Incorporated
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43760 Trade Center Place
Suite 100
Sterling, Virginia 20166
(877) 648-9150
www.aerobiology.net

Certificate of Analysis
EMLAP# 102977

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	**GM-01**				**Out 2 CY**			
Sample Location	**Classroom 1**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-001**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	2	13	5	1/64	8	853	9	-
basidiospores	31	207	79	1/40	77	8213	89	-
Cladosporium	-	-	-	-	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	6	40	15	2/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	39	260	~100%	1/36	113	9253	~100%	-

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Attn: Julie Barth
Project: **J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-02**				**Out 2 CY**			
Sample Location	**Classroom 2**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-002**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	4	27	7	1/32	8	853	9	-
basidiospores	43	287	77	1/29	77	8213	89	-
Cladosporium	1	7	2	1/6	6	40	<1	-
Colorless	1	7	2	1/1	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	5	33	9	2/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	4	1/5	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	56	373	~100%	1/25	113	9253	~100%	-

Client Sample Number	**GM-03**				**Out 2 CY**			
Sample Location	**Classroom 3**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-003**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	4	27	8	1/32	8	853	9	-
basidiospores	40	267	80	1/31	77	8213	89	-
Cladosporium	3	20	6	1/2	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	2	13	4	1/1	2	13	<1	-
Penicillium/Aspergillus group	1	7	2	1/3	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	50	333	~100%	1/28	113	9253	~100%	-

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-04**				**Out 2 CY**			
Sample Location	**Room 4**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-004**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	1	7	2	1/128	8	853	9	-
basidiospores	37	247	86	1/33	77	8213	89	-
Cladosporium	-	-	-	-	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	3	20	7	1/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	5	1/5	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	43	287	~100%	1/32	113	9253	~100%	-

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Attn: Julie Barth
Project: **J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-12**				**Out 2 CY**			
Sample Location	**Classroom 12**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-005**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	3	20	7	1/43	8	853	9	-
basidiospores	32	213	71	1/39	77	8213	89	-
Cladosporium	1	7	2	1/6	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	1	7	2	1/2	2	13	<1	-
Penicillium/Aspergillus group	5	33	11	2/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	3	20	7	1/3	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	45	300	~100%	1/31	113	9253	~100%	-

Client Sample Number	**GM-13**				**Out 2 CY**			
Sample Location	**Classroom 13**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-006**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	1	7	2	1/128	8	853	9	-
basidiospores	27	180	61	1/46	77	8213	89	-
Cladosporium	9	60	20	2/1	6	40	<1	-
Colorless	1	7	2	1/1	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	4	27	9	1/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	5	1/5	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	44	293	~100%	1/32	113	9253	~100%	-

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-23**				**Out 2 CY**			
Sample Location	**Classroom 23**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-007**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	3	20	10	1/43	8	853	9	-
basidiospores	25	167	81	1/49	77	8213	89	-
Cladosporium	1	7	3	1/6	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	2	13	6	1/2	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	31	207	~100%	1/45	113	9253	~100%	-

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-24**				**Out 2 CY**			
Sample Location	**Classroom 24**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-008**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	1	7	4	1/128	8	853	9	-
basidiospores	21	140	88	1/59	77	8213	89	-
Cladosporium	-	-	-	-	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	2	13	8	1/2	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	24	160	~100%	1/58	113	9253	~100%	-

Client Sample Number	**GM-80**				**Out 2 CY**			
Sample Location	**Storage Room 80**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-009**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	2	13	3	1/64	8	853	9	-
basidiospores	34	227	54	1/36	77	8213	89	-
Cladosporium	8	53	13	1/1	6	40	<1	-
Colorless	-	-	-	-	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	-	-	-	-	2	13	<1	-
Penicillium/Aspergillus group	17	113	27	6/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	3	1/5	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **1**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	63	420	~100%	1/22	113	9253	~100%	-

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Attn: Julie Barth
Project: **J15-876 GMS Glenwood MS**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**GM-81**				**Out 2 CY**			
Sample Location	**Portable Classroom 81**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-010**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	13	87	6	1/10	8	853	9	-
basidiospores	178	1187	78	1/7	77	8213	89	-
Cladosporium	19	127	8	3/1	6	40	<1	-
Colorless	1	7	<1	1/1	1	7	<1	-
Epicoccum	-	-	-	-	5	33	<1	-
hyphal elements	1	7	<1	1/2	2	13	<1	-
Penicillium/Aspergillus group	15	100	7	5/1	3	20	<1	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	227	1513	~100%	1/6	113	9253	~100%	-

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Client Sample Number	**Out 1**				**Out 2 CY**			
Sample Location	**Outside Near PCR 81**				**Outside Courtyard**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**15034264-011**				**15034264-012**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
ascospores	8	853	6	1/1	8	853	9	-
basidiospores	131	13973	93	2/1	77	8213	89	-
Cladosporium	11	73	<1	2/1	6	40	<1	-
Colorless	1	7	<1	1/1	1	7	<1	-
Drechslera/Bipolaris group	1	7	<1	-	-	-	-	-
Epicoccum	5	33	<1	1/1	5	33	<1	-
hyphal elements	5	33	<1	3/1	2	13	<1	-
Oidium	1	7	<1	-	-	-	-	-
Penicillium/Aspergillus group	8	53	<1	3/1	3	20	<1	-
Polythrincium	1	7	<1	-	-	-	-	-
Rusts	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	4	27	<1	1/2	9	60	1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **2**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments								
Total *See Footnotes	176	15073	~100%	2/1	113	9253	~100%	-

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

Date Collected: 12/28/2015
Date Received: 12/30/2015
Date Analyzed: 12/31/2016
Date Reported: 01/05/2016
Project ID: 15034264

Footnotes and Additional Report Information

Debris Rating Table

1	Minimal (<5%) particular 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/m^3 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/m^3.

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

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15034264

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Page 1 of 1

ELITE AZ, CO, IA, VA, NJ

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

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

Aerobiology Client	Aria Environmental, Inc.		
Field Contact	Julie Barth	Collected By/Date: 12/28/15	Relinquished By/Date: 12/28/15
Reporting Address	PO Box 286, Woodbine, MD 21797	Relinquished By/Date: 12/28/15	Received By/Date: CM 12/30/2015
Billing Address	SAME	Sampler Type: Andersen____ SAS____	SampleAire____ AeroTrap____ Other Allergenco-D 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 ◉	24 Hour ○ Same Day ○ 4 Hou ○ 2 Hou ○	5 Day (Asbestos Only)	Notes:
SAMPLING LOCATION ZIP CODE	21738	CC Info:	

	Sample No.	Test Code	Sample Location	Total Volume/Area
1	GM-01	1054	Classroom 1	150 L
2	GM-02	1054	Classroom 2	150 L
3	GM-03	1054	Classroom 3	150 L
4	GM-04	1054	Room 4	150 L
5	GM-12	1054	Classroom 12	150 L
6	GM-13	1054	Classroom 13	150 L
7	GM-23	1054	Classroom 23	150 L
8	GM-24	1054	Classroom 24	150 L
9	GM-80	1054	Storage Room 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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