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

JUNE 9, 2016

150876

SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
JUNE 1, 2016

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SPORE TRAP SAMPLING REPORT
FOR GLENWOOD MIDDLE SCHOOL
June 1, 2016

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 and carbon dioxide and collected microbial spore trap sampling for fungal spore identification and counting on June 1, 2016 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 June 1, 2016.

Spore Trap Sampling Report
For Glenwood Middle School
June 1, 2016

I. BACKGROUND

Representatives from Aria Environmental, Inc. (AE) visited Glenwood Middle School on June 1, 2016 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, 17, 18, 25, 26, Tech Ed Lab 40A, Tech Ed Classroom 40B and Portable Classrooms 60 and 61. Outdoor air samples were also collected for comparison purposes in one courtyard and outside near portable classroom 60. 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 sunny and hot.

II. OBSERVATIONS AND MEASUREMENTS

A. Observations and Measurements on June 1, 2016

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 3:23 PM and 4:35 PM ranged from 72.3 to 77.0° F with an average of 76.0° F. The indoor relative humidity ranged from 43.2 to 51.7 percent. The temperature and humidity measurements were acceptable compared to the comfort ranges. 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 92.1° F and the outdoor relative humidity was 27.8% outside near Portable Classroom 60, and the outside temperature at 4:53 PM was 87.2° F and the relative humidity was 34.7% in the outdoor courtyard. 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 290 to 460 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 244 to 263 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 were consistently 0.0 ppm indoors and ranged from 0.0 to 1.0 ppm outdoors. 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 µg/m^3 and 50 µg/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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June 1, 2016

Table 2: Particle, Temperature, Relative Humidity, Carbon Dioxide and Carbon Monoxide Measurements Collected on June 1, 2016 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	3:23 PM	0	0	1	2	3	76.5	48.3	0.0	337
CR 02	3:25 PM	0	0	1	1	3	75.1	49.6	0.0	391
CR 17	3:38 PM	0	0	1	1	3	75.8	43.5	0.0	376
CR 18	3:43 PM	0	0	1	1	3	75.5	43.2	0.0	290
CR 25	3:59 PM	0	0	1	1	4	75.8	48.2	0.0	314
CR 26	4:02 PM	0	0	1	1	2	75.8	49.8	0.0	301
CR 40A	4:11 PM	0	0	3	4	8	76.4	44.4	0.0	308
CR 40B	4:16 PM	0	1	16	27	37	77.0	43.8	0.0	298
PCR 60	4:30 PM	0	0	0	0	1	72.3	45.3	0.0	327
PCR 61	4:35 PM	0	0	2	2	4	77.0	51.7	0.0	460
Out 1	4:50 PM	0	1	4	6	9	92.1	27.8	0.0	244
Out 2 CY	4:53 PM	0	1	3	6	11	87.2	34.7	1.0	263

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

B. Air Monitoring for Fungal Identification and Counting on June 1, 2016

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, 17, 18, 25, 26, Tech Ed Lab 40A, Tech Ed Classroom 40B), two portable classrooms (60 and 61) 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 June 1, 2016.

Indoor spore counts ranged from 427 to 840 total spores per cubic meter of air (m^3) in the main school building and ranged from 707 to 1,047 in the portable classrooms on June 1, 2016. All indoor samples had total spore counts lower than the outdoor samples which ranged from 34,780 to 73,216 spores per m^3. All individual spore types detected indoors had counts lower than the outdoor sample counts with the following exceptions: Chaetomium spores in the Portable Classroom 61 sample (7 spores/m^3), Penicillium and Aspergillus group spores in Classrooms 2 (40 spores/m^3), 17 (67 spores/m^3), 18 (67 spores/m^3) and Portable Classroom 61 (53 spores/m^3) and Smuts, Periconia and Myxomycetes spores in Portable Classroom 60 (187 spores/m^3). These spore counts were above the range of spores detected in the outdoor samples; however, the counts were generally considered low and not problematic.

The secondary colonizers Chaetomium and Stachybotrys were not detected in any samples except for 7 Chaetomium spores detected in the Portable Classroom 61 sample. Hyphal elements were detected in five of the ten indoor samples with counts of 7 to 47 elements per m^3. Hyphal elements were detected in both outdoor samples from 33 to 40 elements/m^3. The Portable Classroom 60 sample had a hyphal element count (47 elements/m^3) slightly above the range detected outdoors. 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 June 1, 2016

Location	Outside (Out 1)	Outside in Courtyard (Out 2)	Room 1 (GM 01)	Room 2 (GM 02)	Room 17 (GM 17)	Room 18 (GM 18)	Room 25 (GM 25)	Room 26 (GM 26)	Room 40A (GM 40A)	Room 40B (GM 40B)
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**
Alternaria	100	100	-	-	-	-	-	-	-	7
Ascospores	18,317	23,077	107	60	140	133	173	113	87	53
Basidiospores	15,974	28,632	233	247	367	473	227	353	180	60
Cercospora	7	13	-	-	-	-	-	-	-	-
Chaetomium	-	-	-	-	-	-	-	-	-	-
Cladosporium	8	20,940	173	140	147	167	200	173	167	213
Colorless	27	7	-	-	-	-	-	-	-	-
Curvularia	-	7	-	-	-	-	-	-	-	-
Drechslera/Bipolaris	-	7	-	-	-	-	-	-	-	-
Epicoccum	73	87	-	-	-	-	-	-	-	-
Exosporium	-	13	-	-	-	-	-	-	-	-
Fusicladium	7	-	-	-	-	-	-	-	-	-
Hyphal Elements	33	40	-	-	7	-	-	-	7	27
Oidium	27	27	-	-	-	-	-	-	-	-
Penicillium/Aspergillus	27	33	-	**40**	**67**	**67**	13	27	33	27
Pithomyces	-	-	-	-	-	-	-	-	-	-
Polythrincium	7	7	-	-	-	-	-	-	-	-
Rusts	-	7	-	-	-	-	-	-	-	-
Smuts, Periconia, Myxomycetes	167	180	7	13	7	-	-	13	7	27
Unknown	7	40	-	-	-	-	-	-	-	13
Total Fungi	34,780	73,216	520	500	733	840	613	680	480	427

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

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June 1, 2016

Table 4: Results of Spore Trap Sampling in Portable Classrooms at Glenwood Middle School on June 1, 2016

Location	Outside (Out 1)	Outside in Courtyard (Out 2)	Room 60 (GM 60)	Room 61 (GM 61)
Spore Type	**Spores/m³**	**Spores/m³**	**Spores/m³**	**Spores/m³**
Alternaria	100	100	20	-
Ascospores	18,317	23,077	47	227
Basidiospores	15,974	28,632	93	360
Cercospora	7	13	-	-
Chaetomium	-	-	-	**7**
Cladosporium	8	20,940	260	327
Colorless	27	7	-	-
Curvularia	-	7	-	-
Drechslera/Bipolaris group	-	7	7	-
Epicoccum	73	87	-	7
Exosporium	-	13	-	-
Fusicladium	7	-	-	-
Hyphal Elements	33	40	**47**	20
Oidium	27	27	7	-
Penicillium/Aspergillus	27	33	33	**53**
Pithomyces	-	-	7	-
Polythrincium	7	7	-	-
Rusts	-	7	-	-
Smuts, Periconia, Myxomycetes	167	180	**187**	47
Unknown	7	40	-	-
Total Fungi	34,780	73,216	707	1,047

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 collected microbial spore trap samples on June 1, 2016.

Thermal comfort parameters of temperature and relative humidity were measured. Temperature and humidity measurements were acceptable compared to comfort ranges. Carbon dioxide, carbon monoxide and particle measurements were within acceptable ranges for good indoor air quality in all areas monitored.

Indoor spore counts ranged from 427 to 840 total spores per cubic meter of air (m^3) in the main school building and ranged from 707 to 1,047 in the portable classrooms on June 1, 2016. All indoor samples had total spore counts lower than the outdoor samples which ranged from 34,780 to 73,216 spores per m^3. All individual spore types detected indoors had counts lower than the outdoor sample counts with the following exceptions: Chaetomium spores in the Portable Classroom 61 sample (7 spores/m^3), Penicillium and Aspergillus group spores in Classrooms 2 (40 spores/m^3), 17 (67 spores/m^3), 18 (67 spores/m^3) and Portable Classroom 61 (53 spores/m^3) and Smuts, Periconia and Myxomycetes group spores in Portable Classroom 60 (187 spores/m^3). These spore counts were above the range of spores detected in the outdoor samples; however, the counts were generally considered low and not problematic. Hyphal elements were detected in five of the ten indoor samples with counts of 7 to 47 elements per m^3. Hyphal elements were detected in both outdoor samples ranging from 33 to 40 elements/m^3. The Portable Classroom 60 sample had a hyphal element count (47 elements/m^3) above the outdoor counts. The secondary colonizers Chaetomium and Stachybotrys were not detected in any samples except for 7 Chaetomium spores detected in the Portable Classroom 61 sample. 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

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Date	Indoor Spore Count Range Spores per m^3	Outdoor Spore Count Range Spores per m^3
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
December 28, 2015	160 to 1,513	9,253 to 15,073
January 19, 2016	40 to 300	200 to 307
January 27, 2016	0 to 113	127 to 167
February 4, 2016	7 to 493	4,093 to 4,367
February 10, 2016	7 to 40	127 to 180
February 18, 2016	13 to 127	200 to 240
February 26, 2016	7 to 260	87 to 173
March 2, 2016	7 to 33	113 to 167
March 9, 2016	20 to 800	3,060 to 3,840
March 16, 2016	60 to 14,672	19,510 to 23,190
March 22, 2016	13 to 1,867	2,173 to 2,220
March 30, 2016	67 to 3,167	1,660 to 2,333
April 5, 2016	7 to 120	980 to 10,960
April 13, 2016	73 to 320	2,000 to 3,067
April 20, 2016	13 to 127	480 to 36,379
April 27, 2016	253 to 7,007	15,360 to 17,160
May 4, 2016	573 to 4,707	42,032 to 48,752
May 12, 2016	487 to 12,727	42,236 to 65,628
May 18, 2016	360 to 6,207	21,406 to 25,773
May 25, 2016	213 to 1,160	10,147 to 16,253
June 1, 2016	427 to 1,047	34780 to 73,216

Spore measurements collected in classrooms were generally acceptable compared to outdoor samples with outdoor total spore counts 82 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 the exceptions described above. Follow up air sampling has been scheduled for June 8, 2016. 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.

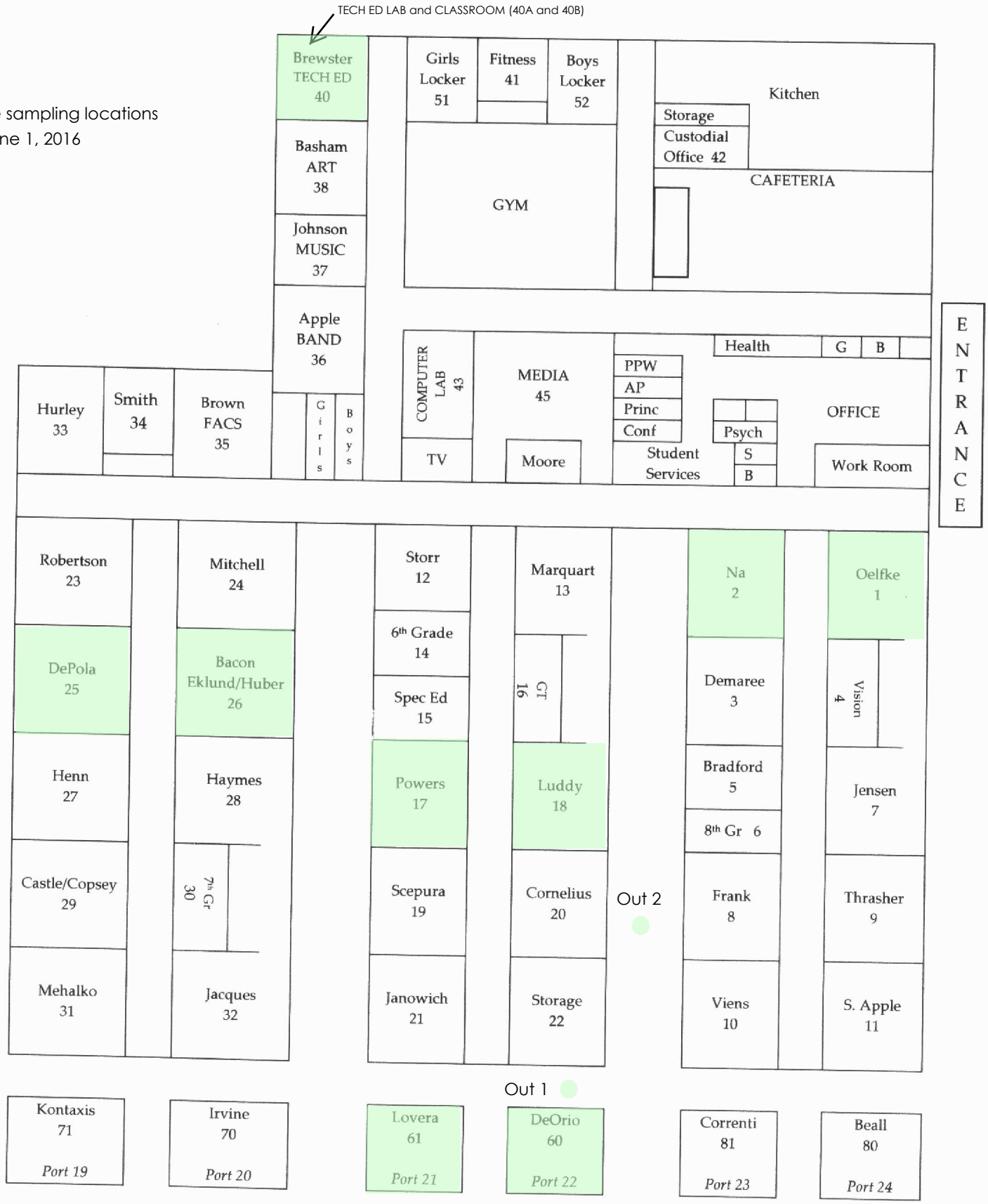
By virtue of providing the services described in this report, the preparer does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for

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 June 1, 2016

Spore sampling locations
for June 1, 2016



Glenwood Middle School Floor Plan

As of 8/02/13

N

Attachment B:

Report of Analysis and Chain of Custody Forms
June 1, 2016

Aerobiology Laboratory Associates, Incorporated
Expertise Since 1997

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: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

1054 Spore Trap Analysis: SOP 3.8

Client Sample Number	**GM-01**				**Out 1**			
Sample Location	**Room 1**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-001**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	16	107	21	1/172	86	18317	53	-
basidiospores	35	233	45	1/68	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	26	173	33	21/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	-	-	-	-	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	1	7	1	1/25	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	78	520	~100%	1/67	275	34780	~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: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-02**				**Out 1**			
Sample Location	**Room 2**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-002**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	9	60	12	1/305	86	18317	53	-
basidiospores	37	247	49	1/65	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	21	140	28	17/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	6	40	8	2/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	3	1/13	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	75	500	~100%	1/70	275	34780	~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: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-17**				**Out 1**			
Sample Location	**Room 17**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-003**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	21	140	19	1/131	86	18317	53	-
basidiospores	55	367	50	1/44	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	22	147	20	17/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	1	7	1	1/5	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	10	67	9	3/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	1	7	1	1/25	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	110	733	~100%	1/47	275	34780	~100%	-

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Certificate of Analysis
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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: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-18**				**Out 1**			
Sample Location	**Room 18**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-004**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	20	133	16	1/137	86	18317	53	-
basidiospores	71	473	56	1/34	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	25	167	20	20/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	10	67	8	3/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	126	840	~100%	1/41	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-25**				**Out 1**			
Sample Location	**Room 25**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-005**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	26	173	28	1/106	86	18317	53	-
basidiospores	34	227	37	1/70	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	30	200	33	24/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	2	13	2	1/2	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	-	-	-	-	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	92	613	~100%	1/57	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-26**				**Out 1**			
Sample Location	**Room 26**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-006**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	17	113	17	1/162	86	18317	53	-
basidiospores	53	353	52	1/45	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	26	173	25	21/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	-	-	-	-	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	4	27	4	1/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	2	13	2	1/13	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	102	680	~100%	1/51	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-40A**				**Out 1**			
Sample Location	**Room 40A (Tech Ed Lab)**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-007**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	13	87	18	1/211	86	18317	53	-
basidiospores	27	180	37	1/89	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	25	167	35	20/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	1	7	1	1/5	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	5	33	7	1/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	1	7	1	1/25	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **3**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments	Large amount of particulate and fibers seen.				Large amount of particulate and fibers seen.			
Total *See Footnotes	72	480	~100%	1/72	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-40B**				**Out 1**			
Sample Location	**Room 40B (Tech Ed Classroom)**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-008**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	1	7	2	1/15	15	100	<1	-
ascospores	8	53	12	1/343	86	18317	53	-
basidiospores	9	60	14	1/266	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	32	213	50	25/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	4	27	6	1/1	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	4	27	6	1/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	4	27	6	1/6	25	167	<1	-
Unknown	2	13	3	2/1	1	7	<1	-
	Debris Rating **3**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments	Large amount of particulate and fibers seen.				Large amount of particulate and fibers seen.			
Total *See Footnotes	64	427	~100%	1/82	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-60**				**Out 1**			
Sample Location	**Portable Classroom 60**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-009**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	3	20	3	1/5	15	100	<1	-
ascospores	7	47	7	1/393	86	18317	53	-
basidiospores	14	93	13	1/171	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Cladosporium	39	260	37	31/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Drechslera/Bipolaris group	1	7	1	-	-	-	-	-
Epicoccum	-	-	-	-	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	7	47	7	1/1	5	33	<1	-
Oidium	1	7	1	1/4	4	27	<1	-
Penicillium/Aspergillus group	5	33	5	1/1	4	27	<1	-
Pithomyces	1	7	1	-	-	-	-	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	28	187	26	1/1	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **3**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	106	707	~100%	1/49	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**GM-61**				**Out 1**			
Sample Location	**Portable Classroom 61**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-010**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	-	-	-	-	15	100	<1	-
ascospores	34	227	22	1/81	86	18317	53	-
basidiospores	54	360	34	1/44	75	15974	46	-
Cercospora	-	-	-	-	1	7	<1	-
Chaetomium	1	7	1	-	-	-	-	-
Cladosporium	49	327	31	39/1	42	8	<1	-
Colorless	-	-	-	-	4	27	<1	-
Epicoccum	1	7	1	1/11	11	73	<1	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	3	20	2	1/2	5	33	<1	-
Oidium	-	-	-	-	4	27	<1	-
Penicillium/Aspergillus group	8	53	5	2/1	4	27	<1	-
Polythrincium	-	-	-	-	1	7	<1	-
Smuts,Periconia,Myxomycetes	7	47	4	1/4	25	167	<1	-
Unknown	-	-	-	-	1	7	<1	-
	Debris Rating **2**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments					Large amount of particulate and fibers seen.			
Total *See Footnotes	157	1047	~100%	1/33	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

Client Sample Number	**Out 2 CY**				**Out 1**			
Sample Location	**Outside Courtyard**				**Outside**			
Sample Volume (L)	**150**				**150**			
Lab Sample Number	**16016690-012**				**16016690-011**			
Spore Identification	Raw Ct	spr/m³	% Ttl	In/Out	Raw Ct	spr/m³	% Ttl	In/Out
Alternaria	15	100	<1	1/1	15	100	<1	-
ascospores	54	23077	32	1/1	86	18317	53	-
basidiospores	67	28632	39	2/1	75	15974	46	-
Cercospora	2	13	<1	2/1	1	7	<1	-
Cladosporium	49	20940	29	>100/1	42	8	<1	-
Colorless	1	7	<1	1/4	4	27	<1	-
Curvularia	1	7	<1	-	-	-	-	-
Drechslera/Bipolaris group	1	7	<1	-	-	-	-	-
Epicoccum	13	87	<1	1/1	11	73	<1	-
Exosporium	2	13	<1	-	-	-	-	-
Fusicladium	-	-	-	-	1	7	<1	-
hyphal elements	6	40	<1	1/1	5	33	<1	-
Oidium	4	27	<1	1/1	4	27	<1	-
Penicillium/Aspergillus group	5	33	<1	1/1	4	27	<1	-
Polythrincium	1	7	<1	1/1	1	7	<1	-
Rusts	1	7	<1	-	-	-	-	-
Smuts,Periconia,Myxomycetes	27	180	<1	1/1	25	167	<1	-
Unknown	6	40	<1	6/1	1	7	<1	-
	Debris Rating **3**				Debris Rating **3**			
Analytical Sensitivity	Analytical Sensitivity: **7** spr/m³				Analytical Sensitivity: **7** spr/m³			
Comments	Large amount of particulate and fibers seen.				Large amount of particulate and fibers seen.			
Total *See Footnotes	255	73216	~100%	2/1	275	34780	~100%	-

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

Date Collected: 06/01/2016
Date Received: 06/03/2016
Date Analyzed: 06/08/2016
Date Reported: 06/08/2016
Project ID: 16016690

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. Analytical Sensitivity is calculated as spr/m^3 divided by raw count. spr/m^3 = raw counts x (100/ % read) x (1000/Sample volume). If Analytical Sensitivity is 13 spr/m^3 at 100% read, Analytical Sensitivity at 50% read would be 27 spr/m^3, which is 2 times higher.

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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Lab Use: 160/6698

AZ, CO, GA, VA, NJ

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: 06/01/16		Relinquished By/Date: 06/02/16	
Reporting Address	PO Box 286, Woodbine, MD 21797	Relinquished By/Date: 06/02/16		Received By/Date: CM 6/3/16	
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 Hour ○ 2 Hour ○	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	Room 1	150 L
2	GM-02	1054	Room 2	150 L
3	GM-17	1054	Room 17	150 L
4	GM-18	1054	Room 18	150 L
5	GM-25	1054	Room 25	150 L
6	GM-26	1054	Room 26	150 L
7	GM-40A	1054	Room 40A (Tech Ed Lab)	150 L
8	GM-40B	1054	Room 40B (Tech Ed Classroom	150 L
9	GM-60	1054	Portable Classroom 60	150 L
10	GM-61	1054	Portable Classroom 61	150 L
11	Out 1	1054	Outside	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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