October 29, 2015

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E: wnewber@clemson.edu

Re: Limited Mold Investigation Report
Clemson University
Martin Hall – Room E209A
Clemson, South Carolina
Terracon Project No. 86127158 – Task 47

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in Room E209A of the Clemson Graduate School on Clemson University's main campus in Clemson, South Carolina. One of the office occupants is expecting a baby and is concerned about a persistent cough she has had. The sampling was performed in general accordance with our IDC with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University Terracon conducted a limited mold investigation of Room E209A in the Clemson Graduate School offices. A current occupant of the office in Room E209A has requested the investigation. Terracon representative Mr. Benjamin Hestir performed this investigation on October 19, 2015.

Standard of Care

This investigation was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our investigation. Many factors, such as weather conditions, building occupancy, ventilation patterns, and seasonal variations in fungal/bacterial concentrations or local sources of volatile chemicals, can affect the conditions observed. The information contained in this report should not be relied upon to

represent conditions that existed prior to or after this investigation. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report.

INVESTIGATION CRITERIA AND METHODS

Physical Inspection

The physical assessment was conducted to determine whether building materials were impacted by moisture intrusion or condensate formation, and to identify the presence of visible suspected fungal growth. The inspection focused primarily on collecting observational data (i.e., information obtained by physical inspection of the building and interviews with the building management, owners, and occupants). The physical inspection can help to formulate plans for more in-depth investigation. Destructive sampling or testing to inspect interior wall cavity spaces or mechanical enclosures was not within the scope of work for this project.

The physical inspection included:

- an examination of the physical structure and potential indoor and outdoor sources of moisture intrusion;
- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth;

Mold Sampling

There are no State or Federal exposure limits established for fungal aerosols. There are currently no regulatory standards or medically based threshold limit or dose-response relationships for exposure to airborne or surface concentrations of mold spores. Terracon relies upon experience, professional judgment, current scientific literature, guidelines and recommendations made by professional organizations and experts, and statistical methods in interpreting mold sampling results.

High variability in airborne fungal spore concentrations can exist in different geographic locations, during different seasons, and weather patterns, and over the course of a given day. As a general rule, indoor air fungal spore concentrations in an HVAC-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment. To help interpret the sampling results, we compared indoor air and outdoor air measurements.

Total non-viable (non-culturable) fungal spore trap samples were collected using Air-O-Cell™ spore trap cassette specifically designed for the collection of airborne mold spores. Air samples

were collected using a calibrated Zefon Bio-Pump™ at a flow rate of 15 liters per minute (LPM) for 5 minutes at each location.

After air sample collection, the samples were hand delivered to Southeast Environmental Microbiology Laboratories, Inc. (SEEML), accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. The total spore count samples were analyzed by direct microscopic examination and are reported in spores per cubic meter of air (spores/m^3).

Temperature and Relative Humidity

Readings of temperature and relative humidity were made with an Extech Model 445580 instrument which was calibrated by the manufacturer.

FINDINGS

Physical Assessment

The office in Room E209A in Martin Hall is part of the Clemson Graduate School offices and currently is occupied by two full time employees. At the time of assessment no musty odors were observed in Room E209A, however one of the office occupants pointed out 2’ by 4’ ceiling tiles in the suspended ceiling that had been replaced due to previous water leaks along the west side of the office which consists of multiple windows that open on a tilt mechanism. Air conditioning units are older “2-pipe” systems and there are three of these units in the office space which is approximately 20’ by 30’.

No evidence of active water intrusion or visible mold growth was observed in the rooms sampled although a few ceiling tiles had minor (less than one square foot) stains from previous leaks.

Mold Air Sampling

On the afternoon of October 19, 2015 Terracon collected six (6) non-viable mold spore trap samples; four in Room E209A (one on each desk/work area) plus two outdoors for comparison.

At the time of testing the indoor temperatures ranged from 73º F to 74º F and indoor relative humidity ranged from 34% to 39%. Outdoor temperature was 80 ºF and outdoor relative humidity was 22% with on a clear day with lots of sunshine and very little wind.

The results of the total spore count samples are summarized in Table 1 below:

Table 1: Summary of Total Spore Count Results – October 19, 2015

Sample #	209-1	209-2	209-3	209-4	209-5	209-6
Location	**Desk 1**	**Desk 2**	**Desk 3**	**Desk 4**	**Outside 1**	**Outside 2**
Spore Type	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Alternaria	---	---	---	---	---	---
Ascospores	---	39	---	---	78	130
Aspergillus/ Penicillium	39	416	5,160	2,380	---	---
Basidiospores	273	260	39	39	936	871
Cladosporium	169	481	2,300	1,870	195	39
Curvularia	---	---	13	---	26	---
Bipolaris/ Drechslera	---	---	---	---	---	---
Myxomycetes/ Perconia/Smuts	---	---	13	13	208	156
Nigrospora	---	---	---	---	---	---
Epiccocum	---	---	---	---	---	---
Polythrincium	---	---	---	---	---	---
Pithomyces	13	---	---	---	---	---
Total	**494**	**1,200**	**7,530**	**4,300**	**1,440**	**1,200**

Three of the four indoor total spore counts were equal to or higher than counts from the outdoor samples. *Aspergillus/Penicillium* were dominant in the two highest indoor spore counts, but were not identified in the outdoor samples. Also *Cladosporium* was found in two indoor samples at levels an order of magnitude higher than the levels in the outdoor samples.

The laboratory analytical report is attached.

Conclusions and Recommendations

The following conclusions and recommendations are provided based on our assessment:

- Total spore counts in three of the indoor samples were equal to or higher than the spore counts measured outside.
- Temperature and relative humidity readings were within normal comfort levels for an office environment.
- Samples results indicate a nearby source of *Aspergillis/Penicillium*.
- Previous leaks onto the drop ceiling tiles were reported by the occupants.
- Further investigation of the three air handling units and the area above the drop ceiling grid is recommended.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited asbestos sampling report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.



Benjamin Hestir, P.E.
Project Industrial Hygienist



Brian J. DuChene, RPIH
Authorized Project Reviewer

Attachments: Photographs
Laboratory Results

Photographs

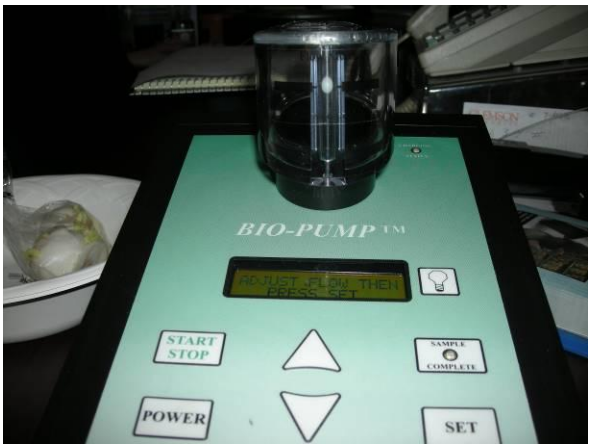


Photo #1 Calibration of the Zefon BioPump prior to sampling in Martin E209A

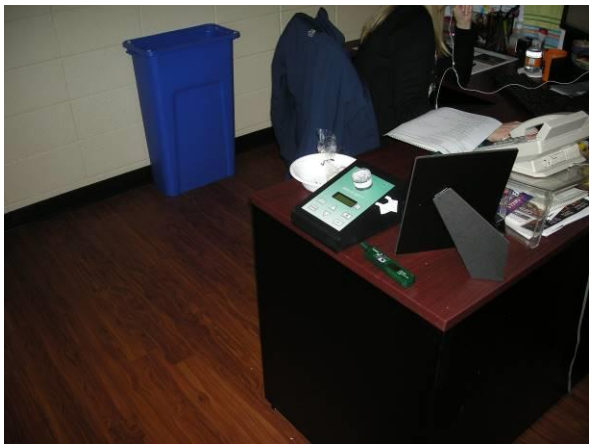


Photo #2 Sample location of Sample 209-1 on the desk of Jessica Stokes



Photo #3 Readings of temperature & relative humidity with Sample 209-1

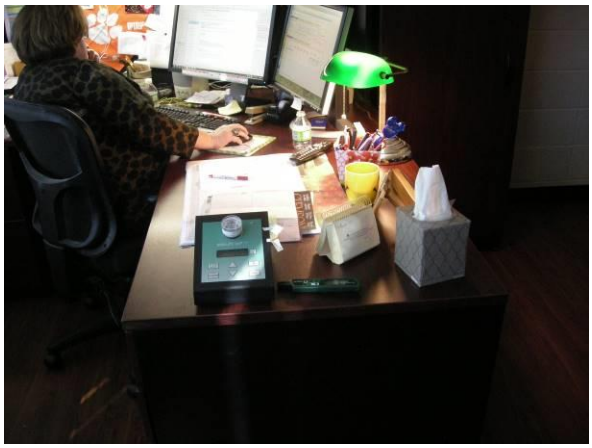


Photo #4 Sample location of Sample 209-2 on the desk of Jan McCracken



Photo #5 Readings of temperature & relative humidity with Sample 209-2

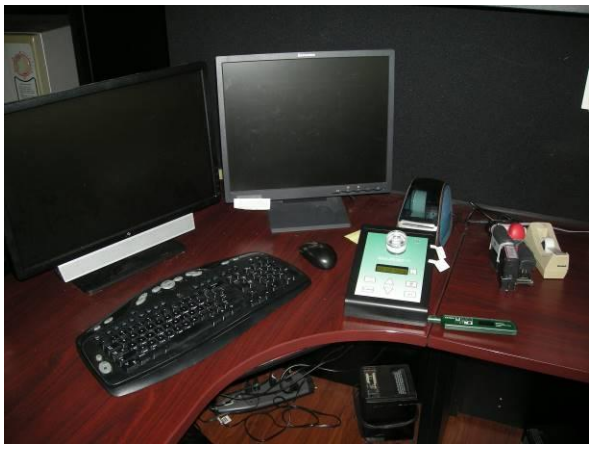


Photo #6 Sample location of Sample 209-3 at work station



Photo #7 Readings of temperature & relative humidity with Sample 209-3

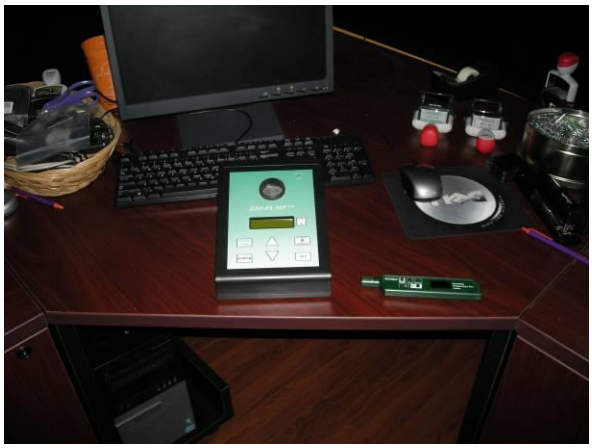


Photo #8 Sample location of Sample 209-4 at work station



Photo #9 Readings of temperature & relative humidity with Sample 209-4



Photo #10 Sample location of Sample 209-5 outside Martin Hall



Photo #11 Readings of temperature & relative humidity with Sample 209-5



Photo #12 Sample location of Sample 209-6 outside Martin Hall

Laboratory Results

SEEML Reference Number:
151020031

Southeast Environmental Microbiology Laboratories
506 Laurens Rd
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

The information and data for **Terracon** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☐ Direct Exam Report
- ☒ Spore Trap Report
- ☐ Quantitative Fungal Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Direct Exam Report

Lab Manager Review: Rafael Berrios Date: 10/20/15

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are AIHA (American Industrial Hygiene Association) Environmental Microbiology Accredited laboratory for only fungal analysis Air-Direct Examination (EMLAP # 173667).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

Confidentiality Notice:
The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of the document(s) is strictly prohibited. If you have received this document in error, please immediately notify us by telephone to arrange for its return. Thank you.

Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 10/19/15
Terracon	Date Received: 10/20/15
3534 Rutherford Road	Date Analyzed: 10/20/15
Taylors, SC 29687	Date Reported: 10/20/15
	Date Revised:
	Project Name: CU-Martin Hall
	Project Number: 86127158-Task 47
	SEEML Reference # : 151020031

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	Martin 209-1			Martin 209-2			Martin 209-3		
Location	Desk 1			Desk 2			Desk 3		
Lab Sample ID	151020031-083			151020031-084			151020031-085		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	1	13					15	195	
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				3	39	3			
Aureobasidium									
Basidiospores	21	273	55	20	260	22	3	39	<1
Bipolaris/Drechslera									
Botrytis									
Chaetomium									
Cladosporium	13	169	34	37	481	40	177	2300	31
Curvularia							1	13	<1
Epicoccum									
Cercospora									
Fusarium									
Nigrospora									
Penicillium/Aspergillus	3	39	8	32	416	35	397	5160	69
Rusts									
Smuts/Periconia/Myxomy							1	13	<1
Stachybotrys									
Stemphylium									
Memnoniella									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	3						
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	38	**494**		92	**1200**		579	**7530**	
Quality Control									

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML, Inc.

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

506 Laurens Road
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 10/19/15
Terracon	Date Received: 10/20/15
3534 Rutherford Road	Date Analyzed: 10/20/15
Taylors, SC 29687	Date Reported: 10/20/15
	Date Revised:
	Project Name: CU-Martin Hall
	Project Number: 86127158-Task 47
	SEEML Reference # : 151020031

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	Martin 209-4			Martin 209-5			Martin 209-6		
Location	Desk 4			Outside 1			Outside 2		
Lab Sample ID	151020031-086			151020031-087			151020031-088		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	7	91		11	143				
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores				6	78	5	10	130	11
Aureobasidium									
Basidiospores	3	39	<1	72	936	65	67	871	73
Bipolaris/Drechslera									
Botrytis									
Chaetomium									
Cladosporium	144	1870	43	15	195	14	3	39	3
Curvularia				2	26	2			
Epicoccum									
Cercospora									
Fusarium									
Nigrospora									
Penicillium/Aspergillus	183	2380	55						
Rusts									
Smuts/Periconia/Myxomy	1	13	<1	16	208	14	12	156	13
Stachybotrys									
Stemphylium									
Memnoniella									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	331	**4300**		111	**1440**		92	**1200**	
Quality Control									

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML, Inc.

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

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Southeast Environmental Microbiology Laboratories
Chain of Custody

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Phone : 864-233-3770, Fax: 864-233-6589, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☒ YES ☐ NO	SEEML Ref #: 15102003	Lab ID: 083 - 088

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	10/19/15	Precipitation in last 16hrs:	None
(Company Name)	Terracon	Project Name:	CU – Martin Hall	Relative Humidity I/O:	/
(Address)	3534 Rutherford Rd.	Project # ~~Address~~:	86127158-Task 47	Temperature I/O:	/
(City, State, Zip)	Taylors, SC 29687	City, State, Zip:		Wind Conditions	
(Phone)	864-293-7348				
(Email)	ben.hestir@terracon.com				

Sample Type Abbreviations:
A- Allergenco **S**-Swab **AP**-Andersen Plate
AOC- Air O Cell **T**-Tape **W**- Water
M5- Micro 5 **B**- Bulk **D**- Dust

Analysis Type:
1. SporeTrap, Air Sample Analysis-Same Day
2. Direct Exam Surface Sample Analysis -Same Day
3. Culturable Air / Surface Samples -7-10 days

Sample ID	Sample Location	Sample Type	Analysis Type	*Area	**Volume (L)	Notes
Martin 209-1	Desk 1	AOC	1		75	
Martin 209-2	Desk 2	"	"		"	
Martin 209-3	Desk 3	"	"		"	
Martin 209-4	Desk 4	"	"		"	
Martin 209-5	Outside 1	"	"		"	
Martin 209-6	Outside 2	"	"		"	

Reliquished By: Ben Hestir Date/Time 10/20/15

Recieved By: Date/Time 10-20-15

* Area is only required for culturable surface samples.
** Volume = Pump setting (L/min) x minutes