April 25, 2018

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

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

Re: Limited Indoor Environmental Quality Investigation Report
Lightsey Bridge – Building 7, Unit 1C
Clemson University
Clemson, South Carolina
Terracon Project No. 86127158 – Task 134

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited indoor environmental quality (IEQ) investigation in Lightsey Bridge, Building 7, Unit 1C on the main campus of Clemson University in Clemson, South Carolina. Reportedly, the occupants of this dormitory room have reported respiratory irritation and/or allergic type health symptoms. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon representative Mr. Stephen Ellis conducted a limited IEQ investigation in the dormitory room on Wednesday, March 14, 2018.

On our March 14th visit, Terracon made measurements of temperature and relative humidity and conducted airborne mold sampling which consisted of collecting spore trap air samples in three locations inside and the collection of two additional samples outside for comparison. We also collected two composite dust samples for allergen analysis and two composite dust wipe samples for Cimex species (bedbug) analysis.

Standard of Care

This limited mold, allergen and bedbug 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 sampling. Many factors, such as weather conditions, building occupancy, ventilation patterns and seasonal variations in fungal concentrations, 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 sampling. 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.

SAMPLING CRITERIA AND METHODS

Mold Sampling

Total mold spore trap samples were collected using Allergenco-D™ spore trap cassettes 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 collection, the spore trap samples were hand delivered to the Southeastern Environmental Microbiology Lab (SEEML) in Greenville, South Carolina. SEEML is accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. Air samples were analyzed by direct microscopic examination and results are reported in spores per cubic meter of air (spores/m^3).

To help interpret the mold sampling results, we compared indoor air and outdoor air measurements. 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 a heating, ventilation and air-conditioning (HVAC)-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment.

No state or federal exposure limits have been established for fungal aerosols. Regulatory standards, medically based threshold limit or dose-response relationships have not been established 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.

Allergen Sampling

Two composite allergen dust samples were collected from flooring, carpet, chair fabrics and furniture surfaces in the occupied offices using a high volume air sampling pump in conjunction with a 3-piece 37 millimeter dust sampling cassette preloaded with a 5.0 micrometer polyvinyl chloride (PVC) filter. After composite dust sample collection, the allergen samples were shipped by overnight courier to EMSL in Cinnaminson, New Jersey. EMSL is accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #100194. The allergen samples were analyzed by direct microscopic examination for allergens from dust mites, mouse, rat, cat, dog, and cockroach. Allergen results are reported in micrograms per gram of dust (µg/g).

Cimex Species (bedbug) Sampling

Two dust swab samples were collected from bedding, bed furniture and horizontal surfaces near the bed in two of the four bedrooms in Unit 1C using a HealthLink Transporter sterile swab. After collection the swab samples were shipped by overnight courier to Research Associates Laboratory (RAL) in Allen, Texas. RAL has been providing DNA analysis to the veterinary industry and others since 1992 and they hold the patent for Bedbug DNA testing. The swab sample was tested for the DNA of the two most common bedbug species (*Cimex lectilarius* and *Cimex hemipterus*) using quantitative real time polymerase chain reaction technology (qPCR). Results are reported as presence/absence.

Temperature and Relative Humidity

Indoor air temperature and relative humidity are physical conditions important to the perception of comfort. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommendations regarding thermal comfort. ASHRAE Standard 55-2013, Thermal Environmental Conditions for Human Occupancy, identifies six primary factors that affect comfort: metabolic rate (affected by the activity being performed); clothing insulation; air temperature; radiant temperature; air speed; and humidity.

Although the relationships are complex, a temperature range between 73 and 79 degrees Fahrenheit (°F) with relative humidity between roughly 20 and 60 percent (%) are recommended for persons in a conditioned setting wearing light summer clothing. Higher temperatures require lower humidity for comfort. For persons in winter clothing, temperatures can range between 68 and 75°F, with relative humidity between 20% and 60%, with preferred conditions falling between 30% and 50% for both winter and summer temperatures. EPA recommends maintaining indoor humidity below 60%, ideally 30-50%, if possible.

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

FINDINGS

General Observations

- The apartment contains 2 bedrooms and one bathroom constructed in 1992 as part of a larger complex.
- A small area (less than 1 square feet) of water staining was observed on the back bedroom ceiling.
- Water stains on the wall below the exhaust fan in the bathroom may have been caused by condensation on the fan.
- The resident of Building 7, Unit 1C complained regarding mold growth in the bathroom on the walls and on the supply register.
- A variety of potted plants were present in the apartment.
- No apparent visible mold was observed in the apartment.

Mold Air Sampling

On the afternoon of March 14, 2018, Terracon collected three mold spore trap samples inside Building 7, Unit 1C at Lightsey Bridge and two samples in outdoor locations for comparison. The results of the total spore count samples analyses are summarized in Table 1 below:

Table 1: Summary of Total Spore Count Analyses – March 14, 2018

Sample #	LB71C1	LB71C2	LB71C3	LB71C8	LB71C9
Location Description	**Bathroom sink**	**Bookcase in back bedroom**	**Kitchen bar**	**On stair landing**	**In parking area**
Spore Type	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**		**Spores/m^3**
Ascospores	---	---	39	---	---
Basidiospores	156	156	39	78	117
Cladosporium	39	117	78	13	39
Curvularia	---	---	13	---	---
Epicoccum	13	---	---	---	---
Penicillium/ Aspergillus	585	429	741	429	234
Smuts/Periconia/ Myxomycetes	13	13	13	---	13
Pithomyces	13	---	---	---	---
Total	**819**	**702**	**923**	**520**	**403**
Temperature (degrees F)	68.1	76.6	66.0	60.4	---
Relative Humidity (%)	32.2	29.8	34.0	12.1	---

The highest indoor total spore count was higher than the highest total spore count outside. The predominant mold types both indoors and out were *Basidiospores* and *Penicillium/Aspergillus.* The weather on the day we sampled was clear and cool. The laboratory analytical report is attached.

Temperature and Relative Humidity

The average indoor temperature was 70.2ºF and the average relative humidity was 32%. The outdoor temperature was 60.4ºF and the relative humidity was 12.1%.

Allergen Sampling

On the afternoon of March 14, 2018, Terracon collected two dust samples from the carpeting, chair fabric, and furniture in Building 7, Unit 1C at Lightsey Bridge. The samples were analyzed for allergens from dust mites, mouse, rat, cat, dog, and cockroach.

Allergens were identified in the samples. Table 2 below summarizes the laboratory results. The laboratory analytical report is attached and references additional information.

Table 2: Summary of Allergen Analyses – March 14, 2018

Sample #	LB71C6	Laboratory assigned risk factor	LB71C7	Laboratory assigned risk factor
Location	Back bedroom composite		Living room composite	
Allergen Type/Antigen	Concentration (ug/g)		Concentration (ug/g)	
Dust Mites / Der fl	0.17	Low	0.34	Low
Dust Mites / Der pl	2.03	Moderate	2.09	Moderate
Mouse / Mus ml	0.002	Low	ND	Low
Rat / Rat nl	ND	NA	ND	NA
Cat / Fel dl	0.38	Low	0.24	Low
Dog / Can fl	0.12	Low	0.07	Low
Cockroach / Bla G2	ND	Low	ND	Low

Note: ug = microgram (10^{-6} grams), NA = Not Applicable, ND = not detected

Cimex Species (bedbug) Sampling

On the afternoon of March 14, 2018, Terracon collected two swab samples from the bedding, Bed furniture, and horizontal surfaces in Building 7, Unit 1C at Lightsey Bridge. The samples were analyzed for DNA of the two most common bedbug species, *Cimex lectilarius* and *Cimex Hemipterus*. Bedbug DNA was not identified in the samples. The laboratory analytical report is attached.

CONCLUSIONS AND RECOMMENDATIONS

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

- Neither of the areas with water stains (beneath the supply register in the bathroom and on the ceiling in the back bedroom) were wet at the time of our assessment. A coat of paint would improve appearances in these areas. Also ensure the bathroom exhaust fan is working properly to remove humidity.

- The results of mold air sampling indicated that the airborne mold spore concentrations of *aspergillus/penicillium* from the samples collected inside the building were higher than the levels measured outside. Ideally indoor levels should be below outdoor levels. Colder weather in the early spring may have contributed to the lower outdoor spore count, typically outdoor mold spore levels for this area are in the 1,000s or 10,000s. The prominent mold type indoors and outdoors was *aspergillus/penicillium* type spores and the difference between indoor and outdoor levels was not exponentially different, i.e. 10 times higher.

- One of the common allergens identified from the dust samples collected in the building (dust mites) were assigned the risk level “moderate” by the lab. All other allergens detected were assigned the risk level “low” or were non-detected. The laboratory risk level is a guideline, there are no federal standards on allergens. A thorough cleaning of the apartment should help alleviate the dust mites.

- General cleanliness in the dorm could be improved and may have contributed to the dust mite results.

- DNA from two common species of bedbugs was not detected in the two dust wipe samples from the bedding, bed furniture and other horizontal surfaces in the vicinity of the beds.

- One temperature reading was below the recommended ASHRAE range for winter and one was above. This is acceptable as long as the relative humidity is maintained below 60%. Relative humidity levels were within EPA guideline ranges, respectively.

- A variety of potted plants were present and may be a source of allergens/mold, either from the soil or from the plants themselves.

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

Sincerely,
Terracon Consultants, Inc.

Benjamin Hestir, P.E.
Project Industrial Hygienist

Jeffrey A. Gurrie
Senior Industrial Hygienist

Attachments: Laboratory Results

Laboratory Results

SEEML Reference Number:
180315067

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
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:

- ☐ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: Rafael Berrios Date: 03/15/18

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are accredited through AIHA-LAP, LLC (EMLAP # 173667) for the analysis of Spore Traps and Surface/Bulk Samples.

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

	Date Sampled: 03/14/18
Terracon	Date Received: 03/15/18
72 Pointe Circle	Date Analyzed: 03/15/18
Greenville, SC 29615	Date Reported: 03/15/18
	Date Revised:
	Project Name: 86127158- Task 134
	Project Address: Lightsey Bridge Bldg 7 Unit 1C
	Project City, State, ZIP: Clemson, SC.
	SEEML Reference # : 180315067

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

Client Sample ID	LB71C1			LB71C2			LB71C3		
Location	Bathroom Sink			Rear Bedroom Bookcase			Kitchen Bar		
Lab Sample ID	180315067-217			180315067-218			180315067-219		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	3	39		1	13		2	26	
Pollen									
Spore Trap Used	Allergenco			Allergenco			Allergenco		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores							3	39	4
Basidiospores	12	156	19	12	156	22	3	39	4
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	3	39	5	9	117	17	6	78	8
Curvularia							1	13	1
Epicoccum	1	13	2						
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	45	585	71	33	429	61	57	741	80
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	2				1	13	1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces	1	13	2						
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	63	**819**		54	**702**		71	**923**	

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

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

	Date Sampled: 03/14/18
Terracon	Date Received: 03/15/18
72 Pointe Circle	Date Analyzed: 03/15/18
Greenville, SC 29615	Date Reported: 03/15/18
	Date Revised:
	Project Name: 86127158- Task 134
	Project Address: Lightsey Bridge Bldg 7 Unit 1C
	Project City, State, ZIP: Clemson, SC.
	SEEML Reference # : 180315067

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

Client Sample ID	LB71C8			LB71C9			LB71C10		
Location	Exterior 1			Exterior 2			Blank		
Lab Sample ID	180315067-220			180315067-221			180315067-222		
Detection Limit (spores/m^3)	13			13			#DIV/0!		
Hyphal Fragments				1	13				
Pollen									
Spore Trap Used	Allergenco			Allergenco			Allergenco		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores									
Basidiospores	6	78	15	9	117	29			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	1	13	3	3	39	10	None		
Curvularia							Detected		
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus	33	429	83	18	234	58			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				1	13	3			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3					
Sample Volume(liters)	75			75			0		
TOTAL SPORES/M^3	40	**520**		31	**403**				

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

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

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SEEML Labs
Analytical Solutions For a Healthy Indoor Environment

Southeast Environmental Microbiology Laboratories
Chain of Custody

102 Edinburgh Court, Greenville, SC 29607
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 #: 180315067	Lab ID: 217 - 222

Company Information	Client Information		Environmental Conditions	
Ben Hestir	Date Sampled:	3/14/2018	Precipitation in last 16hrs:	None
Terracon	Project Name:	86127158 - Task 134	Relative Humidity I/O:	32.7%/12.1%
72 Pointe Circle	Project Address:	Lightsey Bridge Bldg 7 Unit 1C	Temperature I/O:	70.2/60.4
Greenville, SC 29615	City, State, Zip:	Clemson, SC	Wind Conditions	Fair
864-292-2901				
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
LB71C1	Bathroom Sink	A	1		75L	
LB71C2	Rear Bedroom Bookcase	A	1		75L	
LB71C3	Kitchen Bar	A	1		75L	
LB71C8	Exterior 1	A	1		75L	
LB71C9	Exterior 2	A	1		75L	
LB71C10	Blank	A	1		0L	

Reliquished By:	Date/Time	Recieved By:	Date/Time
[signature]	3-5-18 @ 1415	[signature]	9-15-18 3:00

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

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800)220-3675 / (856)786-0262
http://www.EMSL.com cinnmicrolab@emsl.com

EMSL Order #:	**371804739**
Customer ID:	**GTER78**
Customer PO:	**86127158Task134**

Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone: **864-292-2901**
Fax: **864-292-6361**

Project: **CU-Lightsey Bridge Bldg 7 Unit 1C**

Date Collected: **3/14/2018**
Date Received: **3/16/2018**
Date Analyzed: **3/19/2018**

Sample Summary -Indoor Allergen Analysis by MARIA®



Lab Sample Number	Client Sample ID	Sample Location	Sample Type
371804739-0001	LB71C6	Rear Bedroom	Bulk
371804739-0002	LB71C7	Living Room	Bulk

Report Date	Report Revision	Revision Comments
3/23/2018	R0	Initial Report

Vincent Iuzzolino, M.S., Laboratory Director
or approved EMSL Analytical, Inc. signatory

About Us

EMSL Analytical, Inc. offers a full line of analytical solutions for over 30 years across North America. For more information about our nationally accredited locations, vast line of testing services, and our food safety solutions please visit www.EMSL.com or call



Disclaimers

All samples were collected by and all sampling data was provided by the client. The results are valid only for those samples analyzed, and only for those samples collected in accordance with the appropriate methodology as determined by the client. The results herein do not denote or represent a medical or clinical diagnosis or conclusion. In the event that sample(s) were submitted in opened, used, non-sterile or otherwise adulterated condition, EMSL shall not be responsible or liable. EMSL Analytical (Cinnaminson, NJ) is accredited by the American Industrial Hygiene Association (AIHA) in the EMLAP accreditation program for specified Field(s) of Testing as documented on the scope of accreditation.

Please visit our website at http://www.microbiologytestinglab.com/
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http://www.EMSL.com cinnmicrolab@emsl.com

EMSL Order #: **371804739**
Customer ID: **GTER78**
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Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone: **864-292-2901**
Fax: **864-292-6361**

Project: **CU-Lightsey Bridge Bldg 7 Unit 1C**

Date Collected: **3/14/2018**
Date Received: **3/16/2018**
Date Analyzed: **3/19/2018**

EMSL Sample #: **371804739-0001**
Client ID: **LB71C6**
Location: **Rear Bedroom**

Sample Type: **Bulk**
Sample Size: **64**
Sample Units: **mg**

Analytical Results -Indoor Allergen Analysis by MARIA®

Test Parameter	*Antigens*	*Detection Limits*		*Concentrations*		*Allergen Risk Levels*
Dust Mites Allergen	Der f1	0.012	µg/g	**0.17**	µg/g	☑
Dust Mites Allergen	Der p1	0.012	µg/g	**2.03**	µg/g	⚠
Mouse Allergen	Mus m1	0.002	µg/g	**0.002**	µg/g	☑
Rat Allergen	Rat n1	0.004	µg/g	**ND**	µg/g	†
Cat Allergen	Fel d1	0.004	µg/g	**0.38**	µg/g	☑
Dog Allergen	Can f1	0.012	µg/g	**0.12**	µg/g	☑
Cockroach Allergen	Bla g2	0.012	µg/g	**ND**	µg/g	☑

†Sufficient evidence is not available for risk levels.

Allergen Risk Levels:

High -Risk of acute asthmatic attack.

Moderate -Risk for sensitization and bronchial hyperactivity.

Low -Not sufficient to cause symptoms or ND (None Detected); Indicates that the amount of allergen in the sample is below the detection limits.

All samples were collected by and all sampling data was provided by the client. The results are valid only for those samples analyzed, and only for those samples collected in accordance with the appropriate methodology as determined by the client. The results herein do not denote or represent a medical or clinical diagnosis or conclusion. In the event that sample(s) were submitted in opened, used, non-sterile or otherwise adulterated condition, EMSL shall not be responsible or liable.

EMSL Analytical (Cinnaminson, NJ) is accredited by the American Industrial Hygiene Association (AIHA) in the EMLAP accreditation program for specified Field(s) of Testing as documented on the scope of accreditation.

This report has been prepared by EMSL Analytical, Inc. at the request of and for the exclusive use of the client named in this report. Completely read the important terms, conditions, and limitations that apply to this report

Report Date	**Report Revision**	**Revision Comments**
3/23/2018	R0	Initial Report

Vincent Iuzzolino, M.S., Laboratory Director
or approved EMSL Analytical, Inc. signatory

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http://www.EMSL.com cinnmicrolab@emsl.com

EMSL Order #: **371804739**
Customer ID: **GTER78**
Customer PO: **86127158Task134**

Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone: **864-292-2901**
Fax: **864-292-6361**

Project: **CU-Lightsey Bridge Bldg 7 Unit 1C**

Date Collected: **3/14/2018**
Date Received: **3/16/2018**
Date Analyzed: **3/19/2018**

EMSL Sample #: **371804739-0002**
Client ID: **LB71C7**
Location: **Living Room**

Sample Type: **Bulk**
Sample Size: **59**
Sample Units: **mg**

Analytical Results -Indoor Allergen Analysis by MARIA®

Test Parameter	*Antigens*	*Detection Limits*		*Concentrations*		*Allergen Risk Levels*
Dust Mites Allergen	Der f1	0.012	µg/g	**0.34**	µg/g	☑
Dust Mites Allergen	Der p1	0.012	µg/g	**2.09**	µg/g	⚠
Mouse Allergen	Mus m1	0.002	µg/g	**ND**	µg/g	☑
Rat Allergen	Rat n1	0.004	µg/g	**ND**	µg/g	†
Cat Allergen	Fel d1	0.004	µg/g	**0.24**	µg/g	☑
Dog Allergen	Can f1	0.012	µg/g	**0.07**	µg/g	☑
Cockroach Allergen	Bla g2	0.012	µg/g	**ND**	µg/g	☑

†Sufficient evidence is not available for risk levels.

Allergen Risk Levels:

High -Risk of acute asthmatic attack.

Moderate -Risk for sensitization and bronchial hyperactivity.

Low -Not sufficient to cause symptoms or ND (None Detected); Indicates that the amount of allergen in the sample is below the detection limits.

All samples were collected by and all sampling data was provided by the client. The results are valid only for those samples analyzed, and only for those samples collected in accordance with the appropriate methodology as determined by the client. The results herein do not denote or represent a medical or clinical diagnosis or conclusion. In the event that sample(s) were submitted in opened, used, non-sterile or otherwise adulterated condition, EMSL shall not be responsible or liable.

EMSL Analytical (Cinnaminson, NJ) is accredited by the American Industrial Hygiene Association (AIHA) in the EMLAP accreditation program for specified Field(s) of Testing as documented on the scope of accreditation.

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Report Date	**Report Revision**	**Revision Comments**
3/23/2018	R0	Initial Report

Vincent Iuzzolino, M.S., Laboratory Director
or approved EMSL Analytical, Inc. signatory

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EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800)220-3675 / (856)786-0262
http://www.EMSL.com cinnmicrolab@emsl.com

EMSL Order #: **371804739**
Customer ID: **GTER78**
Customer PO: **86127158Task134**

Attn: **Ben Hestir**
Terracon Consultants, Inc.
72 Pointe Circle
Greenville, SC 29615

Phone: **864-292-2901**
Fax: **864-292-6361**

Project: **CU-Lightsey Bridge Bldg 7 Unit 1C**

Date Collected: **3/14/2018**
Date Received: **3/16/2018**
Date Analyzed: **3/19/2018**



Guidelines to Interpretation

µg/g

Allergens	<DL	<1	1	2	3	4	5	6	7	8	9	>10
Fel d1	ND	Low	Mod	Mod	Mod	Mod	Mod	Mod	Mod	High	High	High
Can f1	ND	Low	Low	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	High
Der p1	ND	Low	Low	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	High
Der f1	ND	Low	Low	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	High
Mus m1	ND	Low	Mod	Mod	Mod	High	High	High	High	High	High	High

µg/m3

Rat n1	ND	<0.7 µg /m3 = Not associated with increased risk of asthma

µg/g

	<DL	<0.08	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Bla g2 †	ND	Low	Mod	Mod	Mod	Mod	Mod	Mod	High	High	High	High

† *Suggested levels. Not officially established.*

Note: *This report and guidelines furnish information only. Whether an individual suffers allergic symptoms or not depends on his/her medical history and previous exposure.*

References

Journal of Allergy and Clinical Immunology 1989; 83:416-427
Journal of Allergy and Clinical Immunology 1995; 96:449-456
The American review of respiratory disease 1990; 141:361-367
The American review of respiratory disease 1993; 147:573-578
Environmental Health Perspectives 2002; 110:419-425
Clinical and Experimental Allergy 1998; 28(5):537-44
Pediatric allergy-principles and practice. Mosby Inc 2003: 261-268.

Terminology

ELISA	Enzyme-linked Immunosorbent Assay
MARIA®	Multiplex Array for Indoor Allergens
Allergen	A substance which reacts with the body's immune system to produce an allergic reaction.
Antigen	A substance, foreign to the body, which stimulates the production of antibodies by the immune system.
Bla g2	*Blattella germanica* (Cockroach) allergen 2
Can f1	*Canis familiaris* (Dog) allergen 1
Der f1	*Dermatophagoides farinae* (Dust Mites) allergen 1
Der p1	*Dermatophagoides pteronyssinus* (Dust Mites) allergen 1
Detection Limits	DL is the smallest amount of a substance, in this case antigens, which can be measured.
Fel d1	*Felis domesticus* (Cat) allergen 1
Mus m1	*Mus musculus* (Mouse) allergen 1
ND	None detected, if any allergens are present they are below the detection limits.
Rat n1	*Rattus norvegicus* (Rat) allergen 1

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72 Pointe Circle
Greenville, SC 29615

Phone: **864-292-2901**
Fax: **864-292-6361**

Project: **CU-Lightsey Bridge Bldg 7 Unit 1C**

Date Collected: **3/14/2018**
Date Received: **3/16/2018**
Date Analyzed: **3/19/2018**

Important Terms, Conditions, and Limitations

A. Sample Retention
Samples analyzed by EMSL will be retained for 60 days after analysis date. Storage beyond this period is available for a fee with written request prior to the initial 30 day period. Samples containing hazardous/toxic substances which require special handling will be returned to the client immediately. EMSL reserves the right to charge a sample disposal fee or return samples to the client.

B. Change Orders and Cancellation
All changes in the scope of work or turnaround time requested by the client after sample acceptance must be made in writing and confirmed in writing by EMSL. If requested changes result in a change in cost the client must accept payment responsibility. In the event work is cancelled by a client, EMSL will complete work in progress and invoice for work completed to the point of cancellation notice. EMSL is not responsible for holding times that are exceeded due to such changes.

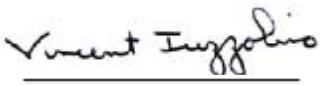
C. Warranty
EMSL warrants to its clients that all services provided hereunder shall be performed in accordance with established and recognized analytical testing procedures and with reasonable care in accordance with applicable federal, state and local laws. The foregoing express warranty is exclusive and is given in lieu of all other warranties, expressed or implied. EMSL disclaims any other warranties, express or implied, including a warranty of fitness for particular purpose and warranty of merchantability.

D. Limits of Liability
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E. Indemnification
Client shall indemnify EMSL and its officers, directors and employees and hold each of them harmless for any liability, expense or cost, including reasonable attorney's fees, incurred by reason of any third party claim in connection with EMSL's services, the test result data or its use by client.

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Report Date	Report Revision	Revision Comments
3/23/2018	R0	Initial Report



Vincent Iuzzolino, M.S., Laboratory Director
or approved EMSL Analytical, Inc. signatory

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EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 371804739

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

OrderID: 371804739

Report To Contact Name: Ben Hestir		**Bill To Company:** Terracon GTER87	**Client ID #:**
Company Name: Terracon		**Attention To:**	
Street: 72 Pointe Circle		**Street:**	
City: Greenville	**State/Province:** SC **Zip/Postal Code:** 29615	**City:**	**State/Province:** **Zip/Postal Code:**
Phone : 864-292-2901	**Fax :** 864-292-6361	**Phone:**	**Fax:**
Project Name: CU-Lightsey Bridge Bldg 7 Unit 1C		**Email Results To:** ben.hestir@terracon.com	**U.S. State where Samples Collected:** SC
# Samples in Shipment: 2	**Date of Shipment:** 3-15-18	**Purchase Order:** 8612715 - Task 134	**Sampled By (Signature):**

Turnaround Time (TAT) – Please Check: If No Selection Made, Standard 2 Week TAT Will Apply

☐ 2 Week ☑ 1 Week ☐ 4 Day ☐ 3 Day ☐ 2 Day ☐ 1 Day ☐ Other (Call Lab)

Media Type:

Manufacturer/Part #: **Lot #:**

Client Sample ID	Location/Description	Analyte / Method	Media	Flow (lpm)	Sample Time On	Sample Time Off	Volume / Area	Sample Type	Sample Date	Comments
LB71C6	Rear Bedroom	M038, M039, M044	Cassette	NA	NA	NA	NA	☑ Area ☐ Personal	3-14-18	
LB71C6	Living Room	M038, M039, M044	"	"	"	"	"	☐ Area ☐ Personal	"	
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		
								☐ Area ☐ Personal		

RECEIVED EMSL CINNAMINSON, N.J. 2018 MAR 16 A 10:27

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	3-15-18 1200	FEDEX QLM	3/16/18 10:15

Comments:

Research Associates Laboratory
(R.A.L.,Inc.)

411 East McDermott Drive Ste B. Allen, TX 75002
Phone: (972)960-2221 Fax: (972)960-1997
www.vetdna.com

TEST RESULTS

Acct ID:**P219**
TERRACON CONSULTANTS INC.
Attn:
72 POINTE CIRCLE
GREENVILLE, SC 29615
Phone: 864-292-2901
Fax: --
Email: BEN.HESTIR@TERRACON.COM

Owner Name: **CU - LIGHTSEY BRIDGE # 71C**
Lab ID: **269456**
Test Date: **03/16/2018**
Animal Name: **LB71C4**
Species: **ENVIRONMENTAL**
Medium: **Swab**

Test Description	Result	Comments
Bed Bug - (C. lectularius and C. hemipterus)	**Negative**	

DIAGNOSTIC ANALYSIS PERFORMED BY QUANTITATIVE REAL TIME POLYMERASE CHAIN REACTION (qPCR)

Research Associates Laboratory
(R.A.L.,Inc.)

411 East McDermott Drive Ste B. Allen, TX 75002
Phone: (972)960-2221 Fax: (972)960-1997
www.vetdna.com

TEST RESULTS

Acct ID:**P219**
TERRACON CONSULTANTS INC.
Attn:
72 POINTE CIRCLE
GREENVILLE, SC 29615
Phone: 864-292-2901
Fax: --
Email: BEN.HESTIR@TERRACON.COM

Owner Name: **CU - LIGHTSEY BRIDGE # 71C**
Lab ID: **269457**
Test Date: **03/16/2018**
Animal Name: **LB771C5**
Species: **ENVIRONMENTAL**
Medium: **Swab**

Test Description	Result	Comments
Bed Bug - (C. lectularius and C. hemipterus)	**Negative**	

DIAGNOSTIC ANALYSIS PERFORMED BY QUANTITATIVE REAL TIME POLYMERASE CHAIN REACTION (qPCR)