June 12, 2015

Clemson University
310 Klugh Avenue
Clemson, SC 29634

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

Re: Wood Mulch Mold Testing Report
Clemson University
Clemson, South Carolina
Terracon Project No. 86127158

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) submitted three samples of wood mulch for mold analysis to EMSL Analytical, Inc. The samples were provided to your office by the University landscaping department due to a staff member complaint regarding possible allergic reactions while working with the material during landscaping operations on Clemson University's main campus in Clemson, South Carolina. Terracon was requested to analyze the material to determine what forms of mold might be associated with the mulch. This service was performed in general accordance with our IDC with Clemson University.

PROJECT DESCRIPTION

Terracon was provided with three separate samples of wood mulch by the Clemson Environmental Health & Safety department. The samples were labeled as:

- Sample 1 – Pile at Landscape Shop
- Sample 2 – Pile at Cherry Crossing
- Sample 3 – Mulch applied at Newman Road and Hwy. 93

The samples were submitted to EMSL Laboratories in Morrisville, NC for analysis by Identification and Enumeration of Culturable Fungi.

INVESTIGATION CRITERIA AND METHODS

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. 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. 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.

In 2013 the New York Committee for Occupational Safety and Health (NYCOSH) published a document entitled *Methods for Evaluation of Indoor Mold Growth.* This document provides guidance on various mold levels within a conditioned environment. The NYCOSH presents guidance on micro-vac sampling of dusts where mold growth less than 50,000 colony forming units per gram of dust (cfu/g) may be interpreted as low or normal growth and results greater than 1,000,000 cfu/g may be interpreted as very active growth. This guideline is specifically for indoor mold growth and to Terracon's knowledge there are no guidelines for outdoor mold levels on materials.

The wood mulch samples provided were shipped to EMSL Analytical, Inc. (EMSL), accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173741. The samples were weighed, placed in solution, and incubated in malt extract agar (MEA) for 7-10 days. Mold growth was identified at the genus level and is reported in cfu/g.

FINDINGS

Results from the sample culture analysis were reported in colony forming units per gram of material cultured as shown in the table below.

Table 1: Summary of Mold Culture Results

Sample #	**Mulch 1**	**Mulch 2**	**Mulch 3**
Location	**Landscape Shop**	**Cherry Crossing**	**Newman Rd & Hwy 93**
Mold Type	**CFU/g**	**CFU/g**	**CFU/g**
Aspergillus fumigatus	14,000	13,000	4,000
Aspergillus niger	2,000	170	100
Penicillium purpurogenum	3,000	3,000	—
Synchephalastrum sp.	20	—	—
Trichoderma sp.	1,000	3,000	1,000
Cunninghamella sp.	—	—	30
Totals (rounded*)	**20,000**	**19,200**	**5,130**

* These totals are rounded due to the dilutions of the samples to the appropriate significant figure.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results from the culturing of the bulk samples, *aspergillus fumigatus* was the dominant species present in each of the three samples.

Without basis for mold level in outdoor environments, Terracon's has used the NYCOSH guidelines to compare the results for the three samples. The total mold concentration was below the low to normal range for mold growth. However, it is understood that the handling of these bulk materials can generate airborne particulate, especially during relocation or spreading using manual methods (i.e – shoveling, raking, etc.). A reaction to that particulate may or may not be allergic in nature depending on the individual involved and their particular allergy profile. Some individuals will have a physical reaction to the sheer amount of particulate in the air during operations of this type. A health care professional should consulted if this individual may exhibit allergies to molds.

Terracon recommends the use of a filtering facepiece style respirator such as an N-95. As these materials are unregulated, the use of this style of respirator would be considered voluntary usage under the OSHA Respiratory Protection Standard (29 CFR 1910.134). The individual should be provided with Appendix D from the standard providing guidance for the voluntary usage.

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

Sincerely,
Terracon Consultants, Inc.

Benjamin Hestir, P.E.
Project Industrial Hygienist

Jeffrey Gurrie
Senior Project Industrial Hygienist

Attachments: Laboratory Results

Laboratory Results

EMSL Analytical, Inc.
2500 Gateway Centre Blvd., Suite 600, Morrisville, NC 27560
Phone/Fax: (919) 465-3900 / (919) 465-3950
http://www.EMSL.com raleighlab@emsl.com

EMSL Order:	291502773
CustomerID:	GTER78
CustomerPO:	86127158
ProjectID:	

Attn: **Ben Hestir**
Terracon Consultants, Inc.
3534 Rutherford Road
Taylors, SC 29687

Phone:	(864) 292-2901
Fax:	(864) 292-6361
Received:	05/15/15 10:15 AM
Analysis Date:	5/29/2015
Collected:	5/12/2015

Project: **CU Wood Chip Mulch**

Test Report: Identification and Enumeration of Culturable Fungi by Bulk (Including Speciation of Penicillium, Aspergillus, Cladosporium, and Stachybotrys (EMSL Method M005))

Sample Description	Sample Location	Temp (C)	Sample Measure (g)	Analytical Sensitivity (CFU/g)	Dilution	Fungal Identification	Colony Count	CFUs (CFU/g)	Percent of Total
Mulch 1	Pile at Landscape Shop	30	10	1000	10000	*Aspergillus fumigatus*	14	14,000	70.0
				1000	10000	*Aspergillus niger*	2	2,000	10.0
291502773-0001	*Media:* MEA			1000	10000	*Penicillium purpurogenum*	3	3,000	15.0
				10	100	*Syncephalastrum sp.*	2	20	<1
				1000	10000	*Trichoderma sp.*	1	1000	5.0
						Total	**22**	**20,000**	
Mulch 2	Pile at Cherry Crossing	30	10	1000	10000	*Aspergillus fumigatus*	13	13,000	67.7
				10	100	*Aspergillus niger*	17	170	<1
291502773-0002	*Media:* MEA			1000	10000	*Penicillium purpurogenum*	3	3,000	15.6
				1000	10000	*Trichoderma sp.*	3	3,000	15.6
						Total	**36**	**19,200**	
Mulch 3	Applied at Newman Rd and Hwy 93	30	10	1000	10000	*Aspergillus fumigatus*	4	4,000	78.0
				10	100	*Aspergillus niger*	10	100	1.9
291502773-0003	*Media:* MEA			10	100	*Cunninghamella sp.*	3	30	<1
				1000	10000	*Trichoderma sp.*	1	1000	19.5
						Total	**18**	**5,130**	

No discernable blank was submitted with this group of samples

Analyst(s)

Linda Bowerman (3)

Alan Goldstein

Alan Goldstein, Ph.D., Laboratory Manager
or other approved signatory

"<" means less than the stated value. The level of detection is equal to 1 CFU per plate of sample analyzed. CFU = colony forming unit. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation of the data contained in this report is the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Morrisville, NC AIHA-LAP, LLC--EMLAP Accredited #173741

Initial report from 05/29/2015 17:16:40

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Terracon Consultants, Inc.
CU Wood Chip Mulch
5/15/2015 10 15
M008 Culturable Fungi GS

TAT: 2 Week
Bulk

Order ID: 291502773
No Samples: 3
Due: 05/29 10:15 AM
Fax: 864-292-6361

EMSL ANALYTICAL, INC
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077

PHONE: 800-220-3675

Order ID: 291502773

Report To Contact Name: Ben Hestir	**Bill To Company:** same	**Sampled By (Signature):** Ben Hestir
Company Name: Terracon Consultants, Inc.	**Attention To:**	**Number of Samples in Shipment:** 3
Address 1: 3534 Rutherford Rd.	**Address 1:**	**Date of Shipment:** 5/13/15
Address 2: Taylors, SC 29687	**Address 2:**	**U.S. State where Samples Collected:** SC
Phone : 864-293-7348 **Fax :**	**Phone:** **Fax:**	**Purchase Order:** 86127158
Email Results To: ben.hestir@terracon.com	**Project Name:** CU Wood Chip Mulch	

Turnaround Time – Please Check: Please Note Standard TAT is 5-10 Business Days.						**Media Type:**
5-10 Days	4 Days	3 Days	2 Days	1 Day	Other (Call Lab)	**Manufacturer/Part #:**
☑	☐	☐	☐	☐	☐ _____	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
Mulch 1	Bulk	M008		5/12/15 16:30	Pile at Landscape ~~Supply~~ Shop	
Mulch 2	Bulk	M008		" "	Pile at Cherry Crossing	
Mulch 3	Bulk	M008		" "	Applied at Newman Rd. and Hwy 93	

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
Ben Hestir - Terracon	5/13/15	CHARLOTTE LAB: Kyle Nelson FAX 7735 9533 5480	5/14/15 9:35 AM
			5/15/15 10:15

Comments:

EMSL Analytical, Inc.
Sample Transfer Form

Receiving Lab:	EMSL- CHARLOTTE	Phone Number:	
		Fax Number:	
Relinquished to:	EMSL- RALEIGH	Phone Number:	
		Fax Number:	
Does new Lab hold equivalent or additional accreditation*		☐ Yes ☐ No	

EMSL Customer ID # (if known):	GTER78
Client Name:	TERRACON
Client Project:	
Date Received:	MAY 14, 2015
Date Relinquished:	MAY 14, 2015
Date Due:	
Special Instructions: (e.g. Work Order # , needed qualifications, project specific procedures/modifications)	

Relinquished by (Signature): Kyle Nelson	Date: 5/14/15	Received by (Signature)	Date:
Relinquished by (Signature):	Date:	Received by (Signature)	Date:

<u>Customer Agreement</u>- Please sign form and send to the receiving laboratory. By signing below you agree to permit the above named receiving lab to transfer samples to a separate EMSL lab with equivalent qualifications* for analysis. The final report will be issued from the analyzing laboratory.

Name (please Print)	Signature	Agent of:	Date:
BEN HESTIR KYLE NELSON	PER CLIENT Kyle Nelson	TERRACON	MAY 14, 2015

If this is a reoccurring project or sample type that may require samples to be relinquished on a regular basis a Standing Agreement form must be completed.

* Equivalent Qualifications required for the project. This should be determined by Receiving Lab before transfer.

Note: If customer has been notified and approved this transfer verbally or by e-mail, the receiving lab must sign for the customer above. EMSL employee filling out form on behalf of customer shall print name of person to whom they spoke, date agreement was received and then sign under Signature.