1251 Weatherstone Court, Reston, VA 20194

Jason L. Smith, P.E. LEED, AP
OCI Associates, Inc.
427 Centerpointe Circle, Suite 1825
Altamonte Springs, Florida 32701

April 4, 2013

Re: Bi-Polar Ionization System – Post-installation Assessment, Valencia College, 12350 Narcoossee Road, Orlando, FL 32832

Dear Mr. Jason Smith, P.E.:

Green Clean Air has created the following Indoor Air Quality (IAQ) report which assesses a BiPolar Ionization/plasma (BPI/plasma) system in an HVAC system at Valencia College located at 12350 Narcoossee Road, Orlando, FL 32832. The manufacturer of the BPI/plasma system is Global Plasma Solutions. The model installed is the GPS-IBAR which is mounted to the air entering side of the cooling coil with a GPS-7000 power supply on each AHU. Pictures of each are in the appendix.

Introduction: On March 21, 2013 Green Clean Air conducted an Indoor Air Quality (IAQ) evaluation at the Valencia College, located at 12350 Narcoossee Road, Orlando, FL 32832.

The IAQ evaluation was conducted to evaluate what impacts on the indoor air quality at Valencia College were as a result of the presence of bipolar ionization/plasma air cleaning equipment installed within the building's air handling units (AHUs). An additional objective was to determine the IAQ impacts of reducing the outdoor air supply to approximately 5 cubic feet per minute (cfm) per person using ASHRAE's (American Society of Heating, Refrigeration and Air Conditioning Engineers) Standard 62.1 Indoor Air Quality Procedure (IAQP). 5 cfm is a reduction from the amount of 17 cfm per person as calculated per ASHRAE's Standard 62.1 Ventilation Rate Procedure (VRP), which required in this application using 10 cfm per person plus 0.12 cfm per square foot and taking into account the ventilation effectiveness of the air distribution system. Using the IAQP procedure required that indoor air quality sampling would needed to be performed in several fully occupied areas while the BPI/plasma air cleaning equipment was activated. In addition, outdoor air quality samples would need to be taken as a reference point by which to evaluate the building's Indoor Air Quality.

Mr. Steven Welty CIE, CAFS, LEED, AP, Project Manager with Green Clean Air, conducted multiple air quality sampling activities on March 21, 2013 at the College. Mr. Adam Talbot of Valencia College was the onsite contact for the project.

Objective: The objectives of this assessment were to provide air quality information in order to assess and evaluate the current conditions at Valencia College. The flowing tasks were performed:

- Visual Walk-Through Inspection
- On-site environmental sampling with portable instruments
- On-site environmental sampling with samples taken for laboratory analysis
- Air Quality Assessment Report

1251 Weatherstone Court, Reston, VA 20194

Air Sampling Location:
Valencia College
12350 Narcoossee Road, Orlando, FL 32832

Visual Walk-Through Inspection: Upon arrival to the site, Green Clean Air's representative Mr. Welty met Adam Talbot and conducted a walk-through inspection of the above-referenced property in order to locate the testing sites that were to be used in the assessment. Green Clean Air had already determined the various sampling activities to be used for this assessment. All indoor air sampling was conducted with the bipolar ionization/plasma system energized. Mr. Talbot accompanied Mr. Welty throughout the day as he was required to brief occupants on the purpose of Mr. Welty's testing protocols, his unique apparatus and the noise that the air pumps would be making in their spaces and also to unlock doors.

Green Clean Air performed the following tasks for this project:

- Conducted air quality sampling in the four selected indoor areas and one outdoor location next to the building at Valencia College in order to evaluate the general indoor air quality in these locations. Results of environmental tests and readings were evaluated with respect to outdoor (reference/background) levels and published and/or recommended air quality levels.

- Collected air samples for selected chemical contaminants using active air sampling techniques by utilizing the Graywolf TVOC instrument model #IQ 610. This instrument was factory calibrated on August 12, 2012. (Certificate in appendix) Chemical air contaminants monitored during each sampling session included: Total Volatile Organic Compounds (TVOC) in parts per billion, Carbon Dioxide (Co_2), Ozone (O_3), Temperature in Fahrenheit (Temp. F) and Relative Humidity (rh).

- Fungal and bacterial air samples were taken on site and then sent for analysis at Sanair Technologies Laboratory-an American Industrial Hygiene Association (AIHA) accredited laboratory located in Richmond, Virginia. All the samples were analyzed by the Culture Analysis on Air Plate using STL 10 Culture for Fungi and Bacteria. All the indoor air sampling lab results were analyzed in relation to outdoor levels.

- Volatile Organic Compound air samples were taken on site and then sent for analysis by Maryland Spectral Services located at 1500 Canton Center Dr Suite G Baltimore MD 21227. Maryland Spectral Services is certified by the National Environmental Laboratory Accreditation Program. All samples were analyzed by an Agilent 5975C Mass Spectrometer equipped with inert MSD with triple axis detector which is equipped to analyze samples using the EPA TO-15 method.

- All the readings (i.e., TVOCs, Temperature, Relative Humidity, Airborne Particulates, Ozone, Viable Bacteria and Fungi) were taken in the four indoor areas during a regular school weekday and outdoors next to the college. Supporting documentation (i.e., air sampling results, direct-reading measurement results, and laboratory documentation for the IAQ Evaluation) are provided in this report.

- Particulate air sample readings were taken on site using a Lighthouse Laser Particle Counter Model #3016 which was calibrated on June 22, 2012. The indoor air sampling results were analyzed in relation to outdoor levels and to air quality limits set by cognizant authorities such as the US Environmental Protection Administration (EPA).

Background: The IAQ study focused on evaluating the effectiveness of the bipolar ionization/plasma (BPI) air cleaning equipment installed within the HVAC (heating, ventilating, and air conditioning) air handling units at Valencia College. The bipolar ionization/plasma air cleaning technology supplements any mechanical air filtration units that are currently installed in the building's HVAC air handling systems.

The four indoor rooms at Valencia College (see below) and one outdoor location were selected for sampling. Air sampling was performed at these four locations and outdoors (i.e., a total of 5 sampling locations) as listed below:

- Classroom No. 105
- Answer Room
- Library
- Bookstore
- Outdoors (Inner Courtyard)

Some results of the air sampling/monitoring at Valencia College were evaluated versus the published data in ASHRAE Standard 62.1-2010, Ventilation for Acceptable Indoor Air Quality. ASHRAE Standard 62.1-2010 was published so that there were parameters to "specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health effects". Readings and lab results were compared to the guidelines in the appendix of ASHRAE 62.1 Standard such as occupational exposure limits which were created by the Occupational Safety and Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH), The Environmental Protection Agency (EPA), and/or other cognizant organizations.

The IAQ evaluation specifically evaluated Section 6.2 of the Indoor Air Quality Procedure of ASHRAE Standard 62.1-2007. ASHRAE defines acceptable indoor air quality as "air in which there are no known concentrations at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction".

Green Clean Air collected direct air samples with the BPI/plasma air cleaning equipment activated for the following selected airborne chemical contaminants:

- Formaldehyde (CH_2O)
- Total Volatile Organic Compounds (TVOCs)
- Ozone (O_3)
- Respirable Particulates (RSP)
- Temperature
- Relative Humidity (rh)

Direct-reading measurements: Green Clean Air collected direct-reading measurements for determination of Total TVOCs using the Graywolf TVOC Meter instrument model #IQ 610. Direct-reading measurements for respirable particulate were collected using a Lighthouse Model 3016 six channel Laser Particle Counter. Direct-reading measurements for formaldehyde were collected using Graywolf Formaldehyde Meter model 801. All instruments were operated and calibrated in accordance with the manufacturer's instructions.

On-site Environmental Sampling with portable instruments: On-site environmental sampling was conducted to evaluate the building's Indoor Air Quality. Sampling was conducted in real-time and was performed with the use of a Graywolf TVOC Indoor Air Quality Meter.

Results: The environmental sampling results indicate that the indoor areas tested comply with the ASHRAE standard for the CO_2 levels. The CO_2 indoors ranged from 742 ppm to 774 ppm. The outdoors or reference CO_2 level was 343 ppm. The recommended range specified by ASHRAE ASHRAE 62.1 Ventilation Rate Procedure (VRP) is 700 ppm + outdoor reference (background) CO_2 levels. ASHRAE 62 Indoor Air Quality Procedure allows up to 5,000 PPM of CO_2 when air cleaning is applied, as in this application, in order to control the contaminants of concern. The environmental sampling results can be found in appendix #1.

Ozone Results: The National Ambient Air Quality Standards (NAAQS) for Ozone is 75 parts per billion. The Graywolf TVOC Indoor Air Quality Meter had 0 (zero) readings for all locations both indoors and outdoors.

The ASHRAE Standard range for humidity is 30-60%rh. All rooms in the College met this criterion.

Air Quality Sampling for laboratory analysis: The following air quality sampling was used evaluate the indoor air quality:

EPA method TO-15 VOC testing: The volatile organic compound air sample tests using EPA method TO-15 were collected at each of the four rooms and the outdoors in the courtyard outside the building. Air samples were collected for a period of four hours for the air quality evaluation. Results of air sampling are presented in the Appendix. The samples were analyzed at the Maryland Spectral Services laboratory in Baltimore, Maryland. The laboratory used analytical methods developed by the EPA for this project.

EPA method TO-15 VOC testing Results: The TO-15 VOCs which were above detectable levels are delineated in appendix #4. All the levels were below any published exposure limits either by ASHRAE or OSHA. The results are published in micrograms per cubic meter (μ/m^3) and parts per billion (ppbv). None of the indoor levels exceeded 15 parts per billion and that level was in the bookstore likely coming from the books (Methylene Chloride). All other TO-15 voc levels were less than 10 parts per billion in the indoor spaces.

In order to clarify some of the results:

- Acetone is produced in exhaled human breath
- Methylene Chloride is used in glues and is present in newly manufactured books, hence its detectable presence in the bookstore's air.
- Ethyl Acetate is used in nail polish.
- Tetrachloroethene is used in dry cleaning fluids and was found at elevated levels outdoors but at barely detectable levels indoors.
- Toulene is found in paint thinners and inks thereby explaining its slightly detectable level in the bookstore.

All the results of the TO-15 lab reports are attached.

Viable fungi spore sampling: Viable fungi sampling will demonstrate the effectiveness of an air cleaning system much better than a spore trap analysis because a viable analysis shows what airborne fungi can actually grow and "amplify" versus just being airborne which is what a spore trap analysis shows. The spore trap analysis cannot differentiate between "viable" and "non-viable" fungi rendering it unable to determine the actual effectiveness of an air cleaning system such as the bipolar ionization/plasma system being evaluated at Valencia College.

Viable air sampling requires the use of an Andersen air sampling system. The Anderson Air Sampling system is a sampling device designed for the collection and analysis of viable fungal spores and bacteria. Air enters the Andersen unit and is sent through 400 small holes which separate the airflow and its contents. All airborne particles become impacted on the sampling substrate, and then the air leaves through the exit orifice.

Since the Andersen sampler is used to collect viable samples of airborne bacterial and fungal spores, the samples which grow fungi and bacteria will act as a measure of the number of viable bacteria or fungal spores in the air at a specific location and time. The air is drawn through a sampling head with 400 small holes at constant rate of 28.3 L/min for 5 minutes and 18 seconds giving a total volume of 150 liters. The airflow and patented cassette housing is designed in such a way that the particles are distributed and deposited equally on the sampling plate. Before sampling, a media plate (usually agar for fungi and blood for bacteria) is placed inside the sampling head where the air pulled through the holes and its heavier particles such as bacterial and fungal spores impact on the media surface and stick there. After the proper sampling time, the plate is removed and sent for culturing by a certified lab to determine the levels of airborne viable bacteria and fungi.

The viable fungi and bacteria samples were collected in the selected rooms and the outdoors which served as the reference sample. The fungi and bacteria laboratory results can be found in Appendix 2 and the full lab report is attached.

Viable Fungi Lab Results: With the BPI/plasma energized the total indoor viable fungi ranged from non-detected levels to 73 colony forming units per cubic meter (CFUs/m3). This was in contrast to an outdoor level of 940 CFUs/M^3. With outdoor cladosporium species levels of 800 CFUs/M^3, the highest indoor level of cladosporium species was 67 CFUs/M^3 in the bookstore which has a door to the outdoors which was opened and closed during the testing and hence may have skewed this reading. In contrast, the only other level of cladosporium species detected indoors was 13 CFUs/M^3 in the answer center which also has a door to the outdoors, though it is not known if this was opened during the testing. Both the bookstore and answer room are on the lower ground level and thus are subject to outdoor air intrusion through door openings. The other two indoor areas tested which did not have doors directly linking to the outdoors (rooms 105 and the library) had no detectable levels of cladosporium species.

It should be noted that while the fungi alternaria, which can be a toxic fungi to humans, was found outdoors at a level of 67 CFUs/m^3, and it was not present on any of the indoor air samples.

Cooling coil viable fungi and bacteria lab Results: With the BPI/plasma system energized the total viable fungi and bacteria were both at non-detected levels on both swab samples taken from 2 separate surfaces of the cooling coil fins.

Viable Bacteria Lab Results: With the BPI/plasma energized the total indoor viable bacteria ranged from non-detected levels to 80 colony forming units per cubic meter (CFUs/m^3) to 153 CFUs/m^3. This was in contrast to an total outdoor level of 960 CFUs/M^3. With outdoor Leifsonia aquatica species levels of 933 CFUs/M^3, the highest indoor level of species was Micrococcus species with 93 CFUs/M^3 in the bookstore which has a door to the outdoors that was opened and closed during the testing and hence may have skewed this reading.

The outdoor bacteria lab results showed that Leifsonia aquatica was present in elevated levels. The bacteria Leifsonia aquatica is an “aquatic” coryneform shaped rod, which can form biofilms in water. Since the area tested is near several Lakes, it follows that this bacterium may be present in the air as a result of these water sources providing the necessary water source. Most importantly this bacterium was not present indoors indicating the possibility that it may have been sterilized by the BIS system.

The fungi that is missing from this survey is Penicillium and Aspergillus which are the common constitutes of indoor air. In their 1999 published paper in the peer reviewed journal Applied and Environmental Microbiology[1], authors Levetin, Shaughnessy et al. found 64,870 airborne Aspergilllus and 16,000 Penicillium fungi. Both Penicillium and Aspergillus were absent from all Valencia College samples and the total fungi levels found in the Valencia College samples are nowhere near these levels. This is important from a health point of view because both Penicillium and Aspergillus are the leading fungi responsible for human mortality.

BPI/plasma system Inspection: Green Clean Air confirmed that the BPI/plasma air cleaning equipment was in operation and energized during the air sampling. Green Clean Air inspected and confirmed that the BPI/plasma air cleaning equipment was in proper working order both by visual inspection of the units and also by the use of an air ion counter instrument in the indoor spaces. The "on" mode of operation was maintained throughout the remainder of the event with no changes to the BPI/plasma cleaning equipment settings.

Positive and Negative Ion counting: Green Clean Air used an Air Ion Counter (AlphaLab, Inc. 3005 South 300 West Salt Lake City, Utah 84115) to measure the Positive and Negative Ions in the indoor air. According to AlphaLabs: "The Air Ion Counter is a handheld meter designed to measure ion density- the number of ions per cubic centimeter (ions/cc) in air. It measures this number separately for positive and negative ions". One objective of using the meter was to validate that the BPI/plasma systems was producing ions above a background (outdoor) level.

Positive and Negative Ion counting Results: Outdoor Ion Counts ranged between 300-400 positive and negative ions per cubic centimeter outside the Valencia College main building.

Answer Center- Ion Counts ranged between 1300-1500 positive and negative ions per cubic centimeter at 5 feet to approximate the breathing zone.

Room 105- Ion Counts ranged between 1200-1500 positive and negative ions per cubic centimeter at 5 feet to approximate the breathing zone.

Bookstore- Ion Counts ranged between 1400-1600 positive and negative ions per cubic centimeter at 5 feet to approximate the breathing zone. Ions counts were also taken at 8 feet which put the Ion Counter in the supply air stream. At that height, Ion Counts ranged between 2,300-2,500 positive and negative ions per cubic centimeter.

Library- Ion Counts ranged between 1300-1500 positive and negative ions per cubic centimeter at 5 feet to approximate the breathing zone. Ions counts were also taken at 8 feet which put the Ion Counter in the supply air stream. At that height, Ion Counts ranged between 2,400-2,600 positive and negative ions per cubic centimeter.

Formaldehyde Levels: Green Clean Air took formaldehyde readings in the building and outdoors using the Graywolf Multimode Monitor model # FM-801, Serial # 003H12. The instrument is calibrated for 30 minutes before each sample is taken.

Results: One of the most important aldehydes tested is formaldehyde. The indoor formaldehyde levels ranged from less than 10 Parts Per Billion (ppb) in the answer room, room 105, library and 14 ppb in the bookstore with the BPI/plasma system energized and an outdoor concentration of less than 10 ppb. These results are compared with the United States Green Building Councils' recommendation that indoor air should have less than 27 parts per billion of formaldehyde. In addition, the US Administration for Housing and Urban development recommends a level of 750 parts per billion as an 8 hour

Permissible exposure level. The formaldehyde levels found at Valencia are below that level and well below the more stringent USGBC levels with the BPI/plasma system energized.

Real Time Particulate sampling: Real Time Particulate sampling was done with a range from .3, .5, 1, 3, 5 and 10 microns (particles that are 10 microns or less are considered respirable particles/dust). A micron (μ) is one millionth of a meter in size.

Real Time Particulate sampling results: The particulate size ranges that were tested therefore ranged from PM.3 to PM10 (Particulate Matter .3 microns to 10 microns), which represents the respirable particulate/dust fraction range in which a human can respire into their lungs and the results ranged from 200 particles at the 10 micron level to 871,000 particles at the .3 micron level. The particulate results can be found below. The EPA National Ambient Air Quality Standards (NAAQS) has a recommended limit of 15 $\mu g/m^3$ (micrograms/cubic meter) for PM 2.5. This is equal to 180,000 airborne 2.5 micron particles. Our 3 micron particle count measurements were between 712 to 846 indoors and 1,746 outdoors as a reference.

Lighthouse Laser Particle Counter Model #3016 Readings
Calibrated on June 22, 2012

Date 3.21.2013

<u>Outdoors 9:59am</u>
.3μ- 871,000
.5 μ- 95,106
1.0μ- 15,400
3.0 μ- 1,706
5.0 μ- 800
10.0 μ-256

<u>Answer Room 10:32am</u>
.3μ- 336,000
.5 μ- 26,213
1.0μ- 3,693
3.0 μ- 846
5.0 μ- 360
10.0 μ-120

<u>Room 105 11:02am</u>
.3μ- 386,000
.5 μ- 36,213
1.0μ- 8,693
3.0 μ- 746
5.0 μ- 359

10.0 µ-138

Bookstore 11:36am
.3µ- 373,000
.5 µ- 33,326
1.0µ- 8,253
3.0 µ- 712
5.0 µ- 398
10.0 µ-141

Library 12:49am
.3µ- 369,000
.5 µ- 32,596
1.0µ- 8,289
3.0 µ- 781
5.0 µ- 334
10.0 µ-129

Findings and Conclusions: The purpose of the investigation was to evaluate what impacts on the indoor air quality at Valencia College were as a result of the presence of bipolar ionization/plasma air cleaning equipment installed within the building's air handling units. Multiple and exhaustive air quality samplings were taken to ascertain this purpose. The sampling results reported herein demonstrate that the Bipolar Ionization/plasma system is likely not having any negative effects on the IAQ, and moreover it is likely having positive effects on the building's IAQ.

The lab results for viable airborne fungi and bacteria spore levels showed significant reductions from outdoors and the absence of harmful fungi (Aspergillus/Penicillium/Alternaria) typically found within indoor air. Another factor in determining the quality of indoor air is comparing the levels of viable airborne fungi and bacteria levels found indoors versus the levels found outdoors. Even with the low levels of fungi and bacteria results, they could not violate any health and safety standards as there are no Federal guidelines for acceptable fungi and bacteria levels.

The TVOC concentrations were significantly lower indoors as were the respirable particulates in the air. In addition, the reported results herein demonstrate that the Bipolar Ionization/plasma System is likely having no negative effect on the formaldehyde concentrations within the building. The TO-15 VOC levels were low and many were at non-detectable levels. Those VOCs detected were explained herein.

The ion counts from the Air Ion Meter show that there are positive and negative ions being actively delivered by the BiPolar Ionization/plasma system into the indoor spaces at levels at over 2,000 positive and negative ions over outdoor "background/ambient" levels. This supports the fact that the energized BiPolar Ionization/plasma system is functioning properly.

1251 Weatherstone Court, Reston, VA 20194

This report pertains to only the conditions in the areas assessed on March 21, 2013. These findings are based upon tests performed in and around the College and the results of the samples obtained at the time of this investigation. While conditions are constantly changing, periodic evaluations will either confirm or challenge the findings herein. It is critical that the staff is able to properly maintain the HVAC systems and BiPolar/plasma ionization systems in order to provide the highest level of indoor air quality to all occupants of Valencia College.

Steven Welty, CIE, CAFS, LEED, AP

1. Levetin, Shaughnessy et al., "Effectiveness of Germicidal UV Radiation for Reducing Fungal Contamination within Air-Handling-Units," *Applied and Environmental Microbiology*, April 2001.

Appendix 1

Date Time Location	TVOC	CO_2	O_3	Temp (F)	rh
21-Feb-13 10:34:29 AM Outdoor	1169	343	0.00	68.9	37.6
21-Feb-13 11:12:29 AM Room 105	690	742	0.00	71.9	34.1
21-Feb-13 11:16:29 AM Answer room	672	766	0.00	71.9	34.1
21-Feb-13 11:17:59 AM Bookstore	666	774	0.00	71.5	34.0
21-Feb-13 11:18:59 AM Library	652	773	0.00	72.0	34.1

Appendix 2

Viable Fungi and Bacteria Lab results

Outdoors

Fungi (Sample No. 10)

Alternaria species	67 CFUs/M^3
Cladosporium species	800 CFUs/M^3
Epicoccum species	73 CFUs/M^3
Total	940 CFUs/M^3

Bacteria (Sample No. 4)

Bacillus species	13 CFUs/M^3
Leifsonia aquatica	933 CFUs/M^3
Pantoea agglomerans	7 CFUs/M^3
Pseudomonas oryzihabitans	7 CFUs/M^3
Total	960 CFUs/M^3

Bookstore

Fungi (Sample No. 7)

Cladosporium species	67 CFUs/M^3
Undifferentiated hyphomycete	7 CFUs/M^3
Total	73 CFUs/M^3

Bacteria (Sample No. 1)

Bacillus species	27 CFUs/M^3
Micrococcus species	93 CFUs/M^3
Staphylococcus species	27 CFUs/M^3
Total	147 CFUs/M^3

Answer Center

Fungi (Sample No. 6)

Cladosporium species	13 CFUs/M^3
Undifferentiated hyphomycete	20 CFUs/M^3
Total	33 CFUs/M^3

Bacteria (Sample No. 2)

Bacillus species	33 CFUs/M^3
Enterococcus species	80 CFUs/M^3
Micrococcus species	20 CFUs/M^3
Staphylococcus species	20 CFUs/M^3
Total	153 CFUs/M^3

Room 105
Fungi (Sample No. 3)
No Fungi Detected

Bacteria (Sample No. 8)

Bacillus species	7 CFUs/M^3
Micrococcus species	67 CFUs/M^3
Staphylococcus species	40 CFUs/M^3
Total	113 CFUs/M^3

Library
Fungi (Sample No. 5)
Undifferentiated hyphomycete 7 CFUs/M3

Bacteria (Sample No. 9)

Bacillus species	40 CFUs/M3
Micrococcus species	20 CFUs/M3
Staphylococcus species	20 CFUs/M3
Total	80 CFUs/M3

Appendix 3

Cooling coil fin Viable Fungi and Bacteria Lab results

Fungi (Sample No. 11)
No Fungi Detected

Bacteria (Sample No. 11)
No Bacteria Detected

Fungi (Sample No. 12)
No Fungi Detected

Bacteria (Sample No. 12)
No Bacteria Detected

1251 Weatherstone Court, Reston, VA 20194

Appendix 4

TO-15 readings above detection limits

Sample Date 3/21/2013 VOC readings in Parts Per Billion (ppbv)

	Units	Room 105	Library	Book-store	Outdoor	Answer Center
Acetone	ppbv	7.65	6.55	9.62	1.96	7.29
Chloromethane	ppbv	0.490	0.470	0.500	0.480	0.490
Dichlorodifluoromethane	ppbv	0.410	0.400	0.420	0.430	0.420
Ethyl Acetate	ppbv	<0.200	0.340	0.340	<0.200	<0.200
Methylene Chloride	ppbv	<4.03	4.61	[1] 14.5	[1] 5.73	[1] <4.03
Methyl Ethyl Ketone (2-Butanone)	ppbv	0.520	0.380	0.350	0.240	0.320
Tetrachloroethene	ppbv	<0.206	<0.206	1.09	19.7	0.220
Toluene	ppbv	<0.199	0.490	2.45	<0.199	0.730
Trichlorofluoromethane	ppbv	<0.196	<0.196	0.200	0.200	<0.196

[1] This gas is used in the laboratory and may have interfered with the results

Sample Date 3/21/2013 VOC readings in micro-grams per cubic meter (ug/m^3)

	Units	Room 105	Library	Book-store	Outdoor	Answer Center
Acetone	ug/m^3	18.2	15.6	22.9	4.06	17.3
Chloromethane	ug/m^3	1.01	0.97	1.03	0.99	1.01
Dichlorodifluoromethane	ug/m^3	2.03	1.98	2.08	2.13	2.08
Ethyl Acetate	ug/m^3	<0.72	1.23	1.23	<0.72	<0.72
Heptane	ug/m^3	<0.82	<0.82	<0.82	<0.82	3.65
Methylene Chloride	ug/m^3	<14.0	16.0	50.2	19.9	<14.0
Methyl Ethyl Ketone (2-Butanone)	ug/m^3	1.53	1.12	1.03	0.71	0.94
Tetrachloroethene	ug/m^3	<1.40	<1.40	7.39	134	1.49
Toluene	ug/m^3	<0.75	1.85	9.23	<0.75	2.75
Trichlorofluoromethane	ug/m^3	<1.10	<1.10	1.12	1.12	<1.10

[1] This gas is used in the laboratory and may have interfered with the results

Picture #1 GPS Model 7000 Power Unit

Picture #2 GPS “IBAR” installed in AHU

Maryland spectral Services

Analytical Chemistry Services

1500 Caton Center Dr Suite G
Baltimore MD 21227
410-247-7600
www.mdspectral.com
VELAP ID 460040

Analytical Results

Project: **VALENCIA**

Project Number: N/A

Project Manager: Steve Welty

Report Issued: 03/29/13 16:11

Green Clean Air
1251 Weatherstone Court
Reston VA, 20194-1348

CLIENT SAMPLE ID:		ROOM 105	LIBRARY	BOOKSTORE	OUTDOOR	ANSWER CENTER
LAB SAMPLE ID:		3032603-01	3032603-02	3032603-03	3032603-04	3032603-05
SAMPLE DATE:		03/21/13	03/21/13	03/21/13	03/21/13	03/21/13
RECEIVED DATE:		03/26/13	03/26/13	03/26/13	03/26/13	03/26/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD TO-15 (GC/MS) (Vapor)						
Acetone	ppbv	**7.65**	**6.55**	**9.62**	**1.96**	**7.29**
Benzene	ppbv	<0.200	<0.200	<0.200	<0.200	**1.16**
Benzyl chloride	ppbv	<0.193	<0.193	<0.193	<0.193	<0.193
Bromodichloromethane	ppbv	<0.194	<0.194	<0.194	<0.194	<0.194
Bromoform	ppbv	<0.203	<0.203	<0.203	<0.203	<0.203
Bromomethane	ppbv	<0.201	<0.201	<0.201	<0.201	<0.201
1,3-Butadiene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Carbon disulfide	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Carbon tetrachloride	ppbv	<0.207	<0.207	<0.207	<0.207	<0.207
Chlorobenzene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Chloroethane	ppbv	<0.201	<0.201	<0.201	<0.201	<0.201
Chloroform	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Chloromethane	ppbv	**0.490**	**0.470**	**0.500**	**0.480**	**0.490**
3-Chloropropene	ppbv	<0.201	<0.201	<0.201	<0.201	<0.201
Cyclohexane	ppbv	<0.200	<0.200	<0.200	<0.200	**0.810**
Dibromochloromethane	ppbv	<0.153	<0.153	<0.153	<0.153	<0.153
1,2-Dibromoethane (EDB)	ppbv	<0.182	<0.182	<0.182	<0.182	<0.182
1,2-Dichlorobenzene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
1,3-Dichlorobenzene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
1,4-Dichlorobenzene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Dichlorodifluoromethane	ppbv	**0.410**	**0.400**	**0.420**	**0.430**	**0.420**
1,1-Dichloroethane	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
1,2-Dichloroethane	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
1,1-Dichloroethene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
cis-1,2-Dichloroethene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
trans-1,2-Dichloroethene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
1,2-Dichloropropane	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
cis-1,3-Dichloropropene	ppbv	<0.201	<0.201	<0.201	<0.201	<0.201
trans-1,3-Dichloropropene	ppbv	<0.201	<0.201	<0.201	<0.201	<0.201
1,4-Dioxane	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Ethyl acetate	ppbv	<0.200	**0.340**	**0.340**	<0.200	<0.200
Ethylbenzene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
4-Ethyltoluene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Freon 113	ppbv	<0.196	<0.196	<0.196	<0.196	<0.196
Freon 114	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Heptane	ppbv	<0.200	<0.200	<0.200	<0.200	**0.890**

1 = Analyte is a possible laboratory contaminant

Analytical Results

1500 Caton Center Dr Suite G
Baltimore MD 21227
410-247-7600
www.mdspectral.com
VELAP ID 460040

Project: **VALENCIA**

Project Number: N/A

Project Manager: Steve Welty

Report Issued: 03/29/13 16:11

Green Clean Air
1251 Weatherstone Court
Reston VA, 20194-1348

CLIENT SAMPLE ID:		ROOM 105	LIBRARY	BOOKSTORE	OUTDOOR	ANSWER CENTER
LAB SAMPLE ID:		3032603-01	3032603-02	3032603-03	3032603-04	3032603-05
SAMPLE DATE:		03/21/13	03/21/13	03/21/13	03/21/13	03/21/13
RECEIVED DATE:		03/26/13	03/26/13	03/26/13	03/26/13	03/26/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD TO-15 (GC/MS) (continued)						
Hexachlorobutadiene	ppbv	<0.197	<0.197	<0.197	<0.197	<0.197
Hexane	ppbv	<3.97	<3.97	<3.97	<3.97	<3.97
2-Hexanone	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Methyl tert-butyl ether (MTBE)	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Methylene chloride	ppbv	<4.03	**4.61 [1]**	**14.5 [1]**	**5.73 [1]**	<4.03
Methyl ethyl ketone (2-Butanone)	ppbv	**0.520**	**0.380**	**0.350**	**0.240**	**0.320**
Methyl isobutyl ketone	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Naphthalene	ppbv	<0.210	<0.210	<0.210	<0.210	<0.210
Propene	ppbv	<0.198	<0.198	<0.198	<0.198	<0.198
Styrene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
1,1,2,2-Tetrachloroethane	ppbv	<0.204	<0.204	<0.204	<0.204	<0.204
Tetrachloroethene	ppbv	<0.206	<0.206	**1.09**	**19.7**	**0.220**
Tetrahydrofuran	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
Toluene	ppbv	<0.199	**0.490**	**2.45**	<0.199	**0.730**
1,2,4-Trichlorobenzene	ppbv	<0.202	<0.202	<0.202	<0.202	<0.202
1,1,1-Trichloroethane	ppbv	<0.202	<0.202	<0.202	<0.202	<0.202
1,1,2-Trichloroethane	ppbv	<0.202	<0.202	<0.202	<0.202	<0.202
Trichloroethene	ppbv	<0.205	<0.205	<0.205	<0.205	<0.205
Trichlorofluoromethane (Freon 11)	ppbv	<0.196	<0.196	**0.200**	**0.200**	<0.196
1,2,4-Trimethylbenzene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
1,3,5-Trimethylbenzene	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
2,2,4-Trimethylpentane	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Vinyl acetate	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Vinyl bromide	ppbv	<0.199	<0.199	<0.199	<0.199	<0.199
Vinyl chloride	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
o-Xylene	ppbv	<0.200	<0.200	<0.200	<0.200	<0.200
m- & p-Xylenes	ppbv	<0.391	<0.391	<0.391	<0.391	**0.420**
4-Bromofluorobenzene	[surr]	96.8%	104%	101%	103%	101%

1 = Analyte is a possible laboratory contaminant

Air Analysis by TO-15

Chain of Custody

1 of 1 COCs

Client Contact Information	**Project Manager:** Steven Wolfe	**Carrier:**
Company: Green Clean Air	Phone:	Samplers Name(s)
Address: 1251 Weathersfield Cir	Site Contact:	
City/State/Zip Reston VA 20194		
Phone:		
FAX: 703 437 7532		
Project Name: Valencia	Analysis Turnaround Time	
Site:	Standard (Specify)	
PO #	Rush (Specify)	

Client Sample ID	Sample Date Start	Time Start (24 hr clock)	Sample Date Stop	Time Stop (24 hr clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Incoming Canister Pressure ("Hg) (Lab)	Sample Regulator ID	Can ID	Can Size (L)	TO-15 FULL LIST	TO-15 ABREVIATED LIST	Indoor / Ambient Air	Soil Gas / Subslab	Comments
~~Room 105~~	~~3-21~~	~~11:49~~													
Room 105	3-21	11:49	3.21	15:49	33	0			026		✓				3032603-01
Library	3-21	12:19	3-21	16:19	35	0			023		✓				-02
Bookstore	3.21	11:30	3.21	15:30	35	0			040		✓				-03
Outdoor	3.21	10:56	3.21	14:56	35	0			047		✓				-04
Answer Center	3.21	11:15	3.21	15:15	35	0			041		✓				-05

Special Instructions/QC Requirements & Comments:

Canisters Shipped by: Steven Wolfe	Date/Time: 3.21 4pm	Canisters Received by:	Date/Time: 3/26/13 13:49
Samples Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

25.1°C

Maryland spectral Services

Analytical Chemistry Services

1500 Caton Center Dr Suite G
Baltimore MD 21227
410-247-7600
www.mdspectral.com
VELAP ID 460040

Analytical Results

Project: **VALENCIA**

Project Number: N/A

Project Manager: Steve Welty

Report Issued: 03/29/13 13:38

Green Clean Air
1251 Weatherstone Court
Reston VA, 20194-1348

CLIENT SAMPLE ID:		ROOM 105	LIBRARY	BOOKSTORE	OUTDOOR	ANSWER CENTER
LAB SAMPLE ID:		3032603-01	3032603-02	3032603-03	3032603-04	3032603-05
SAMPLE DATE:		03/21/13	03/21/13	03/21/13	03/21/13	03/21/13
RECEIVED DATE:		03/26/13	03/26/13	03/26/13	03/26/13	03/26/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD TO-15 (GC/MS) (Vapor)						
Acetone	ug/m³	**18.2**	**15.6**	**22.9**	**4.66**	**17.3**
Benzene	ug/m³	<0.64	<0.64	<0.64	<0.64	**3.71**
Benzyl chloride	ug/m³	<1.00	<1.00	<1.00	<1.00	<1.00
Bromodichloromethane	ug/m³	<1.30	<1.30	<1.30	<1.30	<1.30
Bromoform	ug/m³	<2.10	<2.10	<2.10	<2.10	<2.10
Bromomethane	ug/m³	<0.78	<0.78	<0.78	<0.78	<0.78
1,3-Butadiene	ug/m³	<0.44	<0.44	<0.44	<0.44	<0.44
Carbon disulfide	ug/m³	<0.62	<0.62	<0.62	<0.62	<0.62
Carbon tetrachloride	ug/m³	<1.30	<1.30	<1.30	<1.30	<1.30
Chlorobenzene	ug/m³	<0.92	<0.92	<0.92	<0.92	<0.92
Chloroethane	ug/m³	<0.53	<0.53	<0.53	<0.53	<0.53
Chloroform	ug/m³	<0.97	<0.97	<0.97	<0.97	<0.97
Chloromethane	ug/m³	**1.01**	**0.97**	**1.03**	**0.99**	**1.01**
3-Chloropropene	ug/m³	<0.63	<0.63	<0.63	<0.63	<0.63
Cyclohexane	ug/m³	<0.69	<0.69	<0.69	<0.69	**2.79**
Dibromochloromethane	ug/m³	<1.30	<1.30	<1.30	<1.30	<1.30
1,2-Dibromoethane (EDB)	ug/m³	<1.40	<1.40	<1.40	<1.40	<1.40
1,2-Dichlorobenzene	ug/m³	<1.20	<1.20	<1.20	<1.20	<1.20
1,3-Dichlorobenzene	ug/m³	<1.20	<1.20	<1.20	<1.20	<1.20
1,4-Dichlorobenzene	ug/m³	<1.20	<1.20	<1.20	<1.20	<1.20
Dichlorodifluoromethane	ug/m³	**2.03**	**1.98**	**2.08**	**2.13**	**2.08**
1,1-Dichloroethane	ug/m³	<0.81	<0.81	<0.81	<0.81	<0.81
1,2-Dichloroethane	ug/m³	<0.81	<0.81	<0.81	<0.81	<0.81
1,1-Dichloroethene	ug/m³	<0.79	<0.79	<0.79	<0.79	<0.79
cis-1,2-Dichloroethene	ug/m³	<0.79	<0.79	<0.79	<0.79	<0.79
trans-1,2-Dichloroethene	ug/m³	<0.79	<0.79	<0.79	<0.79	<0.79
1,2-Dichloropropane	ug/m³	<0.92	<0.92	<0.92	<0.92	<0.92
cis-1,3-Dichloropropene	ug/m³	<0.91	<0.91	<0.91	<0.91	<0.91
trans-1,3-Dichloropropene	ug/m³	<0.91	<0.91	<0.91	<0.91	<0.91
1,4-Dioxane	ug/m³	<0.72	<0.72	<0.72	<0.72	<0.72
Ethyl acetate	ug/m³	<0.72	**1.23**	**1.23**	<0.72	<0.72
Ethylbenzene	ug/m³	<0.87	<0.87	<0.87	<0.87	<0.87
4-Ethyltoluene	ug/m³	<0.98	<0.98	<0.98	<0.98	<0.98
Freon 113	ug/m³	<1.50	<1.50	<1.50	<1.50	<1.50
Freon 114	ug/m³	<1.40	<1.40	<1.40	<1.40	<1.40
Heptane	ug/m³	<0.82	<0.82	<0.82	<0.82	**3.65**

1 = Analyte is a possible laboratory contaminant

Analytical Results

1500 Caton Center Dr Suite G
Baltimore MD 21227
410-247-7600
www.mdspectral.com
VELAP ID 460040

Project: **VALENCIA**

Project Number: N/A

Project Manager: Steve Welty

Report Issued: 03/29/13 13:38

Green Clean Air
1251 Weatherstone Court
Reston VA, 20194-1348

CLIENT SAMPLE ID:		ROOM 105	LIBRARY	BOOKSTORE	OUTDOOR	ANSWER CENTER
LAB SAMPLE ID:		3032603-01	3032603-02	3032603-03	3032603-04	3032603-05
SAMPLE DATE:		03/21/13	03/21/13	03/21/13	03/21/13	03/21/13
RECEIVED DATE:		03/26/13	03/26/13	03/26/13	03/26/13	03/26/13
MATRIX	Units	Vapor	Vapor	Vapor	Vapor	Vapor
VOLATILE ORGANICS BY EPA METHOD TO-15 (GC/MS) (continued)						
Hexachlorobutadiene	ug/m³	<2.10	<2.10	<2.10	<2.10	<2.10
Hexane	ug/m³	<14.0	<14.0	<14.0	<14.0	<14.0
2-Hexanone	ug/m³	<0.82	<0.82	<0.82	<0.82	<0.82
Methyl tert-butyl ether (MTBE)	ug/m³	<0.72	<0.72	<0.72	<0.72	<0.72
Methylene chloride	ug/m³	<14.0	**16.0 [1]**	**50.2 [1]**	**19.9 [1]**	<14.0
Methyl ethyl ketone (2-Butanone)	ug/m³	**1.53**	**1.12**	**1.03**	**0.71**	**0.94**
Methyl isobutyl ketone	ug/m³	<0.82	<0.82	<0.82	<0.82	<0.82
Naphthalene	ug/m³	<1.10	<1.10	<1.10	<1.10	<1.10
Propene	ug/m³	<0.34	<0.34	<0.34	<0.34	<0.34
Styrene	ug/m³	<0.85	<0.85	<0.85	<0.85	<0.85
1,1,2,2-Tetrachloroethane	ug/m³	<1.40	<1.40	<1.40	<1.40	<1.40
Tetrachloroethene	ug/m³	<1.40	<1.40	**7.39**	**134**	**1.49**
Tetrahydrofuran	ug/m³	<0.59	<0.59	<0.59	<0.59	<0.59
Toluene	ug/m³	<0.75	**1.85**	**9.23**	<0.75	**2.75**
1,2,4-Trichlorobenzene	ug/m³	<1.50	<1.50	<1.50	<1.50	<1.50
1,1,1-Trichloroethane	ug/m³	<1.10	<1.10	<1.10	<1.10	<1.10
1,1,2-Trichloroethane	ug/m³	<1.10	<1.10	<1.10	<1.10	<1.10
Trichloroethene	ug/m³	<1.10	<1.10	<1.10	<1.10	<1.10
Trichlorofluoromethane (Freon 11)	ug/m³	<1.10	<1.10	**1.12**	**1.12**	<1.10
1,2,4-Trimethylbenzene	ug/m³	<0.98	<0.98	<0.98	<0.98	<0.98
1,3,5-Trimethylbenzene	ug/m³	<0.98	<0.98	<0.98	<0.98	<0.98
2,2,4-Trimethylpentane	ug/m³	<0.93	<0.93	<0.93	<0.93	<0.93
Vinyl acetate	ug/m³	<0.70	<0.70	<0.70	<0.70	<0.70
Vinyl bromide	ug/m³	<0.87	<0.87	<0.87	<0.87	<0.87
Vinyl chloride	ug/m³	<0.51	<0.51	<0.51	<0.51	<0.51
o-Xylene	ug/m³	<0.87	<0.87	<0.87	<0.87	<0.87
m- & p-Xylenes	ug/m³	<1.70	<1.70	<1.70	<1.70	**1.82**
4-Bromofluorobenzene	[surr]	96.8%	104%	101%	103%	101%

1 = Analyte is a possible laboratory contaminant

Air Analysis by TO-15

Chain of Custody

1 of 1 COCs

Client Contact Information	**Project Manager:** Steven Wolfe	**Carrier:**
Company: Green Clean Air	Phone:	Samplers Name(s)
Address: 1251 Weathersfield Cir	Site Contact:	
City/State/Zip Reston VA 20194		
Phone:		
FAX: 703 437 7532		
Project Name: Valencia	Analysis Turnaround Time	
Site:	Standard (Specify)	
PO #	Rush (Specify)	

Client Sample ID	Sample Date Start	Time Start (24 hr clock)	Sample Date Stop	Time Stop (24 hr clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Incoming Canister Pressure ("Hg) (Lab)	Sample Regulator ID	Can ID	Can Size (L)	TO-15 FULL LIST	TO-15 ABREVIATED LIST	Indoor / Ambient Air	Soil Gas / Subslab	Comments
~~Room 105~~	~~3-21~~	~~11:49~~													
Room 105	3-21	11:49	3.21	15:49	33	0			026		✓				3032603-01
Library	3-21	12:19	3-21	16:19	35	0			023		✓				-02
Bookstore	3.21	11:30	3.21	15:30	35	0			040		✓				-03
Outdoor	3.21	10:56	3.21	14:56	35	0			047		✓				-04
Answer Center	3.21	11:15	3.21	15:15	35	0			041		✓				-05

Special Instructions/QC Requirements & Comments:

Canisters Shipped by: Steven Wolfe	Date/Time: 3.21 4pm	Canisters Received by:	Date/Time: 3/26/13 13:49
Samples Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

25.1°C

SanAir Technologies Laboratory

Analysis Report

prepared for

Green Clean Air

Report Date: 4/1/2013
Project Name: College
SanAir ID#: 13006216

NVLAP LAB CODE 200870-0

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #162952

Virginia SBE Certification # 652931

Texas Licensed Mold Analysis Laboratory License # LAB0166

SanAir Technologies Laboratory

804.897.1177 www.sanair.com

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

Green Clean Air
1251 Weatherstone Court
Reston, VA 20194

April 1, 2013

SanAir ID # 13006216
Project Name: College
Project Number:

Dear Steven Welty,

We at SanAir would like to thank you for the work you recently submitted. The 7 sample(s) were received on Monday, March 25, 2013 via FedEx. The final report(s) is enclosed for the following sample(s): 1/6, 2/7, 3/8, 4/9, 5/10, 11, 12.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

L. Claire Macdonald

L. Claire Macdonald
Microbiology Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:
7 sample(s) in Good condition

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM
Analyst: Zhang, Ph.D, Richard

Culture Analysis

SanAir ID: 13006216-006 Sample #: 11 ID:

C3-Culture Analysis on Surface Swab using STL 103
Culture for Mold and Bacteria
Area: 0.5 Sq. In.
Analytical Sensitivity: 2000 CFUs/Sq. In.

Bacteria	Raw Count	CFUs/Sq. In.	% of Total
No Bacteria Detected			

Fungi	Raw Count	CFUs/Sq. In.	% of Total
No Fungi Detected			

SanAir ID: 13006216-007 Sample #: 12 ID:

C3-Culture Analysis on Surface Swab using STL 103
Culture for Mold and Bacteria
Area: 0.5 Sq. In.
Analytical Sensitivity: 2000 CFUs/Sq. In.

Bacteria	Raw Count	CFUs/Sq. In.	% of Total
No Bacteria Detected			

Fungi	Raw Count	CFUs/Sq. In.	% of Total
No Fungi Detected			

Certification

Signature: Date: 4/1/2013

Reviewed: Date: 4/1/2013

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM
Analyst: Zhang, Ph.D, Richard

Culture Analysis

SanAir ID: 13006216-001 Sample #: 1/6 ID:

C3-AP-Culture Analysis on Air Plate using STL 101
Culture for Mold and Bacteria
Volume: 150 Liters
Analytical Sensitivity: 7 CFUs/M^3

Bacteria	Raw Count	CFUs/M^3	% of Total
Bacillus species	4	27	18
Micrococcus species	14	93	64
Staphylococcus species	4	27	18
Total	22	147	

Fungi	Raw Count	CFUs/M^3	% of Total
Cladosporium species	2	13	40
Undifferentiated hyphomycete	3	20	60
Total	5	33	

SanAir ID: 13006216-002 Sample #: 2/7 ID:

C3-AP-Culture Analysis on Air Plate using STL 101
Culture for Mold and Bacteria
Volume: 150 Liters
Analytical Sensitivity: 7 CFUs/M^3

Bacteria	Raw Count	CFUs/M^3	% of Total
Bacillus species	5	33	22
Enterococcus species	12	80	52
Micrococcus species	3	20	13
Staphylococcus species	3	20	13
Total	23	153	

Fungi	Raw Count	CFUs/M^3	% of Total
Cladosporium species	10	67	91
Undifferentiated hyphomycete	1	7	9
Total	11	73	

Certification

Signature: Date: 4/1/2013

Reviewed: Date: 4/1/2013

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM
Analyst: Zhang, Ph.D, Richard

Culture Analysis

SanAir ID: 13006216-003 Sample #: 3/8 ID:

C3-AP-Culture Analysis on Air Plate using STL 101
Culture for Mold and Bacteria
Volume: 150 Liters
Analytical Sensitivity: 7 CFUs/M³

Bacteria	Raw Count	CFUs/M³	% of Total
Bacillus species	1	7	6
Micrococcus species	10	67	59
Staphylococcus species	6	40	35
Total	17	113	

Fungi	Raw Count	CFUs/M³	% of Total
No Fungi Detected			

SanAir ID: 13006216-004 Sample #: 4/9 ID:

C3-AP-Culture Analysis on Air Plate using STL 101
Culture for Mold and Bacteria
Volume: 150 Liters
Analytical Sensitivity: 7 CFUs/M³

Bacteria	Raw Count	CFUs/M³	% of Total
Bacillus species	2	13	1
Leifsonia aquatica	140	933	97
Pantoea agglomerans	1	7	1
Pseudomonas oryzihabitans	1	7	1
Total	144	960	

Fungi	Raw Count	CFUs/M³	% of Total
Undifferentiated hyphomycete	1	7	100

Certification

Signature: Date: 4/1/2013

Reviewed: Date: 4/1/2013

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM
Analyst: Zhang, Ph.D, Richard

Culture Analysis

SanAir ID: 13006216-005 Sample #: 5/10 ID:

C3-AP-Culture Analysis on Air Plate using STL 101
Culture for Mold and Bacteria
Volume: 150 Liters
Analytical Sensitivity: 7 CFUs/M^3

Bacteria	Raw Count	CFUs/M^3	% of Total
Bacillus species	6	40	50
Micrococcus species	3	20	25
Staphylococcus species	3	20	25
Total	12	80	

Fungi	Raw Count	CFUs/M^3	% of Total
Alternaria species	10	67	7
Cladosporium species	120	800	85
Epicoccum species	11	73	8
Total	141	940	

Certification

Signature: Date: 4/1/2013

Reviewed: Date: 4/1/2013

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM

ORGANISM DESCRIPTIONS

The descriptions of the organisms presented are derived from various reference materials. The laboratory report is based on the data derived from the samples submitted and no interpretation of the data, as to potential, or actual, health effects resulting from exposure to the numbers of organisms found, can be made by laboratory personnel. Any interpretation of the potential health effects of the presence of this organism must be made by qualified professional personnel with first hand knowledge of the sample site, and the problems associated with that site.

ALTERNARIA SPECIES - This genus compromises a large number of saprobes and plant pathogens. It is one of the predominate airborne fungal spores indoor and outdoor. Outdoors it may be isolated from samples of soil, seeds, and plants. It is one of the more common fungi found in nature, extremely widespread and ubiquitous. Conidia are easily carried by the wind, with peak concentrations in the summer and early fall. It is commonly found in outdoor samples. It is often found in indoor environments, on drywall, ceiling tiles, in house dust, carpets, textiles, and on horizontal surfaces in building interiors. Often found on window frames. *Health Effects:* In humans, it is recognized to cause type I and III allergic responses. Because of the large size of the spores, it can be deposited in the nose, mouth and upper respiratory tract, causing nasal septum infections. It has been known to cause Baker's asthma, farmer's lung, and hay fever. It has been associated with hypersensitivity pneumoniti, sinusitis, deratomycosis, onychomycosis, subcutaneous phaeohyphomycosis, and invasive infection. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms, chronic cases may develop pulmonary emphysema.
References: Flannigan, Brian, Robert A. Samson, and J. David Miller, eds. Microorganisms in Home and Indoor Work Environments: Diversity, Health Impacts, Investigation, and Control. London and New York: Taylor & Francis, 2001.

CLADOSPORIUM SPECIES - The most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter and are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is commonly found on the surface of fiberglass duct liner in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint and textiles. Often found in dirty refrigerators and especially in reservoirs where condensation is collected, on moist window frames it can easily be seen covering the whole painted area with a velvety olive green layer. *Health Effects:* It is a common allergen. It can cause mycosis. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms, chronic cases may develop pulmonary emphysema. Illnesses caused by this genus can include phaeohyphomycosis, chromoblastomycosis, hay fever and common allergies.
References: Flannigan, Brian, Robert A. Samson, and J. David Miller, eds. Microorganisms in Home and Indoor Work Environments: Diversity, Health Impacts, Investigation, and Control. London and New York: Taylor & Francis, 2001.

EPICOCCUM SPECIES - It is found in plants, soil, grains, textiles, and paper products. Frequently isolated from air and occasionally occurs in house dust. Is a saprophyte and considered a weakly parasitic secondary invader of plants, moldy paper and textiles. Epicoccum is usually isolated with either Cladosporium species or Aureobasidium species. *Health Effects:* A common allergen. It also has the potential to produce type I fungal hypersensitivity reactions.
References: Flannigan, Brian, Robert A. Samson, and J. David Miller, eds. Microorganisms in Home and Indoor Work Environments: Diversity, Health Impacts, Investigation, and Control. London and New York: Taylor & Francis, 2001.

UNDIFFERENTIATED HYPHOMYCETE - This category is used when a fungal identification cannot be obtained due to lack of sporulation. In some instances, a sample may have mycelial fragments present, but cannot be identified without the distinguishing characteristics of the spores or the structures they grow from.

BACILLUS SPECIES - This genus of bacteria is ubiquitous in nature being found in soil, dust, water, plants, humans and animals. The majority of Bacillus species are nonpathogenic or opportunistic pathogens for humans. Exceptions are Bacillus anthracis, the cause of anthrax, and Bacillus cereus as an agent of food poisoning. Several species are plant and insect pathogens

ENTEROCOCCUS SPECIES - Enterococcus species are Gram-positive, catalase-negative cocci. They are frequently associated with bacteriuria in patients who have an underlying structural abnormality.

LEIFSONIA AQUATICA - Isolated from water and hospital environment. Has been reported in clinical cases. Previously classified as Corynebacterium aquaticum.

MICROCOCCUS SPECIES - Members of the genus Micrococcus are generally considered skin flora, although they are opportunistic pathogens. They are gram-positive cocci that test Catalase-positive. It is easy to differentiate them from

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

13006216

FINAL REPORT

Name: Green Clean Air
Address: 1251 Weatherstone Court
Reston, VA 20194

Project Number:
P.O. Number:
Project Name: College

Collected Date: 3/21/2013
Received Date: 3/25/2013 9:40:00 AM
Report Date: 4/1/2013 4:03:45 PM

ORGANISM DESCRIPTIONS

The descriptions of the organisms presented are derived from various reference materials. The laboratory report is based on the data derived from the samples submitted and no interpretation of the data, as to potential, or actual, health effects resulting from exposure to the numbers of organisms found, can be made by laboratory personnel. Any interpretation of the potential health effects of the presence of this organism must be made by qualified professional personnel with first hand knowledge of the sample site, and the problems associated with that site.

Staphylococcus species, however, as Micrococcus species form bright yellow colonies on tryptic soy agar supplemented with 5% sheep blood.

PANTOEA AGGLOMERANS - Pantoea agglomerans can be found in plants and in human and animal feces. Erwinia milletiae and Enterobacter agglomerans are synonyms for Pantoea agglomerans.

PSEUDOMONAS ORYZIHABITANS - (Flavimonas oryyzihabitans) . Is widely distributed in both nature and the hospital environment. It has been associated with nosocomial (hospital-acquired) infections.

STAPHYLOCOCCUS SPECIES - Normal flora of the skin and mucous membranes. Can also be isolated from dust, water, and food products. Several species are considered as opportunistic pathogens to humans and animals.

Additional Information

Cultures– Air, Bulk, Surface

Identification of fungal colonies may not be possible if reproductive structures do not form. In this case, the colonies will be noted in the final report under "undifferentiated mold."

Ascospores (except Chaetomium), basidiospores (mushrooms), and myxomycetes (plant pathogens) are typically not seen in culture analyses. Stachybotrys may be overgrown by fast growing genera such as Cladosporium, Aspergillus, and Penicillium and may never grow on media to a detectable level.

Uncertainty of measurement for swab and bulk samples uses a step-by-step uncertainty calculation derived from the sample processing methods and the overall uncertainty of analysts. The uncertainties for each analysis type are updated quarterly.

Disclaimers

This report is the sole property of and will be released only to the client named on the SanAir Technologies Laboratory chain-of-custody (COC) submitted with these samples. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The information provided in this report applies only to the samples submitted and is relevant only for the date, time and exact location of sampling as described on the COC by the client. The accuracy of the results is dependent upon the client's sampling procedure. SanAir assumes no responsibility for the method of sample procurement. Evaluation reports are based solely on the sample(s) in the condition in which they arrived at the laboratory and on the information provided by the client on the COC. It is the client's responsibility to understand and use these results as a tool during their examination of a building. SanAir will not provide any opinion on the safety of a building as visual inspection and knowledge of water damage, past remediation, and weather conditions during sampling, among other elements, is essential in this decision. All culture plates are disposed of after 7 days unless otherwise requested by the client. SanAir Technologies Laboratory performs quality checks on all media and other materials provided to the client. Fungal or bacterial species identified on a field blank sample generally indicate contamination resulting from mishandling of the blank. The client should evaluate the sampling protocol and make a decision as to whether or not the sampling should be repeated. SanAir is accredited by and, therefore, follows all analytical and quality control guidelines required by the American Industrial Hygiene Association (AIHA) in the Environmental Microbiology Laboratory Accreditation Program (EMLAP) for the Direct Examination of air, bulk and surface samples as documented by the Scope of Accreditation Certificate.

This report does not constitute endorsement by AIHA/NVLAP and/or any other U.S. governmental agencies; and may not be certified by every local, state and federal regulatory agencies.

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B - Powhatan, VA 23139
804-897-1177 / 888-895-1177 / Fax 804-897-0070
www.sanair.com

Microbiology
Chain of Custody

SanAir ID Number: 13006216

Company: Green Clean Air	Project Number:	Phone #: 703.927.7532
Address: 1251 Weatherstone Ct	Project Name: College	Phone #:
City, State, Zip: Reston, VA 20194	Date Collected: 3.21.2013	Fax #:
Samples Collected By: Steven Welty	P.O. Number:	Email: Steve@greencleanair.co

Sample Types		Analysis Types	Turn Around Time
AC	Air Cassette	A1 - Identification and Enumeration of Fungal spores, plus total dander, fiber, and pollen count	Hours 3/6/24/48-Std
		A2 - Identification and Enumeration of Fungal spores only	Hours 3/6/24/48-Std
T B S*	Tape Bulk Swab*	D1 - Direct Identification of Fungi	Hours 3/6/24/48-Std
		D2 - Direct Identification of Mites, Insects, Pollen, etc.	Hours 3/6/24/48-Std
AP	Air Plate	C1 - Culture Identification and Enumeration of Fungi only	5-10 Days
B	Bulk	C2 - Culture Identification and Enumeration of Bacteria only	2-4 Days
S	Swab	C3 - Culture Identification and Enumeration of Fungi and Bacteria	5-10 Days
		C4 - Culture Identification and Enumeration of Thermophilic Bacteria with C2 or C3 analysis	2-4 or 5-10 Days
W	Water	L1 – Culture Identification and Enumeration of *Legionella sp.*	7-10 Days
D	Dust	M1 – Dust Mite Allergen Test	Hours 3/6/24/48-Std
SanAir Technologies Laboratory offers speciation by PCR. Please call for details and pricing.			

Sample #	Sample Identification	Sample Type	Analysis Type(s)	Turn Around Time	Total Volume (L) or Area (in^2)	Time Start – Stop	
1			C3		150L		
2			C3		150L		
3			C3		150L		
4			C3		150L		
5			C3		150L		
6			C3		150L		
7			C3		150L		
8			C3		150L		
9			C3		150L		
10			C3		150L		
11			C3		.5 sq in		
12			C3		.5 sq in		

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
Steven Welty	3.22.2013	6:00 pm		MAR 25 2013	940A

Unless scheduled, the turn around time for all samples received after 3 pm Friday will begin at 8 am Monday morning. Weekend or Holiday work must be scheduled ahead of time and is charged 150% of analytical rate.

*Although we allow Direct Identification from a swab sample, best results are received from tape samples.

Gray Wolf Sensing Solutions
Calibration Certificate

Model # IQ-610 Indoor Air Quality Probe with PID
Serial # 05-1138
Multiprobe: Yes
Date: 29th August 2012

Temperature		
Actual (+/-0.3°C)	21.03°C	40.56°C
Measured	21.03°C	40.56°C

Relative Humidity		
Actual (+/-2%RH)	10.00%	75.00%
Measured	10.00%	75.00%

Carbon Dioxide (Socket 2) (Serial # SU 020742)		
Actual (+/-2%)	354ppm	1237ppm
Measured	354ppm	1237ppm

Ozone (Socket 3) (Serial # 11712839226)		
Actual (+/-2%)	0ppm	6.20ppm
Measured	0ppm	6.20ppm

TVOC (Socket 4) (PPB) (Serial # 141200052)		
Actual (+/-2%)	0ppb	7800ppb
Measured	0ppb	7800ppb

Carbon Monoxide (Socket 5) (Serial # 15721364072)		
Actual (+/-2%)	0ppm	95.80ppm
Measured	0ppm	95.80ppm

Email: Quality@GrayWolfSensing.com
Web: www.GrayWolfSensing.com

Gray Wolf Sensing Solutions
Certificate of Conformance

GrayWolf Model # IQ-610 Indoor Air Quality Probe with PID, Serial # 05-1138, has been manufactured and tested to assure that it conforms to GrayWolf Sensing Solutions published specifications.

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received,
including interference that may cause undesired operation.

This device complies with the EEC Directive on Electromagnetic Compatibility (EMC) 2004/108/EC, applied Harmonised Standards: EN55022 Radiated Emissions and EN61000 Radiated and ESD immunities.

Signed: D McNamara.

David McNamara.
Calibration Manager

Date: 29th August 2012

Email: Quality@GrayWolfSensing.com
Web: www.GrayWolfSensing.com