

# INDOOR AIR QUALITY AND MOLD ASSESSMENT



FIRST FLIGHT ELEMENTARY & MIDDLE SCHOOLS

107 AND 109 VETERANS DRIVE  
KILL DEVIL HILLS, NORTH CAROLINA 27948

ECS PROJECT NO. 49:20986

FOR: DARE COUNTY SCHOOLS

AUGUST 22, 2023





August 22, 2023

Mr. Ian Adams  
Dare County Schools  
3020 South Wrightsville Avenue  
Nags Head, North Carolina 27959  
adamsia@daretolearn.org

ECS Project No. 49:20986

Reference: Indoor Air Quality and Mold Assessment, First Flight Elementary & Middle Schools, 107 and 109 Veterans Drive, Kill Devil Hills, North Carolina

Dear Mr. Adams:

ECS Southeast, LLP (ECS) is pleased to provide Dare County Schools with the results of the above referenced Indoor Air Quality and Mold Assessment performed at the First Flight Elementary & Middle Schools located at 107 and 109 Veterans Drive in Kill Devil Hills, Dare County, North Carolina. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 49:39208P and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide Dare County Schools with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

ECS Southeast, LLP

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## 1.0 PROJECT DESCRIPTION

ECS conducted an Indoor Air Quality (IAQ) and mold assessment at First Flight Elementary School (FFES) and First Flight Middle School (FFMS) located at 107 and 109 Veterans Drive in Kill Devil Hills, Dare County, North Carolina. Based on the information provided, we understand that the recent downtime between replacement of heating, ventilating, and air conditioning (HVAC) systems and components resulted in increased humidity and decreased ventilation in the facilities, and that suspect visible mold has been observed in limited areas. We also understand that suspect visible mold was cleaned in-house, and that this initial assessment was performed to document 'baseline' airborne mold levels and conditions in the facilities.

## 2.0 PURPOSE

The purpose of the Indoor Air Quality and Mold Assessment was to conduct visual observations and testing for mold and moisture to identify evidence of moisture-affected building materials or selective amplification of mold within tested areas of the subject structures.

## 3.0 METHODOLOGY

ECS performed the authorized Scope of Services in general accordance with our proposal, standard industry practice(s) and methods specified by guidelines and industry standards for the identification of mold and moisture-affected building materials.

### **Mold and Moisture**

The initial assessment was performed on August 17, 2023, by Mr. Braxton Dawson, and included a non-invasive visual and sampling survey for mold and moisture within client-identified areas of concern on the subject property. The assessment focused on the client-selected areas in the buildings indicated by Dare County Schools. The ECS site personnel observed readily accessible areas and selected building materials to evaluate visible suspect fungal growth and/or moisture-impacted materials. A reasonable effort was made to identify water and mold-impacted areas; however, this does not imply a guarantee that all possible reservoirs of mold were identified because mold or water-impacted building materials may be hidden by walls, flooring, partitions, etc.

Ambient temperature, relative humidity, and carbon dioxide were measured during the surveys using a TSI Q-TRAK Indoor Air Quality Meter. The purpose of these measurements was to identify elevated interior humidity levels, which could potentially support indoor mold growth or indicate ongoing moisture problems.

Selected potentially moisture-affected materials were tested using a Delmhorst Model BD 2100 moisture meter to evaluate moisture content. Based on the Delmhorst moisture meter settings, moisture levels greater than 1.0% are considered elevated for drywall or other gypsum materials, and greater than 17% is elevated for wood-based materials. This was not a comprehensive moisture mapping survey of all building materials within the areas surveyed but rather a non-invasive survey of moisture in select areas of specific building materials which may be impacted by moisture.



Fungal spore air samples were collected by means of a high volume pump and Air-O-Cell® cassettes. Samples were transported to Scientific Analytical Institute, Inc. (SAI) located in Greensboro, North Carolina for analysis. SAI is accredited by the Environmental Microbiology Laboratory Accreditation Program, administered by the American Industrial Hygiene Association. Air samples were reported to the genus or group level according to the laboratory standard quantification procedures.

It is important to note that fungal spore samples represent a snapshot in time of a constantly changing microbiome. Environmental conditions such as temperature and humidity may influence sample results. The goal of the sampling performed was not to establish precise numerical concentrations over time, but rather to generally identify the dominant fungi in the sampled locations and the general significance of their relative concentrations as compared to outdoor concentrations or unaffected locations.

#### 4.0 RESULTS

The following is a summary of laboratory results, measurements, findings and observations.

##### 4.1 Mold and Moisture

The following visual observations were made during ECS' IAQ assessment on August 17, 2023:

- Evidence of suspect visible mold growth was noted on books in the media centers and cloth items (bags) in various classrooms.
- Commercial dehumidifiers were in operation throughout each school at the time of assessment.
- Musty odors were not noted; and,
- The HVAC system was observed to be operating at the time of the assessment, but it was reported that facility-integrated dehumidifiers were not running.

Below is a summary of the sampling data collected as part of this evaluation.

##### 4.1.1 Spore-Trap Air Samples

Fungal spore-trap air samples were collected from the surveyed areas of each school facility. Representative exterior samples were collected for comparison. The following table summarizes the results of sample analysis reported in spore counts per cubic meter of air.

##### Spore-Trap Sample Results

Sample Number	Sample Location	Total Fungal Spore Concentration (count/cubic meter) / Predominant Genus Identified
<b>First Flight Middle School</b>		



Sample Number	Sample Location	Total Fungal Spore Concentration (count/cubic meter) / Predominant Genus Identified
A1	First Flight MS - Exterior	<i>Alternaria</i> - 78.4 <i>Ascospores</i> - 1920 <i>Aspergillus/Penicillium-like</i> - 0 <i>Basidiospores</i> - 627 <i>Cladosporium</i> - 313 <i>Curvularia</i> - 118 <i>Eppicoccum</i> - 78.4
A2	First Flight MS - A104	<i>Ascospores</i> - 39.2
A3 (Lab Report Error, A31)	First Flight MS - Media Center	<b><i>Aspergillus/Penicillium-like</i> - &gt;11800</b>
A4	First Flight MS - K127	No Spores Detected
A5	First Flight MS - M110	<b><i>Aspergillus/Penicillium-like</i> - 744</b>
A6	First Flight MS - Art Room	No Spores Detected
A7	First Flight MS - J124 Hallway	<i>Ascospores</i> - 39.2
A8	First Flight MS - Cafeteria	<i>Ascospores</i> - 118
A9	First Flight MS - M118	No Spores Detected
A10	First Flight MS - Exterior	<i>Alternaria</i> - 39.2 <i>Ascospores</i> - 980 <i>Aspergillus/Penicillium-like</i> - 0 <i>Basidiospores</i> - 549 <i>Cladosporium</i> - 627 <i>Curvularia</i> - 196 <i>Eppicoccum</i> - 0
<b>First Flight Elementary School</b>		
A11	First Flight ES - Exterior	<i>Alternaria</i> - 39.2 <i>Ascospores</i> - 1370 <i>Aspergillus/Penicillium-like</i> - 0 <i>Basidiospores</i> - 744 <i>Cladosporium</i> - 862 <i>Curvularia</i> - 157 <i>Myxomycete/Rust</i> - 118
A12	First Flight ES - D117	No Spores Detected
A13	First Flight ES - A121	No Spores Detected



Sample Number	Sample Location	Total Fungal Spore Concentration (count/cubic meter) / Predominant Genus Identified
A14	First Flight ES - B148	No Spores Detected
A15	First Flight ES - Media Center	Ascospores - 78.4 <b><i>Aspergillus/Penicillium-like</i> - &gt;11800</b>
A16	First Flight ES - B102	<b><i>Aspergillus/Penicillium-like</i> - &gt;11800</b>
A17	First Flight ES - Hallway C, Near C114	No Spores Detected
A18	First Flight ES - D125	Ascospores - 118
A19	First Flight ES - F123	No Spores Detected
A20	First Flight ES - Exterior	<i>Ascospores</i> - 157 <i>Aspergillus/Penicillium-like</i> - 2390 <i>Basidiospores</i> - 588 <i>Cladosporium</i> - 392 <i>Curvularia</i> - 118 <i>Nigrospora</i> - 39.2

During the August 17, 2023 assessment and the laboratory results, the following areas contain amplified levels of indoor *Aspergillus/Penicillium-like* mold:

#### First Flight Middle School

- Media Center
- Room M110

#### First Flight Elementary School

- Media Center
- Room B102

There are currently no accepted regulatory standards or guidelines with respect to acceptable fungal levels inside buildings. It is important to note however that spore trap measurements can fluctuate rapidly, and the readings reported should not be used as a definitive indication that mold and or health hazards related to mold are present or absent.



#### 4.1.2 Temperature and Relative Humidity

As cited by NIOSH, the ANSI/ASHRAE Standard 55-2020: Thermal Environmental Conditions for Human Occupancy specifies the combinations of indoor environmental and personal factors that produce acceptable thermal conditions to a majority of occupants within a space [ANSI/ASHRAE 2013b]. ASHRAE recommends that indoor relative humidity be maintained at or below 50% [ANSI/ASHRAE 2013b]. The USEPA recommends maintaining indoor relative humidity between 30% and 60% to reduce mold growth [EPA 2012]. Assuming slow air movement (less than 40 feet per minute) and 50% indoor relative humidity, the operative temperatures recommended by ASHRAE range from 68.5°F to 75°F in the winter, and from 75°F to 80.5°F in the summer. The difference in temperature ranges between the seasons is largely due to clothing selection. ANSI/ASHRAE 62 also recommends that indoor carbon dioxide (CO<sub>2</sub>) levels be no higher than 700 parts per million (ppm) above the outdoor concentrations.

The indoor comfort parameters measured were generally acceptable, with exception to relative humidity. While we understand that this assessment is being performed as a baseline survey prior to remediation and HVAC operation, humidity levels throughout each facility at the time of our survey may contribute to indoor mold growth.

The following table summarizes the indoor air temperature and relative humidity readings collected by ECS from various locations.

#### Temperature, Relative Humidity, and Carbon Dioxide

Sample Number	Location	Temperature (Fahrenheit)	Relative Humidity (%)	Carbon Dioxide (ppm)
<b>First Flight Middle School</b>				
A1	First Flight MS - Exterior	79.5	98.7	349
A2	First Flight MS - A104	72.5	<b>72.9</b>	507
A3 (Lab Report Error, A31)	First Flight MS - Media Center	72.4	<b>90.9</b>	705
A4	First Flight MS - K127	71.8	<b>80.3</b>	459
A5	First Flight MS - M110	73.8	<b>85.5</b>	587
A6	First Flight MS - Art Room	72.1	<b>86.9</b>	667
A7	First Flight MS - J124 Hallway	72.7	<b>78.4</b>	462



Sample Number	Location	Temperature (Fahrenheit)	Relative Humidity (%)	Carbon Dioxide (ppm)
A8	First Flight MS - Cafeteria	73.2	<b>78.7</b>	652
A9	First Flight MS - M118	73.6	<b>77.8</b>	538
A10	First Flight MS - Exterior	80.4	99.8	353
<b>First Flight Elementary School</b>				
A11	First Flight ES - Exterior	83.7	80.5	406
A12	First Flight ES - D117	76.6	<b>63.3</b>	497
A13	First Flight ES - A121	74.0	<b>70.3</b>	453
A14	First Flight ES - B148	74.2	<b>79.6</b>	463
A15	First Flight ES - Media Center	74.9	<b>62.3</b>	542
A16	First Flight ES - B102	73.6	<b>75.1</b>	434
A17	First Flight ES - Hallway C, Near C114	75.4	<b>72.2</b>	417
A18	First Flight ES - D125	73.8	<b>65.8</b>	510
A19	First Flight ES - F123	73.9	<b>65.6</b>	427
A20	First Flight ES - Exterior	83.8	91.4	352
Items in <b>BOLD</b> are considered elevated				

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our understanding of the purpose of the Indoor Air Quality and Mold Assessment, the results of laboratory analysis, and our findings and observations, ECS presents the following recommendations.



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## **Mold and Moisture**

ECS recommends remediation be performed for water and mold impacted materials within the surveyed areas as soon as reasonably possible. This includes all materials that have visible suspected mold and/or have been subjected to elevated moisture conditions for greater than 48 hours without proper drying efforts. Particular emphasis should be placed on the following areas, where airborne mold levels were considered amplified at the time of assessment.

### **First Flight Middle School**

- Media Center
- Room M110

### **First Flight Elementary School**

- Media Center
- Room B102

### General

ECS recommends that a qualified mold remediation/drying contractor be retained to properly remove mold impacted materials. Remediation activities should be performed in general accordance with the guidelines described in EPA's March 2001 document "Mold Remediation in Schools and Commercial Buildings" and under the OSHA 2010 Guidelines for mold removal. Additional remedial guidance documents are also referenced in Section at the end of this report. Workers performing this work should wear proper personal protective equipment (PPE) including HEPA filtered respirators and disposable clothing (per OSHA standards for PPE).

HVAC systems should be evaluated to ensure proper function according to manufacturer specifications to ensure that relative humidity levels are reduced on the interior of the structures.

ECS was not requested to assess the potential presence of hazardous materials, and ECS assumes no responsibility for actions taken to address mold or moisture that inadvertently disturb hazardous materials. ECS is unaware of the presence of possible asbestos containing materials or lead based paint (LBP). Prior to remediation work, if not performed already, an asbestos/LBP survey is recommended for the building. Pending the results of this survey, disclosures and/or abatement should be made with regards to hazardous containing materials prior to mold/water damage material removal efforts.

ECS recommends that the identified areas undergo a thorough cleaning following guidelines described in EPA's March 2001 document "Mold Remediation in Schools and Commercial Buildings." Surface remediation should include HEPA vacuuming of vertical and horizontal surfaces and a clean-wipe with a mild detergent. The surfaces should not be saturated and discard cleaning cloths. All areas (affected and unaffected) should be left dry, visibly free from contamination and debris prior to build back activities.

### Follow-up



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A post-remediation survey and sampling should be performed to assess the remediation efforts. Visible suspect mold and moisture-affected porous materials should not be present in the work area (although ECS recognizes that some semi-porous materials may still have stains present following cleaning).

Air sampling will be performed by fungal spore trap method to document mold levels following remediation efforts. The results of air sampling should find air samples in and adjacent to the work area to be less than concurrent outdoor samples, and the indoor samples will not find a prevalence of certain fungi considered likely indoor contaminants as determined by rank-order analysis.

Because of the nature of the environment, complete elimination of all microbial organisms within a building cannot be expected and is not the goal of remediation. The goal of remediation is to restore the affected materials to at least the condition of unaffected materials. It is important to note that the reported mold levels are only reflective of conditions at the time of this test and that mold populations can vary over time, depending upon a number of conditions, including environmental factors (i.e., temperature and relative humidity). If significant mold growth reappears, or if the occupants experience prolonged allergic-type health complaints, they should seek further investigation of the problem.

Note: The purpose of this survey was to evaluate areas where moisture intrusion or suspected visible mold growth has occurred and provide findings and recommendations for remedial work efforts. Identification and recommendations for correction of sources of moisture should be performed by a qualified engineer.

## 6.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

This survey is not intended to represent an exhaustive research of every potential hazard or condition that may exist, nor does it claim to represent indoor conditions or events that arise after the survey. This report has been prepared in accordance with generally accepted environmental practices. Our conclusions and findings are based, in part, upon information provided to us by others and our site observations. We have not verified the completeness or accuracy of the information provided by others. The scope of services performed was limited to those requested by the Client and does not constitute a full microbial assessment of the site or a comprehensive moisture survey of the site. The data provided in this study is only indicative of conditions sampled at the immediate time of the study.

This report does not warrant against future operations or conditions, nor does it warrant against extant, or future, conditions of a type or at a location not investigated. Because of the nature of this type of work and the difficulties involved in conducting remediation work, ECS cannot guarantee that the methods or recommendations described in this report will eliminate all potential indoor air quality issues. Since performance of the remediation work is also beyond ECS scope of services, ECS also cannot be held responsible for the execution of the remediation work. The reported microbial



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levels are only reflective of conditions at the time of this test and that microbial populations can vary over time, depending upon a number of conditions, including environmental factors (i.e., temperature and relative humidity). The work performed in conjunction with this assessment and the data developed is intended as a description of available information at the dates and locations given.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.



# **Appendix I: Figures**

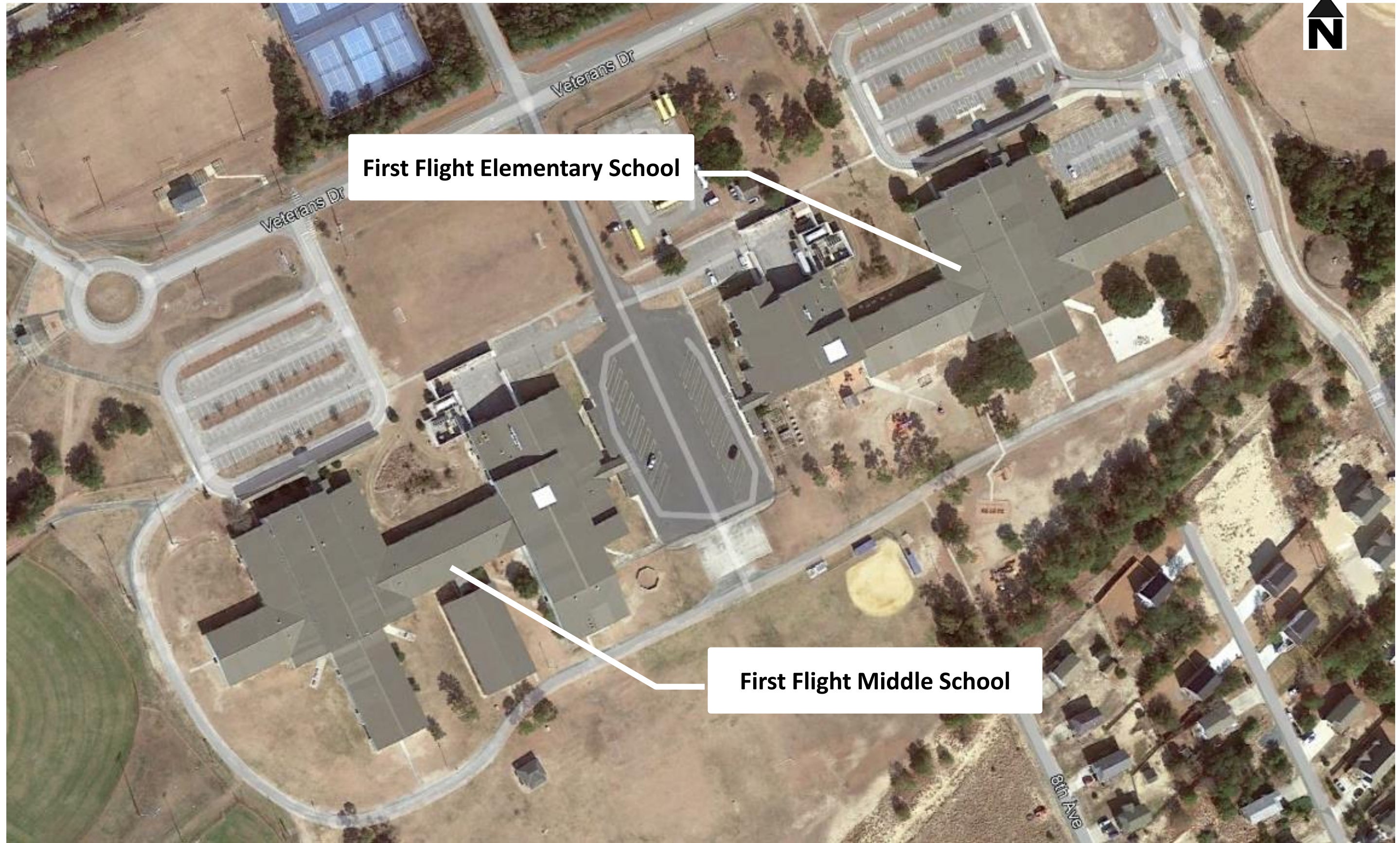


**IAQ and Mold Assessment**

**Figure 1**

**Site Overview**

First Flight Middle / Elementary Schools  
109 and 109 Veterans Drive  
Kill Devil Hills, NC 27948  
ECS Project No. 49-20986







# IAQ and Mold Assessment

Figure 2

## Sample Locations, FFMS

First Flight Middle  
Kill Devil Hills, NC 27948  
ECS Project No. 49-20986

### LEGEND

-  Sample Location
-  Amplified Mold







# IAQ and Mold Assessment

Figure 3

## Sample Locations, FFES

First Flight Elementary  
Kill Devil Hills, NC 27948  
ECS Project No. 49-20986

### LEGEND

-  Sample Location
-  Amplified Mold



# **Appendix II: Site Photographs**



1 - First Flight Elementary - Exterior



2 - First Flight Middle - Exterior



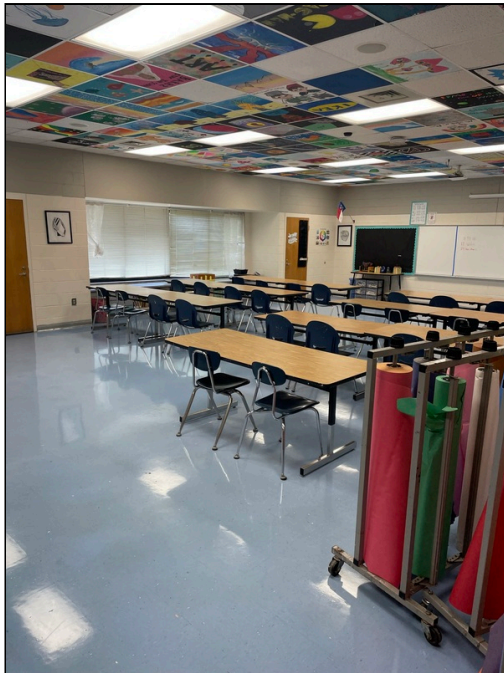
3 - Representative classroom



4 - Dehumidifiers were noted to be operating throughout each facility



5 - Typical Classroom



6 - Typical Classroom



7 - Media Center



8 - Cafeteria



9 - Media Center



10 - Cafeteria



11 - Typical Corridor

# **Appendix III: Laboratory Report(s)**

















**Scientific Analytical Institute**  
 4604 Dundas Dr. Greensboro, NC 27407  
 Phone: 336.292.3888 Fax: 336.292.3313  
 www.sailab.com lab@sailab.com

Lab Use Only  
 Lab Order ID: 10630621  
 Client Code: \_\_\_\_\_

**Company Contact Information**

Company: ECS Southeast, LLC	Contact: Braxton Dawson
Address: 6714 Netherlands Dr	Phone: 910-899-1289
Wilmington, NC 28405	Fax: <input type="checkbox"/>
	Email: <input checked="" type="checkbox"/> bdawson@ecslimited.com

**Microbiology Test Types**

Spore Trap - Slit Impact, ie, AOC/Allergenco (STA)	<input checked="" type="checkbox"/>
Spore Trap Other, ie. Micro-5 (STO)	<input type="checkbox"/>
Direct Exam Tape (DET)	<input type="checkbox"/>
Direct Exam Swab (DES)	<input type="checkbox"/>
Direct Exam Bulk (DEB)	<input type="checkbox"/>
Fungal Culture Air (FCA)	<input type="checkbox"/>
Fungal Culture Swab (FCS)	<input type="checkbox"/>
Fungal Culture Bulk (FCB)	<input type="checkbox"/>
Bacteria Culture Air (BCA)	<input type="checkbox"/>
Bacteria Culture Bulk (BCB)	<input type="checkbox"/>
Bacteria Culture Swab (BCS)	<input type="checkbox"/>
Biolog (BLG)	<input type="checkbox"/>
Drinking Water (BCC) (Coliform/E.coli)	<input type="checkbox"/>
Other:	<input type="checkbox"/>

**Billing/Invoice Information**

Company: Same  
 Contact:  
 Address:

**Turn Around Times**

90 Min. <input checked="" type="checkbox"/>	48 Hours <input type="checkbox"/>
3 Hours <input checked="" type="checkbox"/>	72 Hours <input type="checkbox"/>
6 Hours <input type="checkbox"/>	96 Hours <input type="checkbox"/>
12 Hours <input type="checkbox"/>	120 Hours <input type="checkbox"/>
24 Hours <input type="checkbox"/>	144+ Hours <input type="checkbox"/>

\* Results ASAP

PO Number: 49-20986  
 Project Name/Number: First Flight schools - IAQ

Sample ID #	Description/Location	Volume/Area	Comments	
A1	Outside	150L	First Flight Middle School Backgrounds	
A2	A104			
A3	Media Center			
A4	K127			
A5	M110			
A6	Art Room			
A7	J124 - Mallway			
A8	Caffeteria			
A9	M118			
A10	Outside			
A11	Outside			
A12	D117	Accepted <input checked="" type="checkbox"/>		First Flight Elementary School Backgrounds
A13	A121	Rejected <input type="checkbox"/>		
A14	B148			
A15	Media Center			
	(see Back)			

Total # of Samples 20

Relinquished by	Date/Time	Received by	Date/Time
[Signature]	8/18/23 4:00pm	[Signature]	8/21 10:30 am

(Conti)

A16 | B102

A17 | Hallway C near C114

A18 | D125

A19 | F123

A20 | Outside

150L

First Flight Elementary  
School Backgrounds



# **Appendix IV: Mold Reference and Guidance Documents**

## REFERENCE AND GUIDANCE DOCUMENTS

A Brief Guide to Mold in the Workplace, Occupational Safety Health Administration (OSHA), SHIB 03-10-10, updated 11-08-13

ANSI/IICRC S520 Standard and Reference Guide for Professional Mold Remediation, Institute of Inspection, Cleaning, and Restoration Certification, 2015.

ANSI/IICRC S500 Standard and Reference Guide for Professional Water Damage Restoration, Institute of Inspection, Cleaning, and Restoration Certification, 2015.

Bioaerosols: Assessment and Controls, American Conference of Governmental Industrial Hygienists, 1999.

Building Air Quality: A Guide for Building Owners and Facility Managers, EPA, EPA 402-F-91-102, December 1991

Centers for Disease Control and Prevention (CDC), <https://www.cdc.gov/mold/faqs.htm>

Department of Energy and the Environment (DOEE), Mold Assessment and Remediation Licensure Regulations.

EPA – Mold Resources, <https://www.epa.gov/mold>

Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene, November 2008.

Mold Moisture and Your Home, EPA, EPA-402-K-02-003, September 2012

Mold Remediation in Schools and Commercial Buildings, EPA, EPA 402-K-01-001, September 2008