

# **Limited Indoor Air Quality Report**

Inspection Date: August 24, 2023 & August 31, 2023  
Fairfield Ludlowe High School  
785 Unquowa Road, Fairfield, CT

## **Fairfield Public Schools**

Fairfield, CT

August 2023  
Revised September 2023



**FUSS & O'NEILL**

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August 30, 2023

Revised September 8, 2023

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**RE: Limited Indoor Air Quality**  
**Fairfield Ludlowe High School**  
**785 Unquowa Road, Fairfield, CT**  
Fuss & O'Neill Project No. 20110458.A50

Dear Mr. Papageorge:

Enclosed please find the report for the Limited Indoor Air Quality (IAQ) work conducted at the Fairfield Ludlowe High School, Fairfield, Connecticut (the "Site"). The work was conducted for Fairfield Public Schools (the "Client").

The services were performed on August 24, 2023 and August 31, 2023 by a Fuss & O'Neill, Inc. representative. The August 24, 2023 Site visit included a visual and olfactory assessment and the collection of typical IAQ indicators in the vicinity of Room 148. The initial work was performed in accordance with our proposal dated August 22, 2023. The supplemental collection of IAQ indicators and bio-aerosol air sampling in Room 148 and Room 181 was conducted at the Client's request based on the August 31, 2023 email request and authorization.

If you have any questions regarding the enclosed report, please do not hesitate to contact me at (860) 783-4751. Thank you for this opportunity to have served your environmental needs.

Sincerely,

Eduardo Miguel Marques  
Senior Environmental Analyst

Enclosure

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## 1 Introduction and Background

Fuss & O'Neill, Inc. (Fuss & O'Neill) was retained to conduct Limited Indoor Air Quality (IAQ) assessments at the Fairfield Ludlowe High School located at 785 Unquowa Road, Fairfield, Connecticut (the "Site"). The work was conducted for Fairfield Public Schools (the "Client") in accordance with the proposal dated August 22, 2023 and our emailed contract amendment forwarded on August 31, 2023, and is subject to the limitations included in *Appendix A*. Based on information provided by the Client, building materials in Room 148 were impacted by water and visible mold which were due to a malfunctioning cooling unit. According to the Client the area was cleaned prior to the initial assessment.

Fuss & O'Neill's Environmental Analyst, Vikki DeVoe-LeMoine, conducted the initial assessment on August 24, 2023. On August 31, 2023, Fuss & O'Neill's Environmental Technician, Vincent Savarese, conducted a supplemental assessment.

## 2 Building Description

The following information was gathered during our initial assessment. Room 148 was initially reported as the area of concern and the primary focus of the Limited Indoor Air Quality Assessment (IAQ); however, based on interviews with on-site personnel during the Limited IAQ most of the ground-level wing in the western portion of building was previously affected by visible mold and/or mildew which included Rooms 145 to 151 and the hallway between. The affected ground-level wing is oriented in a roughly north to south direction. The rooms located along the western portion of the wing (Rooms 145 to 149) have ground level windows which were closed at the time of the assessment. Rooms along the eastern portion of the wing (Rooms 150 to 153) did not have windows and included foundation walls located along unexcavated materials. The floor slab in the area is located on grade and first floor rooms are located above the area.

Interior building finishes throughout the wing included painted concrete masonry unit (CMU) walls, gypsum board, vinyl floor tile, vinyl cove base molding, and suspended ceiling tiles. The rooms were utilized as classrooms, a kitchen lab, a computer room, and physics rooms. The kitchen lab included typical kitchen appliances, cabinets, desks, and shelving units. A small room off the kitchen was utilized as a laundry room. Classrooms were finished with typical classroom furniture such as desks, shelving, a smartboard, and bulletin boards. The science rooms were also furnished with upper and lower cabinets. In addition, painted fiberboard bulletin boards and metal lockers were located on the walls in the hallway.

According to on-site personnel, heating and cooling of the area is achieved through roof-top heating, ventilation, and air conditioning (HVAC) units. Approximately six (6) diffusers for the HVAC system were observed in each room. Fresh make-up air is brought into the room directly from the exterior via roof-top units and initial mixing occurs within the room at a set rate of 30% intake air. According to on-site personnel the humidity of the intake air is the same as outside air, which results in high indoor humidity levels when exterior humidity levels are high, especially during rain events. Staff indicated the HVAC system is maintained by an outside contractor. At the time of the assessment, general air flow was noted at diffusers in each room; and very low flow was detected at make-up vents.

In addition, maintenance staff indicated the HVAC system was not operating approximately 3 weeks ago, which also contributed to the elevated humidity (lack of ventilation) and suspect mold issues identified within the area. The outside HVAC contractor has since repaired the system.

Maintenance staff indicated all the affected rooms were thoroughly cleaned approximately 2 weeks ago, including all walls, cabinets, bulletin boards, the inside and outside of lockers and cabinets. Additionally, a second round of cleaning was required shortly after the initial cleaning.

Room 181 is in the northwestern portion of the wing and was reportedly outside the area of previous impact. This section of the building was reportedly constructed as an addition and has a separate roof-top HVAC.

Refer to *Appendix B* for Site floor plans.

### 3 Scope of Testing and Methodology

The scope of work for the initial assessment included Room 148 and surrounding rooms and included the following:

- A visual and olfactory assessment to identify areas with suspect visible mold, moldy/musty odors, leaks, moisture intrusion, or other conditions indicative of suspect mold and/or elevated moisture. A Delmhorst Moisture Meter, Model BD-10 was used to verify suspect leaks and/or elevated moisture observations in accessible areas.
- Real-time measurements of typical IAQ indicators and comparison to recognized guidelines. Test parameters included measurement of temperature, relative humidity (RH), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>). Measurements were obtained using a calibrated portable TSI Q-Trak IAQ meter, Model 7545X.

As requested by the Client; on August 31, 2023, Fuss & O'Neill performed a supplemental assessment which included real-time measurements and bio-aerosol air sampling for the presence of bio-aerosols in Room 148 (an area of concern) and Room 181 (an area of no concern) and submitted the collected air samples for laboratory analysis. Refer to *Appendix C* for a complete instrumentation list and corresponding calibration information used in conducting this assessment.

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#### 3.1 Temperature and Relative Humidity

Temperature and relative humidity levels are indicators of thermal comfort. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) recommends that wintertime indoor temperature be maintained between 68°F and 74°F and summertime indoor temperature be maintained between 73°F and 79°F. ASHRAE also recommends that humidity be maintained in the range of 30% to 60%. Humidity below this range may cause stress through the drying of mucous membranes and skin. Humidity above this range may promote the growth of fungi spores with resultant contamination of the building and/or ventilation system.

According to its Standard 55-2017, Thermal Environmental Conditions for Human Occupancy, ASHRAE has defined the operative temperature (68°F to 79°F) as that temperature range at which at least 80% of the sedentary or near sedentary occupants will find the environment thermally acceptable.

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## **3.2 Carbon Dioxide (CO<sub>2</sub>)**

Carbon dioxide (CO<sub>2</sub>) is a product of human respiration. CO<sub>2</sub> concentrations in a building are used as a primary indicator of outside air exchange. CO<sub>2</sub> at very high concentrations (e.g., greater than 5,000 parts per million [ppm]) can pose a health risk. However, in most buildings, concentrations rarely rise to these levels and CO<sub>2</sub> at the concentrations commonly identified in buildings is not a direct health risk. At the activity levels in typical office buildings, steady CO<sub>2</sub> concentrations of about 700 ppm above outdoor air measurements indicate an outdoor air ventilation rate of about 15 cubic feet per minute (cfm) per person. CO<sub>2</sub> concentrations in outdoor air typically range from 300 to 500 ppm.

ASHRAE Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality, suggests an indoor CO<sub>2</sub> concentration of up to 1,000 to 1,200 ppm in spaces housing sedentary people is acceptable and an indicator of adequate outside air exchange.

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## **3.3 Carbon Monoxide (CO)**

Carbon monoxide (CO) is a colorless and odorless toxic gas that most often occurs as a by-product of incomplete hydrocarbon fuel combustion. The most likely sources of CO are from incomplete hydrocarbon fuel combustion inside a building, and from air intakes placed in, at, or near parking garages or street level that may entrain automotive exhaust gases into the air handling system. Back drafts from boiler flues may also provide a pathway for CO infiltration. In absence of any formal IAQ standard, Fuss & O'Neill uses the more conservative National Ambient Air Quality Standard (NAAQS) of 9 ppm for CO. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for carbon monoxide is 50 ppm, as an eight-hour time-weighted-average (8-hr. TWA).

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## **3.4 Moisture Meter Testing**

Moisture measurements were obtained using a Delmhorst Moisture Meter. Measurements were collected in various locations during the assessment to determine if there was moisture present, which may be an indicator of an active water intrusion.

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## **3.5 Bio-Aerosol (Quantitative Spore Count) Air Sampling**

### **3.5.1 Introduction**

Air-dispersed fungal particles are common in indoor and outdoor environments. The particles can include spores (air-disseminated “seeds” of fungi), yeasts, and other particles. The particles of many fungi can produce allergic reactions in susceptible members of the population.

The possible sources for the growth of fungi are varied and numerous, including stagnant water, water-soaked building materials (i.e., ceiling tiles, drywall, carpets, etc.), soiled ducting and filters in air handling units, and plants and landscaping inside a building.

### 3.5.2 Air Sampling

On August 31, 2023, during our supplemental assessment, air samples were collected for Quantitative Spore Count (QSC) analysis, representing concentrations of both viable and non-viable spores, as the latter can also have an influence on occupants as well as viable spores.

Per the Client, a total of two (2) interior air samples were collected from the areas listed below:

- Room 148 (affected area)
- Room 181 (unaffected area)

In addition to the interior locations listed above, two air samples (pre-assessment and post-assessment) were collected from an exterior location to provide ambient data. The ambient air samples were collected as controls for the type and amount of particulate gathered in the interior samples.

One sample was collected in one affected area to understand if additional samples may be required in other areas, per the Client.

### 3.5.3 Quantitative Spore Count Method

On August 31, 2023, air samples are collected on Air-O-Cell™ brand cassettes at 15.0 liters per minute (lpm) for ten minutes each. Vacuum is provided by a high volume sampling pump and calibrated on site with a rotameter. Particulate impacted onto the adhesive strip in the cassette is visually examined by microscope by a properly trained analyst to determine the quantitative spore count of the sample.

The collected samples were submitted for laboratory analysis to EMSL Analytical, Inc. (EMSL) of Meriden, Connecticut. EMSL is an American Industrial Hygiene Association (AIHA) accredited laboratory for Environmental Microbiology.

### 3.5.4 Interpretation of Results

Molds are ubiquitous in the environment. As such, there are no regulatory standards regarding exposures to mold spores or even consistent guidelines for interpreting indoor mold concentrations. Most industry sources agree that it is not possible to recommend limits for mold concentrations due to the lack of data from which the concentrations can be linked to the onset of disease. Also, airborne mold concentrations may change according to spatial and temporal variations. Numerical standards and guidelines for mold; therefore, are not likely to be available in the near future.

Without standards and guidelines, the current approach to interpretation of results of mold samples relies on comparison of indoor vs. outdoor results and complaint vs. non-complaint area results. In general, indoor airborne mold counts should be significantly lower than those on a building exterior.

Airborne mold counts in non-complaint areas should be significantly lower than those in complaint areas. In addition, the genus/species identified indoors should be similar to those identified in exterior samples. However, this may not always be consistent. Occupied buildings with many entrances and operable windows may have indoor mold airborne concentrations higher than or as high as those from the exterior. Also, the concentrations of exterior mold genus/species are likely to be lower on a cold or rainy day compared to the expected concentrations on a warm, sunny day when the spores may be abundant. A situation may be considered unusual when the airborne mold concentrations in the indoor/complaint area are significantly higher than those in the exterior/non-complaint area. Interpretation of these results requires considerable professional judgment.

## 4 Observations

For the assessment performed on August 23, 2023 the weather was overcast and breezy, with periodic rain showers, at temperatures ranging from 67°F to 73°F.

Fuss & O'Neill performed a visual and olfactory assessment of the areas noted below.

Level	Room/Area	Assessment Observations
Ground Level	Room 148	<ul style="list-style-type: none"> <li>• No obvious musty odor.</li> <li>• No obvious leaks or water-stained areas observed.</li> <li>• White residue was observed on the gypsum wall that appears consistent with cleaning materials. No elevated moisture readings were identified on gypsum walls in the vicinity of the staining or at other random locations.</li> <li>• Stained areas observed on CMU walls; however, no obvious or suspect mold or mildew was observed.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. No elevated moisture was identified on adjacent ceiling tiles.</li> <li>• Area above suspended ceiling (by diffusers) inspected. Dust and/or possible mold was observed on top of metal diffuser.</li> <li>• Occupant reported that room previously had strong musty odor and suspect mold/mildew was visible throughout, including on backpack left in room over the summer.</li> </ul>
	Hall by Room 148	<ul style="list-style-type: none"> <li>• No obvious musty odor identified on initial entry; however, slight odor noted toward end of assessment.</li> <li>• Some staining observed on CMU walls; however, no obvious or suspect existing mold or mildew observed at stained areas.</li> <li>• No water-stained ceiling tiles, or obvious leaks noted.</li> <li>• No mildew or suspect mold observed on lockers, suspended ceiling tiles, or bulletin boards. No suspect mold observed on interior of lockers randomly selected for inspection.</li> </ul>



Level	Room/Area	Assessment Observations
	Room 147	<ul style="list-style-type: none"> <li>• No obvious musty odor.</li> <li>• Stained areas observed on CMU walls; however, no obvious or suspect mold or mildew was identified.</li> <li>• No water-stained areas or obvious leaks observed.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. No elevated moisture was identified on adjacent ceiling tiles.</li> </ul>
	Room 149	<ul style="list-style-type: none"> <li>• No obvious musty odor.</li> <li>• No evidence of leaks or water-stained areas on walls, floors, or ceilings noted.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Stained areas on suspended ceiling tiles adjacent to diffuser exhibited slightly elevated moisture levels compared to non-stained areas.</li> </ul>
	Room 150 (Computer Room)	<ul style="list-style-type: none"> <li>• No obvious musty odor.</li> <li>• No obvious leaks or water-stained areas on walls, floors, or ceilings noted.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Rusted areas on metal diffuser noted and stained areas on suspended ceiling tiles adjacent to diffuser exhibited slightly elevated moisture levels compared to non-stained areas.</li> </ul>
	Room 151 (Physics)	<ul style="list-style-type: none"> <li>• No obvious musty odor.</li> <li>• No obvious leaks or water-stained areas on walls, floors, or ceilings noted.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• Possible/suspect mold was observed on the bottom of upper cabinets and top of upper cabinets by fresh air intake.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Stained areas on suspended ceiling tiles adjacent to diffuser exhibited slightly elevated moisture levels compared to non-stained areas.</li> <li>• The occupant reportedly observed additional suspect mold earlier in the day (including on the entry door frame and cabinets) which was cleaned prior to this assessment.</li> </ul>

Level	Room/Area	Assessment Observations
	Room 153 (Physics)	<ul style="list-style-type: none"> <li>• Slight musty odor.</li> <li>• Water staining (drips) was observed on CMU walls in northeast corner of the room and some water-stained ceiling tiles were observed throughout the area. The ceiling tiles and stained CMU wall did not exhibit elevated moisture at the time of the assessment. Maintenance staff indicated the issue was likely due to isolated leaks from above and were not an on-going issue.</li> <li>• Black staining, possible suspect mold/mildew, was observed on gypsum wall in southeast corner of the room.</li> <li>• No elevated moisture readings were identified on gypsum walls at stained areas.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Stained areas on suspended ceiling tiles adjacent to diffuser exhibited slightly elevated moisture levels compared to non-stained areas.</li> </ul>
	Room 145 (Kitchen)	<ul style="list-style-type: none"> <li>• No obvious musty odor noted.</li> <li>• No obvious leaks or water staining observed.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Stained areas on suspended ceiling tiles adjacent to diffuser did not exhibit elevated moisture levels.</li> </ul>
	Room 146	<ul style="list-style-type: none"> <li>• Slight musty odor.</li> <li>• Suspect mold/mildew was observed at southeast corner of room on wall finishes.</li> <li>• No elevated moisture readings identified on gypsum wall where suspect mildew/mold was observed.</li> <li>• Some dust build-up and possible/suspect mold observed on HVAC diffusers and adjacent suspended ceiling tiles. Stained areas on suspended ceiling tiles adjacent to diffuser exhibited slightly elevated moisture levels compared to non-stained areas.</li> </ul>
	Room 181	<ul style="list-style-type: none"> <li>• Identified as outside the area of concern.</li> <li>• No musty odor noted.</li> <li>• No obvious water-stained areas or areas with elevated moisture.</li> <li>• No elevated moisture readings identified on gypsum walls at randomly selected areas.</li> <li>• No significant dust/suspect mold observed on HVAC diffusers or adjacent suspended ceiling tiles.</li> </ul>
1st Floor	Hallway	<ul style="list-style-type: none"> <li>• No musty odors noted.</li> <li>• No obvious signs of leaks or moisture.</li> </ul>

For the assessment performed on August 31, 2023, the weather was sunny with temperatures ranging from 77°F to 78°F. Fuss & O'Neill performed a visual and olfactory assessment of the areas noted below as requested by the Client.

Level	Room/Area	Assessment Observations
Ground Level	Room 148	<ul style="list-style-type: none"> <li>The hallway outside of the classroom smelled slightly musty.</li> <li>No visible mold or water.</li> <li>No distinct smells in room.</li> </ul>
	Room 181	<ul style="list-style-type: none"> <li>The hallway outside of the classroom smelled slightly musty.</li> <li>No visible mold or water.</li> <li>No distinct smells in room.</li> <li>Ceiling tiles appears newer.</li> </ul>

## 5 Results

### 5.1 Temperature and Relative Humidity

#### Initial Assessment

Interior temperature ranges measured at the time of the assessment ranged from 67.2 °F to 73.5 °F, which were within the ASHRAE comfort range of 68°F and 79°F.

Interior relative humidity ranges measured within the area of concern (Rooms 145 to 153) at the time of the assessment ranged from 70.8% (Room 153) to 76.5% (Room 149). Measurements collected outside the area of concern were 72.8% and 65.9% at Room 181 (ground level) and in the hallway of the first level, respectively.

All of the measurements collected were above the ASHRAE recommended range of 30% to 60%.

Outdoor ambient temperatures ranged from 70.4°F to 72.6°F and outdoor relative humidity measurements ranged from 67.2% to 75.3% on the day of the assessment.

#### Supplemental Assessment

Interior temperature ranges measured at the time of the assessment ranged from 67.9 °F to 68.9 °F, which were within the ASHRAE comfort range of 68°F and 79°F.

Interior relative humidity measured within the area of concern (Room 148) at the time of the assessment was 51.8%. Measurements collected outside the area of concern were 52.6% in Room 181. All of the measurements collected were within the ASHRAE recommended range of 30% to 60%.

Outdoor ambient temperatures ranged from 77.3°F to 78.0°F and outdoor relative humidity measurements ranged from 37.0% to 37.4% on the day of the assessment.

Refer to *Appendix D* for the data sheet for temperature, relative humidity, carbon dioxide, and carbon monoxide.

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## 5.2 Carbon Dioxide

Interior concentrations of carbon dioxide measurements ranged from 432 ppm to 468 ppm during the initial assessment period. These measurements were acceptable in accordance with ASHRAE recommendations of up to 1,000 to 1,200 ppm.

During the supplemental assessment period, interior concentrations of carbon dioxide measurements ranged from 479 ppm to 525 ppm. These measurements were acceptable in accordance with ASHRAE recommendations of up to 1,000 to 1,200 ppm.

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## 5.3 Carbon Monoxide

Within the limitation of instrumental accuracy, there was no carbon monoxide detected in the building during either assessment.

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## 5.4 Moisture Meter Testing

During the initial assessment, moisture concentrations collected from representative areas of gypsum board wall systems, bulletin boards, and ceiling tiles displayed similar moisture concentrations in non-impacted areas of similar building materials, with the following exceptions:

- In Rooms 146, 149, 150, 151, and 153 suspended ceiling tiles with possible/suspect mold located adjacent to HVAC diffusers exhibited slightly elevated moisture readings when compared to non-stained areas.

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## 5.5 Bio-Aerosol (Quantitative Spore Count) Air Sampling

As requested by the Client, bio-aerosol air sampling for Quantitative Spore Count (QSC) was conducted on August 31, 2023 in Room 148 (a representative room in the area of concern) Room 181 (unaffected area), and exterior ambient air. The QSC in the ambient air samples ranged from 21,127 Count/m<sup>3</sup> (pre-assessment sample) to 20,507 Count/m<sup>3</sup> (post-assessment sample). The QSC in the interior air samples ranged from 274 Count/m<sup>3</sup> to 610 Count/m<sup>3</sup>.

Results for Room 148 (an affected area) displayed lower QSC than for Room 181 (an unaffected room). The interior samples displayed species similar to those exhibited in the exterior ambient samples and the identified spore types were present in concentrations similar or less than those exhibited in the exterior ambient samples when comparing data presented in the laboratory report.

Refer to *Appendix E* for the Quantitative Spore Count laboratory report and chain of custody form.

## 6 Conclusions and Recommendations

Based on the measurements, physical walk-through, and information available at the time of this assessment, Fuss & O'Neill concludes and recommends the following:

### 6.1 Conclusions

- Interior concentrations of carbon dioxide were acceptable in accordance with ASHRAE recommendations for areas tested during the assessments.
- No interior concentrations of carbon monoxide were identified in areas tested during the assessments.
- The temperature measurements recorded were within the ASHRAE comfort range of 68°F and 79°F in areas tested during the assessment.
- Water-stains were observed during the initial assessment on a CMU wall and suspended ceiling tiles in Room 153. The ceiling tiles and stained CMU wall did not exhibit elevated moisture at the time of the assessment. Maintenance staff indicated the staining was likely due to isolated leaks from above and was not an on-going issue. The area was not reviewed during the supplemental assessment.
- At the time of the initial assessment slight musty odors were noted in Rooms 146 and 153, and in the ground-level hallway (noted toward end of assessment). Suspect visible mold was noted in the following areas:
  - Room 153 on gypsum board located at the southeast end of the room.
  - Room 146 along the southeast corner (at CMU/gypsum wall joint).
  - Room 151 at bottom of top of upper cabinets along eastern wall.
  - In Rooms 148, 149, 150, 147, 151, 153, 145, and 146 suspect mold and/or dust build-up was observed on HVAC ceiling diffusers and adjacent ceiling tiles. These impacted ceiling tiles exhibited slightly elevated moisture readings in rooms 146, 149, 150, 151, and 153.
  - In Room 148 the area above the suspended ceiling by impacted diffusers was inspected. Dust and/or possible mold observed on top of metal diffuser.

These areas were not reviewed during the supplemental assessment.

- During the initial assessment, the relative humidity measurements collected at the time of the assessment were all above the ASHRAE recommended range of 30% to 60%, with the highest reading at 76.5% (Room 149). Concentrations were highest in the ground-level areas and were consistent within the areas of concern where mold impacts were previously reported (Rooms 145 to 153) and outside the areas of concern (Room 181) where no mold impacts were reported or observed during the assessment. Room 181 is believed to be conditioned with a separate HVAC system. The levels on the first floor (outside the area of concern) were less than the ground level concentrations (at 65.9%). These elevated humidity readings are likely a result of

issues associated with the HVAC system and the greater concentration in the ground-level are consistent with improper ventilation typical of basement areas.

- During the supplemental assessment, the relative humidity measurements collected at the time of the assessment in Rooms 148 and 181 were within the ASHRAE recommended range of 30% to 60%. Only Rooms 148 and 181 were assessed.
- Minimal areas with musty odors, suspect mold impact and damp ceiling tiles remain at scattered locations within the area of concern. Elevated humidity was identified within the area of concern which was slightly higher than exterior levels. The issue appears to be the makeup air in the spaces. When it is hot/humid outdoors the spaces are impacted, and the basement area is not ventilated effectively. Further, the elevated humidity measured in the area of concern indicates conditions conducive to the growth of fungi spores may result in further contamination in the area if not addressed.
- Laboratory air sampling data collected during the supplemental assessment for the interior samples displayed species similar to those exhibited in the exterior samples and identified spore types were present in concentrations well below exterior concentrations.

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## **6.2 Recommendations**

- Verify and ensure the source(s) of water impacted surfaces identified in Room 153 are properly repaired. Replace any water damaged materials as needed after correcting moisture source(s).
- Remediate the observed and suspected mold growth noted on the surfaces identified. Further investigation in the areas behind walls and wall finishes and above suspended ceiling tiles may be required to identify the extent of suspect mold growth. Any remediation and further inspection should be performed in a controlled manner by an Institute of Inspection Cleaning and Restoration (IICRC)-certified professionals to prevent the potential migration of concealed mold growth.
- It is our understanding that the HVAC/mechanical contractor has been retained by the Client to review and maintain the HVAC system. Fuss & O'Neill recommends coordination of feedback from the mechanical company regarding the HVAC system and controls they may be able to put in place to address the moisture/humidity issues identified. It is important to note that the reported suspect mold/and mildew appeared to be isolated to ground-level Rooms 145 through 153, and the system associated with these rooms is of primary concern for the purposes of this Limited IAQ.
- For interim management of humidity, we recommend the installation of dehumidifiers in rooms/spaces located in the area of concern. Any dehumidifier installed should be maintained and cleaned on a regular basis in accordance with manufacturers instruction.
- Prior to any destructive/intrusive investigations or repairs surfaces/materials that may potentially be disturbed must be tested for the presence of asbestos or the materials must be

assumed to contain asbestos if there is no previous information available (such as roofing materials, ceiling tiles, gypsum board, etc.).

Refer to *Appendix F* for photographs taken during the initial assessment.

On September 7, 2023, the Client notified Fuss & O'Neill that corrective action has taken place and has requested that Fuss & O'Neill prepare a proposal to conduct a follow-up assessment to verify and confirm that recommended response actions have been completed.

Report prepared by Environmental Analyst, Vikki DeVoe-LeMoine, revised by Environmental Technician, Julia Grounds.

Reviewed by:



Eduardo Miguel Marques  
Senior Environmental Analyst

## **Appendix A**

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### Limitations



## **APPENDIX A**

**Site: Fairfield Ludlowe High School – Room 148  
785 Unquowa Road, Fairfield, CT**

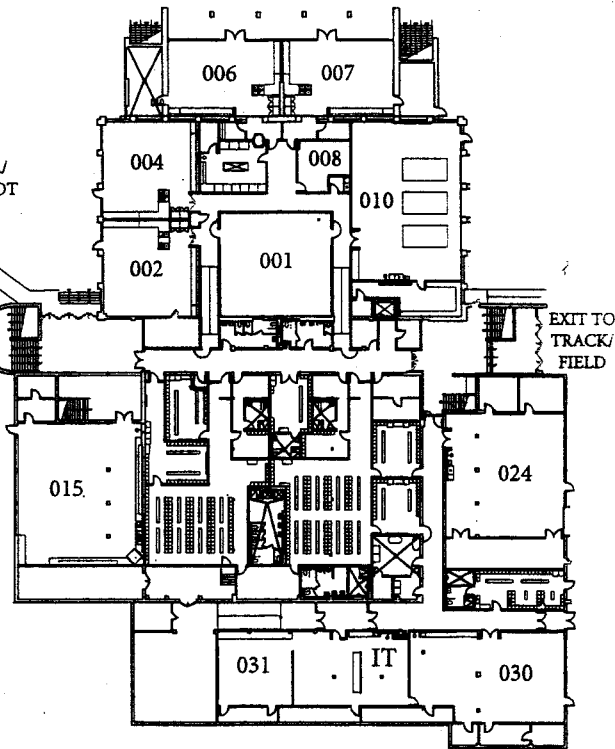
- 1 This environmental report has been prepared for the exclusive use of Fairfield Public Schools (the “Client”), and is subject to, and is issued in connection with our proposal and written authorization dated August 22, 2023 and our emailed contract amendment forwarded on August 31, 2023. Any use or reliance upon information provided in this report, without the specific written authorization of the Client and Fuss & O’Neill, Inc. (Fuss & O’Neill) shall be at the User's individual risk.
- 2 Fuss & O’Neill has obtained and relied upon information from multiple sources to form certain conclusions regarding the Site when conducting this assessment. Except as otherwise noted, no attempt has been made to verify the accuracy or completeness of such information or verify compliance by any party with federal, state, or local laws or regulations.
- 3 Fuss & O’Neill has obtained and relied upon laboratory analytical results in conducting the sampling. This information was used to form conclusions regarding the types and quantities of bio-aerosols and mold at the Site. Fuss & O’Neill has not performed an independent review of the reliability of this laboratory data.
- 4 The findings, observations, and conclusions presented in this report are limited by the scope of services outlined in the proposal dated August 22, 2023, which reflects schedule and budgetary constraints imposed by Client. Furthermore, the assessment has been conducted in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made.
- 5 The conclusions presented in this report are based solely upon information gathered by Fuss & O’Neill to date. Should further environmental or other relevant information be discovered at a later date, the Client should immediately bring the information to Fuss & O’Neill’s attention. Based upon an evaluation and assessment of relevant information, Fuss & O’Neill may modify this report and its conclusions.

## **Appendix B**

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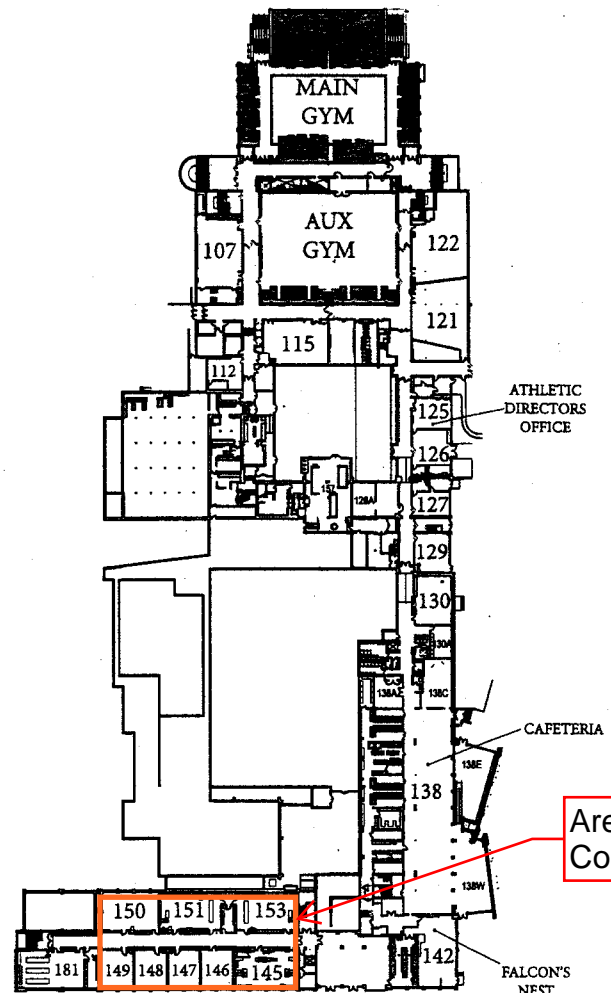
### Floor Plans

TEACHER/  
VISITOR LOT

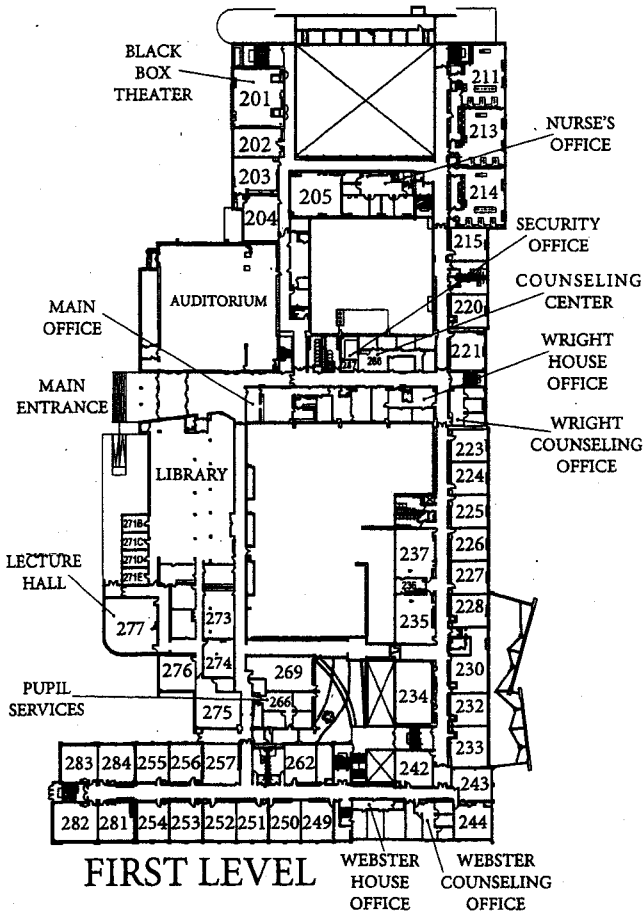


LOWER LEVEL

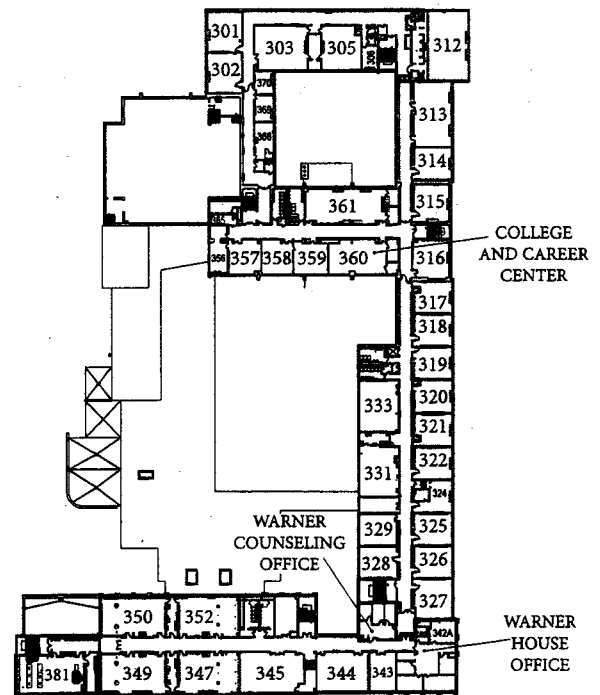
# WELCOME TO FAIRFIELD LUDLOWE HIGH SCHOOL



GROUND LEVEL



FIRST LEVEL



SECOND LEVEL

## **Appendix C**

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### List of Instrumentation

## Instrumentation

Measurement Parameter	Description	Calibration
Temperature, Relative Humidity, Carbon Dioxide & Carbon Monoxide	TSI IAQ-Calc IAQ Meter (7545X)	Annually – 2023
Moisture Content on/in Building Materials	Delmhorst Moisture Meter Model BD-10	Factory
Bio-Aerosol Air Sampling	High Volume Sampling Pump with Air- O-Cell™ Cassettes	Rotameter # 101819 4/20/23

## Appendix D

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### Data Sheet for Temperature, Relative Humidity, Carbon Dioxide, and Carbon Monoxide

## Air Quality Parameters

**CLIENT:** Fairfield Public Schools

**SITE ADDRESS:** 785 Unquowa Road

**CITY & STATE:** Fairfield, CT

**FUSS & O'NEILL PROJECT NO.** 20110458.A50

**Date:** August 24, 2023

**Location:** Fairfield Ludlowe High School – Room 148

**Page** 1 of 1

Location	Time	# of Occupants	CO <sub>2</sub> (PPM)	CO (PPM)	Temp. (°F)	RH (%)
<b>Recommended Guidelines</b>			<b>&lt; 1,200</b>	<b>&lt; 9.0</b>	<b>68-79</b>	<b>30-60</b>
Exterior	09:34 – 09:44	NA	421	0.0	71.7	67.2
Room 148	09:58 – 10:08	0	447	0.0	67.2	73.3
Hall by Room 148	10:09 – 10:19	0	465	0.0	67.7	73.9
Room 147	10:20 – 10:31	0	468	0.0	68.0	73.4
Room 149	10:34 – 10:44	0	461	0.0	67.4	76.5
Room 150	10:45 – 10:55	0	454	0.0	67.8	73.3
Room 151	11:08 – 11:18	1	463	0.0	68.7	74.0
Room 153	11:20 – 11:30	0	459	0.0	69.2	70.8
Room 145	11:32 – 11:42	0	432	0.0	70.8	70.9
Room 146	11:44 – 11:54	0	449	0.0	69.1	72.5
Room 181	11:55 – 12:05	1	462	0.0	70.7	72.8
Exterior Carport	12:26 – 12:36	NA	425	0.0	70.4	75.3
Main Level – Hall	12:43 – 12:53	0	462	0.0	73.5	65.9
Exterior Parking Area	12:56 – 13:00	NA	425	0.0	72.6	69.4

**Date:** August 31, 2023

Location	Time (0000)	# of Occupants	CO <sub>2</sub> (PPM)	CO (PPM)	Temp. (°F)	RH (%)
<b>Recommended Guidelines</b>			<b>&lt; 1,200</b>	<b>&lt; 9.0</b>	<b>68-79</b>	<b>30-60</b>
Exterior – outside back parking lot	2:59 – 3:09	NA	401	0.0	77.3	37.4
Room 148	3:18 – 3:28	0	525	0.0	67.9	51.8
Room 181	3:31 – 3:41	0	479	0.0	68.9	52.6
Exterior – outside back parking lot	3:45 – 3:55	NA	387	0.0	78.0	37.0

NA = Not Applicable

## Appendix E

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### Quantitative Spore Count Laboratory Report and Chain of Custody Form





# EMSL Analytical, Inc.

165 Gracey Avenue Meriden, CT 06451  
 Tel/Fax: (203) 284-5948 / (203) 284-5978  
<http://www.EMSL.com / meridenlab@emsl.com>

EMSL Order: 242304646  
 Customer ID: ENVI54  
 Customer PO: 20230741.A10  
 Project ID:

**Attention:** Eduardo Marques  
 Fuss & O'Neill, Inc.  
 146 Hartford Road  
 Manchester, CT 06040

**Phone:** (860) 646-2469

**Fax:**

**Collected Date:** 08/31/2023

**Received Date:** 08/31/2023 05:30 PM

**Analyzed Date:** 09/01/2023

**Project:** 20230741.A10

## Test Report: Air-O-Cell™ Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	242304646-0001			242304646-0002			242304646-0003		
Client Sample ID:	06			07			08		
Volume (L):	150			150			150		
Sample Location:	OUTSIDE AMBIENT START			RM 148			RM #181		
Spore Types	Raw Count	Count/m <sup>3</sup>	% of Total	Raw Count	Count/m <sup>3</sup>	% of Total	Raw Count	Count/m <sup>3</sup>	% of Total
Alternaria (Ulocladium)	-	-	-	-	-	-	-	-	-
Ascospores	96	2000	9.5	1	20	7.3	2	40	6.6
Aspergillus/Penicillium	9	200	0.9	6	100	36.5	6	100	16.4
Basidiospores	840	17200	81.4	7	100	36.5	22	450	73.8
Bipolaris++	-	-	-	-	-	-	-	-	-
Chaetomium++	-	-	-	-	-	-	-	-	-
Cladosporium	54	1100	5.2	1	20	7.3	1	20	3.3
Curvularia	2*	10*	0	-	-	-	-	-	-
Epicoccum	1	20	0.1	-	-	-	-	-	-
Fusarium++	-	-	-	-	-	-	-	-	-
Ganoderma	20	410	1.9	1*	7*	2.6	-	-	-
Myxomycetes++	1	20	0.1	1*	7*	2.6	-	-	-
Pithomyces++	4	80	0.4	1	20	7.3	-	-	-
Rust	-	-	-	-	-	-	-	-	-
Scopulariopsis/Microascus	-	-	-	-	-	-	-	-	-
Stachybotrys/Memnoniella	-	-	-	-	-	-	-	-	-
Unidentifiable Spores	-	-	-	-	-	-	-	-	-
Zygomycetes	-	-	-	-	-	-	-	-	-
Nigrospora	-	-	-	-	-	-	-	-	-
Pestalotia++	4	80	0.4	-	-	-	-	-	-
Spegazzinia	1*	7*	0	-	-	-	-	-	-
<b>Total Fungi</b>	<b>1032</b>	<b>21127</b>	<b>100</b>	<b>18</b>	<b>274</b>	<b>100</b>	<b>31</b>	<b>610</b>	<b>100</b>
Hyphal Fragment	-	-	-	-	-	-	-	-	-
Insect Fragment	-	-	-	-	-	-	-	-	-
Pollen	-	-	-	-	-	-	-	-	-
Analyt. Sensitivity 600x	-	21	-	-	21	-	-	21	-
Analyt. Sensitivity 300x	-	7*	-	-	7*	-	-	7*	-
Skin Fragments (1-4)	-	1	-	-	1	-	-	1	-
Fibrous Particulate (1-4)	-	1	-	-	1	-	-	1	-
Background (1-5)	-	1	-	-	1	-	-	1	-

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Gloria V. Oriol-Aguilar, Microbiology Director  
or other Approved Signatory

No discernable field blank was submitted with this group of samples.

Skin Fragment and Fibrous Particulate ratings are based on the percent of non-fungal material they represent: 1 (1-25%), 2 (26-50%), 3 (51-75%), or 4 (76-100%). Background ratings are based on the total area covered by non-fungal particles: 1 (1-25%), 2 (26-50%), 3 (51-75%), 4 (76-99%), or 5 (100%; overloaded, prohibiting accurate detection and quantification). High levels of background will obscure spores and other particulates, leading to underestimation. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. \*- Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. 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. The report reflects the samples as received. When the information supplied by the customer can affect the validity of the result, it will be noted on the report.

Samples analyzed by EMSL Analytical, Inc. Meriden, CT AIHA LAP, LLC-EMLAP Accredited #165118

Initial report from: 09/01/2023 04:10 PM

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)



# EMSL Analytical, Inc.

165 Gracey Avenue Meriden, CT 06451  
Tel/Fax: (203) 284-5948 / (203) 284-5978  
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EMSL Order: 242304646  
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Project ID:

Attention: Eduardo Marques  
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146 Hartford Road  
Manchester, CT 06040

Phone: (860) 646-2469

Fax:

Collected Date: 08/31/2023  
Received Date: 08/31/2023 05:30 PM  
Analyzed Date: 09/01/2023

Project: 20230741.A10

## Test Report: Air-O-Cell™ Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods MICRO-SOP-201, ASTM D7391)

Lab Sample Number:	242304646-0004				
Client Sample ID:	09				
Volume (L):	150				
Sample Location:	OUTSIDE AMBIENT AIR END				
Spore Types	Raw Count	Count/m³	% of Total		
Alternaria (Ulocladium)	-	-	-		
Ascospores	115	2360	11.5		
Aspergillus/Penicillium	16	330	1.6		
Basidiospores	804	16500	80.5		
Bipolaris++	-	-	-		
Chaetomium++	-	-	-		
Cladosporium	43	880	4.3		
Curvularia	1	20	0.1		
Epicoccum	-	-	-		
Fusarium++	-	-	-		
Ganoderma	12	250	1.2		
Myxomycetes++	2	40	0.2		
Pithomyces++	2	40	0.2		
Rust	-	-	-		
Scopulariopsis/Microascus	-	-	-		
Stachybotrys/Memnoniella	-	-	-		
Unidentifiable Spores	-	-	-		
Zygomycetes	-	-	-		
Nigrospora	1	20	0.1		
Pestalotia++	3	60	0.3		
Spegazzinia	1*	7*	0		
Total Fungi	1000	20507	100		
Hypheal Fragment	1	20	-		
Insect Fragment	-	-	-		
Pollen	-	-	-		
Analyt. Sensitivity 600x	-	21	-		
Analyt. Sensitivity 300x	-	7*	-		
Skin Fragments (1-4)	-	1	-		
Fibrous Particulate (1-4)	-	1	-		
Background (1-5)	-	1	-		

++ Includes other spores with similar morphology; see EMSL's fungal glossary for each specific category.

Gloria V. Oriol-Aguilar, Microbiology Director  
or other Approved Signatory

No discernable field blank was submitted with this group of samples.

Skin Fragment and Fibrous Particulate ratings are based on the percent of non-fungal material they represent: 1 (1-25%), 2 (26-50%), 3 (51-75%), or 4 (76-100%). Background ratings are based on the total area covered by non-fungal particles: 1 (1-25%), 2 (26-50%), 3 (51-75%), 4 (76-99%), or 5 (100%; overloaded, prohibiting accurate detection and quantification). High levels of background will obscure spores and other particulates, leading to underestimation. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. \*- Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. 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. The report reflects the samples as received. When the information supplied by the customer can affect the validity of the result, it will be noted on the report.

Samples analyzed by EMSL Analytical, Inc. Meriden, CT AIHA LAP, LLC-EMLAP Accredited #165118

Initial report from: 09/01/2023 04:10 PM

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)

## **Appendix F**

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### Site Photographs



Ground level Hallway (facing south) – Typical conditions shown.



Ground level Hallway (facing north) – Typical conditions shown.



Ground level hallway – Staining on CMU walls shown. No obvious/suspect mold/mildew growth noted at the time of the assessment.



Ground level hallway – Staining on CMU walls shown. No obvious/suspect mold/mildew growth noted at the time of the assessment.





Room 148 classroom – Typical conditions shown.



Room 148 classroom - Staining on CMU walls shown. No obvious/suspect mold/mildew growth noted at the time of the assessment.



Room 148 classroom – HVAC diffuser with built-up dust and/or possible mold.



Room 148 classroom – Staining (dust build-up and/or possible mold) observed on suspended ceiling tile adjacent to HVAC diffuser (typical).





Room 148 classroom – Top of HVAC diffuser (above suspended ceiling tile).



Room 147 classroom - HVAC diffuser with built-up dust and/or possible mold.





Room 149 classroom - HVAC diffuser and adjacent suspended ceiling tile with built-up dust and/or possible mold.



Room 145 Kitchen Lab – Typical conditions shown.



Room 145 Kitchen Lab - HVAC diffuser with built-up dust and/or possible mold.



Room 146 Classroom – Typical conditions shown.





Room 146 Classroom – Suspect mold/mildew at southeast corner.



Room 181 Science Room – Typical conditions shown.



Room 181 Science Room – Typical HVAC diffuser vent.



Room 150 Computer Lab – Typical conditions shown.





Room 150 Computer Lab - HVAC diffuser and adjacent suspended ceiling tile with built-up dust and/or possible mold.



Room 151 Physics – Typical conditions shown.



Room 151 Physics - Fresh air supply (typical).



Room 151 Physics – Suspect mold below upper cabinets.



Room 151 Physics – Suspect mold below upper cabinets.



Room 151 Physics – Suspect mold on top of upper cabinets.





Room 151 Physics - HVAC diffuser and adjacent suspended ceiling tile with built-up dust and/or possible mold.



Room 153 Physics – Typical conditions shown.





Room 153 Physics – Water staining (drips) on CMU wall.



Room 153 Physics - HVAC diffuser and adjacent suspended ceiling tile with built-up dust and/or possible mold. Water stained ceiling tile shown.



Room 153 Physics – Staining on gypsum wall in southeast corner of room.



QSC Air Sampling – Ambient





QSC Air Sampling – Interior



QSC Air Sampling – Interior