



Community Meeting
October 21, 2025



Photograph: <https://shelcollc.com/portfolio/education>

Air Quality Monitoring Results

Pre- and Post-Occupancy

July and September 2025 Sampling Events

October 21, 2025

Flint Hill Elementary School
392 Gold Hill Road
Fort Mill, South Carolina 29715





A Trusted Third-Party Provider

As a 100% employee-owned firm with over 30 years of experience and a thriving team of 100+ people, we deliver objective analysis and clear communication for complex environmental and health & safety challenges.



Deep Environmental & Regulatory Expertise

Environmental Engineers, Environmental Scientists, Certified Industrial Hygienists, Toxicologists, Geologists, Certified Safety, Hazardous Materials, Sustainability and Environmental Compliance Professionals.



Environmental Protection Agency (EPA) Award-Winning

Recognized for excellence in climate leadership and sustainability.



Federal Emergency Management Agency (FEMA) & General Service Administration (GSA) Certified

Authorized for emergency response and federal contracting.

Commitments and Future Actions

Our commitment to community safety and environmental stewardship extends to several ongoing and planned initiatives, ensuring continuous improvement and transparency.



Emergency Plan Alignment

Intensive review and on-going discussions about FMSD and Silfab Solar emergency plans with York County EMS to strengthen coordination; joint drill to be held with York County EMS and Silfab Solar. Additional emergency preparedness training with Flint Hill Schools staff is forthcoming.



WELL Health-Safety Rating

Process underway for independent from Citadel, third-party verification by the International WELL Building Institute of FMSD's health, safety, and emergency preparedness policies and procedures. Citadel's review of FMSD's policies and procedures is complete, IWBI-required substantiating documentation development in progress. On-track to meet 15-point criteria (target Q1 2026).



Air Quality Monitoring

Quarterly indoor and outdoor air quality testing aligned with Silfab Solar's operational phases; continuous outdoor air monitoring stations to be installed during the next sampling event (target Dec. '25 or Jan. '26).



MOU Development

Draft Memorandum of Understanding in development —ongoing discussions and collaboration among FMSD, Silfab Solar, and York County EMS to formalize joint emergency coordination, air quality exceedance thresholds, and corresponding response actions for all parties.

Speaker Bio

Adrian Olivares, MPH, CIH

**Senior Consultant
Citadel EHS, Inc.**

20+ years of experience in industrial hygiene, occupational safety, and environmental health. Served as project manager for a diverse portfolio of clients, including K-12 schools, universities, local municipalities, life sciences organizations, developers, contractors, and commercial and industrial businesses.

Specializes in air contaminants, chemical exposures, and comprehensive industrial hygiene assessments.

Education

- MPH Environmental Health, San Diego State University
- BS Environmental Studies, UC Santa Barbara

Certifications / Associations

- BGC Certified Industrial Hygienist
- 40-Hour OSHA HAZWOPER Certification
- San Diego American Industrial Hygiene Association, Board Member

Presentation Overview

1

Project Background

Project context and community concerns

2

Scope & Methodology

Sampling approach and technical procedures

3

Field Observations

Conditions during sampling events

4

Results & Discussion

Laboratory analysis and data findings

5

Key Conclusions & Recommendations

Interpretation of air quality data and next steps



Photograph: <https://shelcollc.com/portfolio/education>



1. Project Background

Project Background

- Citadel EHS, Inc. was engaged by the Fort Mill School District to perform indoor air quality (IAQ) monitoring at Flint Hill Elementary School.
- The District responded to community concerns about industrial chemicals and gases at the Silfab Solar facility.
- The facility is located ~1,300 feet from the school campus.
- The proximity prompted questions about potential chemical releases.
- Citadel prepared an Air Quality Monitoring Plan outlining the sampling strategy.



Image: Bing Maps

Citadel was retained as an independent third-party firm to assess whether the indoor air quality at Flint Hill Elementary is safe and whether it's being impacted by the adjacent Silfab Solar facility. To do this, we monitored air quality before and after school occupancy—providing a clear baseline for comparison and identifying any changes over time.

Potential Sources that Contribute to Indoor Air Quality

Understanding potential sources of indoor air quality issues is crucial for maintaining a healthy environment. Here are key areas that can influence indoor air quality:

New Building Materials & Furnishings

- Volatile Organic Compounds (VOCs) from paints, sealants, adhesives, flooring.
- Formaldehyde from pressed wood products and fabrics.
- New furniture and equipment releases VOCs for weeks or months.

Operational Activities & Maintenance

- VOCs from cleaning products, disinfectants, and air fresheners.
- Art and craft supplies (markers, glue, paints) releasing VOCs.
- Elevated CO₂ levels from human respiration, indicating poor ventilation.

HVAC System

- Poor ventilation leading to pollutant buildup.
- Contaminated ductwork distributing dust and debris.

External Sources

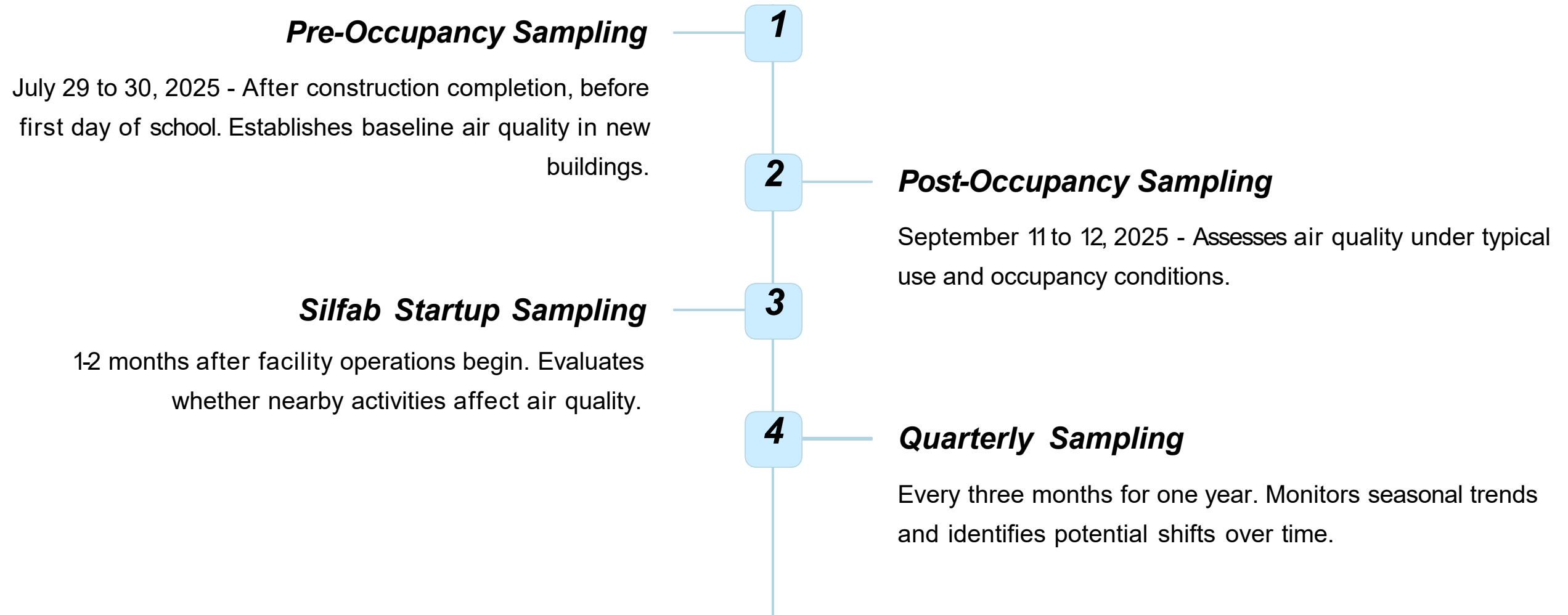
- Ambient air, including outdoor pollen and spores.
- Vehicle exhaust (CO, Particulate Matter) from nearby traffic.
- Dust and diesel exhaust from nearby construction sites.
- Industrial emissions from nearby factories or facilities.

Our monitoring plan accounted for each of these to distinguish between typical conditions and potential external impacts.



2. *Scope & Methodology*

Monitoring Plan Timeline



Citadel implemented a phased monitoring plan aligned with school operations to observe air quality before occupancy, after occupancy, and later when Silfab begins operations

Chemicals of Potential Concern

Citadel qualitatively assessed the Silfab operation to identify chemical that have the potential to cause adverse health effects when inhaled.

Hydrochloric Acid (HCl)

Hydrogen Fluoride (HF)

Volatile Organic Compounds (VOCs)

Ammonia (NH₃)

Formaldehyde (CH₂O)

Silane

Particulate Matter (PM)

Carbon Monoxide (CO)

Sample Locations

Sampling locations were strategically selected across the school to represent different air handling zones.

1

Pre-Occupancy Sampling: July 29-30, 2025

1st Floor

- **Wing A:** Classroom
- **Wing B:** Classroom
- **Wing C:** Classroom
- **Wing D:** Student Dining
- **Wing E:** Music Room
- **Wing F:** Classroom

2nd Floor

- **Wing A:** Classroom
- **Wing B:** Classroom

Outdoor Locations

North and South building exterior

2

Post-Occupancy Sampling: September 11-12, 2025

1st Floor

- **Wing A:** Classroom
- **Wing B:** Classroom
- **Wing C:** Classroom
- **Wing D:** Classroom
- **Wing E:** Music Room
- **Wing F:** Classroom

2nd Floor

- **Wing A:** Classroom
- **Wing B:** Classroom

Outdoor Locations

North and East building exterior

For each sampling event, we sampled eight indoor and two outdoor locations representing different HVAC zones and areas of typical student and staff activity.

Sampling Methodology Summary

Analyte	Method	Technique	Duration	Samples	Laboratory
HCl	Modified NIOSH 7907	Ion Chromatography	2 x 12 hours	20 + 1 Blank	SGS Galson
HF	Modified NIOSH 7902	Ion-Specific Electrode	2 x 12 hours	20 + 1 Blank	SGS Galson
VOCs	EPA TO-15	GC/MS	1 x 24 hours	10	EMSL
Ammonia	Modified OSHA ID188	Ion Chromatography	1 x 24 hours*	10 + 1 Blank	Assay Technology
Formaldehyde	Modified OSHA ID1007	High-Performance Liquid Chromatography	1 x 24 hours*	10 + 1 Blank	Assay Technology

*High humidity (>80%) and light rain encountered. Outdoor passive badges stopped at ~8.5 hours to prevent bias (July 2025 event).

Laboratory Analysis and Data Evaluation

Quality Assurance

- Pump flow rates checked before and after sampling.
- Samples submitted following proper chain of custody protocol.
- Field blanks submitted to ensure samples were not inadvertently contaminated during handling and transport.
- Each laboratory is accredited by the American Industrial Hygiene Association Laboratory Accreditation Program (AIHA-LAP).

Data Calculation

Air samples were collected for up to 24 hours. Sample results were extrapolated to determine the 24-hour time-weighted average using the following formula:

$$\text{24-hour TWA} = \frac{C_1T_1 + C_2T_2}{T}$$

Our methodology was designed to meet the same level of rigor applied to occupational and environmental health studies across the country. This ensured that our data was both defensible and comparable to recognized regulatory and health-based standards.

Screening Level Comparison

Air sampling data was compared to the maximum allowable 24-hour average concentration for contaminants.

South Carolina TAP Regulation 61-62.5

- Establishes allowable ambient air concentrations of toxic air pollutants beyond a facility's property line as determined through air dispersion modeling.
- Not intended for indoor air assessment but used here for comparison purposes.

EPA Regional Screening Levels (RSLs), Residential Air

- Chemical-specific concentrations for individual contaminants in air using generic exposure parameters for long-term (chronic) exposure scenarios.
- Risk-based screening tools, not regulatory limits.
- Residential air scenario assumes 350 days/year over 26-year exposure duration. Intentionally conservative and does not reflect typical school exposure parameters.



3. Field Observations

Field Observations

Throughout the monitoring periods, detailed field observations were recorded to contextualize air quality data, noting environmental conditions, building activities, and potential contributing factors.

July Observations

- **Weather:** Hot, humid with intermittent rain; outdoor sampling was modified due to weather.
- **Building Activity:** Staff actively preparing classrooms. HVAC system functioning as typical.
- **Janitorial:** To avoid using chemical cleaning products before the sampling event.
- **Construction:** Ongoing at an adjacent middle school.
- **Sampling Adjustments:** Minor protective measures for equipment; outdoor sampling (passive badges) terminated early due to rain.

September Observations

- **Weather:** Warm, dry with moderate humidity; stable conditions throughout.
- **Building Activity:** Normal school operations with HVAC system functioning as typical.
- **Staff Guidance:** Teachers advised to avoid air fresheners and scented products during testing periods.
- **Janitorial:** Standard nightly cleaning procedures using approved products.
- **Construction:** Continued nearby; no specific adjustments to sampling were necessary.

Field observations provide the necessary context to interpret the laboratory data and understand the true source and significance of any detected indoor contaminants.



4. Results & Discussion

Hydrochloric Acid Results

July 29-30, 2025 and September 11 to 12, 2025

8

Indoor Locations per Event

All below detection limit

2

Outdoor Locations per Event

All below detection limit

<0.0046

Maximum Concentration

mg/m³ (24-hour average)

All sample results were below the laboratory reporting limit and below both the EPA RSL (0.021 mg/m³) and South Carolina TAP limit (0.175 mg/m³) for HCl.

Screening Levels

- EPA RSL: 0.021 mg/m³
- SC TAP Limit: 0.175 mg/m³

Common Uses

Production of chlorides, fertilizers, dyes, electroplating, photographic, textile, and rubber industries.

Hydrofluoric Acid Results

July 29-30, 2025 and September 11 to 12, 2025

8

Indoor Locations per Event

All below detection limit

2

Outdoor Locations per Event

All below detection limit

<0.0046

Maximum Concentration (July)

mg/m³ (24-hour average)

<0.0021

Maximum Concentration (Sept)

mg/m³ (24-hour average)

All eight indoor and both outdoor sample results were below the laboratory reporting limit for HF. Sample results were below the EPA RSL (0.015 mg/m³); however, the laboratory reporting limit was above the South Carolina TAP limit (0.0021 mg/m³).

Screening Levels

- EPA RSL: 0.015 mg/m³
- SC TAP Limit: 0.0021 mg/m³

Common Uses

Manufacturing refrigerants, herbicides, pharmaceuticals, high-octane gasoline, fluorescent light bulbs, aluminum, metals, plastics, glass etching, and electrical components.

Ammonia Results

July 29-30, 2025 and September 11 to 12, 2025

All Samples Below Detection Limit

For each event, all eight indoor and both outdoor sample results were below the laboratory detection limit (<0.11 ppm) and below the EPA RSL for ammonia.

Screening Level

EPA RSL: 0.75 ppm

Common Sources

Ammonia occurs naturally and is produced by human activity. Used in chemicals, dyes, pesticides, fertilizers, pharmaceuticals, plastics, and textiles.



Photograph: Citadel 2025

Formaldehyde Results Summary

July 29-30, 2025 & September 11-12, 2025

July 29 to 30, 2025 Event

Range: 0.0065 (2nd Floor A wing)– 0.019 (1st Floor B Wing) ppm

Average: 0.010 ppm

Outdoor: Not detected (<0.0099 ppm)

September 11-12, 2025 Event

Range: 0.0039 (2nd Floor B wing) – 0.016 (Wing E) ppm

Average: 0.0094 ppm

Outdoor: Outdoor East (0.016 ppm), Outdoor North (<0.004 ppm)

Note: Sample results corrected due to formaldehyde in the field blank.

Comparison to Reference Criteria

		July 29 to 30, 2025	September 11-12, 2025
EPA Regional Screening Level (Residential)	0.00011 ppm	All above (screening only)	All above (screening only)
South Carolina Std. No. 8 TAP	0.012 ppm	1 exceedance	2 exceedances indoors, 1 outdoors
LEED Preoccupancy Limit (v. 4.0)	0.027 ppm	All below	All below
Interpretation			

Formaldehyde is a common indoor air contaminant with multiple typical sources in building environments.

Detected at very low levels consistent with new construction. All results were below LEED’s preoccupancy limit.

Summary of VOC Results

Presence of VOCs

- Of the 74 VOCs reported, 19 VOCs with human-health screening levels were present in indoor samples.

Concentration Levels

- Most VOCs were present at low concentrations typical of occupied institutional settings.

Regulatory Compliance

- Several compounds were measured above conservative U.S. EPA Regional Screening Levels (RSLs), though all results remained below South Carolina Standard No. 8 Toxic Air Pollutant limits .

Overall, these findings suggest that while some VOCs were detected above conservative screening levels, their concentrations were not indicative of a health concern.

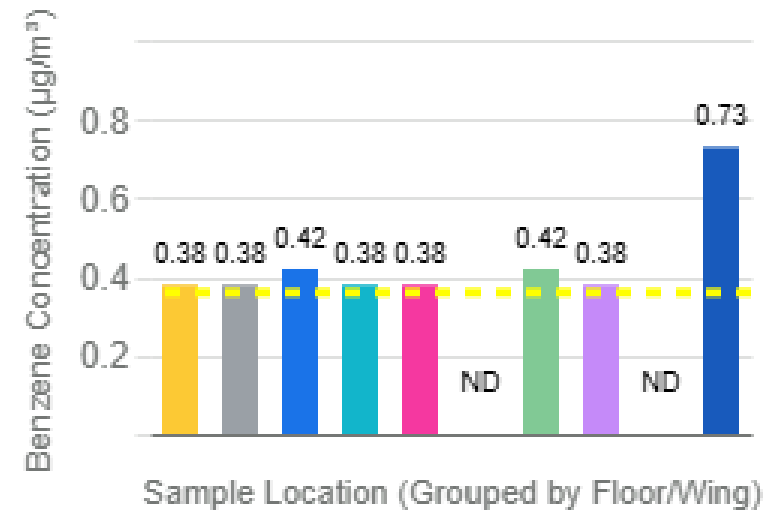
Benzene Results

Benzene

Detected in most indoor samples (0.38 to 0.89 $\mu\text{g}/\text{m}^3$), exceeding the residential RSL (0.36 $\mu\text{g}/\text{m}^3$). While a known carcinogen, measured levels are very low, several orders of magnitude below regulatory limits, and not indicative of a health hazard.

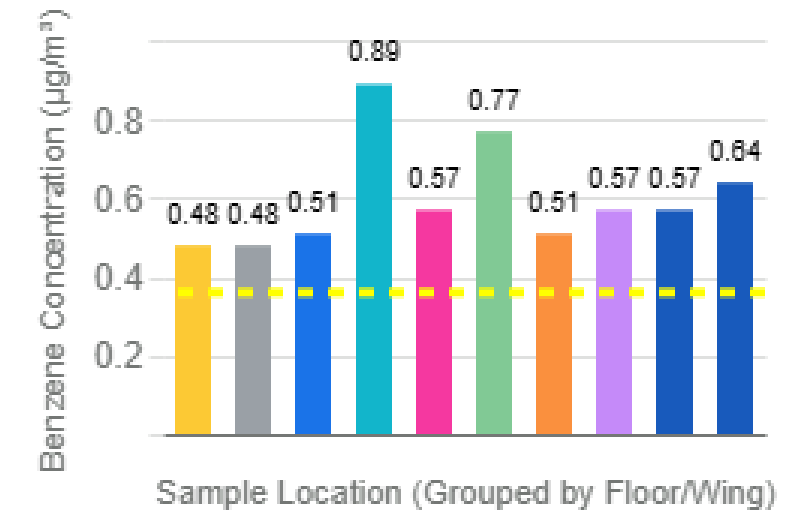
LEED Preoccupancy Limit (v. 4.0) = 3 $\mu\text{g}/\text{m}^3$

July (Pre-Occupancy)



- 1st Floor / Wing A
- 1st Floor / Wing B
- 1st Floor / Wing C
- 1st Floor / Wing D
- 1st Floor / Wing E
- 1st Floor / Wing F
- 2nd Floor / Wing A
- 2nd Floor / Wing B
- Outdoor

September (Occupied)



- 1st Floor / Wing A
- 1st Floor / Wing B
- 1st Floor / Wing C
- 1st Floor / Wing D
- 1st Floor / Wing E
- 1st Floor / Wing F
- 2nd Floor / Wing A
- 2nd Floor / Wing B
- Outdoor

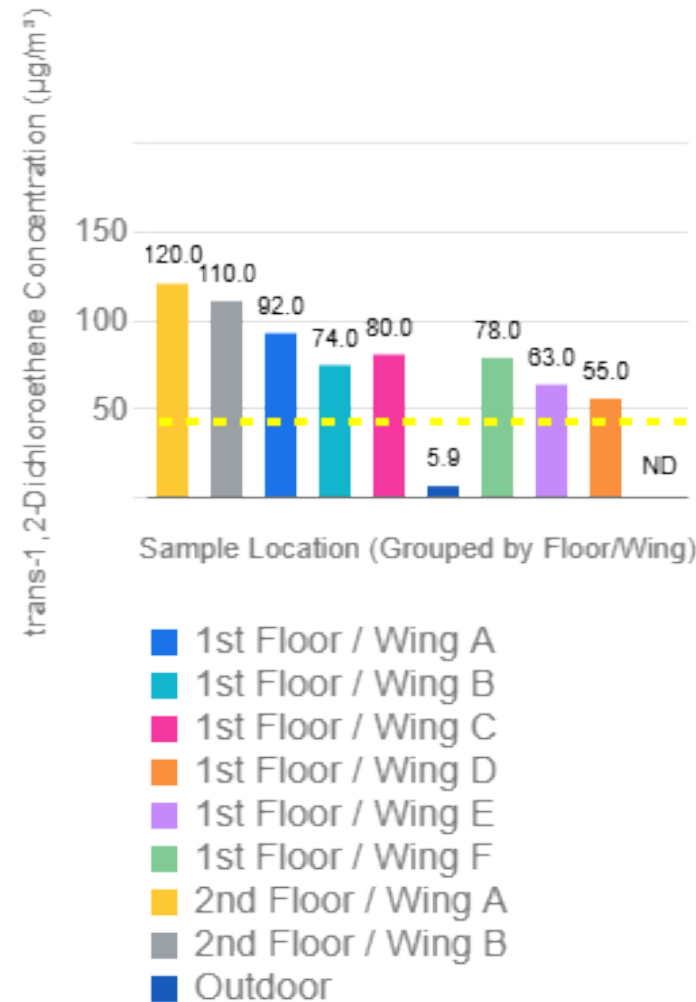
Benzene levels were consistent with ambient outdoor air.

Trans-1,2-Dichloroethene (DCE) Results

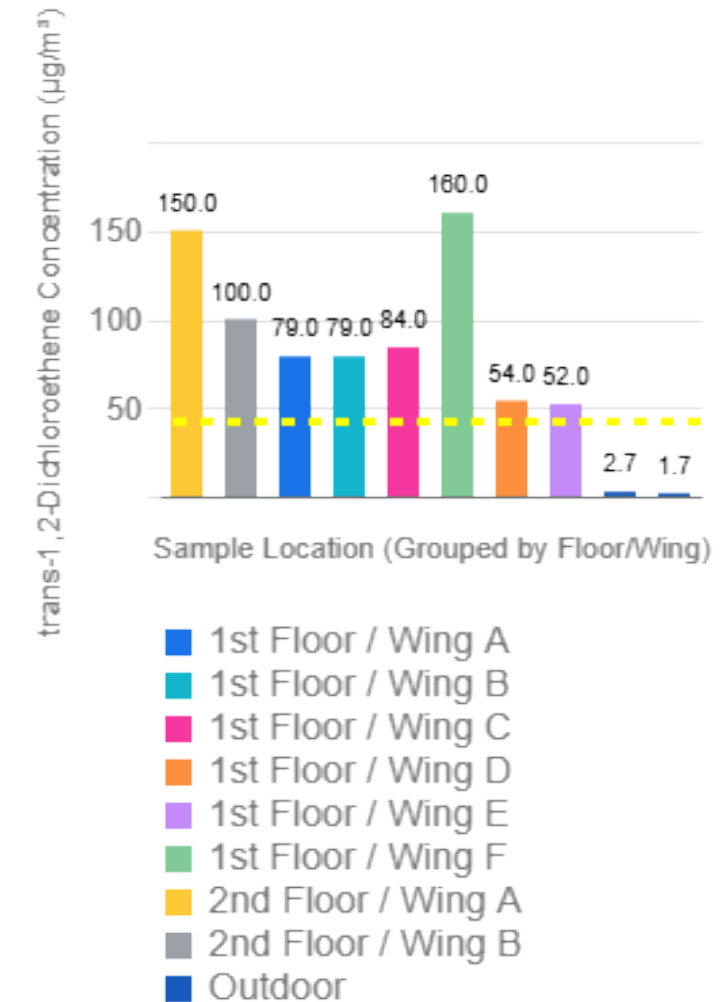
Trans-1,2-DCE

Detected in all indoor samples (52 to 160 $\mu\text{g}/\text{m}^3$), exceeding the RSL (42 $\mu\text{g}/\text{m}^3$). These low-level detections are well below regulatory limits.

July (Pre-Occupancy)



September (Occupied)



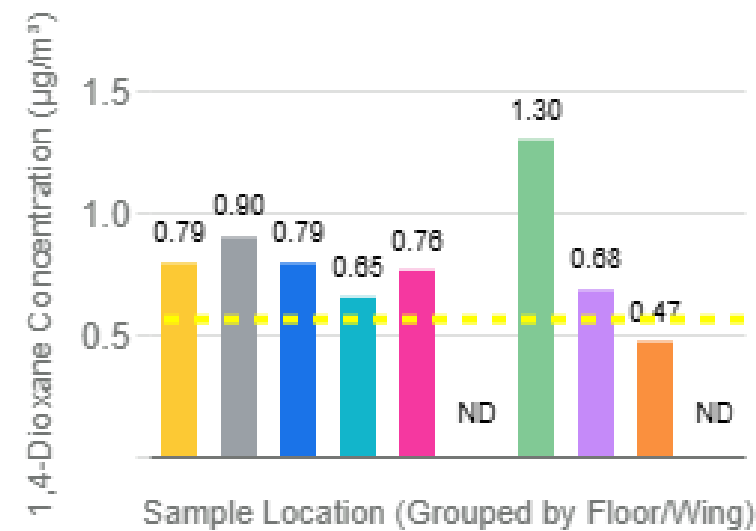
Levels reflect minor residual emissions from cleaning solvents, adhesives, or sealants rather than an active source.

1,4-Dioxane Results

1,4-Dioxane

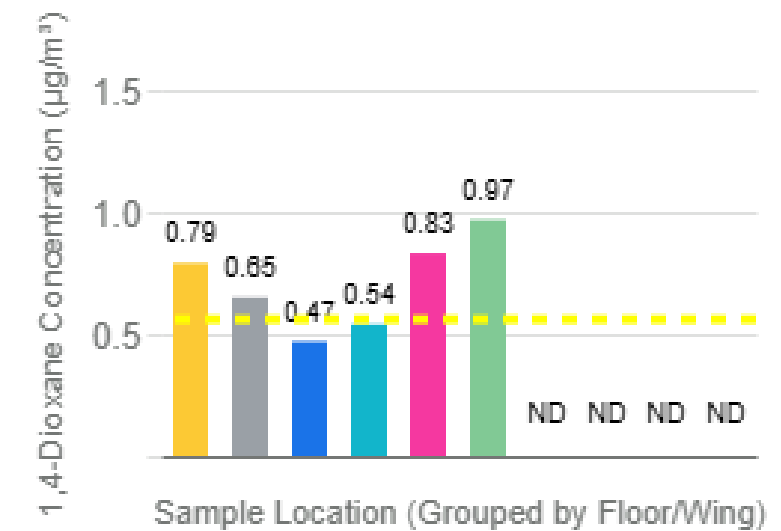
Detected slightly above its RSL ($0.56 \mu\text{g}/\text{m}^3$) up to $0.97 \mu\text{g}/\text{m}^3$. Though a potential carcinogen, concentrations are extremely low and consistent with background levels typically observed indoors.

July (Pre-Occupancy)



- 1st Floor / Wing A
- 1st Floor / Wing B
- 1st Floor / Wing C
- 1st Floor / Wing D
- 1st Floor / Wing E
- 1st Floor / Wing F
- 2nd Floor / Wing A
- 2nd Floor / Wing B
- Outdoor

September (Occupied)



- 1st Floor / Wing A
- 1st Floor / Wing B
- 1st Floor / Wing C
- 1st Floor / Wing D
- 1st Floor / Wing E
- 1st Floor / Wing F
- 2nd Floor / Wing A
- 2nd Floor / Wing B
- Outdoor

Levels consistent with background levels typically observed indoors.

Ethylbenzene, Naphthalene, and Acrylonitrile Results

While overall VOC levels were low, specific compounds were detected at trace concentrations, highlighting potential contributions from common indoor materials.

Ethylbenzene

Detected at trace levels, marginally above RSLs in one sample but significantly below occupational exposure limits. Commonly found in asphalt, gasoline, plastics, and as a component in paints and solvents.

Naphthalene

Observed at concentrations slightly above RSL, yet far below occupation exposure limit. Sources include coal tar, mothballs, and emissions from new building materials like wood products and dyes.

Acrylonitrile

Identified at minimal levels, exceeding RSLs but well within safe limits. Primarily linked to manufacturing of acrylic fibers, rubber, and various plastics, often outgassing from adhesives, coatings, and textiles.

The trace presence of these VOCs is typical in newly constructed or renovated buildings and does not pose a health concern at the measured concentrations, consistent with their common origins in new materials.

VOC Conclusions

Based on the air quality monitoring, the findings regarding Volatile Organic Compounds lead to several key conclusions about indoor air quality.

Conservative Screening

EPA RSLs, while exceeded by some VOCs, are intentionally conservative. They serve as a screening tool to identify compounds for further review, not as definitive indicators of unsafe conditions or health risks.

Regulatory Compliance

No measured VOC concentrations exceeded South Carolina Standard No. 8 or LEED preoccupancy limits, indicating compliance with established health and environmental guidelines.

Acceptable Air Quality

Overall, the indoor air quality across the sampled areas is deemed acceptable. The detected VOC levels do not present an elevated health risk to building occupants.

Common Sources

The detected VOCs are consistent with background conditions typically found in newly constructed and actively used buildings, stemming from common sources such as cleaning products, occupant activities, and interior materials.

These findings collectively affirm that the indoor environment maintains a healthy and safe atmosphere for occupants.

Summary of Indoor Air Quality Measurements

A comprehensive summary of direct-read indoor air quality measurements conducted in July and September offers key insights into the building's environmental conditions. The data provides a comparative overview against established guidelines.

Parameter	July Range	Sept Range	Guideline	Observations
Temperature (°F)	65–69	70–73	73–79 (ASHRAE 55)	Slightly below ASHRAE comfort range, indicating cool indoor conditions.
Relative Humidity (%)	56–77	53–57	20–65 (ASHRAE 55)	Mostly within acceptable range; one exceedance (77%) in Student Dining in July.
CO ₂ (ppm)	534–610	607–798	<1,208 (ASHRAE 62.1)	Well below guidelines, suggesting adequate ventilation. Slight September increases may reflect higher occupancy.
CO (ppm)	0.7–0.9	0.1–0.3	<9 (LEED)	Very low concentrations, well below health or LEED criteria, with no combustion concerns.
TVOCs (ppb)	18–84	Not Measured	<500 (LEED)	July results well below LEED target, suggesting minimal VOC sources.
PM _{2.5} (µg/m³)	0–3	2-5	<35 (EPA NAAQS)	Extremely low levels, far below EPA limits, indicating excellent indoor air quality.
PM ₁₀ (µg/m³)	0–4	2-6	<150 (EPA NAAQS)	Well below EPA standards; outdoor readings higher, showing effective filtration.
Silane (ppm)	0.00	0.00	<5 (ACGIH TLV)	No detectable Silane in any samples from either event.



5. Key Conclusions & Recommendations

Key Conclusions

Safe Formaldehyde/VOC Levels

Detected levels were low, within regulatory limits, and consistent with background concentrations in new buildings.

Excellent IAQ & Compliance

Indoor air quality is fully compliant with all applicable OSHA, EPA, LEED, and ASHRAE standards and guidelines.

No Neighboring Facility Impact

Specific chemicals from the nearby Silfab Solar facility were not detected in any samples.

Effective Ventilation & Filtration

General IAQ parameters (CO, CO₂, PM) demonstrate robust ventilation and filtration, successfully mitigating outdoor pollutants.

In summary, the monitoring confirmed the school's air quality is safe and healthy for occupants, with no increased risk identified from the neighboring solar manufacturing facility.

Recommendations

Based on the findings from the pre- and post-occupancy air quality monitoring event, Citadel recommends the following actions:

Continue Monitoring Plan

Implement the Air Quality Monitoring Plan and conduct additional rounds of quarterly monitoring and continuous perimeter monitoring after the Silfab startup.

Monitor Exceedances

Continue to track the chemicals that exceeded the conservative health-based screening levels, including benzene, formaldehyde, trans-1,2-dichloroethene, 1,4-dioxane, and ethylbenzene, naphthalene, and acrylonitrile.

THANK YOU!

To the Fort Mill School District and Fort Mill community for entrusting us with this meaningful work. It's a privilege to apply our expertise and industry experience in support of a project that directly impacts the well-being of students, staff, and the broader Flint Hill school community.



CITADEL EHS
assess • resolve • strengthen



Community Meeting
October 21, 2025