



McCABE
ENVIRONMENTAL SERVICES LLC

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INDOOR AIR QUALITY INVESTIGATION REPORT

Conducted for:

Green Brook Township Public Schools
132 Jefferson Avenue
Green Brook Township, New Jersey 08812

Conducted at:

Green Brook Middle School
132 Jefferson Avenue
Green Brook Township, New Jersey 08812

Submitted by:

McCabe Environmental Services, L.L.C.
464 Valley Brook Avenue
Lyndhurst, New Jersey 07071

REPORT DATE: July 28, 2023

MES PROJECT NO.: 23-04565

Prepared by:

Gerard D'Alessio
Environmental Scientist

Signed for the Company by:

John H. Chiaviello
Vice President

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Carbon Dioxide, Carbon Monoxide,
Temperature, & Relative Humidity

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1.0 INTRODUCTION

McCabe Environmental Services, L.L.C. (McCabe) was retained by Green Brook Township Public Schools (Client) to conduct an indoor air quality general investigation at Green Brook Middle School in order to determine the general air quality of the school.

The project information is as follows:

Client Name: Green Brook Township Public Schools
Contact Person: Mr. Jason Weber

Project Name: Green Brook Middle School - Indoor Air Quality General Investigation
Project Location: Green Brook Middle School
132 Jefferson Avenue
Green Brook Township, New Jersey 08812

Date(s) of Service: June 23, 2023 & June 28, 2023

McCabe Investigator: Gerard D’Alessio

2.0 SCOPE OF WORK

This indoor air quality investigation took place at the Green Brook Middle School located at 132 Jefferson Avenue, Green Brook Township, New Jersey. The Green Brook Middle School is a one-story structure with a layout that consists of separate rooms and facilities connected by hallways. The school is separated into 100, 200 and 300 labeled wings. The weather at the time of the first investigation date of June 23, 2023 was 69.6°F, raining, with light winds, and a barometric pressure of 30.01 inches, and June 28 was 74.2, Cloudy, and a barometric pressure of 29.78 inches.

To conduct the indoor air quality investigation, McCabe completed the following:

- Collected direct measurements of carbon monoxide, carbon dioxide, relative humidity, and temperature throughout Green Brook Middle School.
- Performed a visual inspection of classrooms, offices, hallways, and other special purpose rooms.

3.0 PROCEDURES

The following procedures and methods were utilized during this indoor air quality investigation:

Carbon Dioxide, Carbon Monoxide, Temperature, and Relative Humidity

Direct readings of carbon dioxide, carbon monoxide, temperature, and relative humidity were recorded with a TSI IAQ-Calc digital instrument (Model 7545, Serial# T75450852006). The level of each tested parameter is read directly in the field and can either be logged manually or logged by the instrument. Elevated levels of carbon dioxide can be an indication that a room or group of rooms is receiving an adequate exchange of air throughout the day and that other chemicals may also be building up over the course of the day. Elevated levels of carbon monoxide usually occur as a result of inadequate exhausting of a combustion source.

4.0 RESULTS AND DISCUSSION

Carbon Dioxide and Carbon Monoxide

Air testing was conducted on June 23, 2023 & June 28, 2023. The carbon dioxide levels taken in the new Green Brook Middle School were below the Occupational Health and Safety Association (OSHA) health-based permissible exposure limit of 5,000 parts per million (ppm), and therefore do not pose a serious occupational health risk. However, individuals in offices with elevated carbon dioxide, above 800 ppm, often report drowsiness, lethargy, and a sense of stale air. Because the elevated carbon dioxide concentrations are indicative of inadequate exchange of fresh air, other compounds may also be accumulating in the air causing occupant reactions and symptoms. It is the accumulation of these other, unidentified, contaminants which can result in air quality complaints by occupants. The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) recommend that indoor office air carbon dioxide concentrations be maintained at or below 800 ppm. The main source of carbon dioxide in an indoor office environment is human respiration. Therefore, the concentration will tend to rise throughout the day while the office is occupied then decrease overnight.

With respect to carbon monoxide (CO), the compound was not detectable in the air of Green Brook Middle School. The OSHA Worker Permissible Exposure Limit for CO is 50 ppm time weighted average (TWA) over an 8-hour day. The acceptable level for indoor air quality in an environment for an 8-hour exposure period as established by the World Health Organization is 9.0 ppm. Finally, the EPA's National Ambient Air Quality Standard (Outdoor Air) for CO is also 9.0 ppm. EPA also reports that the average level within a home without a gas stove is between 0.5-5.0 ppm, and levels within homes with gas stoves are often 5-15 ppm and can occasionally be higher.

Temperature & Relative Humidity

Relative humidity was also measured with the readings taken on June 23, 2023 & June 28, 2023 at the new Purchasing Department and Procurement Office. ASHRAE Standard 62.1-2013 requires that relative humidity levels be designed to be limited to 65% or less for mechanical systems with dehumidification capabilities. ASHRAE recommends indoor temperatures of between 69.6°F and 75.0°F, the relative humidity level comfortable for 80% of people engaged in largely sedentary activities is between 30-60%. The levels of relative humidity in the four offices were higher than the recommended 30%. Elevated levels of relative humidity can lead to surface mold growth. Mold growth can then lead to indoor air quality complaints.

5.0 CONCLUSION

Standard IAQ parameters tested include carbon dioxide, carbon monoxide, temperature and relative humidity. Based on the data collected during our site visit the carbon dioxide and carbon monoxide levels were both within acceptable ranges. The temperature and relative humidity readings were close to or slightly above the recommended ASHRAE/ANSI Standards and should be corrected.

In conclusion, based on our visual inspection, along with the data collected, we believe the Middle School is safe for occupancy. However prolonged elevated relative humidity can lead to mold growth and mold related air quality complaints.

APPENDIX A

**Carbon Dioxide, Carbon Monoxide,
Temperature, & Relative Humidity**

McCabe Environmental Services, L.L.C	Phone (201) 438-4839
Client: Green Brook Public School	Project No. 23-04565
Project Name: - Middle School Radon Testing	Date- 06/23/2023
Property Address:132 Jefferson Ave, Green Brook Township, NJ 08812	

Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Hallway Front Entrance	1115	71.4	55.1	0	323	IAQ-Calc
Main Office 180	1120	70.5	54.2	0	265	IAQ-Calc
101 BOE Offices	1125	70.6	53.1	0	289	IAQ-Calc
101 BOE Offices Conference Room	1126	70.0	55.4	0	294	IAQ-Calc
101 BOE Offices KB Room	1127	70.0	55.9	0	291	IAQ-Calc
101 BOE Offices Work Room	1128	70.1	56.1	0	289	IAQ-Calc
Room 102	1130	71.6	72.9	0	252	IAQ-Calc
Room 104	1131	71.6	71.6	0	253	IAQ-Calc
Room 103	1132	71.9	71.2	0	242	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Hallway 2	1145	71.4	65.3	0	253	IAQ-Calc
Room 106	1146	71.5	68.9	0	243	IAQ-Calc
Room 108	1147	71.2	71	0	258	IAQ-Calc
Room 105	1146	71.1	70.5	0	249	IAQ-Calc
Room 107	1147	71.2	71.0	0	259	IAQ-Calc
Room 110	1154	71.3	71.5	0	276	IAQ-Calc
Room 112	1155	71.5	71.6	0	296	IAQ-Calc
Gym	1156	70.7	58.5	0	252	IAQ-Calc
Room 109	1157	71.3	73.0	0	303	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Room 111	1203	71.1	73.3	0	270	IAQ-Calc
Room 113	1204	71	70.3	0	275	IAQ-Calc
Auditorium	1206	72.1	66.3	0	259	IAQ-Calc
Room 307	1211	70.3	63.0	0	264	IAQ-Calc
Room 309	1213	71.4	60.6	0	295	IAQ-Calc
Room 308	1217	71.3	61.4	0	288	IAQ-Calc
Room 310	1220	72.2	61.0	0	282	IAQ-Calc
Room 312	1222	72.1	62.1	0	296	IAQ-Calc
Room 313	125	72.4	63.2	0.1	412	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Outdoor	1235	69.6	74.8	0	251	IAQ-Calc
Room 318	1229	72.9	59.3	0	296	IAQ-Calc
Room 318	1230	72.2	70.4	0	261	IAQ-Calc
Room 319	1231	72.3	62.9	0	338	IAQ-Calc
Room 321	1232	72.3	59.3	0	290	IAQ-Calc
Room 320	1232	72.7	57.9	0	296	IAQ-Calc
Room 300 media center	1235	72.6	59.9	0	269	IAQ-Calc
Room 323	1246	72.4	61.5	0	341	IAQ-Calc
Room325	1247	72.9	59.3	0	363	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Room 224	1248	72.3	60.8	0	287	IAQ-Calc
Room 223	1248	72.6	64.2	0	263	IAQ-Calc
Room225	1249	72.7	60.7	0	315	IAQ-Calc
Room 222	1249	73.1	59.2	0	289	IAQ-Calc
Room 221	1249	73.3	61.3	0	367	IAQ-Calc
Room 220 faculty Room	1250	73.2	62.4	0	272	IAQ-Calc
Room 219	1250	72.0	58.5	0	280	IAQ-Calc
Maintenance Room	1251	73.8	66.2	0	263	IAQ-Calc
Maintenance Office	1251	74.6	66.0	0	287	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Kitchen 214	1254	74.2	67.2	0	259	IAQ-Calc
Cafeteria	1254	74.0	67.7	0	251	IAQ-Calc
Tech Lab 217	1255	73.4	65.5	0	264	IAQ-Calc
Room 210	1256	74.4	60.1	0	284	IAQ-Calc
Room 208	1257	73.6	62.3	0	273	IAQ-Calc
Room 213	1314	72.9	61.5	0	285	IAQ-Calc
Room 215	1314	72.8	60.2	0	272	IAQ-Calc
Fridge Room	1315	71.5	65.6	0	270	IAQ-Calc
Room 209	1316	72.2	64.0	0	270	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Room 206	1317	72.6	70.4	0	269	IAQ-Calc
Room 207	1317	72.5	71.5	0	253	IAQ-Calc
Room 211	1318	72.9	71.2	0	270	IAQ-Calc
Hallway 3	1318	72.9	72.9	0	274	IAQ-Calc
Room 205	1319	73.4	73.4	0	256	IAQ-Calc
Room 203	1320	73.9	63.0	0	278	IAQ-Calc
Room 202	1320	73.7	64.8	0	262	IAQ-Calc
Room 204	1320	73.6	62.8	0	272	IAQ-Calc
Room 201	1337	72.7	58.4	0	273	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Superintendent	1337	72.3	60.3	0	358	IAQ-Calc
Room 301	1338	72.7	65.5	0	266	IAQ-Calc
Room 302	1338	72.8	59.6	0	280	IAQ-Calc
Room 304	1339	72.8	65.2	0	272	IAQ-Calc
Room 232	1340	72.6	62.8	0	320	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Hallway Front Entrance	1048	75.0	52.4	0	344	IAQ-Calc
Main Office 180	1048	70.5	54.5	0	324	IAQ-Calc
101 BOE Offices	1050	73.6	57.9	0	335	IAQ-Calc
101 BOE Offices Conference Room	1050	73.6	58.0	0	324	IAQ-Calc
101 BOE Offices KB Room	1051	72.2	59.1	0	344	IAQ-Calc
101 BOE Offices Work Room	1051	72.9	60.5	0	353	IAQ-Calc
Room 102	1058	72.0	75.5	0	309	IAQ-Calc
Room 104	1058	71.5	75.1	0	298	IAQ-Calc
Room 103	1100	71.3	79.9	0	308	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Hallway 2	1100	71.0	70.0	0	318	IAQ-Calc
Room 106	1101	70.7	79.2	0	313	IAQ-Calc
Room 108	1103	70.8	79.2	0	286	IAQ-Calc
Room 105	1104	70.6	76.1	0	302	IAQ-Calc
Room 107	1105	71.1	86.9	0	294	IAQ-Calc
Room 110	1105	70.9	73.7	0	282	IAQ-Calc
Room 112	1107	70.6	76.2	0	296	IAQ-Calc
Gym	1109	70.2	65.8	0	297	IAQ-Calc
Room 109	1113	71.0	88.7	0	313	IAQ-Calc

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Room 111	1113	71.5	87.1	0	312	IAQ-Calc
Room 113	1113	71.7	87.2	0	289	IAQ-Calc
Auditorium	1120	74.4	73.4	0	324	IAQ-Calc
Room 307	1121	73.6	75.8	0	333	IAQ-Calc
Room 309	1123	74.1	61.8	0	362	IAQ-Calc
Room 308	1124	73.8	62.6	0	344	IAQ-Calc
Room 310	1124	73.4	64.8	0	316	IAQ-Calc
Room 312	1125	74.1	65.9	0	322	IAQ-Calc
Room 313	1125	73.2	60.9	0.1	376	IAQ-Calc

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Outdoor	1126	74.2	77.6	0	299	IAQ-Calc
Room 318	1127	73.3	65.5	0	340	IAQ-Calc
Room 318	1128	73.1	63.9	0	314	IAQ-Calc
Room 319	1128	73.4	64.3	0	350	IAQ-Calc
Room 321	1129	73.6	59.9	0	362	IAQ-Calc
Room 320	1130	73.0	51.7	0	323	IAQ-Calc
Room 300 media center	1131	73.9	83.4	0	284	IAQ-Calc
Room 323	1131	73.9	69.1	0	378	IAQ-Calc
Room325	1131	73.8	69.0	0	372	IAQ-Calc

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Room 224	1132	73.3	63.0	0	316	IAQ-Calc
Room 223	1133	73.7	65.6	0	394	IAQ-Calc
Room225	1133	73.8	65.3	0	366	IAQ-Calc
Room 222	1135	74.0	66.4	0	334	IAQ-Calc
Room 221	1135	74.3	74.2	0	296	IAQ-Calc
Room 220 faculty Room	1136	73.4	68.6	0	306	IAQ-Calc
Room 219	1136	72.9	68.9	0	320	IAQ-Calc
Maintenance Room	1137	74.8	69.9	0	315	IAQ-Calc
Maintenance Office	1137	74.9	70.3	0	331	IAQ-Calc

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Kitchen 214	1137	74.9	70.5	0	329	IAQ-Calc
Cafeteria	1137	74.6	65.5	0	309	IAQ-Calc
Tech Lab 217	1138	74.6	65.8	0	301	IAQ-Calc
Room 210	1140	73.9	73.2	0	338	IAQ-Calc
Room 208	1141	74.1	67.4	0	336	IAQ-Calc
Room 213	1141	73.8	67.8	0	318	IAQ-Calc
Room 215	1143	73.7	66.4	0	327	IAQ-Calc
Fridge Room	1144	73.1	64.4	0	417	IAQ-Calc
Room 209	1144	73.1	70.3	0	353	IAQ-Calc

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Room 206	1145	72.6	66.4	0	321	IAQ-Calc
Room 207	1145	72.6	72.6	0	347	IAQ-Calc
Room 211	1146	72.2	66.7	0	389	IAQ-Calc
Hallway 3	1146	72.8	67.8	0	322	IAQ-Calc
Room 205	1147	73.2	73.2	0	344	IAQ-Calc
Room 203	1147	73.5	68.5	0	354	IAQ-Calc
Room 202	1148	73.3	69.1	0	355	IAQ-Calc
Room 204	1148	72.9	64.9	0	362	IAQ-Calc
Room 201	1148	72.8	72.8	0	316	IAQ-Calc

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Room/Location	Time	Temperature (°F)	RH %	CO (PPM)	CO ₂ (PPM)	Instrument
Superintendent	1150	72.5	61.1	0	324	IAQ-Calc
Room 301	1152	72.8	67.4	0	357	IAQ-Calc
Room 302	1152	73.2	64.3	0	364	IAQ-Calc
Room 304	1154	73.6	65.2	0	349	IAQ-Calc
Room 232	1154	73.9	68.9	0	356	IAQ-Calc