

## **Summary**

Between November 15<sup>th</sup> through 18<sup>th</sup>, 2016 an indoor air quality (IAQ) assessment was conducted at Hillsboro School District. The assessment was completed at Lenox Elementary School. The District has historically used their workers compensation carrier to assist with performing IAQ assessments. It is the goal of the District to conduct assessments of ten facilities annually as a preventative measure to ensure the schools IAQ is within acceptable limits.

**The assessment revealed there were no immediate concerns that conditions would be unsafe for employees.**

## **Sample Environment**

Lenox Elementary School provides educational space for kindergarten through sixth grade. Data logging sampling was conducted of four classrooms (2, 9, 12 and 18) during the assessment. The classrooms that were sampled were representative of different HVAC zones as well as of the typical classroom environment with a typical occupancy load.

*Attached are graphs reports from the data that was collected with the IAQ monitor*

## **Sampling Methodology**

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

A Gray Wolf Direct Sense IAQ monitor was used to evaluate carbon dioxide, carbon monoxide, temperature and relative humidity. These parameters are used to evaluate the overall air quality and comfort levels of the indoor air. The monitor was used for data logging sampling over a 24 hour period in each classroom taking readings once every minute. This unit is owned by Hillsboro School District and is calibrated annually by an outside agency. The monitor was placed and moved from classroom to classroom by Hillsboro School District staff and was within the calibration period at the time of the sampling.

## **Results**

### **Carbon Dioxide**

Carbon dioxide concentrations ranged from low-400 ppm during unoccupied periods and up to around 2,400 ppm during occupied periods. The American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) recommend maintaining indoor carbon dioxide concentrations below 1000 ppm for classroom environments and below 800 ppm for office environments. It is important to remember that carbon dioxide is not a toxin but is a constituent in exhaled breath, and is used as an indicator in determining whether or not adequate amounts of outside make-up air are entering an area. In a building with insufficient make-up air, carbon dioxide levels can build up without adequate dilution. Symptoms in buildings with high carbon dioxide levels involve sleepiness, headaches, excessive fatigue, and eye irritation. The sampling results indicate that the four classrooms had periods of time where adequate amounts of fresh air are not being provided by the ventilation system.

When downloading the data from the air meter, we were able to visit with Jim Peterson about this school. He reported that Lennox Elementary has room ventilators that are standalone units. Thus in the winter months they are not used as it would make the classrooms too cold. Because they are not used there is not enough fresh air into the rooms to dilute the carbon dioxide levels. The levels found in these classrooms are not dangerous to occupants but may provide for an uncomfortable environment.

### Carbon Monoxide

Trace amounts of Carbon Monoxide were detected during the assessment. These levels are in line with expected levels with any building that has parking lots or is near roadways. Symptoms of mild poisoning include headaches and dizziness at concentrations less than 100 ppm. OR-OSHA permissible exposure limit (PEL) is 50 ppm. Carbon monoxide is produced from the partial combustion of carbon-containing compounds, notably in internal-combustion engines. Carbon monoxide is a significantly toxic gas and has no odor or color. It is the most common type of fatal poisoning in many countries. Exposures can lead to significant toxicity of the central nervous system and heart.

### Temperature

The temperature of the building during occupied periods appeared to be within acceptable ranges, to provide a comfortable working environment. OSHA technical manuals recommend temperature for a comfortable indoor work environment range between 68°F and 76°F.

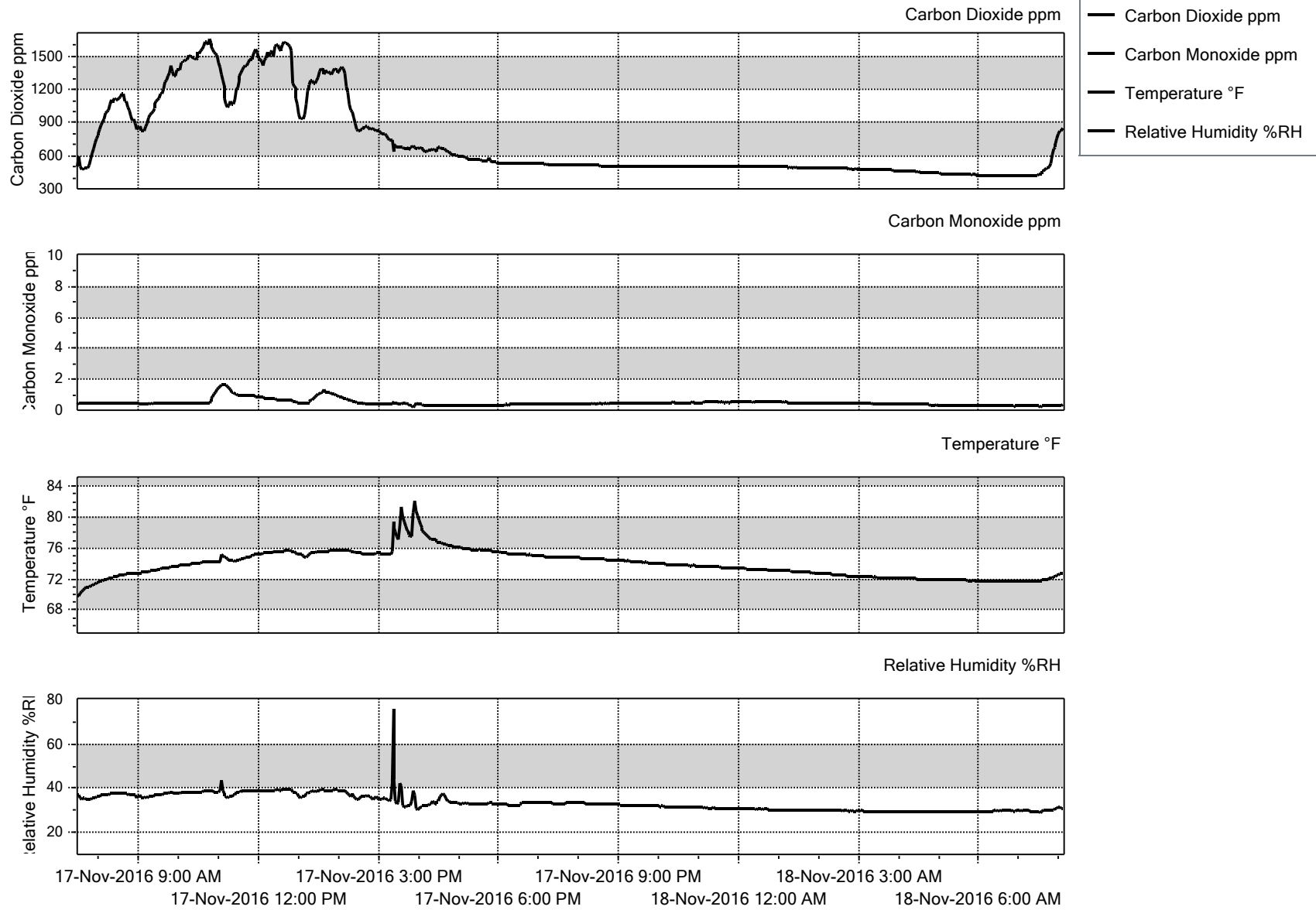
### Relative Humidity and Moisture

The relative humidity of the building ranged from the low 30% range to the mid 50% range. OSHA technical manuals recommend maintaining the relative humidity between 20% and 60% to help maintain a comfortable indoor air quality environment and below 70% to prevent mold growth. Molds can be found almost anywhere; they can grow on virtually any substance, providing moisture is present. Molds can grow within wood, paper, carpet and foods. When excessive moisture accumulates in buildings or on building materials, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. There is no practical way to eliminate all molds and mold spores in the indoor environment. The key to control indoor mold growth is to control moisture. If mold is discovered, clean it up immediately and remove excess water or moisture.

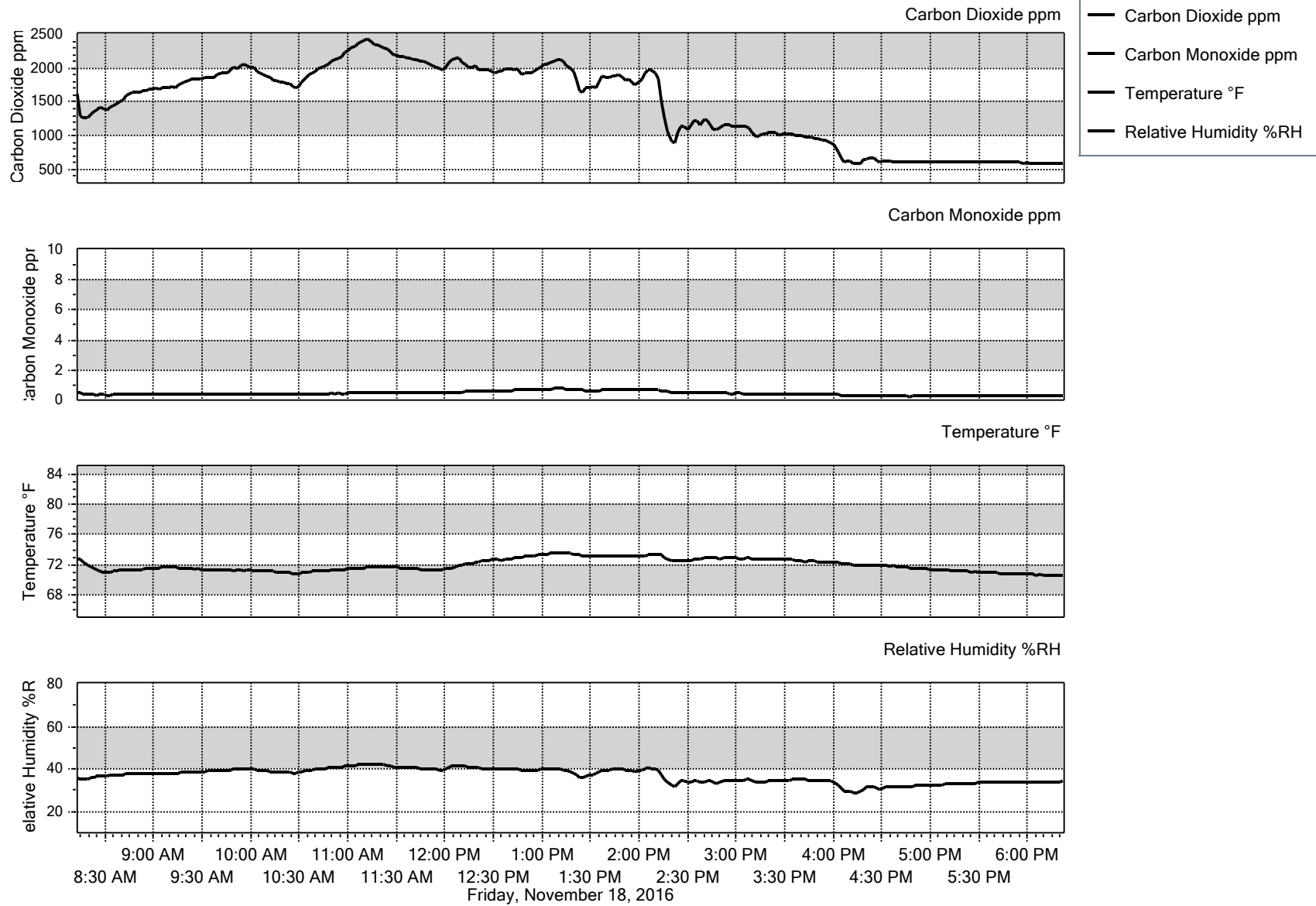
### **Conclusions/Recommendations**

- As a result of the assessment the IAQ should provide for a safe work environment.
- All classrooms had readings of carbon dioxide of over 1,000 ppm at times. These levels are not unsafe for occupants but may provide for an uncomfortable environment. Due to the design of the current HVAC system, there is not much change that can be made to lower these levels in the colder months without a significant upgrade to the HVAC system in the building.

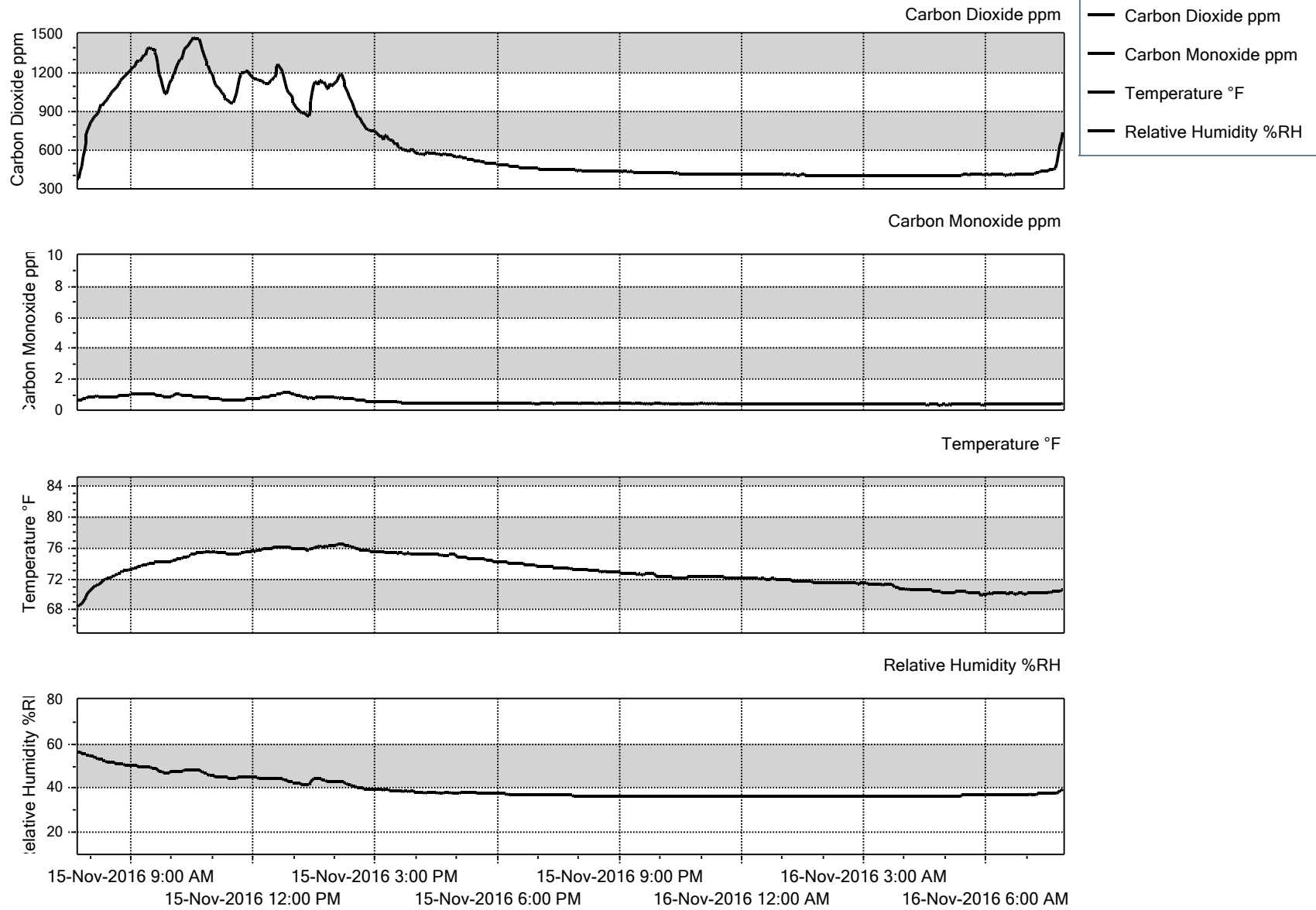
Lenox Classroom 2 (17-Nov-16)



Lenox Classroom 9 (18-Nov-16)



Lenox Classroom 12 (15-Nov-16)



Lenox Classroom 18 (16-Nov-16)

