

# 2023 Q1 SENSOR REPORT COMMERCE CITY NORTH DENVER COMMUNITY AIR MONITORING NETWORK COMMERCE CITY, COLORADO

Prepared For:

**Suncor Energy (U.S.A.) Inc.**

5801 Brighton Boulevard  
Commerce City, CO 80022

Prepared By:

**Montrose Air Quality Services, LLC**

990 W 43<sup>rd</sup> Avenue  
Denver, CO 80211

Document Number: **085AA-022555-RT-376**  
Report Period: **January 1 – March 31, 2023**  
Submittal Date: **May 10, 2023**



## TABLE OF CONTENTS

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
Executive Summary .....	4
1.0 INTRODUCTION .....	6
1.1 Air Monitoring Site Description .....	6
2.0 METHODS.....	9
2.1 Continuous Monitoring .....	9
2.2 Assessment of Community Health Implications.....	10
2.3 Summary of Downtime or Equipment Malfunction.....	12
3.0 RESULTS .....	13
3.1 Results Summary.....	13
3.2 Carbon Monoxide (CO).....	15
3.3 Nitric Oxide (NO).....	15
3.4 Nitrogen Dioxide (NO <sub>2</sub> ).....	15
3.5 Sulfur Dioxide (SO <sub>2</sub> ).....	15
3.6 Hydrogen Sulfide (H <sub>2</sub> S).....	15
3.7 Particulate Matter (PM <sub>2.5</sub> ).....	16
3.8 Total Volatile Organic Compounds (VOC).....	16
4.0 CONCLUSIONS.....	16
5.0 PROGRAM CHANGES.....	26

### LIST OF APPENDICES

- A CALIBRATION AND QA/QC DATA
- B FIELD DATA SHEETS
- C CALIBRATION GAS CERTIFICATION SHEETS

### LIST OF TABLES

1-1 CCND MONITORS AND SUMMA CANISTER SAMPLING LOCATIONS .....	8
1-2 CCND MONITORING TECHNOLOGY.....	9
1-3 CCND MONITORING DATA RECOVERY .....	12
1-4 CCND MONITORS RESULTS SUMMARY .....	14

### LIST OF FIGURES

1-1 MAP OF CCND MONITOR LOCATIONS.....	7
1-2 CCND COMMUNITY MONITORING CO DATA (ONE-HOUR ROLLING AVERAGES) ....	17
1-3 CCND COMMUNITY MONITORING NO DATA (ONE-HOUR ROLLING AVERAGES).....	18
1-4 CCND COMMUNITY MONITORING NO <sub>2</sub> DATA (ONE-HOUR ROLLING AVERAGES) ...	19

CCND Community Monitoring  
2023 Q1

1-5 CCND COMMUNITY MONITORING SO<sub>2</sub> DATA (ONE-HOUR ROLLING AVERAGES)....20  
1-6A CCND COMMUNITY MONITORING H<sub>2</sub>S DATA (ONE-HOUR ROLLING AVERAGES)....21  
1-6B CCND COMMUNITY MONITORING H<sub>2</sub>S DATA (24-HOUR ROLLING AVERAGES) .....22  
1-7A CCND COMMUNITY MONITORING PM<sub>2.5</sub> DATA (ONE-HOUR BLOCK AVERAGES) .....23  
1-7B CCND COMMUNITY MONITORING PM<sub>2.5</sub> DATA (24-HOUR BLOCK AVERAGES).....24  
1-8 CCND COMMUNITY MONITORING VOC DATA (ONE-HOUR ROLLING AVERAGES).....25

## Executive Summary

In response to feedback received by Suncor Energy (U.S.A.) Inc. (Suncor) through community engagement conducted in the fall of 2020, Suncor voluntarily committed to developing a continuous, near real-time air monitoring program to gain insight into air quality for neighborhoods in the vicinity of the Suncor refinery in Commerce City, Colorado. Montrose Environmental Group - Air Quality Services, LLC (Montrose) was contracted by Suncor to deploy, operate, and maintain the network in the Commerce City and North Denver (CCND) neighborhoods. Air monitoring was accomplished through three separate technical approaches: (1) continuous, near real-time monitoring for the following analytes<sup>1</sup>: carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), nitrogen oxide or nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>2.5</sub>), and total volatile organic compounds (VOCs); (2) periodic collection and laboratory analysis for the presence of specific VOCs from 6-liter evacuated stainless steel (“Summa”) canisters; and (3) periodic real-time air monitoring throughout neighborhoods using a mobile monitoring van to detect the presence of specific VOCs. This report details approach number one, continuous near real-time air monitoring and a screening health risk analysis. Periodic collection and analysis of Summa canister air samples and mobile monitoring van data are presented in separate reports.

Continuous air monitoring sensors were operating at 10 locations across the CCND neighborhoods. The first quarter of 2023 air monitoring preliminary data was made available in near real-time at [ccnd-air.com](http://ccnd-air.com) from January 1 – March 31, 2023, and final data is presented in this report. The sensors used in this program integrate different technologies including a photoionization detector for VOCs; an electrochemical sensor for CO, NO, NO<sub>2</sub>, H<sub>2</sub>S, and SO<sub>2</sub>; laser scattering for PM<sub>2.5</sub>; and a sonic anemometer for wind speed and direction. All sensor monitoring was conducted in accordance with the Quality Assurance Project Plan (QAPP) available at [ccnd-air.com/documents](http://ccnd-air.com/documents).

Health scientists from CTEH, LLC (CTEH®) (a subsidiary company of Montrose Environmental Group) evaluated the air monitoring data and compared them to air quality standards, health-based reference values, and previously published regional data to determine if the measured air quality may have the potential for adverse effects on community health.

The results of this assessment indicate the following:

- The monitored analyte levels at each location were below their respective acute health-based reference levels, if available, or within the range of previously published regional data provided by the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD).
- It should be noted that the National Ambient Air Quality Standards (NAAQS) comparisons are used in the CCND Air Monitoring program for reference use only and may not be used to determine air quality compliance. This is because NAAQS compliance must be

---

<sup>1</sup> An “analyte” is a material that a measuring device is designed to detect and measure. It may be a chemical gas, an airborne particle, or other type of material.

determined through the use of regulatory-certified instrumentation and required calculation methodology further discussed in section 2.

## 1.0 INTRODUCTION

In response to feedback received by Suncor Energy (U.S.A.) Inc. (Suncor) through community engagement conducted in the fall of 2020, Suncor voluntarily committed to developing a continuous, near real-time air monitoring program to gain insight into air quality for neighborhoods in the vicinity of the Suncor refinery in Commerce City, Colorado. Montrose Environmental Group-Air Quality Services, LLC (Montrose) was contracted by Suncor to deploy, operate, and maintain the network in the Commerce City and North Denver (CCND) neighborhoods. Air monitoring was accomplished through three separate technical approaches: (1) continuous, near real-time monitoring for the following analytes: carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>2.5</sub>), and total volatile organic compounds (VOCs); (2) periodic collection and laboratory analysis for the presence of specific VOCs from Summa canisters; and (3) periodic real-time air monitoring throughout neighborhoods using a mobile monitoring van to detect presence of specific VOCs. An “analyte” is a material that a measuring device is designed to detect and measure. It may be a chemical gas, an airborne particle, or other type of material. This report details approach number one, the continuous, near real-time monitoring for the analytes listed. The Summa canister sampling and mobile monitoring van data are presented in separate reports. Air monitoring, sampling, and analysis from approaches (1) and (2) were conducted in accordance with the Quality Assurance Project Plan (QAPP) that can be found online at <https://www.ccnd-air.com/Documents/>.

### 1.1 Air Monitoring Site Description

Continuous air monitoring sensors were installed at ten locations across CCND neighborhoods within a three-mile radius of refinery operations in July 2021 (CM1-CM8). Two additional monitoring sensors were installed in December 2021 (CM9) and March 2022 (CM10). The monitor locations are shown in Figure 1-1 and described in Table 1-1; and were selected based on the following criteria:

- Historical wind pattern data
- Proximity to the refinery and non-refinery sources
- Existing infrastructure, as well as site access and safety
- Community feedback

**FIGURE 1-1  
MAP OF CCND MONITOR LOCATIONS**



**TABLE 1-1  
CCND MONITORS AND SUMMA CANISTER SAMPLING LOCATIONS**

<b>Location ID</b>	<b>Secondary ID</b>	<b>GPS Coordinates</b>	<b>Distance from Refinery Center (miles)</b>	<b>Cross Streets</b>
CM1	Rose Hill Elementary School	39.80164, -104.90882	2.0	E. 58 <sup>th</sup> Ave. & Oneida St., Commerce City
CM2	Suncor Refinery Business Center	39.79630, -104.95727	0.70	Brighton Blvd. & York St., Commerce City
CM3	Adams City High School	39.82736, -104.90193	2.9	E. 72 <sup>nd</sup> Ave. & Quebec Pkwy, Commerce City
CM4	Adams City Middle School	39.82893, -104.93499	1.9	Birch St. & E. 72 <sup>nd</sup> Ave., Commerce City
CM5	Central Elementary School	39.81457, -104.91928	1.7	Holly St. & E. 64 <sup>th</sup> Ave., Commerce City
CM6	Focus Points Family Resource Center	39.78436, -104.95663	1.4	Columbine St. & 48 <sup>th</sup> Ave., Denver
CM7	Kearney Middle School	39.80888, -104.91545	1.7	E 62 <sup>nd</sup> Ave. & Kearney St., Commerce City
CM8	Monroe	39.81560, -104.94503	0.85	Monroe St. & E 64 <sup>th</sup> Ave., Denver
CM9	48 <sup>th</sup> and Race	39.78455, -104.96264	1.7	East 48 <sup>th</sup> Ave. & Race St., Denver
CM10	Alsup Elementary School	39.820268, -104.936616	1.2	East 68 <sup>th</sup> Ave. & Birch St., Commerce City



## 2.0 METHODS

### 2.1 Continuous Monitoring

The sensors used in the CCND network were manufactured by Lunar Outpost (Canary-S sensor), a Colorado-based company, and AQMesh (Pod), a United Kingdom-based company. The near-Federal Equivalency Method (FEM) AQM65 monitors used for quality assurance of the network were manufactured by Aeroqual, a New Zealand-based company. Each sensor is solar powered and transmits data to the data platform via Long Term Evolution (LTE) cell technology. The monitoring in the community is being performed using a variety of technology, as described in Table 1-2.

**TABLE 1-2  
CCND MONITORING TECHNOLOGY**

<b>Air Pollutant/Parameter Category</b>	<b>Principle of Operation</b>	<b>Sensor Manufacturer</b>
Total VOC	Photoionization Detector	Lunar Outpost
SO <sub>2</sub>	Electrochemical Sensor	AQMesh
CO	Electrochemical Sensor	AQMesh
NO	Electrochemical Sensor	AQMesh
NO <sub>2</sub>	Electrochemical Sensor	AQMesh
H <sub>2</sub> S	Electrochemical Sensor	AQMesh
PM <sub>2.5</sub>	Laser Scattering	Lunar Outpost
Wind Speed, Wind Direction	Sonic Anemometer	Lunar Outpost
Temperature, Relative Humidity, Barometric Pressure	Solid State	Lunar Outpost

The sensors monitor the ambient air by allowing it to passively enter each sensor's exterior housing via small holes and pass over the surface of the sensor. The AQM65 monitors the ambient air via a pump that pulls the sample into the individual analyte specific gas modules for analysis. Each device used in this project is solar-powered and transmits data via cellular communication.

The Photoionization Detector (PID) sensors used to measure VOCs contain a lamp that produces photons that carry enough energy to break molecules into ions. The PID responds to molecules that have an ionization energy at or below the energy of the lamp; the PID used on this project employs a 10.6 electron-volt lamp. The produced ions then generate an electrical current that is measured as the output of the detector. PIDs are known to drift with ambient temperature and humidity variation. The PIDs used in this program mitigate the humidity issue by having a hydrophobic filter installed between the lamp and the ambient air. This deters water molecules

from entering the ion-producing chamber and absorbing radiation. The PIDs are also heated slightly above ambient temperature to improve the stability of the detector.

Electrochemical sensors measure the concentration of a specific gas (SO<sub>2</sub>, CO, NO, NO<sub>2</sub>, and H<sub>2</sub>S) within an external circuit via oxidation or reduction reactions. These reactions generate the positive or negative current flow through the external circuit. An electrochemical sensor is made up of a working, counter, and reference electrode. All these components sit inside of a sensor housing along with a liquid electrolyte that is specific to the compound of interest. Temperature and relative humidity are known to affect the electrochemical sensors being used and could influence data quality. The AQMesh Pods collect sensor temperature and ambient relative humidity data to mitigate the impact of these interferences via algorithms that were developed during extensive [global comparisons with reference data](#). AQMesh Pod non-zero readings that are below the instrument's detection limit are artifacts of AQMesh's algorithm. Extreme temperature and humidity conditions can cause the liquid electrolyte to dry up and cause erratic readings on the monitors. The AQMesh Pod monitors conditions that can cause these erratic readings and automatically invalidates this data to improve the overall quality of the data the sensors are reporting.

Additionally, electrochemical sensors have known cross-sensitivity to other compounds. For example, ozone causes a response in the NO<sub>2</sub> sensor. This issue is mitigated by using an ozone filter on the face of the NO<sub>2</sub> sensor. Similarly, the SO<sub>2</sub> sensor can have a response caused by the presence of H<sub>2</sub>S. Again, the SO<sub>2</sub> sensor has a built-in filter to mitigate the H<sub>2</sub>S interference. The SO<sub>2</sub> sensor has additional interference from NO<sub>2</sub>. The AQMesh data processing algorithms incorporate any data correction for these interferences.

The sensor data are intended to be used for informational purposes only and cannot be used for official compliance determinations. The accuracy of sensors used in the program are not as high as certified ambient air monitoring equipment used by federal and local officials for NAAQS compliance monitoring. The sensors' detection limits and accuracy can be found in the QAPP online at <https://www.ccnd-air.com/Documents/>. State regulatory compliance data can be found on the CDPHE air quality website at <https://www.colorado.gov/airquality>.

The sampled particles are measured by the physical principle of light scattering. Each single particle is illuminated by a defined laser light and each scattering signal is detected at an angle of 90° by a photo diode. In accordance with the Mie theory, each measured pulse height is directly proportional to the particle size whereas each pulse is classified in an electronic register of 32 different size channels.

Sensors like the Lunar Outpost Canary-S and AQMesh Pod are also known to produce data that is noisier (lower signal-to-noise ratio) than traditional regulatory reference method quality ambient air monitoring equipment. To mitigate this issue, the data were averaged at one or 24-hours to improve the signal-to-noise of the instrument readings.

All sampling and quality assurance procedures were performed by Montrose.

## 2.2 Assessment of Community Health Implications

Health scientists from CTEH, LLC (CTEH®) (a subsidiary company of Montrose) evaluated the air monitoring data collected by Montrose from January 1, 2023, through March 31, 2023. Results were compared to various standards, health-based reference levels, and previously published

regional data to determine if the measured air quality may have the potential for adverse health effects within the surrounding communities.

The analytes CO, NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>2.5</sub> are all listed by the United States Environmental Protection Agency (USEPA) as “criteria air pollutants”. These analytes were identified in the U.S. federal Clean Air Act as airborne pollutants that, at certain levels, may adversely impact public health and welfare and for which NAAQS would be established and updated based on the periodically reviewed scientific data associating criteria pollutant levels and public health impacts. Unlike chemical-specific health reference values, the NAAQS provide air quality standards designed to protect public health at the regional level.

The determination that a criteria pollutant is at a level legally required to be mitigated comes from evaluation of one year (CO) to three years (NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>2.5</sub>) of air monitoring data<sup>2</sup> collected by regulatory-grade instrumentation. If the maximum or average analyte levels in this report are higher than their respective NAAQS, it does not indicate a violation of the NAAQS or that adverse health effects are likely. Any measurement of a criteria air pollutant over its respective NAAQS reference concentration must be evaluated in the context of one to three years of data previously collected. For example, a 1-hour average value above the NO<sub>2</sub> standard concentration would not constitute an exceedance of the NO<sub>2</sub> NAAQS. To be a NAAQS exceedance, a measurement must be made by a regulatory grade instrument and compared to one-hour daily maximum concentration measurements, averaged over three years, to determine whether it is part of the 98<sup>th</sup> percentile or higher. However, the data reported herein may be used to determine trends in criteria pollutant levels in the CCND communities.

H<sub>2</sub>S and NO are not criteria air pollutants but were selected to be monitored because of the potential to produce reactive nitrogen compounds in the air (NO), or because of presence in some grades of crude oil and its refined products (H<sub>2</sub>S). Although NO does not have a health-based reference value, average and maximum NO levels for the Front Range region have been previously measured and reported by the CDPHE Air Pollution Control Division (APCD)<sup>3</sup>. The maximum and average NO levels measured by Montrose from January 1 to March 31, 2023 were compared to the regional values reported by APCD. The health reference values for H<sub>2</sub>S were developed by the Agency for Toxic Substances and Disease Registry (ATSDR)<sup>4</sup>. The ATSDR acute health-based reference levels (one day to two weeks of continuous exposure) is a health reference value below which continuous exposure is likely to be without risk of developing adverse health effects, even in sensitive sub-populations. Maximum one-hour rolling average H<sub>2</sub>S levels recorded in each CCND neighborhood were compared to an ATSDR acute-health-based reference level.

Finally, the USEPA has established values for use in emergency situations, termed Acute Exposure Guideline Levels (AEGs). Unlike health-based reference levels that can be thousands of times below exposure levels where adverse effects are observed, AEGs values are levels at which different acute adverse health effects may be anticipated to occur. According to USEPA, “AEG-1 represent exposure levels that could produce mild and progressively increasing but transient and non-disabling odor, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentration above each AEG, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each

---

<sup>2</sup> USEPA NAAQS Table, available online at <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

<sup>3</sup> CO APCD 2020 Air Quality Data Report, available online at [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=2020AnnualDataReport.pdf](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020AnnualDataReport.pdf)

<sup>4</sup> ATSDR MRL List available online at <https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx>

corresponding AEGL [i.e., AEGL-2 or AEGL-3].” The AEGL-1 60-minute value, if available for the applicable compound, was also used for comparison purposes because it is more precautionary (than AEGL-2 or AEGL-3) as the AEGL-1 level reflects potential health impacts that are reversible upon cessation of exposure. The AEGL-1 60-minute values for H<sub>2</sub>S (510 ppb), NO<sub>2</sub> (500 ppb), and SO<sub>2</sub> (200 ppb) were also listed for comparison purposes. The USEPA did not derive an AEGL-1 value for CO, therefore an AEGL-2 (83 ppm) was selected.

### 2.3 Summary of Downtime or Equipment Malfunction

Data recovery is a percentage of the number of data points collected divided by the expected number of data points. For example, if a data point is expected every five minutes, 12 data points would be expected over a one-hour period. If only 11 data points were received, the data recovery for that hour would be 92%. The data recovery during the reporting period meets the QAPP targets and are presented in Table 1-3.

**TABLE 1-3  
CCND MONITORING DATA RECOVERY**

<b>Location ID</b>	<b>AQMesh (excludes periods of adverse atmospheric conditions)</b>	<b>AQMesh (includes periods of adverse atmospheric conditions)</b>	<b>Lunar Outpost</b>
CM1	99.6%	99.6%	99.9%
CM2	99.6%	99.6%	89.7%
CM3	99.6%	99.6%	99.8%
CM4	99.6%	99.6%	99.9%
CM5	99.6%	99.6%	99.9%
CM6	99.8%	99.8%	99.9%
CM7	99.5%	99.5%	99.6%
CM8	99.6%	99.6%	98.5%
CM9	99.8%	99.8%	99.8%
CM10	99.2%	99.2%	99.8%

Data recovery may be below 100% for several reasons, including instrument malfunction, instrument communication issues, monitor downtime when performing quality assurance procedures, etc. In alignment with the QAPP, data recovery does not include downtime when adverse atmospheric conditions such as extreme humidity, extreme temperature, and other conditions can affect a monitor’s ability to provide reliable data.

The data recovery between January 1 and March 31, 2023, for the Lunar Outpost monitor at location CM2 was lower than the >95% data recovery goal outlined in the QAPP. The data

recovery was lower due to an instrument electrical shortage caused by a snow drift on the roof of the Refinery Business Center that led to snow entering the instrument through holes that allow ambient air to enter the instrument for measurement. Montrose attempted to replace the monitor with a spare unit but it was discovered that the spare unit was a newer model which was not compatible with the meteorological station or the summa canister triggering system. Multiple attempts were made by Montrose and the manufacturer to find a stopgap to this issue while suitable replacement for the original unit was found. During this time, the original unit was undergoing inspection at Lunar Outpost. After approximately nine days, Montrose was able to procure and deploy a similar model Lunar Outpost monitor to the original unit. It was determined that the manufacturer no longer supports that original model of the monitor. To mitigate similar issues in the future, Montrose will be replacing all of the network Lunar Outpost monitors with SENSIT RAMP monitors during Q2 2023, refer to Section 5.0 for more details.

The AQMesh Pod's internal quality assurance and procedures automatically invalidates this data to improve the overall quality of the data the sensors are reporting.

### **3.0 RESULTS**

#### **3.1 Results Summary**

The one-hour rolling average results for CO, NO, NO<sub>2</sub>, PM<sub>2.5</sub>, H<sub>2</sub>S, SO<sub>2</sub>, and VOCs during this reporting period can be found in Table 1-4 and Figures 1-2 through 1-8. The gaseous (CO, NO, NO<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub>, and VOC) data is reported on a one-hour rolling average updated every 5 minutes. The PM<sub>2.5</sub> data presented on the website is a one-hour block average to align with the other PM<sub>2.5</sub> sensor-based monitoring programs around the local community. The 24-hour block average for PM<sub>2.5</sub> and rolling average for H<sub>2</sub>S are also reported. Values reported as zero do not necessarily mean that the analyte is not present, but instead indicates that the analytes' concentration, if present, is below the detectable level of the instrument.

This evaluation includes screening values from the USEPA NAAQS, EPA AEGL, and ATSDR Minimal Risk Level (MRL). The Clean Air Act requires USEPA to set NAAQS for criteria air pollutants. AEGLs are used by emergency planners and responders worldwide as guidance for emergency response situations. Health reference levels, such as MRLs provided by the ATSDR, are intended to serve as a screening tool to help public health professionals determine where further evaluation may be needed. As explained above in Section 2.2, if the maximum or average analyte levels in this report are higher than their respective NAAQS reference level, it does not indicate an exceedance of the NAAQS or that adverse health effects are likely. Table 1-4 and Figures 1-2 to 1-8 indicate readings for the monitoring period relative to the NAAQS and MRLs (if applicable).

**TABLE 1-4  
CCND MONITORS RESULTS SUMMARY**

Analyte	Range Across Network <sup>5</sup>	NAAQS Reference Values	Health-based Reference Value (Source)
CO	<0.1 – 1.8 ppm (1-hour average)	<b>35 ppm</b> (1-hour average not to be exceeded more than one per year)	<b>83 ppm</b> (1-hour USEPA AEGL-2)
NO	<10 - 217 ppb (1-hour average)	NA	NA
NO <sub>2</sub>	<10 - 80 ppb (1-hour average)	<b>100 ppb</b> (98 <sup>th</sup> percentile of 1-hour daily maximum, averaged over 3 years)	<b>500 ppb</b> (1-hour USEPA AEGL-1)
SO <sub>2</sub>	<30 - 64 ppb (1-hour average)	<b>75 ppb</b> (99 <sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years)	<b>200 ppb</b> (1-hour USEPA AEGL-1)
H <sub>2</sub> S	<30 ppb (1-hour and 24-hour average)	NA	<b>70 ppb</b> (acute <sup>6</sup> ATSDR MRL) <b>510 ppb</b> (1-hour USEPA AEGL-1)
PM <sub>2.5</sub>	<3 - 17 µg/m <sup>3</sup> (24-hour average)	<b>35 µg/m<sup>3</sup></b> (98 <sup>th</sup> percentile of 24-hour daily average concentrations, averaged over 3 years)	NA
Total VOC	<0.3 – 0.3 ppm (1-hour average)	NA	NA

<sup>5</sup> The "<" symbol indicates that the recorded concentration was less than the instrument's detection limit

<sup>6</sup> An acute exposure is defined by ATSDR as 1-14 days

### 3.2 Carbon Monoxide (CO)

Figure 1-2 shows the one-hour rolling averages of CO from January 1, 2023, through March 31, 2023. The USEPA NAAQS for CO is 35 ppm as a one-hour average not to be exceeded twice in one year. Figure 1-2 shows that all the measured one-hour average CO values in all CCND neighborhoods were more than 19-times lower (maximum 1-hour average: 1.8 ppm) than the CO NAAQS reference level. Further, the maximum one-hour measured CO values in the CCND neighborhoods were more than 46-times lower than the one-hour USEPA AEGL-2 of 83 ppm.

### 3.3 Nitric Oxide (NO)

Figure 1-3 shows the one-hour rolling averages of NO from January 1, 2023, through March 31, 2023. There are no established USEPA NAAQS, health-based reference level, or USEPA AEGL-1 value for NO since NO demonstrates low toxicity and is naturally occurring in the human body<sup>7</sup>. Thus, measured NO levels were compared to NO levels published by APCD in 2021<sup>8</sup>. The annual average NO levels reported by APCD for Denver (four locations), Jefferson County, and Weld County ranged from 0.7 to 30 ppb, (maximum levels ranged from 32 to 386 ppb), while the maximum one-hour rolling average NO values by site measured by Montrose in the CCND neighborhoods concentration ranged from 106 - 217 ppb.

### 3.4 Nitrogen Dioxide (NO<sub>2</sub>)

Figure 1-4 shows the one-hour rolling averages of NO<sub>2</sub> from January 1, 2023, through March 31, 2023. The USEPA NAAQS for NO<sub>2</sub> is 100 ppb as the 98<sup>th</sup> percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-4 shows that all measured 1-hour average NO<sub>2</sub> values in all CCND neighborhoods (maximum 1-hour average: 80 ppb) were at least 20% lower than the NO<sub>2</sub> NAAQS concentration. Thus, NO<sub>2</sub> levels such as those measured in the CCND neighborhoods would not contribute to an annual exceedance of the NAAQS. Further, the maximum measured one-hour average NO<sub>2</sub> concentration across all the CCND neighborhoods was at least six times lower than the one-hour USEPA AEGL-1 for NO<sub>2</sub> of 500 ppb.

### 3.5 Sulfur Dioxide (SO<sub>2</sub>)

Figure 1-5 shows the one-hour rolling averages of SO<sub>2</sub> from January 1, 2023, through March 31, 2023. The USEPA NAAQS for SO<sub>2</sub> is 75 ppb as 99<sup>th</sup> percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-5 shows a maximum one-hour average SO<sub>2</sub> value of 64 ppb, approximately 15% lower than the NAAQS concentration. Further, the maximum measured one-hour average SO<sub>2</sub> concentrations measured across all the CCND neighborhoods are more than 3-times lower than the one-hour USEPA AEGL-1 for SO<sub>2</sub> of 200 ppb.

### 3.6 Hydrogen Sulfide (H<sub>2</sub>S)

Figures 1-6A and 1-6B show the one-hour and 24-hour rolling averages of H<sub>2</sub>S, respectively, from January 1, 2023, through March 31, 2023. The maximum 24-hour average was less than the instrument detection limit of 30 ppb from all CCND neighborhoods and is below the ATSDR acute-duration MRL of 70 ppb, thus, it is unlikely that H<sub>2</sub>S levels measured in the CCND neighborhoods would result in an increased risk of adverse acute health effects. Further, the maximum measured

<sup>7</sup> [https://www.epa.gov/sites/default/files/2014-11/documents/nitrogen\\_oxides\\_volume\\_11.pdf](https://www.epa.gov/sites/default/files/2014-11/documents/nitrogen_oxides_volume_11.pdf)

<sup>8</sup> Colorado Air Pollution Control Division. 2021 Air Quality Data Report, dated November 4, 2022. Available online at: [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=2021AnnualDataReport.pdf](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2021AnnualDataReport.pdf)

one-hour average H<sub>2</sub>S values (below the 30 ppb detection limit) in the CCND neighborhoods are more than 17-times lower than the one-hour USEPA AEGL-1 for H<sub>2</sub>S of 510 ppb.

### 3.7 Particulate Matter (PM<sub>2.5</sub>)

Figures 1-7A and 1-7B show the one-hour and 24-hour block averages of PM<sub>2.5</sub>, respectively, from January 1, 2023, through March 31, 2023. The USEPA NAAQS for PM<sub>2.5</sub> is 35 µg/m<sup>3</sup> as 98<sup>th</sup> percentile of 24-hour daily (block) average concentrations, averaged over 3 years. The maximum measured one-hour average of PM<sub>2.5</sub> (30 ug/m<sup>3</sup>) and the maximum measured 24-hour average (17 ug/m<sup>3</sup>) were below the NAAQS reference level.

### 3.8 Total Volatile Organic Compounds (VOC)

Figure 1-8 shows the one-hour rolling averages of total VOCs from January 1, 2023, through March 31, 2023. The measured maximum one-hour average across this reporting period was 0.3 ppm. There are no NAAQS or health-based reference values for total VOCs because this measurement may be made of one to thousands of different chemical compounds having various thresholds of toxic effects.

VOC sensor-triggered samples were collected automatically when instantaneous total VOCs were detected at an airborne concentration of 1 part per million (ppm) or higher for one minute or longer. During the first quarter of 2023, total VOC levels went above 1 ppm once, which triggered the capture of one air sample. The results of the sensor-triggered events and health risk evaluations are presented in separate reports found at [ccnd-air.com/Documents](https://ccnd-air.com/Documents).

## 4.0 CONCLUSIONS

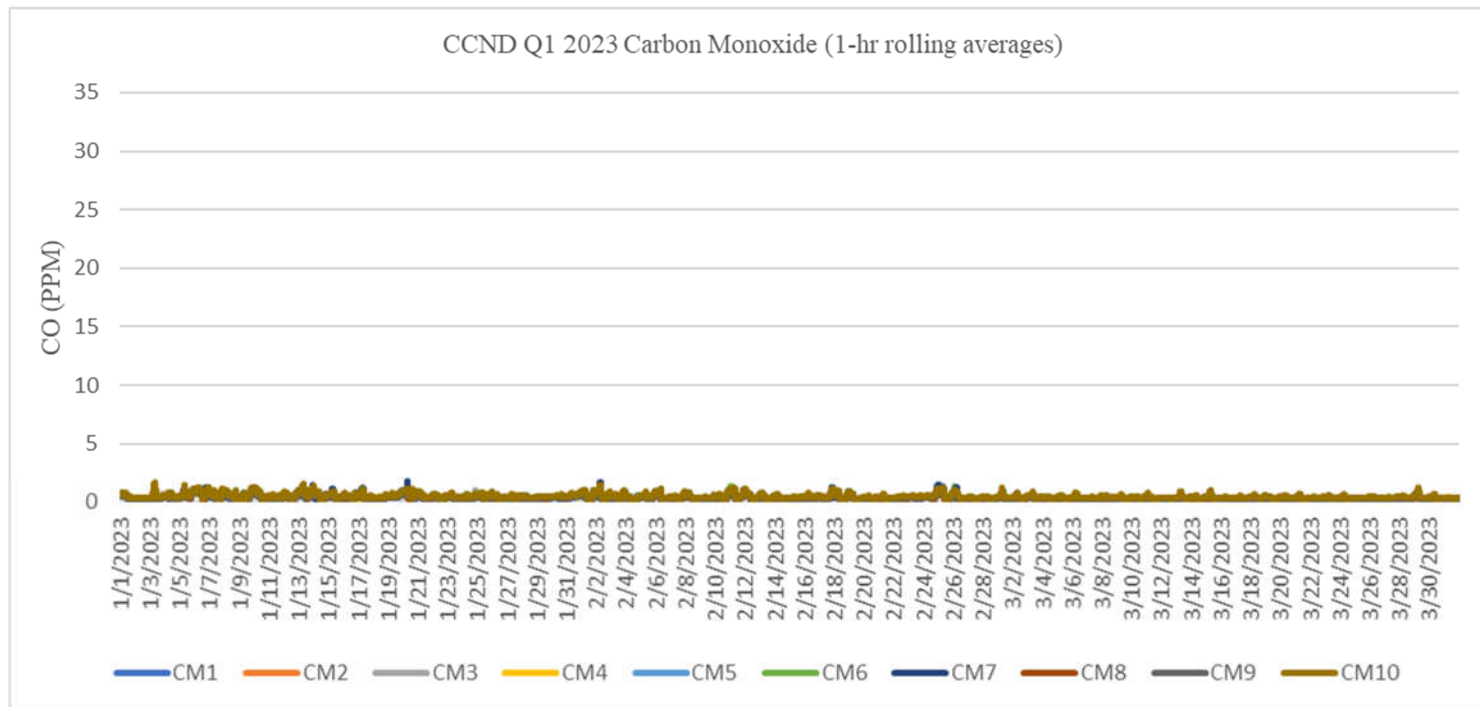
Continuous air monitoring sensors were operating at ten locations across the CCND neighborhoods during the monitoring period. The air monitoring data from January-March 2023 was compared to air quality standards, health-based reference values, and previously published regional data to determine if the measured air quality may have the potential for adverse effects on community health.

The results of this assessment indicate the following:

- The monitored analyte levels at each location were below their respective acute health-based reference levels, if available, or within the range of previously published regional data provided by the CDPHE APCD.
- It should be noted that the NAAQS comparisons are used in the CCND Air Monitoring program for reference use only and may not be used to determine air quality compliance. This is because NAAQS compliance must be determined through the use of regulatory certified instrumentation and required calculation methodology further discussed in section 2 of this report.

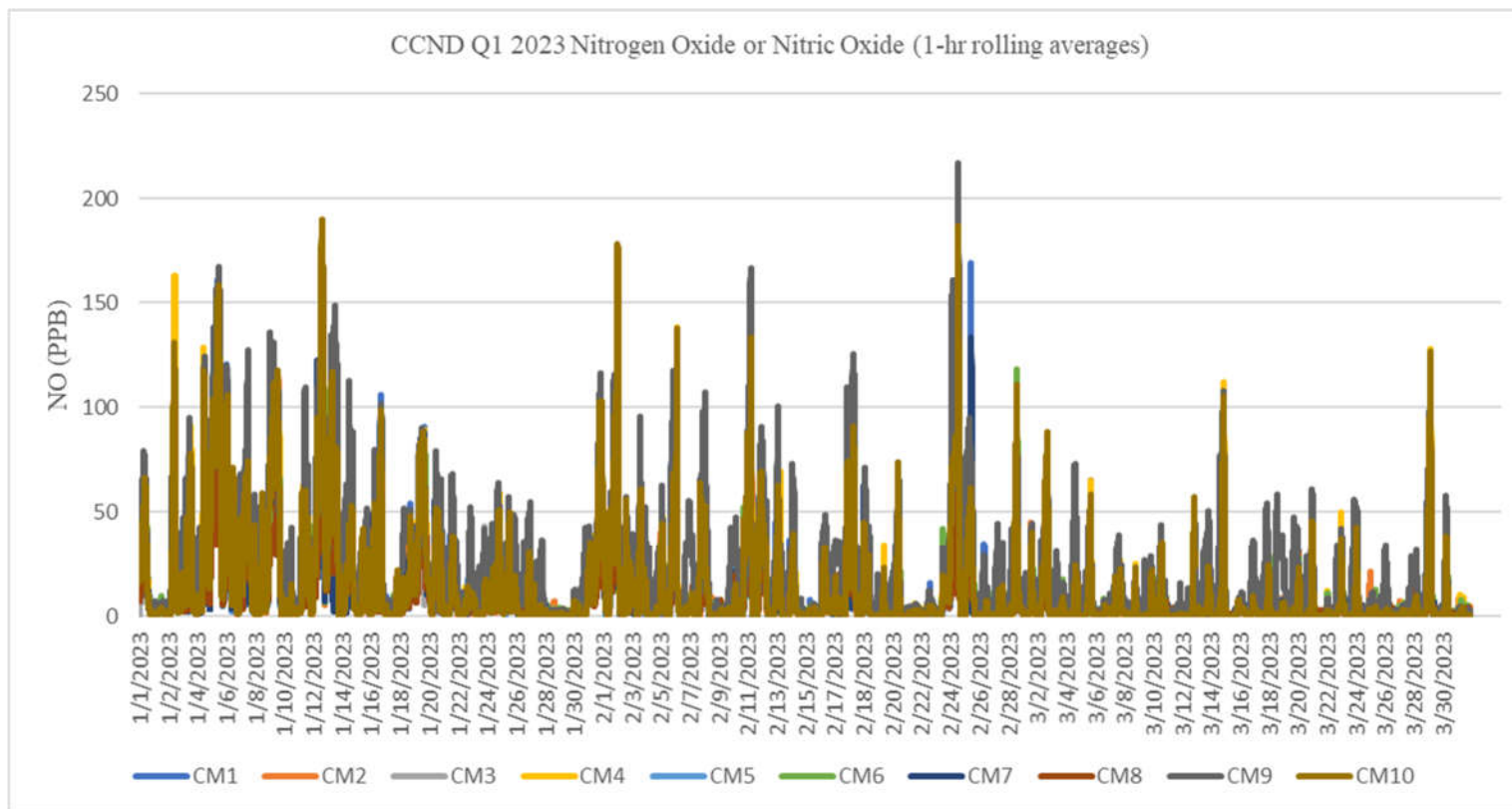


**FIGURE 1-2**  
**CCND COMMUNITY MONITORING CARBON MONOXIDE (CO) DATA<sup>9</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



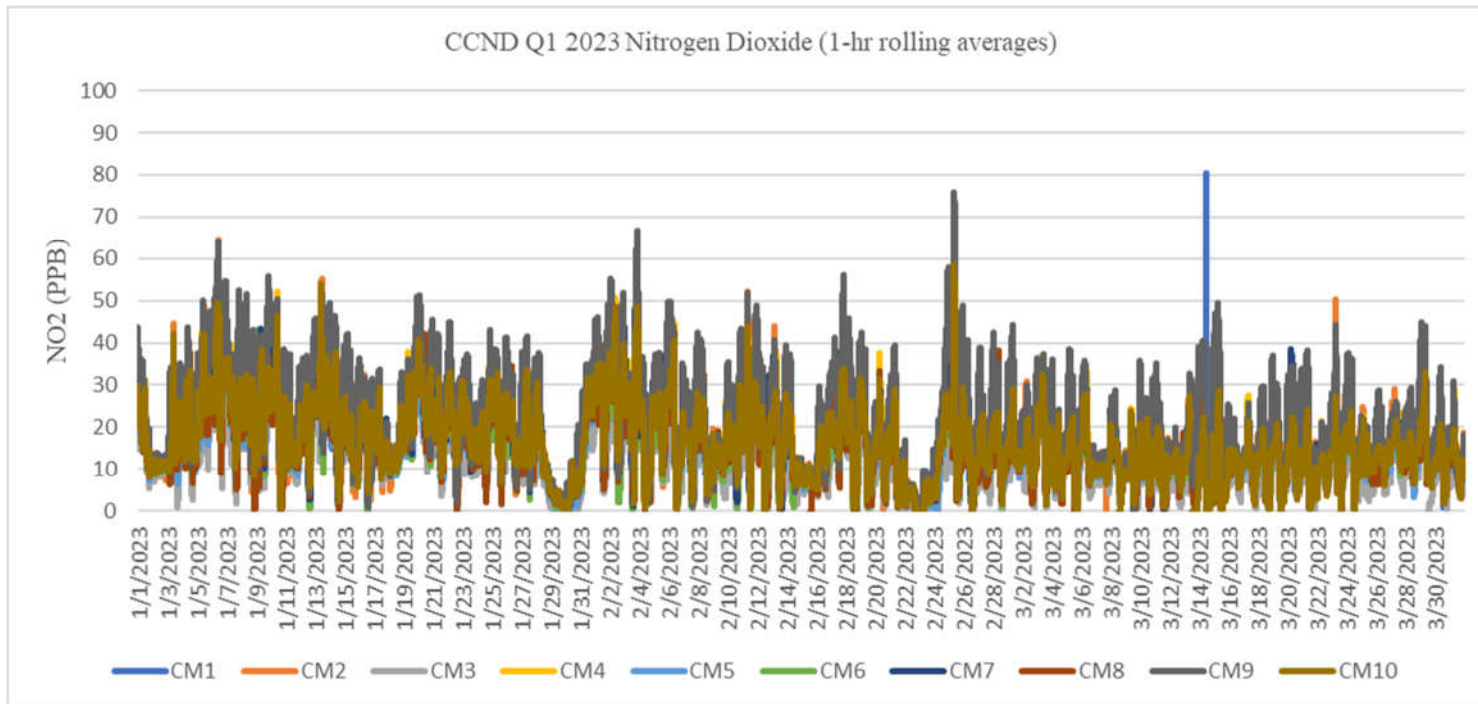
<sup>9</sup> The AQMesh Pod's detection limit for carbon monoxide is 0.1 ppm.

**FIGURE 1-3**  
**CCND COMMUNITY MONITORING NITRIC OXIDE (NO) DATA<sup>10</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



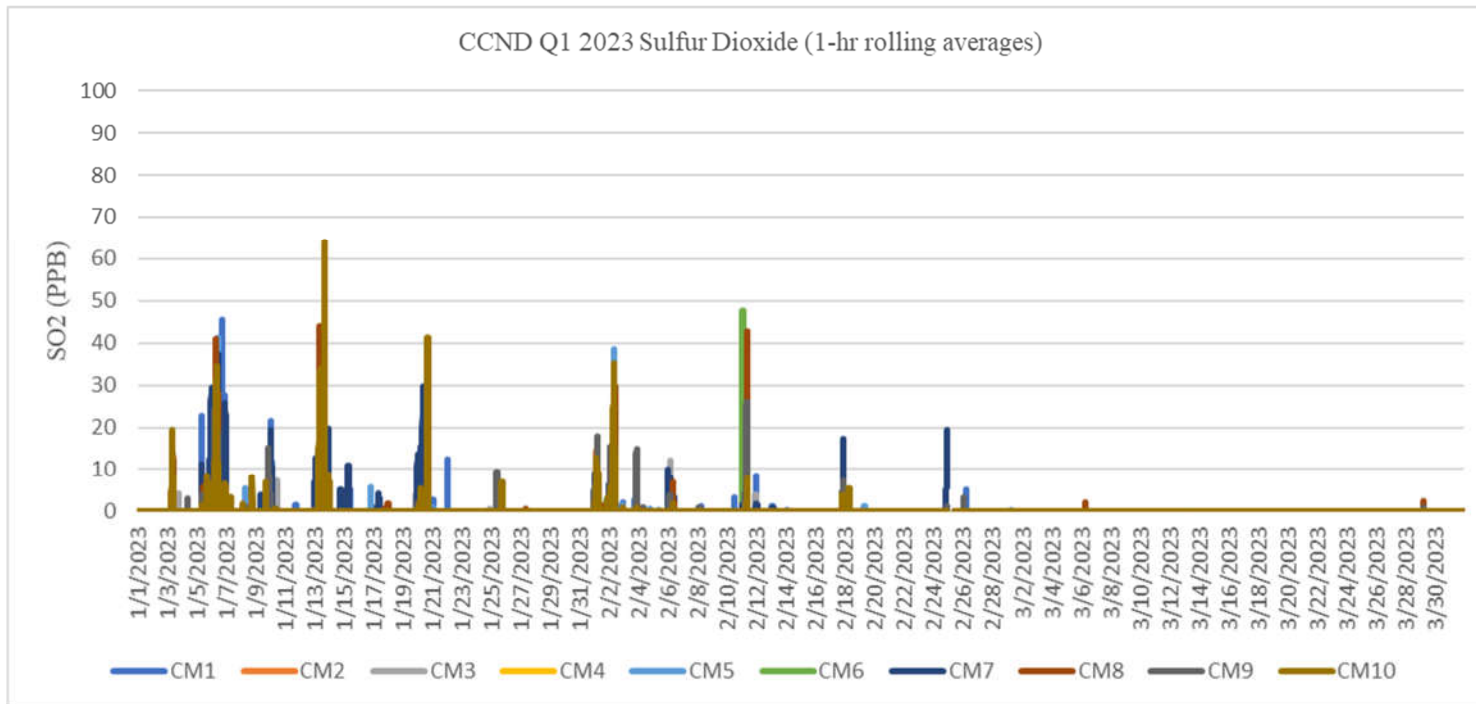
<sup>10</sup> The AQMesh Pod's detection limit for nitrogen oxide or nitric oxide is 10 ppb.

**FIGURE 1-4**  
**CCND COMMUNITY MONITORING NITROGEN DIOXIDE (NO<sub>2</sub>) DATA<sup>11</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



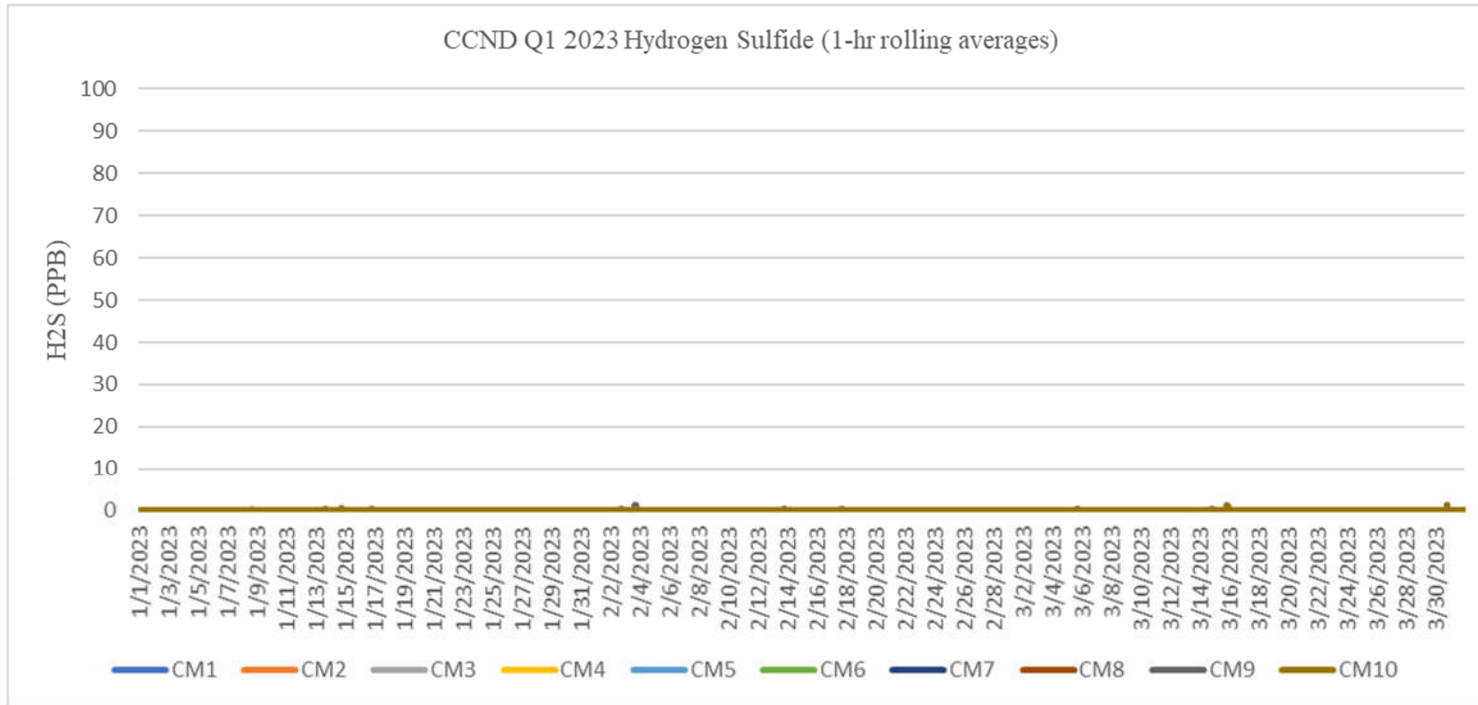
<sup>11</sup> The AQMesh Pod's detection limit for nitrogen dioxide is 10 ppb.

**FIGURE 1-5**  
**CCND COMMUNITY MONITORING SULFUR DIOXIDE (SO<sub>2</sub>) DATA<sup>12</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



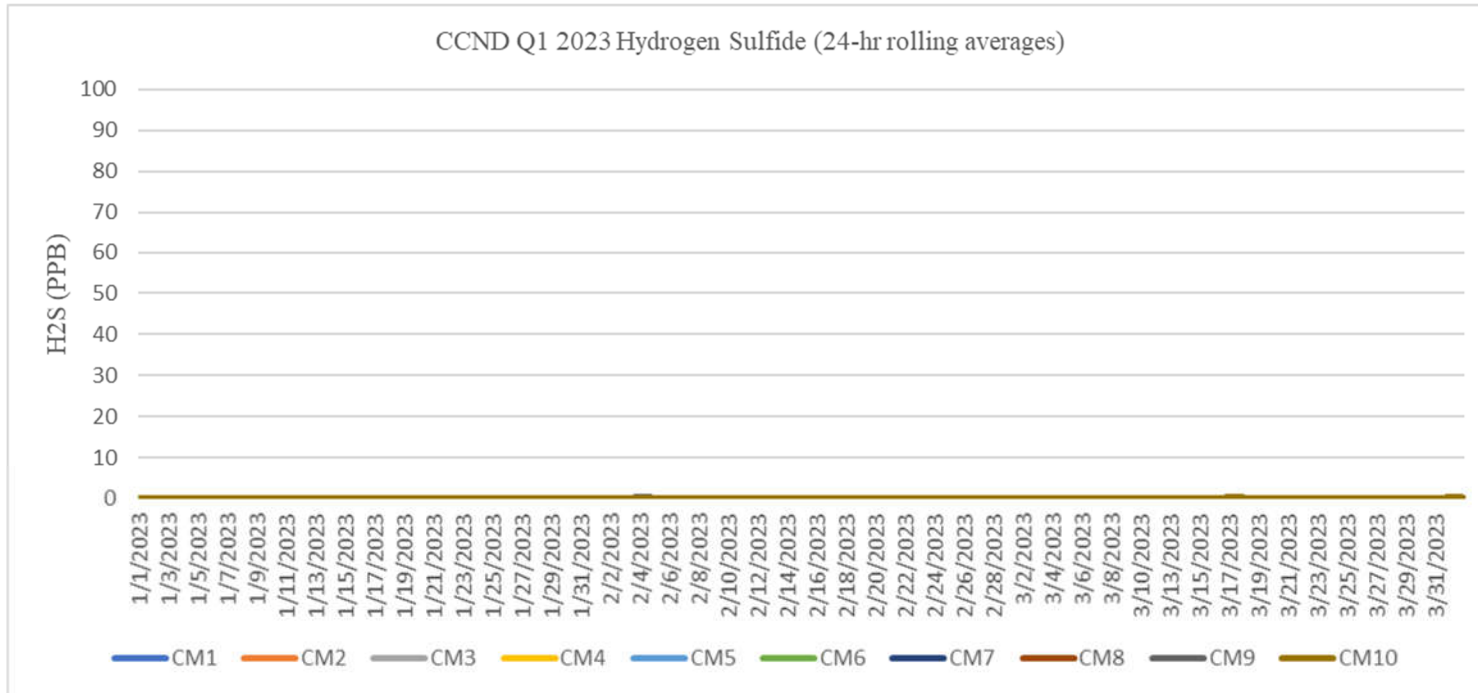
<sup>12</sup> The AQMesh Pod's detection limit for sulfur dioxide is 30 ppb.

**FIGURE 1-6A**  
**CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H<sub>2</sub>S) DATA<sup>13</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



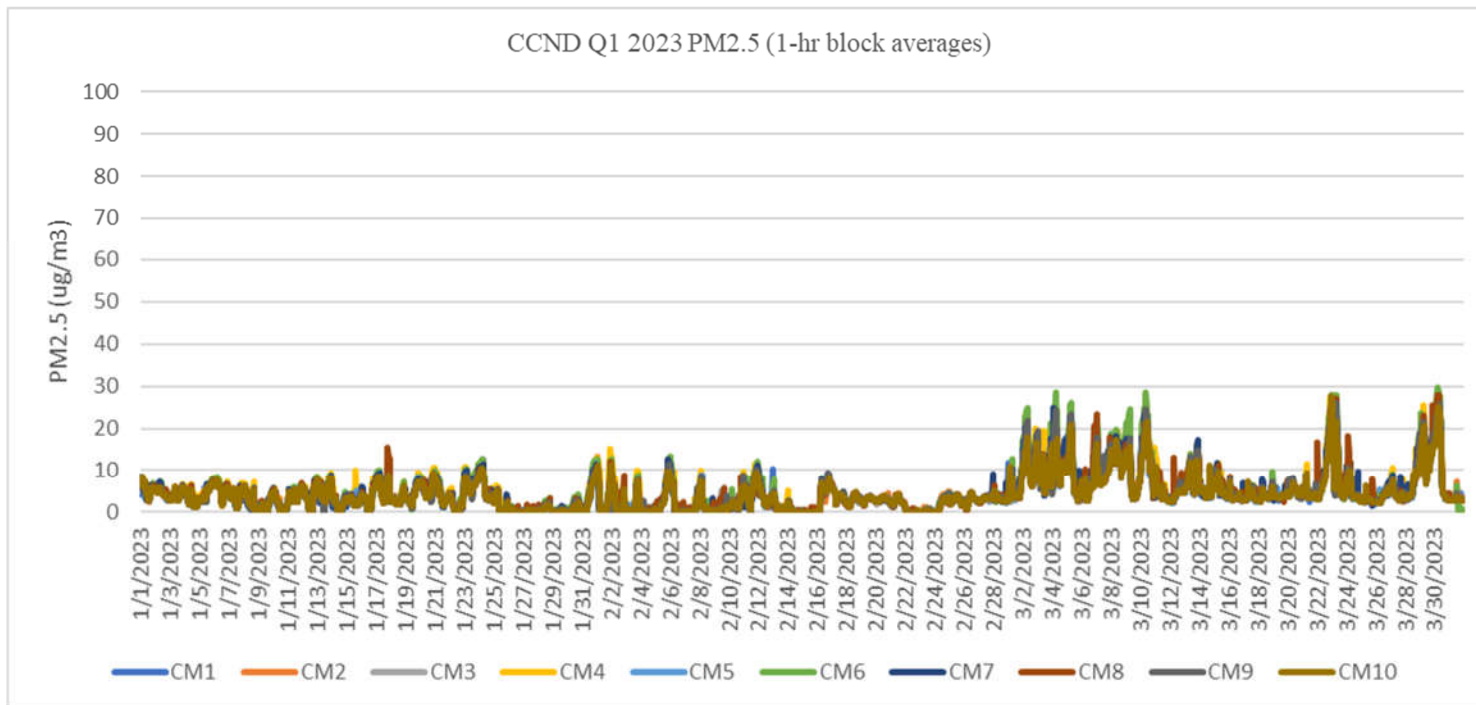
<sup>13</sup> The AQMesh Pod's detection limit for hydrogen sulfide is 30 ppb.

**FIGURE 1-6B**  
**CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H<sub>2</sub>S) DATA<sup>14</sup>**  
**(24-HOUR ROLLING AVERAGES)**



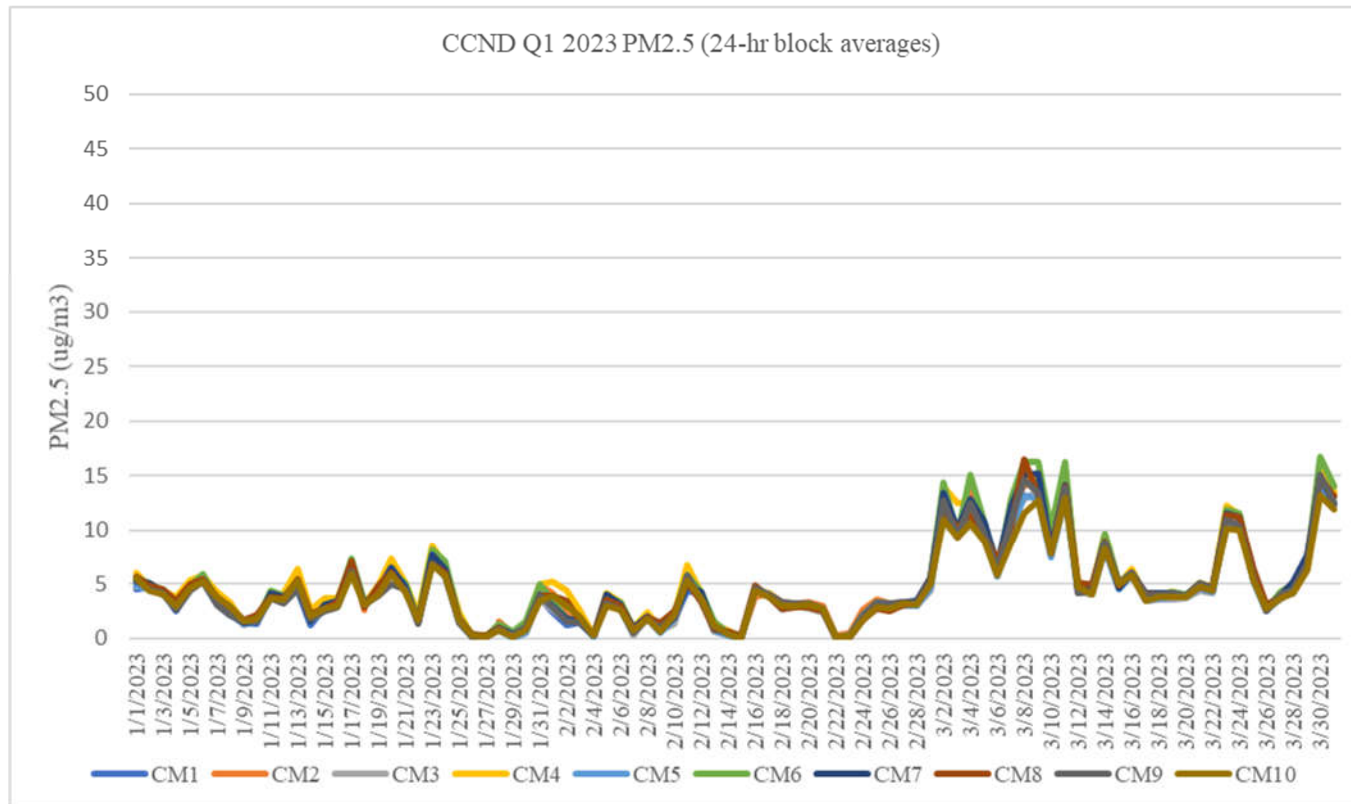
<sup>14</sup> The AQMesh Pod's detection limit for hydrogen sulfide is 30 ppb.

**FIGURE 1-7A**  
**CCND COMMUNITY MONITORING PM<sub>2.5</sub> DATA<sup>15</sup>**  
**(ONE-HOUR BLOCK AVERAGES)**



<sup>15</sup> The Lunar Outpost Canary-S's detection limit for PM<sub>2.5</sub> is 3 µg/m<sup>3</sup>.

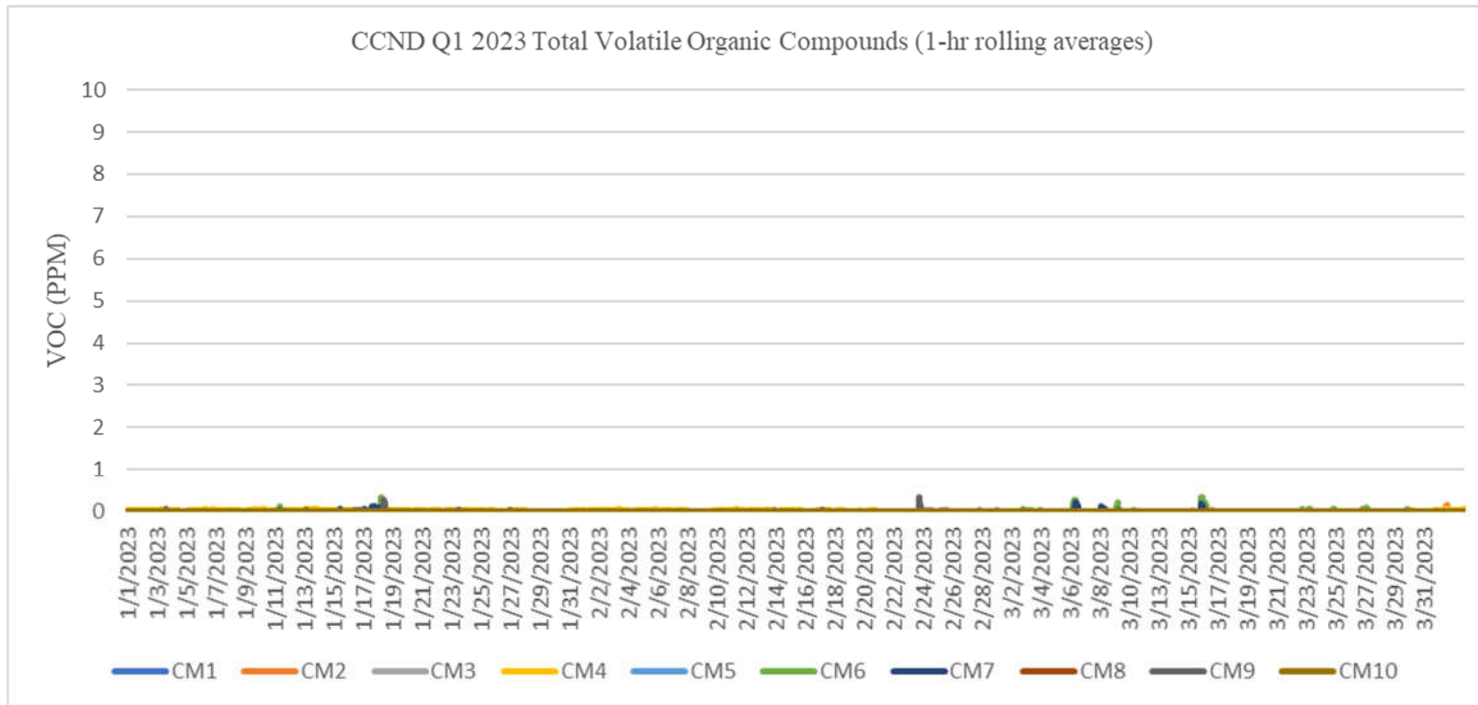
**FIGURE 1-7B**  
**CCND COMMUNITY MONITORING PM<sub>2.5</sub> DATA<sup>16</sup>**  
**(24-HOUR BLOCK AVERAGES)**



<sup>16</sup> The Lunar Outpost Canary-S's detection limit for PM<sub>2.5</sub> is 3 µg/m<sup>3</sup>.



**FIGURE 1-8**  
**CCND COMMUNITY MONITORING VOC DATA<sup>17</sup>**  
**(ONE-HOUR ROLLING AVERAGES)**



<sup>17</sup> The Lunar Outpost Canary-S's detection limit for VOC is 0.3 ppm.

## 5.0 PROGRAM CHANGES

1. On January 27, 2023, the Lunar Outpost Canary-S monitor at location CM2 was replaced due to instrument damage, as described in Section 2.3.
2. As previously described in the Q3 2022 Sensor Report, Montrose developed a deployment plan to switch the network over from AQMesh to ENVEA devices. During the pre-deployment quality assurance inspections the ENVEA devices failed the monitor uptime requirements described in the programs QAPP due to an unresolvable cell modem issue. To maintain the improved data quality that the ENVEA sensors offer and resolve the data uptime issue Montrose opted to instead use the SENSIT RAMP monitors. The SENSIT RAMP monitors integrate the SO<sub>2</sub>, H<sub>2</sub>S, CO, and NO<sub>2</sub> ENVEA gas sensors with a more reliable data communication system. The SENSIT RAMP modules add the additional benefit of incorporating the PM<sub>2.5</sub>, tVOC, anemometer, and summa canister triggering system all into one single unit, removing the need for the Lunar Outpost monitors in addition to the AQMesh monitors. We anticipate the sensor installation to happen during Q2 2023.

Prepared by:

*Austin Heitmann*

---

Austin Heitmann  
Director - Emerging Technology  
Montrose Air Quality Services, LLC

*Michael H. Lumpkin*

---

Michael Lumpkin, PhD, DABT  
Senior Toxicologist  
CTEH®, LLC

# APPENDIX A CALIBRATION AND QA/QC DATA

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450728	Mon_Dutch_004	CM1	1/10/2023	1%	33%	44%	5%	43%	36%	0%	33%	37%	0%	1%	1%	0%	43%	45%	0%	20%	19%
2450728	Mon_Dutch_004	CM1	2/2/2023	0%	22%	33%	0%	33%	38%	0%	4%	29%	0%	2%	8%	0%	38%	49%	0%	18%	13%
2450728	Mon_Dutch_004	CM1	3/30/2023	5%	0%	34%	1%	48%	23%	0%	26%	33%	2%	6%	10%	0%	47%	46%	0%	12%	5%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450729	Mon_Dutch_003	CM2	1/11/2023	1%	25%	42%	1%	21%	21%	0%	18%	24%	0%	13%	12%	0%	43%	18%	0%	16%	12%
2450729	Mon_Dutch_003	CM2	2/20/2023	1%	27%	42%	1%	40%	23%	10%	37%	47%	0%	9%	2%	0%	11%	29%	0%	12%	25%
2450729	Mon_Dutch_003	CM2	3/7/2023	1%	26%	44%	0%	21%	11%	0%	37%	39%	0%	45%	18%	0%	11%	44%	0%	16%	3%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450730	Mon_Dutch_005	CM3	1/17/2023	1%	25%	28%	0%	36%	17%	0%	31%	8%	0%	6%	12%	0%	46%	45%	0%	15%	11%
2450730	Mon_Dutch_005	CM3	2/17/2023	1%	30%	39%	0%	43%	25%	0%	46%	0%	0%	11%	6%	0%	47%	50%	2%	23%	18%
2450730	Mon_Dutch_005	CM3	3/29/2023	3%	5%	28%	1%	46%	18%	0%	17%	25%	0%	13%	6%	0%	49%	25%	2%	18%	12%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450732	Mon_Dutch_006	CM4	1/18/2023	10%	12%	43%	1%	34%	42%	0%	35%	44%	0%	18%	50%	0%	27%	24%	0%	20%	22%
2450732	Mon_Dutch_006	CM4	2/21/2023	1%	38%	43%	1%	42%	31%	0%	22%	30%	0%	10%	33%	0%	48%	44%	4%	24%	20%
2450732	Mon_Dutch_006	CM4	3/31/2023	1%	26%	34%	0%	33%	36%	1%	31%	45%	0%	38%	40%	0%	42%	39%	0%	22%	21%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450734	Mon_Dutch_007	CM5	1/20/2023	2%	38%	45%	1%	43%	3%	1%	31%	40%	0%	2%	2%	0%	18%	45%	0%	12%	14%
2450734	Mon_Dutch_007	CM5	2/22/2023	1%	25%	46%	0%	26%	7%	0%	27%	18%	0%	17%	2%	0%	3%	47%	0%	23%	3%
2450734	Mon_Dutch_007	CM5	3/28/2023	2%	13%	34%	1%	42%	21%	1%	31%	37%	0%	12%	41%	0%	10%	47%	0%	24%	8%



Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450737	Mon_Dutch_009	CM6	1/23/2023	1%	25%	37%	0%	16%	17%	0%	41%	44%	0%	13%	7%	0%	31%	46%	0%	12%	8%
2450737	Mon_Dutch_009	CM6	2/16/2023	2%	13%	36%	0%	14%	37%	0%	44%	44%	0%	47%	9%	0%	8%	46%	5%	15%	1%
2450737	Mon_Dutch_009	CM6	3/20/2023	2%	8%	37%	0%	15%	7%	0%	31%	18%	0%	37%	42%	0%	11%	44%	0%	15%	18%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450735	Mon_Dutch_008	CM7	1/24/2023	1%	21%	38%	0%	14%	32%	0%	38%	37%	0%	37%	19%	0%	34%	46%	0%	14%	9%
2450735	Mon_Dutch_008	CM7	2/13/2023	1%	23%	36%	1%	20%	21%	0%	18%	19%	0%	24%	14%	0%	28%	50%	0%	9%	2%
2450735	Mon_Dutch_008	CM7	3/10/2023	2%	7%	8%	1%	19%	30%	0%	25%	5%	0%	3%	1%	0%	43%	6%	1%	21%	19%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450731	Mon_Dutch_010	CM8	1/19/2023	1%	8%	30%	0%	45%	17%	0%	37%	39%	0%	23%	7%	0%	33%	46%	0%	12%	2%
2450731	Mon_Dutch_010	CM8	2/15/2023	0%	1%	38%	0%	41%	28%	0%	41%	36%	0%	5%	11%	0%	43%	47%	0%	12%	14%
2450731	Mon_Dutch_010	CM8	3/8/2023	0%	5%	4%	1%	22%	28%	0%	42%	15%	0%	9%	48%	0%	33%	46%	0%	21%	10%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450736	Mon_Dutch_001	CM9	1/13/2023	1%	42%	39%	1%	16%	30%	0%	19%	19%	0%	19%	14%	0%	4%	29%	0%	18%	9%
2450736	Mon_Dutch_001	CM9	2/14/2023	2%	43%	34%	0%	27%	31%	0%	6%	38%	0%	4%	34%	0%	6%	47%	0%	12%	12%
2450736	Mon_Dutch_001	CM9	3/21/2023	1%	13%	36%	0%	22%	32%	0%	2%	16%	0%	2%	8%	0%	5%	25%	0%	17%	3%

Validation Results Table																					
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
				Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450730	Mon_Dutch_009	CM10	1/12/2023	2%	25%	42%	1%	32%	17%	1%	38%	33%	0%	31%	39%	0%	12%	18%	0%	14%	8%
2450730	Mon_Dutch_009	CM10	2/3/223	2%	11%	38%	0%	10%	31%	0%	18%	33%	0%	15%	24%	0%	11%	8%	0%	18%	17%
2450730	Mon_Dutch_009	CM10	3/13/2023	5%	35%	48%	1%	35%	13%	0%	34%	11%	0%	32%	17%	0%	27%	11%	0%	19%	3%

# APPENDIX B FIELD DATA SHEETS

AQM Serial Number	831	831	831
Community Monitor Location	6	6	6
Date	1/23/2023	2/16/2023	3/20/2023
Operator	AH	AH	AH

**Gas Inlet**

Gas Validation Checks (weekly) (Review Monthly)	Pass	Pass	Pass
Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Field Calibration (Quarterly)	NA	Pass	NA

**Particulate Monitor**

Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Check for Leaks (Quarterly)	NA	Pass	NA
Check Zero (Quarterly)	NA	Pass	NA
Check laser and detector (Quarterly)	NA	Pass	NA
Clean Cyclone (Quarterly)	NA	Pass	NA

Notes:

AQM Serial Number	830	830	830
Community Monitor Location	7	7	7
Date	1/24/2023	2/13/2023	3/10/2023
Operator	AH	AH	AH

**Gas Inlet**

Gas Validation Checks (weekly) (Review Monthly)	Pass	Pass	Pass
Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Field Calibration (Quarterly)	NA	Pass	NA

**Particulate Monitor**

Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Check for Leaks (Quarterly)	NA	Pass	NA
Check Zero (Quarterly)	NA	Pass	NA
Check laser and detector (Quarterly)	NA	Pass	NA
Clean Cyclone (Quarterly)	NA	Pass	NA

Notes:



AQM Serial Number	829	829	829
Community Monitor Location	2	2	2
Date	1/11/2023	2/20/2023	3/7/2023
Operator	AH	AH	AH

**Gas Inlet**

Gas Validation Checks (weekly) (Review Monthly)	Pass	Pass	Pass
Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Field Calibration (Quarterly)	NA	Pass	NA

**Particulate Monitor**

Flow Rate (Quarterly)	NA	Pass	NA
Filter Change (Quarterly)	NA	Pass	NA
Check for Leaks (Quarterly)	NA	Pass	NA
Check Zero (Quarterly)	NA	Pass	NA
Check laser and detector (Quarterly)	NA	Pass	NA
Clean Cyclone (Quarterly)	NA	Pass	NA

Notes:

# **APPENDIX C CALIBRATION GAS CERTIFICATION SHEETS**



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## CERTIFICATE OF ANALYSIS

**Date:** June 8, 2021  
**Order Number:** 22039172  
**Lot Number:** 304-402132386-1

**Customer:** Cal Gas Direct Inc

**Use Before:** 06/08/2025

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Isobutylene	200 PPM	193 PPM
Air	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

*Umar Reyes*

Umar Reyes



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## CERTIFICATE OF ANALYSIS

**Date:** April 20, 2022  
**Order Number:** 22055981  
**Lot Number:** 304-402415340-1

**Customer:** Cal Gas Direct Inc.

**Use Before:** 04/20/2026

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Carbon Monoxide	500 PPM	512 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## CERTIFICATE OF ANALYSIS

**Date:** April 20, 2022  
**Order Number:** 22055981  
**Lot Number:** 304-402415341-1

**Customer:** Cal Gas Direct Inc.

**Use Before:** 04/20/2023

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Nitric Oxide	100 PPM	105 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

  
Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

**CERTIFICATE OF ANALYSIS**

**Date:** April 20, 2022  
**Order Number:** 22055981  
**Lot Number:** 304-402415342-1

**Customer:** Cal Gas Direct Inc.

**Use Before:** 04/20/2024

<b>Component</b>	<b>Requested Concentration</b>	<b>Analytical Result (+/-2%)</b>
Sulfur Dioxide	100 PPM	98.3 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials

**Analyst:**

Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

**CERTIFICATE OF ANALYSIS**

**Date:** April 20, 2022  
**Order Number:** 22055981  
**Lot Number:** 304-402415343-1

**Customer:** Cal Gas Direct Inc.  
**Use Before:** 04/20/2024

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Hydrogen Sulfide	99 PPM	106 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

  
Glenn Velez

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA PROTOCOL STANDARD

Part Number: E02NI99E33W0007	Reference Number: 153-402155966-1
Cylinder Number: D645448	Cylinder Volume: 22.7 Cubic Feet
Laboratory: 124 - Tooele (SAP) - UT	Cylinder Pressure: 1800 PSIG
PGVP Number: B72021	Valve Outlet: 660
Gas Code: NO2,BALN	Certification Date: Jul 14, 2021

**Expiration Date: Jul 14, 2024**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NITROGEN DIOXIDE	100.0 PPM	100.1 PPM	G1	+/- 2.0% NIST Traceable	07/07/2021, 07/14/2021
NITROGEN	Balance				

### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	401648671104	CC508227	58.42 PPM NITROGEN DIOXIDE/NITROGEN	1.8%	Feb 19, 2023
PRM	12388	D685030	59.5 PPM NITROGEN DIOXIDE/NITROGEN	1.7%	Feb 20, 2020

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

### ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR NO2 018143349	FTIR	Jun 24, 2021

Triad Data Available Upon Request

PERMANENT NOTES: OXYGEN ADDED TO MAINTAIN STABILITY



\_\_\_\_\_  
Signature on file

Approved for Release





**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## **CERTIFICATE OF ANALYSIS**

**Date:** November 3, 2022

**Customer:** Cal Gas Direct Inc.

**Order Number:** 22061695

**Lot Number:** 304-402508457-1

**Use Before:** 08/05/2026

<b><u>Component</u></b>	<b><u>Requested Concentration</u></b>	<b><u>Analytical Result (+/- 2%)</u></b>
Isobutylene	200 PPM	214.5 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## **CERTIFICATE OF ANALYSIS**

**Date:** November 3, 2022  
**Order Number:** 22061695  
**Lot Number:** 304-402508456-1

**Customer:** Cal Gas Direct Inc.  
**Use Before:** 08/05/2024

<u><b>Component</b></u>	<u><b>Requested Concentration</b></u>	<u><b>Analytical Result (+/- 2%)</b></u>
Hydrogen Sulfide	99 PPM	100.9 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

  
Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## CERTIFICATE OF ANALYSIS

**Date:** November 3, 2022  
**Order Number:** 22061695  
**Lot Number:** 304-402508458-1

**Customer:** Cal Gas Direct Inc.  
**Use Before:** 08/05/2023

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Nitric Oxide	100 PPM	99.6 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

  
Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## **CERTIFICATE OF ANALYSIS**

**Date:** November 3, 2022  
**Order Number:** 22061695  
**Lot Number:** 304-402508459-1

**Customer:** Cal Gas Direct Inc.  
**Use Before:** 08/05/2024

<b>Component</b>	<b>Requested Concentration</b>	<b>Analytical Result (+/-2%)</b>
Sulfur Dioxide	100 PPM	98.29 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials

**Analyst:**

  
Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## **CERTIFICATE OF ANALYSIS**

**Date:** November 3, 2022  
**Order Number:** 22061695  
**Lot Number:** 304-402508455-1

**Customer:** Cal Gas Direct Inc.  
**Use Before:** 08/05/2026

<u><b>Component</b></u>	<u><b>Requested Concentration</b></u>	<u><b>Analytical Result (+/- 2%)</b></u>
Carbon Monoxide	500 PPM	538 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

A handwritten signature in black ink, appearing to read "Glenn Velez".

Glenn Velez



**GASCO AFFILIATES, LLC.**

320 Scarlet Blvd.  
Oldsmar, FL 34677  
(800) 910-0051  
fax: (866) 755-8920  
www.gascogas.com

## CERTIFICATE OF ANALYSIS

**Date:** April 20, 2022  
**Order Number:** 22055981  
**Lot Number:** 304-402415344-1

**Customer:** Cal Gas Direct Inc.

**Use Before:** 04/20/2026

<u>Component</u>	<u>Requested Concentration</u>	<u>Analytical Result (+/- 2%)</u>
Isobutylene	200 PPM	202 PPM
Nitrogen	Balance	Balance

**Cylinder Size:** 2.0 Cu. Ft.  
**Contents:** 58 Liter

**Valve:** 5/8" -18UNF  
**Pressure:** 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

**Analyst:**

Glenn Velez

**THIS IS THE LAST PAGE OF THIS DOCUMENT**