2022 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 43rd Avenue
Denver, CO 80211

Document Number:	**085AA-013370-RT-52**
Report Period:	**January 1 – March 31, 2022**
Submittal Date:	**May 20, 2022**

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

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[1]: carbon monoxide (CO), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), nitrogen oxide or nitric oxide (NO), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$), 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 2022 air monitoring preliminary data was made available in near real-time at ccnd-air.com from January 1 – March 31, 2022, 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_2, H_2S, and SO_2; laser scattering for $PM_{2.5}$; 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.

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).

- Over the three-month period, two NO_2 measurements were recorded higher than the corresponding National Ambient Air Quality Standards (NAAQS) reference value, and one SO_2 measurement was recorded higher than the corresponding NAAQS reference value.

[1] 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.

However, while these measurements of NO_2 and SO_2 were higher than their NAAQS reference values, they do not indicate a trend toward unhealthy analyte levels and do not constitute an exceedance of the NAAQS.

- 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.

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_2), hydrogen sulfide (H_2S), nitric oxide (NO), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$), 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 eight 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

Location ID	Secondary ID	GPS Coordinates	Distance from Refinery Center (miles)	Cross Streets
CM1	Rose Hill Elementary School	39.80164, -104.90882	2.0	E. 58th Ave. & Oneida St., Commerce City
CM2	Suncor Refinery Business Center	39.79599, -104.95603	0.70	Brighton Blvd. & York St., Commerce City
CM3	Adams City High School	39.82736, -104.90193	2.9	E. 72nd Ave. & Quebec Pkwy, Commerce City
CM4	Adams City Middle School	39.82893, -104.93499	1.9	Birch St. & E. 72nd Ave., Commerce City
CM5	Central Elementary School	39.81457, -104.91928	1.7	Holly St. & E. 64th Ave., Commerce City
CM6	Focus Points Family Resource Center	39.78436, -104.95663	1.4	Columbine St. & 48th Ave., Denver
CM7	Kearney Middle School	39.80888, -104.91545	1.7	E 62nd Ave. & Kearney St., Commerce City
CM8	Monroe	39.8156, -104.94503	0.85	Monroe St. & E 64th Ave., Denver
CM9	48th and Race	39.78455, -104.96264	1.7	East 48th Ave. & Race St., Denver
CM10	Alsup Elementary School	39.820268, -104.936616	1.2	East 68th 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

Air Pollutant/Parameter Category	Principle of Operation	Sensor Manufacturer
Total VOC	Photoionization Detector	Lunar Outpost
SO_2	Electrochemical Sensor	AQMesh
CO	Electrochemical Sensor	AQMesh
NO	Electrochemical Sensor	AQMesh
NO_2	Electrochemical Sensor	AQMesh
H_2S	Electrochemical Sensor	AQMesh
$PM_{2.5}$	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_2, CO, NO, NO_2, and H_2S) 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. 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_2 sensor. This issue is mitigated by using an ozone filter on the face of the NO_2 sensor. Similarly, the SO_2 sensor can have a response caused by the presence of H_2S. Again, the SO_2 sensor has a built-in filter to mitigate the H_2S interference. The SO_2 sensor has additional interference from NO_2. 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 National Ambient Air Quality Standard (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, 2022, through March 31, 2022. 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_2, SO_2, and $PM_{2.5}$ 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_2, SO_2, and $PM_{2.5}$) of air monitoring data[2] 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_2 standard concentration would not constitute an exceedance of the NO_2 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 98th percentile or higher. However, the data reported herein may be used to determine trends in criteria pollutant levels in the CCND communities.

H_2S 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_2S). 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)[3]. The maximum and average NO levels measured by Montrose from January 1 to March 31, 2022 were compared to the regional values reported by APCD. The health reference values for H_2S were developed by the Agency for Toxic Substances and Disease Registry (ATSDR)[4]. 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_2S 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 (AEGLs). Unlike health-based reference levels that can be thousands of times below exposure levels where adverse effects are observed, AEGL values are levels at which different acute adverse health effects may be anticipated to occur. According to USEPA, "AEGL-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 AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each

[2] USEPA NAAQS Table, available online at https://www.epa.gov/criteria-air-pollutants/naaqs-table
[3] CO APCD 2020 Air Quality Data Report, available online at https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020AnnualDataReport.pdf
[4] 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_2S (510 ppb), NO_2 (500 ppb), and SO_2 (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

Location ID	AQMesh (excludes periods of adverse atmospheric conditions)	AQMesh (includes periods of adverse atmospheric conditions)	Lunar Outpost
CM1	99.7%	99.7%	97.0%
CM2	99.7%	99.7%	99.5%
CM3	99.8%	99.8%	99.8%
CM4	99.7%	99.7%	98.4%
CM5	99.7%	99.7%	98.7%
CM6	99.8%	99.8%	98.1%
CM7	99.7%	99.7%	99.9%
CM8	99.8%	99.8%	92.6%
CM9	99.6%	99.6%	99.1%
CM10	98.4%	98.4%	99.3%

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, 2022, for the Lunar Outpost monitor at location CM8 was lower than the >95% data recovery goal outlined in the QAPP. The data

recovery goal was lower due to poor solar power input caused by a shadow cast on the monitor from the fence surrounding the system and lower solar radiation during Q1 months. This issue was exacerbated by a flaw in the device design that does not allow the unit to automatically turn back on when solar input resumes after completely draining the system's internal battery. To mitigate these issues, the solar panel was repositioned to minimize shadows from the fence surrounding the system, and Lunar Outpost provided a system improvement that allows the system to automatically turn back on once solar input resumes following a complete battery drain.

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_2, $PM_{2.5}$, H_2S, SO_2, and VOCs during this reporting period can be found in Table 1-4 and Figures 1-2 through 1-8. The gas (CO, NO, NO_2, H_2S, SO_2, and VOC) data is reported on a one-hour rolling average updated every 5 minutes. The $PM_{2.5}$ data presented on the website is a one-hour block average to align with the other $PM_{2.5}$ sensor-based monitoring programs around the local community. The 24-hour block average for $PM_{2.5}$ and rolling average for H_2S are also reported. Values reported as zero do not necessarily mean that the analyte is not present, but instead indicates that the analyte is present 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).

Elevated SO_2 one-hour rolling averages occurred in the mornings during reporting period. Often, though not always, these elevated readings coincide with elevated NO_2 readings during morning rush hour traffic. NO_2 is a known interferant for SO_2, presence of NO_2 can cause a false positive response on SO_2 sensors. Currently, this is mostly mitigated by AQMesh applying a correction to the SO_2 response based on the NO_2 reading. It is possible that these readings do not truly represent elevated levels of SO_2 but may be attributable to elevated NO_2. This is supported by a strong correlation between elevated SO_2 readings and NO_2 readings. These SO_2 data anomalies are also supported by other CDPHE monitors in the region that did not show elevated readings during the same time frame that the AQMesh Pods did.

TABLE 1-4
CCND MONITORS RESULTS SUMMARY

Analyte	Range Across Network	NAAQS Reference Values	Health-based Reference Value (Source)
CO	0.08 - 1.9 ppm (1-hour average)	**35 ppm** (1-hour average not to be exceeded more than one per year)	**83 ppm** (1-hour USEPA AEGL-2)
NO	<10 - 200 ppb (1-hour average)	NA	NA
NO_2	<10 - 102 ppb (1-hour average)	**100 ppb** (98th percentile of 1-hour daily maximum, averaged over 3 years)	**500 ppb** (1-hour USEPA AEGL-1)
SO_2	<30 - 82 ppb (1-hour average)	**75 ppb** (99th percentile of 1-hour daily maximum concentrations, averaged over 3 years)	**200 ppb** (1-hour USEPA AEGL-1)
H_2S	<30 ppb (24-hour average)	NA	**70 ppb** (acute[5] ATSDR MRL) **510 ppb** (1-hour USEPA AEGL-1)
$PM_{2.5}$	<3 - 18 µg/m^3 (24-hour average)	**35 µg/m^3** (98th percentile of 24-hour daily average concentrations, averaged over 3 years)	NA
Total VOC	<0.3 - 1.8 ppm (1-hour average)	NA	NA

[5] 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, 2022, through March 31, 2022. 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 18 times lower (maximum reading: 1.9 ppm) than the CO NAAQS reference level. Further, the maximum one-hour measured CO values in the CCND neighborhoods were more than 42 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, 2022 through March 31, 2022. 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[6]. Thus, measured NO levels were compared to NO levels published by APCD in 2020[7]. The annual average NO levels reported by APCD for Denver (four locations), Jefferson County, and Weld County ranged from 0.7 to 29 ppb, (maximum levels ranged from 38 to 308 ppb), while the maximum one-hour rolling average NO values measured by Montrose in the CCND neighborhoods concentration ranged from 121 - 200 ppb.

3.4 Nitrogen Dioxide (NO_2)

Figure 1-4 shows the one-hour rolling averages of NO_2 from January 1, 2022, through March 31, 2022. The USEPA NAAQS for NO_2 is 100 ppb as the 98th percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-4 shows that locations CM2 and CM3 reported maximum one-hour average NO_2 values of 101 and 102 ppb, respectively. While two individual one-hour average values over the course of three months were above the 100 ppb level, they do not indicate levels above the NAAQS reference level for NO_2. Exceedance determinations require calculating the 98th percentile of one-hour daily maximum, averaged over 3 years using regulatory grade instruments. Further, the maximum measured one-hour average NO_2 values in the CCND neighborhoods are at least five times lower than the one-hour USEPA AEGL-1 for NO_2 of 500 ppb.

3.5 Sulfur Dioxide (SO_2)

Figure 1-5 shows the one-hour rolling averages of SO_2 from January 1, 2022, through March 31, 2022. The USEPA NAAQS for SO_2 is 75 ppb as 99th percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-5 shows that location CM3 reported a maximum one-hour average SO_2 value of 82 ppb. While an individual value was above the 75 ppb, it does not indicate levels above the NAAQS reference level for SO_2. Exceedance determinations requires calculating the 99th percentile of one-hour daily maximum, averaged over 3 years using regulatory grade instrumentation. Further, the maximum measured one-hour average SO_2 values in the CCND neighborhoods are more than two times lower than the one-hour USEPA AEGL-1 for SO_2 of 200 ppb.

[6] https://www.epa.gov/sites/default/files/2014-11/documents/nitrogen_oxides_volume_11.pdf
[7] Colorado Air Pollution Control Division. 2020 Air Quality Data Report, dated November 2, 2021. Available online at: https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020AnnualDataReport.pdf

3.6 Hydrogen Sulfide (H_2S)

Figures 1-6A and 1-6B show the one-hour and 24-hour rolling averages of H_2S, respectively, from January 1, 2022, through March 31, 2022. 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_2S levels measured in the CCND neighborhoods would result in an increased risk of adverse acute health effects. Further, the maximum measured one-hour average H_2S values in the CCND neighborhoods are more than 24 times lower than the one-hour USEPA AEGL-1 for H_2S of 510 ppb.

3.7 Particulate Matter ($PM_{2.5}$)

Figures 1-7A and 1-7B show the one-hour and 24-hour block averages of $PM_{2.5}$, respectively, from January 1, 2022, through March 31, 2022. The USEPA NAAQS for $PM_{2.5}$ is 35 µg/m^3 as 98th percentile of 24-hour daily (block) average concentrations, averaged over 3 years. The maximum measured one-hour average of $PM_{2.5}$ (29 ug/m^3) and the maximum measured 24-hour average (18 ug/m3) 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, 2022, through March 31, 2022. There are no NAAQS or health-based reference values for total VOCs because this measurement represents numerous chemical compounds having various thresholds of toxic effects.

Figure 1-8 shows the one-hour rolling averages of total VOCs from January 1, 2022, through March 31, 2022. 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 2022, total VOC levels went above 1 ppm on three separate occasions, which triggered the capture of three air samples. The results of the sensor-triggered events and health risk evaluations are presented in separate reports found at ccnd-air.com/Documents.

The third 1 ppm exceedance that occurred began at 8 p.m. February 9, 2022, and lasted until 9 a.m. February 10, 2022, at location CM1 failed to collect an air sample due to operator error. During field validation tests the air sample collection system must be disabled so that the validation test does not trigger the sample collection. Following the field validation test on February 8, 2022, the air sample collection system was not enabled, causing a sample not to be collected on February 9, 2022. To reduce the likelihood of this issue occurring again, Montrose integrated a standard operating procedure to confirm that the air sample collection system is enabled following all field validation tests.

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 2022 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.

- Over the three-month period, two NO_2 measurements were recorded higher than the corresponding NAAQS reference value, and one SO_2 measurement was recorded higher than the corresponding NAAQS reference value. However, while these measurements of NO_2 and SO_2 were higher than their NAAQS reference values, they do not indicate a trend toward unhealthy analyte levels and do not constitute an exceedance of the NAAQS.

- 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

(ONE-HOUR ROLLING AVERAGES)

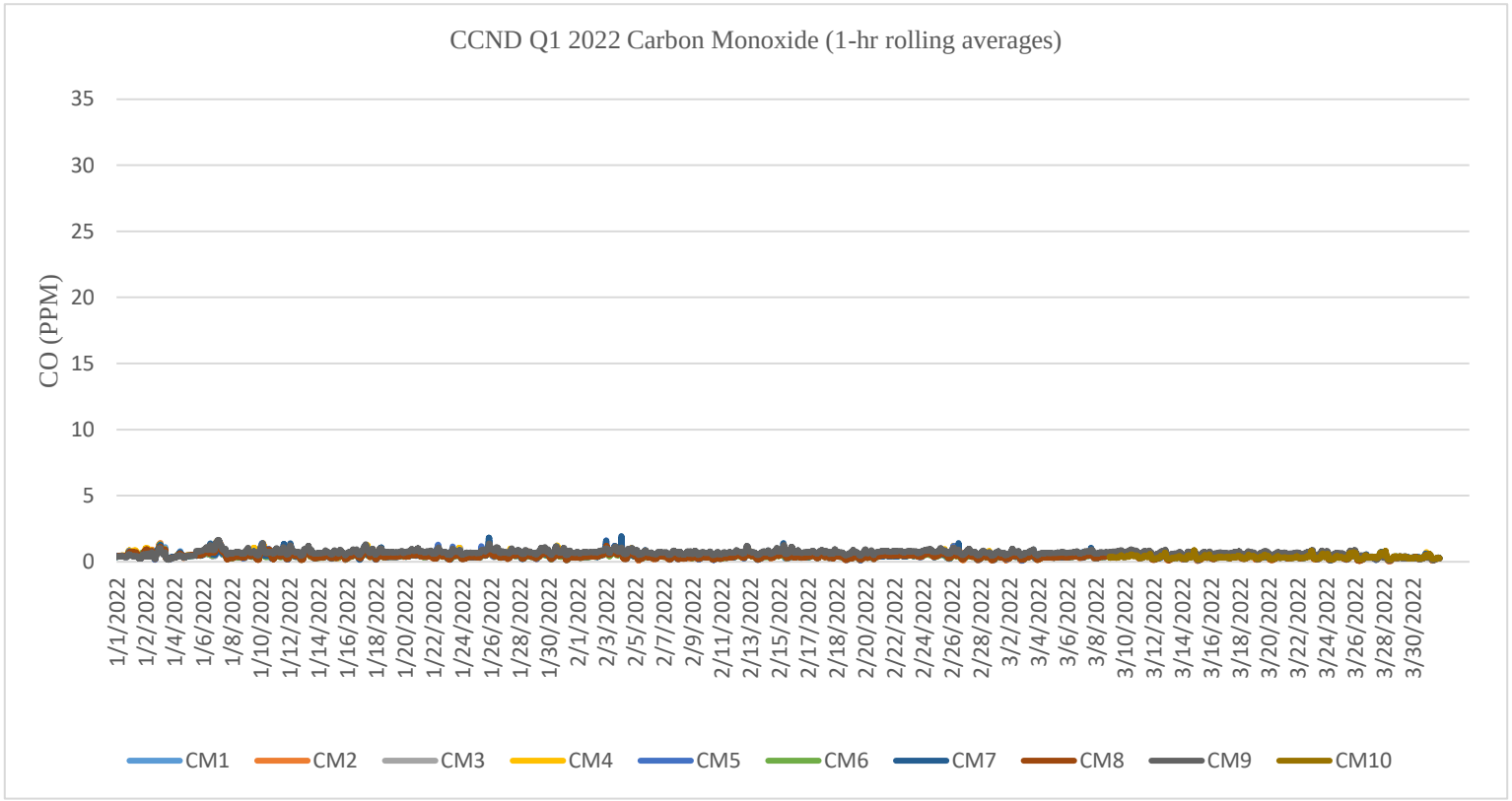


FIGURE 1-3
CCND COMMUNITY MONITORING NITRIC OXIDE (NO) DATA

(ONE-HOUR ROLLING AVERAGES)

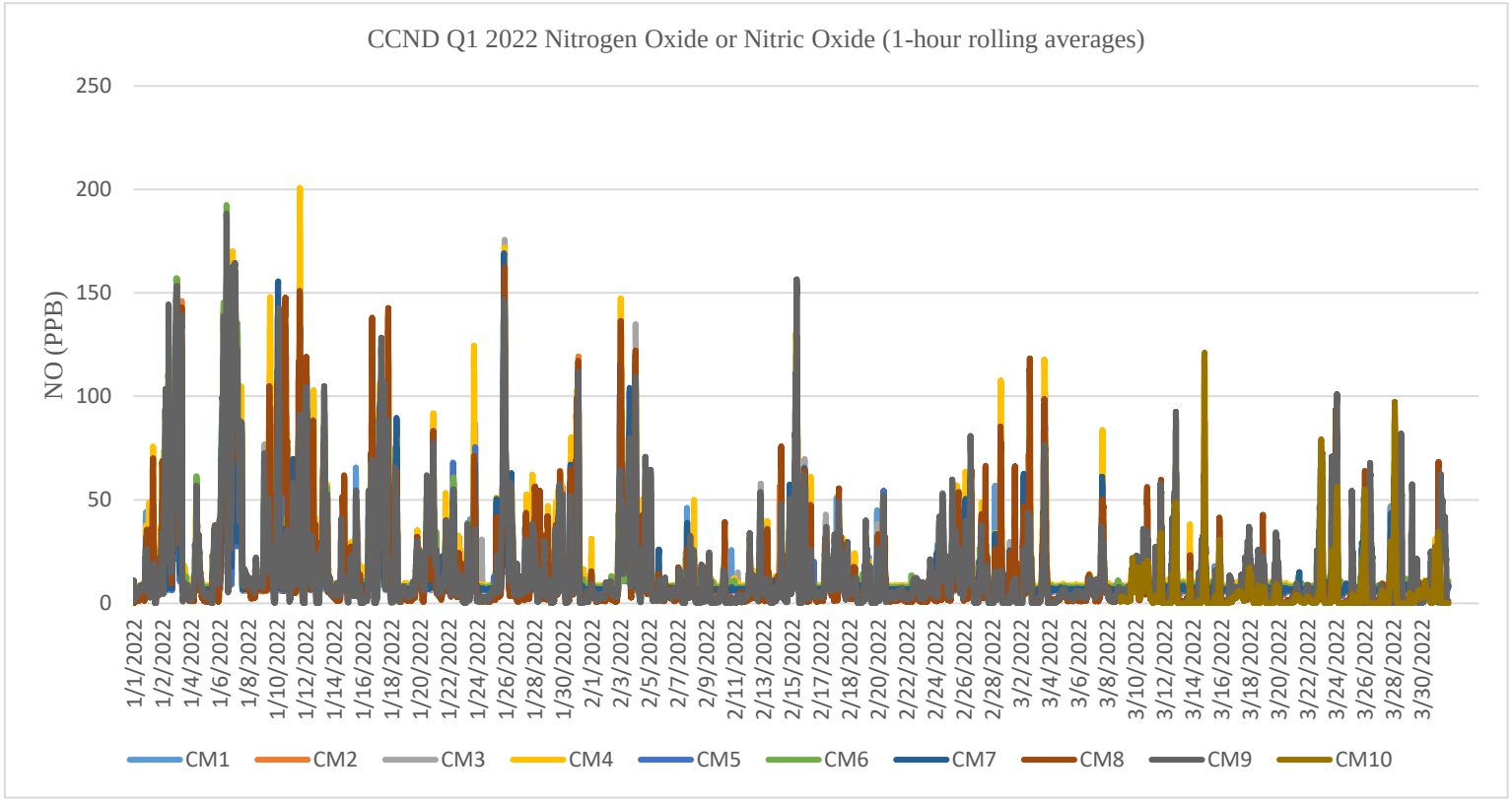


FIGURE 1-4
CCND COMMUNITY MONITORING NITROGEN DIOXIDE (NO_2) DATA

(ONE-HOUR ROLLING AVERAGES)

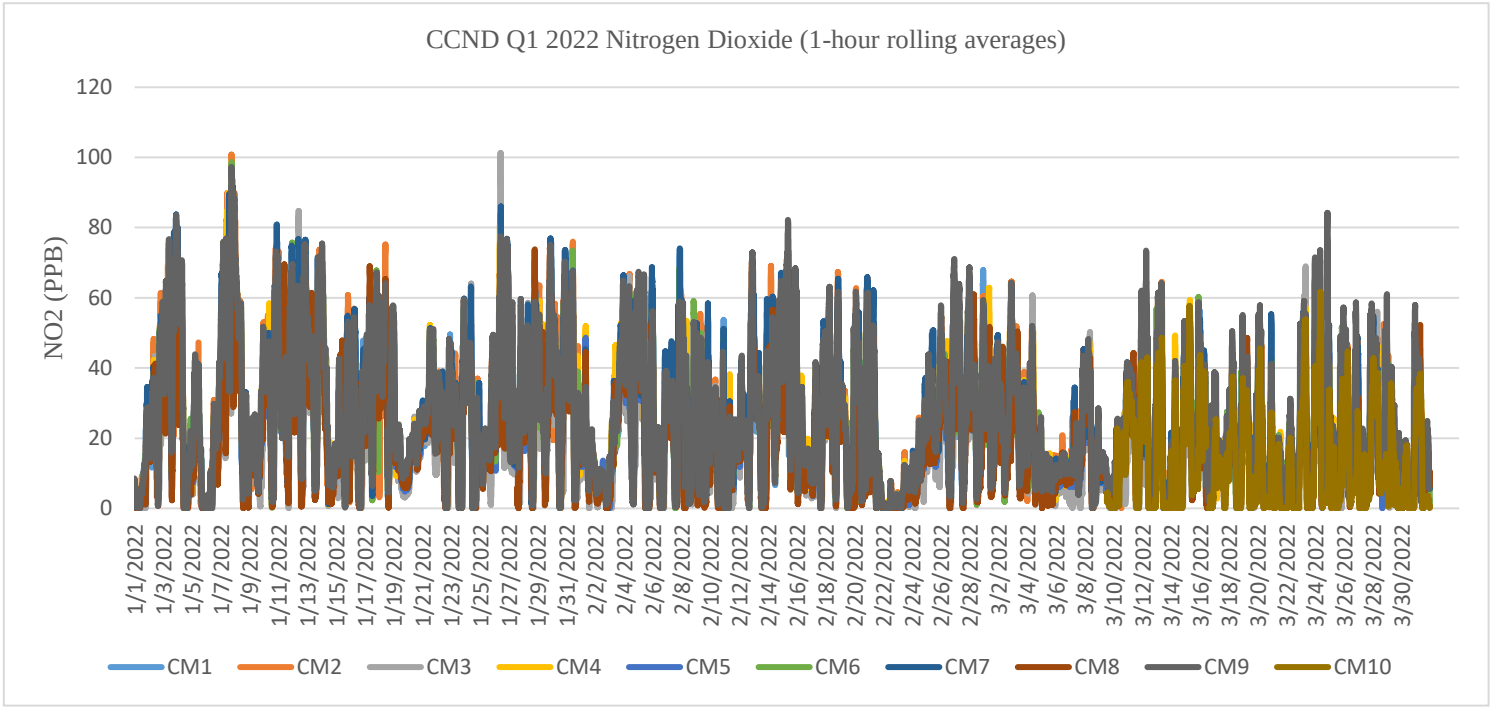


FIGURE 1-5
CCND COMMUNITY MONITORING SULFUR DIOXIDE (SO_2) DATA

(ONE-HOUR ROLLING AVERAGES)

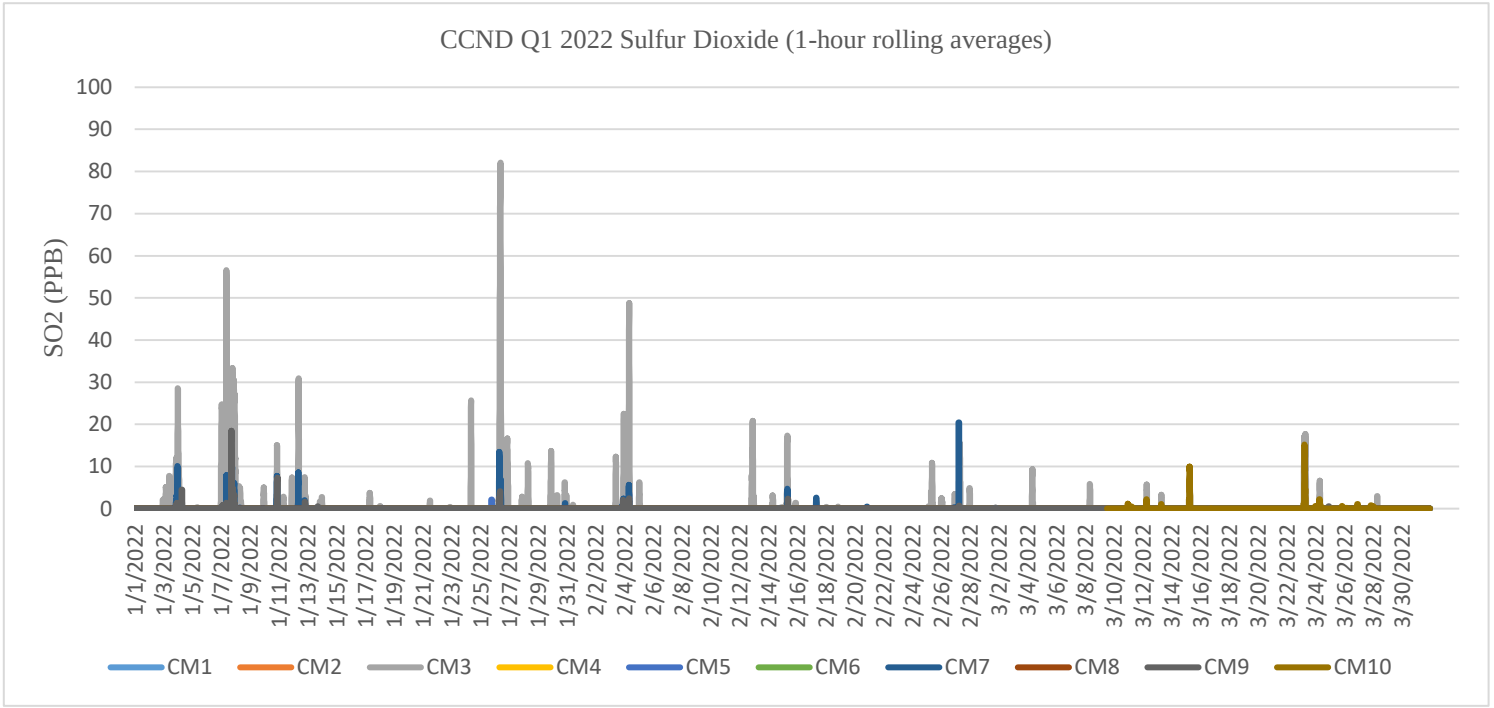


FIGURE 1-6A
CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H_2S) DATA

(ONE-HOUR ROLLING AVERAGES)

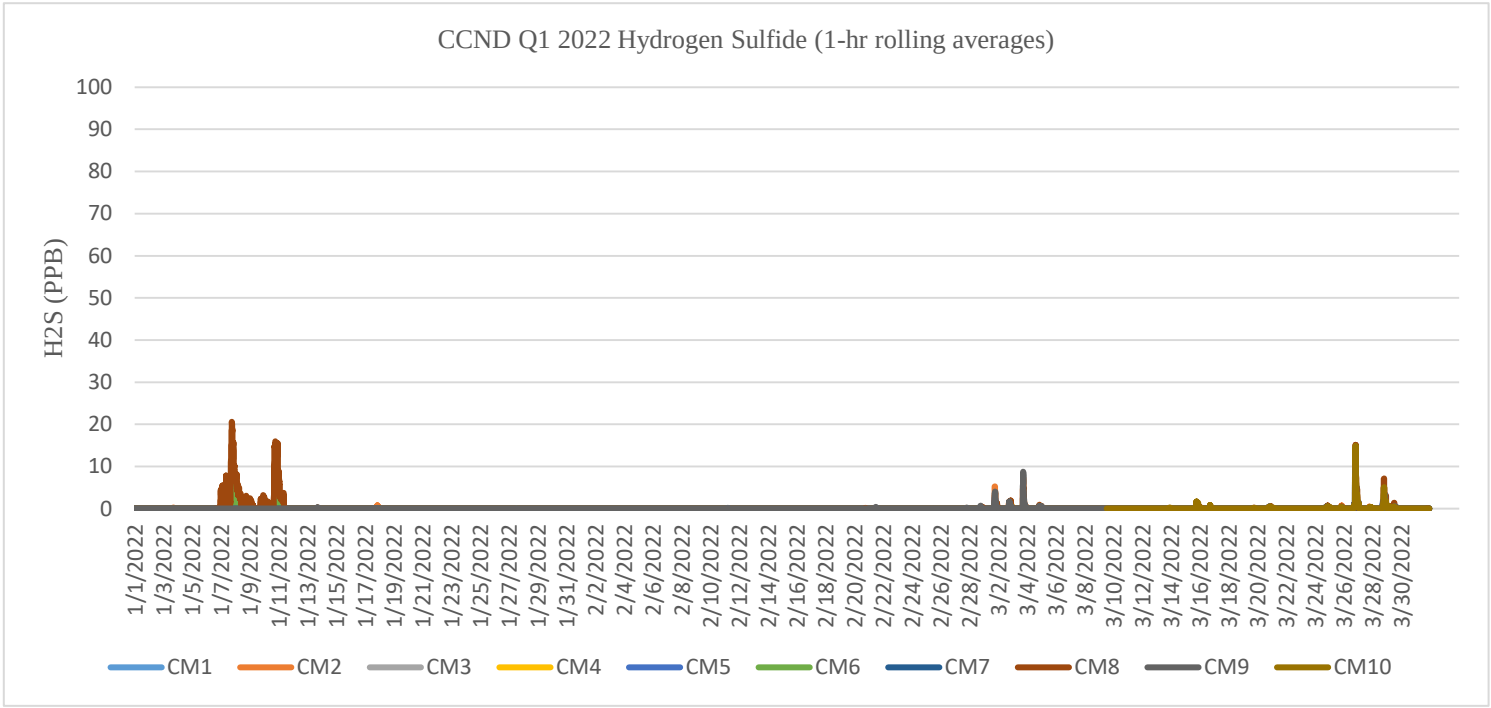


FIGURE 1-6B
CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H_2S) DATA

(24-HOUR ROLLING AVERAGES)

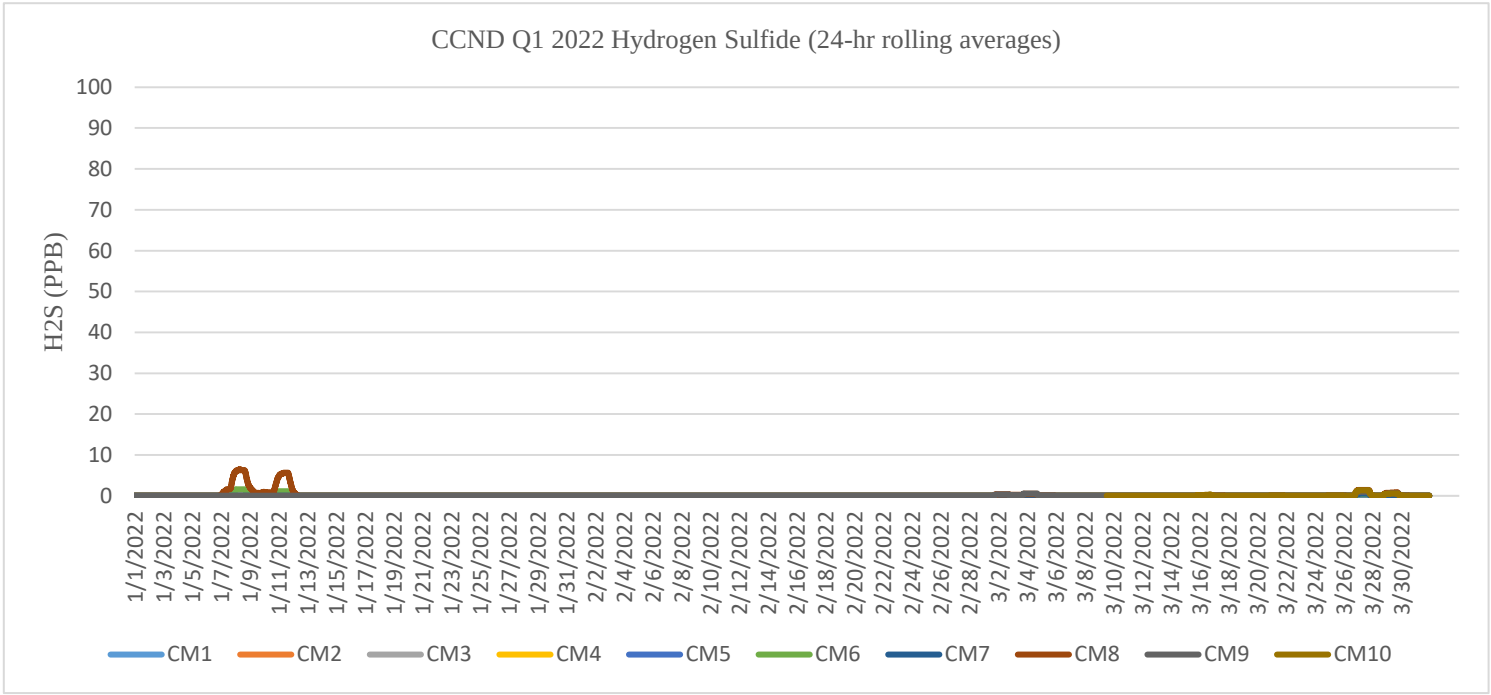


FIGURE 1-7A
CCND COMMUNITY MONITORING $PM_{2.5}$ DATA

(ONE-HOUR BLOCK AVERAGES)

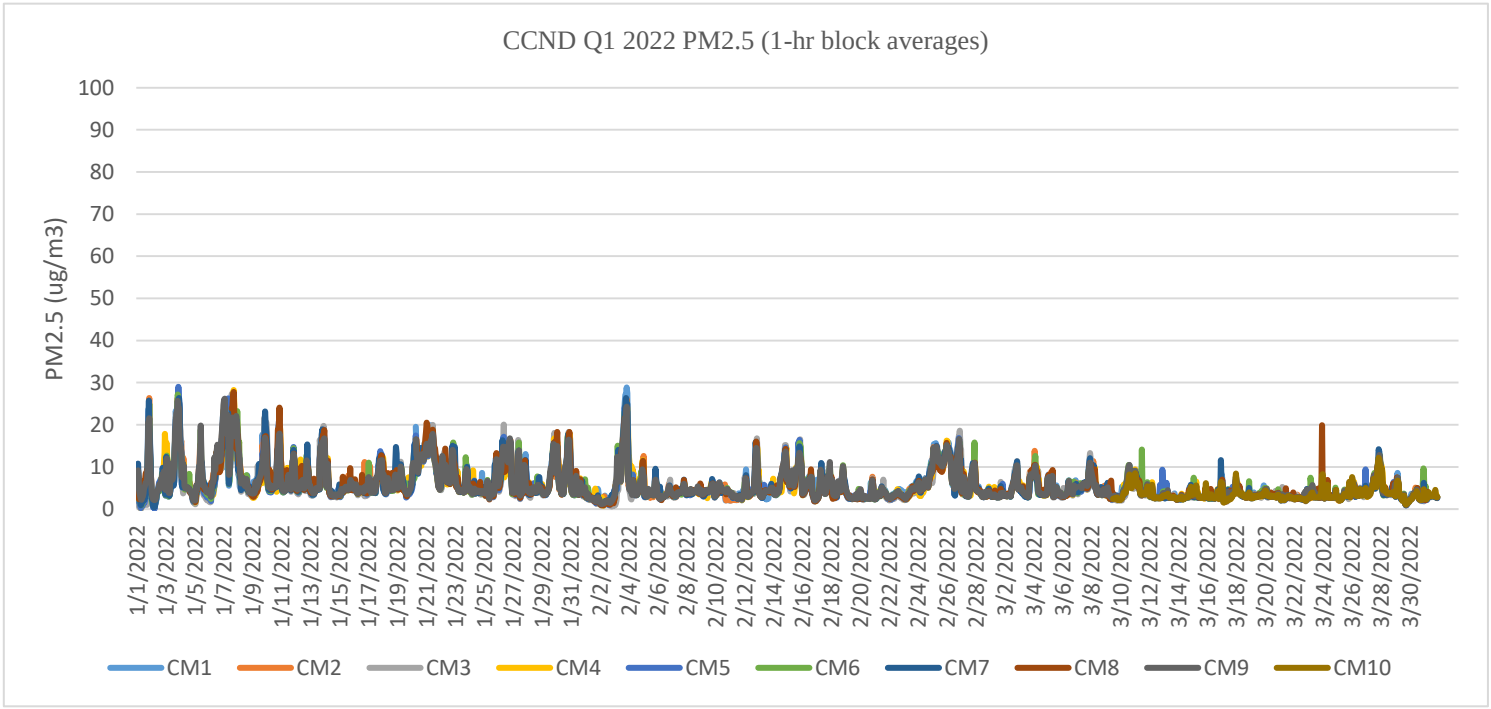


FIGURE 1-7B
CCND COMMUNITY MONITORING $PM_{2.5}$ DATA

(24-HOUR BLOCK AVERAGES)

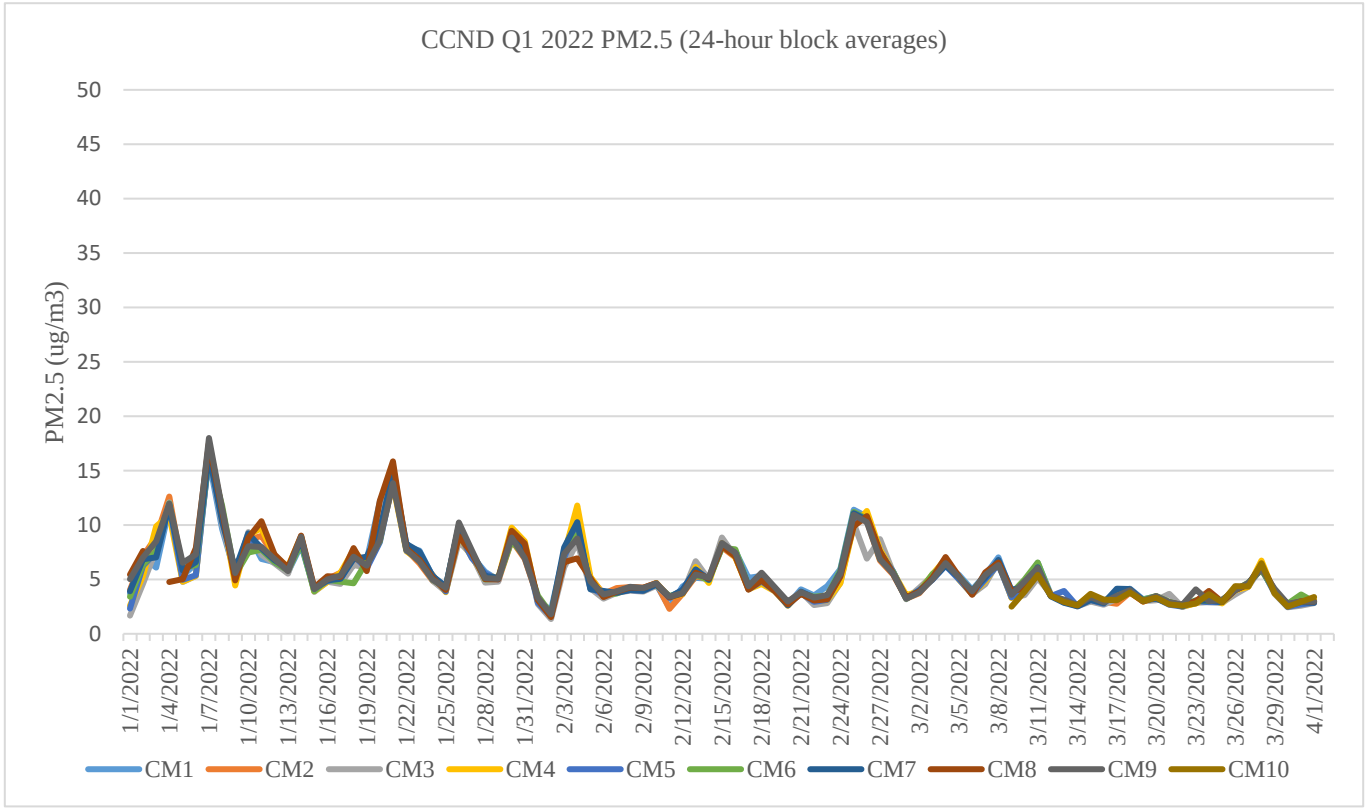
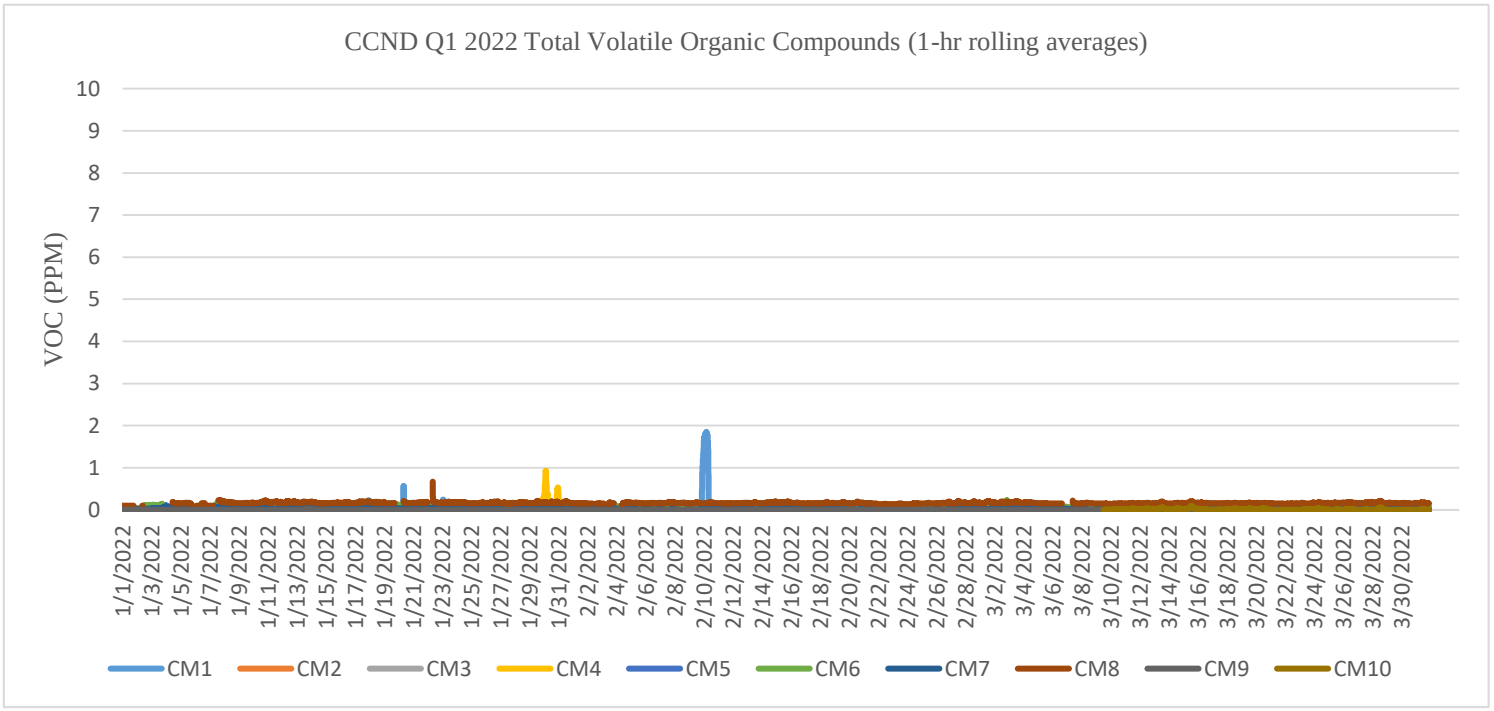


FIGURE 1-8
CCND COMMUNITY MONITORING VOC DATA

(ONE-HOUR ROLLING AVERAGES)



5.0 PROGRAM CHANGES

1. CM10 went online 3/9/22 and is now live on the ccnd-air.com website.

2. On March 26, 2022 AQMesh rebased the CO readings coming from the monitor at CM9. AQMesh may periodically rebase the monitors when baseline readings of a specific compound begin to drift from the readings of other monitors in the network.

3. The solar panel for the Lunar Outpost Canary-S sensor at location CM8 was repositioned to improve solar radiation on the solar panel to minimize data outages during poor sunlight days.

4. AQMesh performed a software update in Q4 2021 that affected the performance of the H_2S sensors. The H_2S sensor manufacturer made changes to their product in 2021 that were not compatible with the software update AQMesh performed. In Q1 2022 AQMesh restored the previous software version once this issue was identified.

Prepared by:

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

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

APPENDIX A
CALIBRATION AND QA/QC DATA

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial	Community Monitor	Validation Date	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	1/11/2022	1%	12%	35%	0%	38%	37%	0%	24%	12%	0%	43%	49%	0%	39%	17%	1%	11%	6%
2450728	Mon_Dutch_004	CM1	2/8/2022	0%	11%	31%	0%	37%	32%	0%	44%	40%	0%	44%	47%	0%	37%	11%	0%	19%	13%
2450728	Mon_Dutch_004	CM1	3/9/2022	2%	14%	31%	0%	37%	21%	0%	0%	9%	0%	46%	41%	0%	33%	21%	1%	6%	1%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450729	Mon_Dutch_003	CM2	1/5/2022	1%	13%	27%	0%	27%	24%	0%	10%	7%	0%	36%	47%	0%	18%	14%	5%	24%	15%
2450729	Mon_Dutch_003	CM2	2/9/2022	2%	12%	34%	0%	14%	28%	0%	20%	33%	0%	33%	24%	0%	11%	3%	2%	19%	9%
2450729	Mon_Dutch_003	CM2	3/10/2022	0%	8%	27%	0%	27%	27%	1%	43%	44%	0%	50%	8%	0%	22%	13%	0%	8%	7%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450730	Mon_Dutch_005	CM3	1/12/2022	1%	25%	31%	0%	25%	18%	0%	31%	18%	0%	25%	42%	0%	27%	15%	6%	17%	3%
2450730	Mon_Dutch_005	CM3	2/14/2022	1%	13%	27%	0%	29%	26%	0%	34%	8%	0%	23%	8%	0%	26%	14%	0%	18%	6%
2450730	Mon_Dutch_005	CM3	3/11/2022	1%	3%	28%	0%	28%	28%	0%	13%	11%	0%	29%	45%	0%	3%	12%	2%	13%	5%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450732	Mon_Dutch_006	CM4	1/5/2022	1%	19%	42%	0%	27%	3%	0%	23%	3%	0%	42%	43%	0%	39%	28%	5%	1%	2%
2450732	Mon_Dutch_006	CM4	2/15/2022	2%	9%	39%	0%	22%	20%	0%	20%	6%	0%	41%	42%	0%	39%	33%	4%	4%	1%
2450732	Mon_Dutch_006	CM5	3/21/2022	1%	10%	35%	0%	39%	29%	0%	6%	32%	0%	26%	41%	0%	42%	27%	0%	0%	11%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450733	Mon_Dutch_007	CM5	1/6/2022	1%	14%	45%	0%	6%	30%	0%	22%	8%	0%	33%	48%	0%	39%	25%	4%	5%	13%
2450733	Mon_Dutch_007	CM5	2/10/2022	1%	39%	29%	0%	6%	1%	0%	18%	7%	0%	41%	19%	0%	36%	12%	4%	14%	13%
2450733	Mon_Dutch_007	CM5	3/23/2022	1%	45%	21%	0%	10%	1%	0%	25%	2%	0%	36%	29%	0%	18%	4%	3%	19%	1%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450737	Mon_Dutch_009	CM6	1/4/2022	1%	10%	13%	0%	26%	27%	0%	23%	29%	0%	39%	24%	1%	39%	33%	6%	13%	3%
2450737	Mon_Dutch_009	CM6	2/11/2022	1%	22%	23%	0%	34%	20%	0%	2%	12%	0%	39%	8%	0%	16%	20%	5%	11%	3%
2450737	Mon_Dutch_009	CM6	3/3/2022	1%	27%	36%	0%	35%	32%	0%	40%	32%	0%	20%	15%	0%	21%	39%	5%	18%	7%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Serial Number	Monitor Serial	Monitor	Date	(<10%)	(<50%)	(<50%)	(<10%)	(<50%)	(<50%)	(<10%)	(<50%)	(<50%)	(<10%)	(<50%)	(<50%)	(<10%)	(<50%)	(<50%)	(<10%)	(<25%)	(<25%)
2450735	Mon_Dutch_008	CM7	1/17/2022	1%	15%	17%	0%	19%	9%	0%	26%	18%	0%	23%	47%	0%	39%	7%	1%	6%	5%
2450735	Mon_Dutch_008	CM7	2/25/2022	0%	0%	26%	0%	27%	23%	0%	1%	3%	0%	42%	45%	0%	20%	19%	0%	8%	3%
2450735	Mon_Dutch_008	CM7	3/22/2022	2%	4%	34%	0%	24%	8%	1%	0%	6%	0%	18%	41%	0%	7%	0%	0%	2%	1%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450731	Mon_Dutch_010	CM8	1/27/2022	2%	10%	26%	0%	23%	21%	0%	7%	39%	0%	37%	44%	0%	11%	12%	8%	20%	18%
2450731	Mon_Dutch_010	CM8	2/23/2022	2%	4%	17%	0%	22%	14%	0%	15%	31%	0%	42%	37%	0%	3%	5%	6%	18%	8%
2450731	Mon_Dutch_010	CM8	3/25/2022	1%	12%	18%	1%	5%	2%	1%	20%	21%	0%	29%	33%	0%	17%	18%	5%	9%	13%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450736	Mon_Dutch_001	CM9	1/18/2022	0%	22%	14%	0%	17%	11%	1%	7%	20%	1%	1%	17%	0%	12%	23%	0%	8%	4%
2450736	Mon_Dutch_001	CM9	2/22/2022	1%	0%	19%	0%	12%	6%	0%	12%	1%	0%	9%	8%	0%	3%	1%	0%	12%	3%
2450736	Mon_Dutch_002	CM9	3/15/2022	2%	11%	39%	0%	39%	24%	0%	12%	12%	0%	32%	12%	0%	38%	44%	0%	24%	13%

				Validation Results Table																
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450734	Mon_Dutch_009	CM10	3/31/2022	1%	4%	31%	0%	30%	32%	0%	8%	18%	0%	18%	36%	0%	24%	3%	5%	10%	13%

APPENDIX B
FIELD DATA SHEETS

AQM Serial Number	831
Community Monitor Location	6
Date	3/3/2022
Operator	AH

Gas Inlet

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

Particulate Monitor

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

Notes:

H2S and SO2 modules need replacement

AQM Serial Number	830
Community Monitor Location	7
Date	3/17/2022
Operator	BL

Gas Inlet

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

Particulate Monitor

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

Notes:

H2S and SO2 modules need replacement

AQM Serial Number	829	829	829
Community Monitor Location	2	2	2
Date	1/5/2022	2/9/2022	3/10/2022
Operator	BL	BL	AH
Gas Inlet			
Gas Validation Checks (weekly) (Review Monthly)	Pass	Pass	Pass
Flow Rate (Quarterly)	Pass	NA	NA
Filter Change (Quarterly)	Pass	NA	NA
Field Calibration (Quarterly)	Pass	NA	NA
Particulate Monitor			
Flow Rate (Quarterly)	Pass	NA	NA
Filter Change (Quarterly)	Pass	NA	NA
Check for Leaks (Quarterly)	Pass	NA	NA
Check Zero (Quarterly)	Pass	NA	NA
Check laser and detector (Quarterly)	Pass	NA	NA
Clean Cyclone (Quarterly)	Pass	NA	NA

Notes:

APPENDIX C
CALIBRATION GAS CERTIFICATION SHEETS

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

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: June 8, 2021
Order Number: 22039172
Lot Number: 304-402132387-1

Customer: Cal Gas Direct Inc.

Use Before: 06/08/2022

Component	Requested Concentration	Analytical Result (+/- 2%)
Nitric Oxide	100 PPM	98 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:
Omar Reyes
Omar Reyes

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: 304-402132389-1

Customer: Cal Gas Direct Inc

Use Before: 06/08/2023

Component	Requested Concentration	Analytical Result (+/-2%)
Sulfur Dioxide	100 PPM	103 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:

Omar Reyes

Omar Reyes

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: 304-402132385-1

Customer: Cal Gas Direct Inc

Use Before: 06/08/2023

Component	Requested Concentration	Analytical Result (+/- 2%)
Hydrogen Sulfide	100 PPM	103 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:

Omar Reyes

Omar Reyes

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: 304-402132384-1

Customer: Cal Gas Direct Inc

Use Before: 06/08/2025

Component	Requested Concentration	Analytical Result (+/- 2%)
Carbon Monoxide	500 PPM	492 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:

Omar Reyes

Omar Reyes

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

Component	Requested Concentration	Analytical Result (+/- 2%)
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:
Omar Reyes
Omar 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

Component	Requested Concentration	Analytical Result (+/- 2%)
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

Component	Requested Concentration	Analytical Result (+/- 2%)
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

Component	Requested Concentration	Analytical Result (+/-2%)
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

Component	Requested Concentration	Analytical Result (+/- 2%)
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

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

Component	Requested Concentration	Analytical Result (+/- 2%)
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