QUALITY ASSURANCE PROJECT PLAN
SUNCOR ENERGY (USA) – COMMERCE CITY REFINERY AMBIENT AIR MONITORING PROGRAM
COMMERCE CITY, COLORADO

Prepared For:

Suncor Energy (U.S.A.) Inc.
5455 Brighton Blvd
Commerce City, CO 80022

Prepared By:

Montrose Air Quality Services, LLC
990 W 43rd Ave
Denver, CO 80204

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MONTROSE
AIR QUALITY SERVICES

DOCUMENT REVISIONS LOG

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2/24/22	017ET-008224-PP-3-R1	Added CM9 location in Table 1-2, Updated correct RMSE in Table 3-10	B. Lawlor
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1.0 OBJECTIVES AND SUMMARY OF TEST PROGRAM

1.1 BACKGROUND

Suncor Energy (U.S.A.) Inc. (Suncor) installed an air quality (AQ) monitoring network in neighborhoods adjacent to the Commerce City refinery to provide real-time AQ data. Montrose Air Quality Services, LLC (Montrose) has been selected to deploy, maintain and operate the AQ monitoring network on behalf of Suncor. The ambient air monitoring network will utilize cutting-edge air pollution sensor technology, redeveloped with solar power capabilities, battery storage and data connectivity. The network will also include monitoring stations that are considered 'Near-Federal Equivalent Method' (near-FEM) instruments; these instruments will be used to improve the accuracy of the sensors. The network will include 10 separate monitoring locations with measurement data transmitted to a platform dashboard. The dashboard will display near real-time data and recent alerts.

1.2 GENERAL

The procedures outlined in this document cover the quality assurance procedures to be utilized in the deployment, operations and maintenance of the sensors. The sensors and samplers to be employed during the project are the SENSIT RAMP (integrated with ENVEA Cairnet® sensor modules), Aeroqual AQM65, and VOC automated canister collection. Meteorological monitoring will also be conducted at all of the locations. A specification sheet on the sensors can be found in Appendices A and B. As part of this program, an AQ data platform, developed by Montrose, called SensibleIOT, manages, quality controls, and reports the sensor data. The following table details the equipment that will be deployed and their respective pollutant and parameters measured:

TABLE 1-1
SUMMARY OF EQUIPMENT

Equipment Model	Pollutant/Parameter
SENSIT RAMP	SO2, CO, NO2, H2S, Total VOC (TVOC), PM2.5, Ambient Temperature, Relative Humidity, Wind Speed and Direction
AQM65	TVOC, SO2, CO, NO2, H2S, PM2.5, Ambient Temperature and Relative Humidity.
Summa Canisters	Speciated VOC

A list of the monitoring locations are outlined in Table 1-2 below.

TABLE 1-2
SUMMARY OF INITIAL DEPLOYMENT

Location	Facility	Address	Latitude/Longitude	Equipment
Community Monitoring Site 1	Rose Hill Elementary	6900 E 58th Ave, Commerce City, CO 80022	39.80164, -104.90882	SENSIT RAMP
Community Monitoring Site 2	Suncor – Refinery Business Center	5801 Brighton Blvd., Commerce City, CO 80022	39.79599, -104.95603	AQM65, SENSIT RAMP
Community Monitoring Site 3	Adams City High School	7200 Quebec Pkwy, Commerce City, CO 80022	39.82736, -104.90193	SENSIT RAMP
Community Monitoring Site 4	Adams City Middle School	4451 E. 72nd Ave., Commerce City, CO 80022	39.82893, -104.93499	SENSIT RAMP
Community Monitoring Site 5	Central Elementary School	6450 Holly St., Commerce City, CO 80022	39.81457, -104.91928	SENSIT RAMP
Community Monitoring Site 6	Focus Point Family Resource Center	2501 E. 48th Ave. Denver, CO, 80216	39.78436, -104.95663	AQM65, SENSIT RAMP
Community Monitoring Site 7	Kearney Middle School	6160 Kearney St., Commerce City, CO 80022	39.80888, -104.91545	AQM65, SENSIT RAMP
Community Monitoring Site 8	Suncor-Monroe St Property	6599-6401 Monroe St., Commerce City, CO 80022	39.8156, -104.94503	SENSIT RAMP
Community Monitoring Site 9	48th and Race	East 48th Ave. & Race St., Denver	39.78455, -104.96264	SENSIT RAMP
Community Monitoring Site 10	Alsup Elementary School	4413 E. 68th Ave., Commerce City, CO 80022	39.82027, -104.93662	SENSIT RAMP

1.3 PROJECT CONTACTS

1.3.2 Personnel

A list of project participants is included below in Table 1-3:

TABLE 1-3
PROJECT PERSONNEL

Montrose Air Quality Services, LLC

Project Contact:	Antonios Tasoglou, PhD, PMP	Austin Heitmann
Title:	Project Manager	Operations Director-Real Time Air
Address:	990 W. 43rd Ave. Denver, CO 80211	990 W. 43rd Ave. Denver, CO 80211
Telephone:	303-670-0530	303-670-0530
Email:	antasoglou@montrose-env.com	aheitmann@montrose-env.com

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

Suncor Project Technical Lead Contact:	Bernd Haneke
Title:	Manager of Environmental and Regulatory
Address:	5455 Brighton Blvd Commerce City, CO 80022
Email:	bhaneke@suncor.com

Laboratory

Laboratory:	Enthalpy Analytical
City, State:	Deer Park, Texas

Data Platform

Company:	Sensible IOT
Contact:	Matt Beach
Telephone:	805-233-2298
Email:	matt@sensibleiot.com

1.3.2 Responsibilities

Table 1-4 below details the roles and responsibilities of the project team.

TABLE 1-4
PERSONNEL RESPONSIBILITIES

Person/Company	Primary Assignment
Montrose	Project Operator, Sensor Deployment, sensor operations, sensor maintenance and QA/QC
Bernd Haneke	Suncor Project Technical Lead
SENSIT	Sensor manufacturer
Aeroqual	Near-FEM manufacturer
Enthalpy	Offsite Laboratory
SensibleIOT	Data platform development and ongoing platform operations

2.0 EQUIPMENT DESCRIPTION

2.1 SENSIT RAMP

The SENSIT RAMP is a solar powered air quality monitoring system manufactured by SENSIT, an Indiana based company. It is equipped with a variety of sensors, cellular communication, and powered via a solar panel and battery. A multitude of units can be deployed to create a network of real-time, localized data focusing on air quality and meteorological measurements. The sensors contained in the units are capable of measuring PM2.5 and tVOC. ENVEA Cairnet® sensor modules have been integrated into the SENSIT RAMP units to additionally measure SO_2, CO, NO_2, and H_2S. The SENST RAMP units will also measure ambient temperature, barometric pressure, relative humidity, wind speed and direction. The SENSIT RAMP principle of operation is outlined in the Table 2-1 and provides a sampling frequency of one (1) minute. A complete datasheet summarizing the specifications of the SENSIT RAMP can be found in the Appendix A of this QAPP.

TABLE 2-1
SENSIT RAMP Specifications

Air Pollutant/Parameter Category	Principle of Operation	Lower Detection Limit[1]	Upper Detection Limit[3]
SO_2	Electrochemical Sensor	40 ppb	1,000 ppb
CO	Electrochemical Sensor	0.1 ppm	50 ppm
NO_2	Electrochemical Sensor	20 ppb	250 ppb
H_2S	Electrochemical Sensor	10 ppb	1,000 ppb
Total VOC	Photoionization Detector	10 ppb	40 ppm or 3 ppm
$PM_{2.5}$	Laser Scattering	1 ug/m^3	1000 ug/m^3
Wind Direction	Sonic Anemometer	N/A	N/A
Wind Speed	Sonic Anemometer	N/A	N/A
Relative Humidity	Solid State	N/A	N/A
Barometric Pressure	Solid State	N/A	N/A
Temperature	Solid State	N/A	N/A

2.2 VOC CANISTER SAMPLING

EPA Methods TO-15 and TO-14A will be utilized to collect and analyze all summa canister samples. Sampling canisters will be provided pre-cleaned and batch certified by Enthalpy Analytical (Enthalpy), a NELAC accredited laboratory. Canister sampling will be conducted using an Entech Instruments Silonite™ CS1200E Passive Canister Sampler or equivalent.

The SENSIT system is capable of integrating a passivated stainless-steel canister triggering system that will automatically open the valve of the canister to collect a pre-determined time integrated (1-hour) canister sample based on preset TVOC thresholds. A properly sized critical orifice will be placed at the inlet of the canister to ensure the sample is collected for a predetermined time period. An electronic vacuum gauge is integrated into the canister valve to ensure the integrity of the sample. The vacuum gauge pressure for each system will be included in the sensor payload to the data platform and can be continuously monitored to ensure that the sample media is still valid. If the sample media is compromised an automated alert will be sent out to designated Montrose and Suncor personnel to have the canister replaced. Typically, the

[1] This information was provided by the manufacturer spec sheet

canister can maintain a vacuum that does not compromise the sample integrity for 3 months, though this can vary from unit to unit.

Once per quarter planned 1-hour and 7-day summa canister samples will be collected by field technicians at the ten locations within the CCND neighborhoods, and at an additional three non-CCND community monitoring reference sites (urban and rural background). These non-CCND locations will be at the E470-I25 Junction, the Brighton Fire Department, and the Colorado Department of Health and Environment's (CDPHE) CAMP air monitoring station. The E470-I25 Junction and Berthoud Fire Department monitoring locations were chosen as rural background locations about 13 miles north of the CCND network. The CAMP location was selected as a representative urban location that has comparative data collected by CDPHE[2]. All 1-hour air samples will be collected during periods when TVOC concentrations are below the preset triggering threshold.

2.3 AEROQUAL AQM 65

The "AQM 65" is a ground powered or solar/battery powered air quality monitor manufactured by Aeroqual, a New Zealand company. The AQM 65 is a fully integrated air monitoring station offering near-FEM measurements. The units will be configured to measure the following parameters:

TABLE 2-2
AQM 65 Specifications

Air Pollutant/Parameter Category	Principle of Operation	Lower Detection Limit[3]	Upper Detection Limit[3]
Total VOC	Photoionization Detector	50 ppb	30 ppm
SO_2	Electrochemical Sensor	9 ppb	10 ppm
CO	Electrochemical Sensor	50 ppb	25 ppm
NO_2	Electrochemical Sensor	3 ppb	500 ppb
H_2S	Electrochemical Sensor	12 ppb	10 ppm
$PM_{2.5}$	Laser Scattering	1 ug/m^3	1000 ug/m^3
Temperature	Various	N/A	N/A
Relative Humidity	Various	N/A	N/A

[2] CDPHE describes CAMP as Urban in many reports. As an example, this description can be found on page 6 of the 2020 Ambient Air Monitoring Network Assessment: https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020_CO_5yr_Network_Assessment.pdf

[3] This information was provided by the manufacturer spec sheet

The AQM 65 offers measuring criteria pollutants to concentrations similar to a traditional monitoring station. The AQM 65 comes with a fully integrated calibration system which enables automatic scheduling of validation checks using two gas cylinders. Automatic validations are a key piece to the improved data quality over lower costs instruments. The system automatically zeros itself with the built-in zero air scrubber nightly for $PM_{2.5}$ and every minute for gaseous compounds to mitigate drift issues these sensors typically experience.

The AQM 65 contains different sensor modules that were designed specifically based on the strengths and weaknesses of the sensor selected. A sensor module can incorporate flow control orifices, solenoids, scrubbers, humidity equalizer, and additional electronics to account for sensor drift, noise, humidity, and cross interference. The system is temperature controlled and maintained at 30°C +/- 0.2°C to remove any temperature sensitivity that typical sensors exhibit. Active sampling starts with the stainless steel inlet on top of the enclosure. The inlet is lined with an inert material that ensures no target pollutant is lost. From there sample air is passed through a PTFE filter that removes particulate, protecting the sensors and extending their life. A sampling manifold delivers air to each module independently. Air is drawn continuously by a brushless DC pump. This pump works together with the flow control orifice in each module to deliver a precise flow of air to the sensor. Knowing the exact flow rate allows a higher degree of confidence in the measurement. Exhaust gas is released well away from the inlet to ensure no impact on the inlet sample. The AQM 65 is designed to then be calibrated in the field to minimize system downtime and adjust for any sensor degradation. The analyzer brochure can be found in Appendix B.

2.5 DATA PLATFORM

The AirSense data management platform, developed by SensibleIOT, handles traditional air monitoring data and air sensor data. The AirSense system is a cloud-based system that ingests data, performs quality control, and calibrates air sensor data. AirSense handles 1-second data (fixed or mobile), any pollutant or parameter, and offers intuitive navigation to view and display data for public and technical applications.

For the program staff at Suncor and Montrose, AirSense's dashboard provides a summary of the operational status of the network. This back-end data platform provides features not available on the community site. This back-end site gives Montrose access to additional features that Suncor personnel and the public will not, such as instrument and sensor settings, calibration and data correction features, and data invalidation. Figure 2-1 and 2-2 provide a screenshot of the back-end and community dashboard, respectively. For each location, AirSense provides a display showing near real-time readings and a map of the monitor location.

FIGURE 2-1
SCREEN SHOT OF THE AIRSENSE DASHBOARD

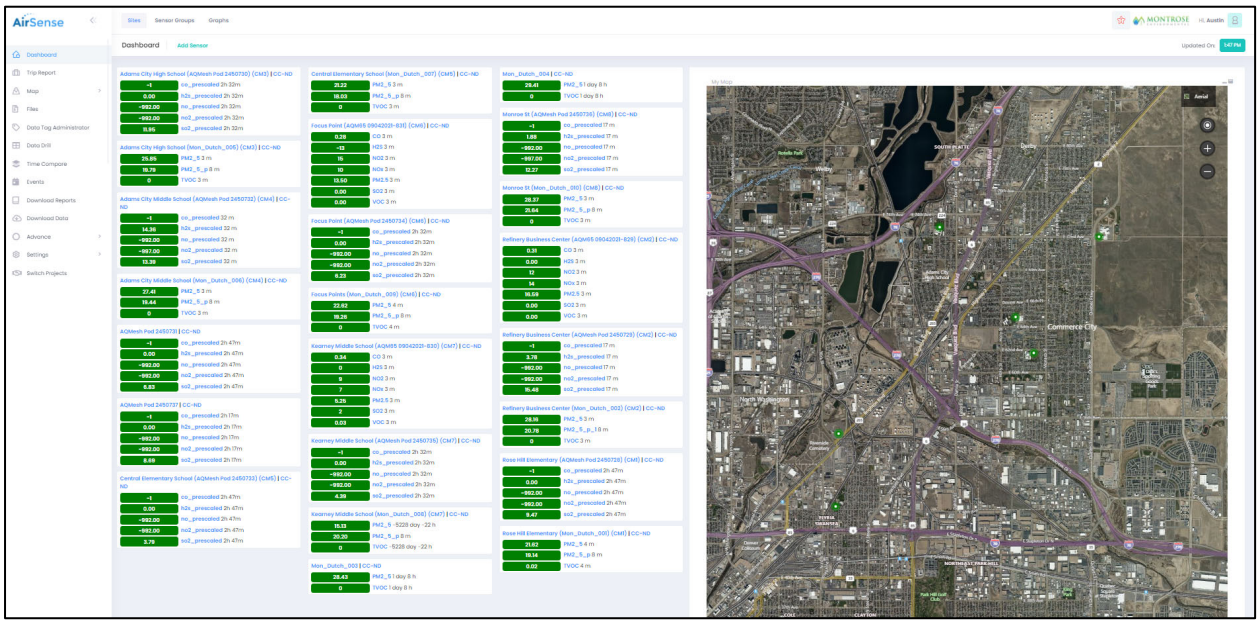
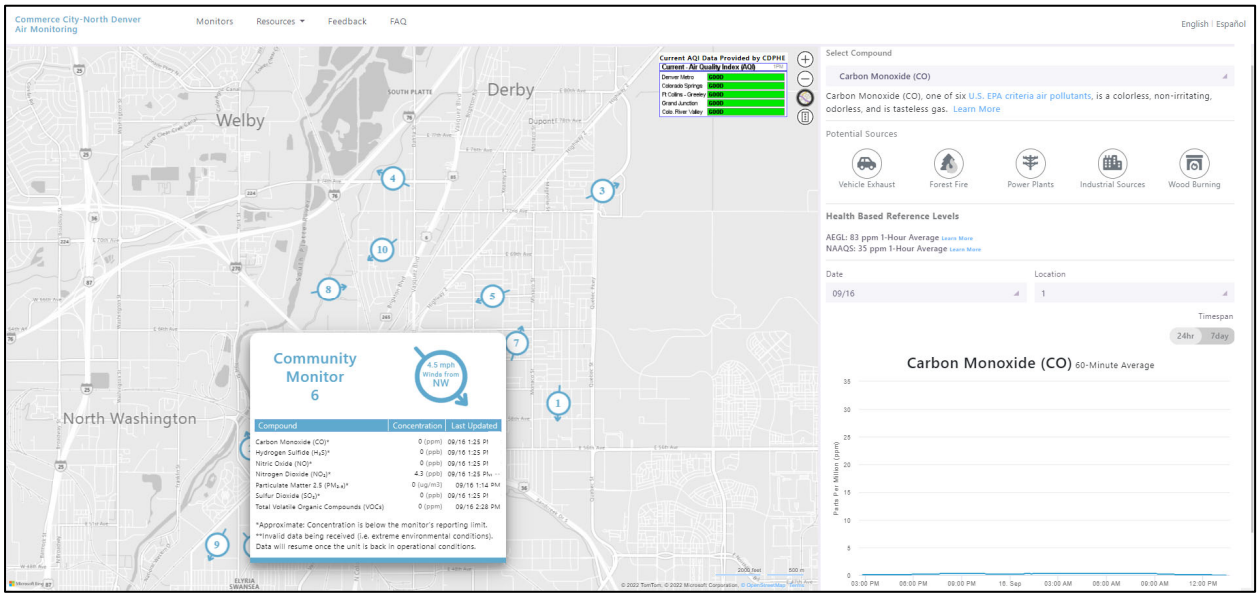


FIGURE 2-2
SCREEN SHOT OF THE PUBLIC DASHBOARD



3.0 QUALITY ASSURANCE QUALITY CONTROL

3.1 KNOWN-LIMITATIONS AND INTERFERENCES

Montrose plans to integrate three (3) of the AQM 65 Sampling Stations into the network. These stations would be collocated with one (1) of the SENSIT Ambient Sampling Stations. This collocation will allow for a multivariable regression between the AQM 65 and SENSIT units. This regression can then be applied to all monitors in the network and in doing so will provide higher data quality across the monitoring network. This collocation will also allow for a scaling correction factor to be applied between the AQM65 and the SENSIT. This scaling correction will also be applied to all monitors in the network to provide more accurate data if deemed necessary.

Temperature and relative humidity are known to affect the electrochemical sensors being used and could influence data quality. The SENSIT monitors collect sensor temperature and ambient relative humidity data and correct for these interferences via algorithms, the system also limits the effect of humidity interference by using a specific and patented inlet filter combined with dynamic sampling and heating.

Additionally, some of the sensors being used for specific compounds that are being monitored for in this program have known cross sensitivity to other compounds. Some significant cross sensitivities include ozone causing a response on the NO_2 sensor, this program mitigates this issue by using an ozone scrubber filter on the inlet of the NO_2 sensor. Similarly, the SO_2 sensor can have a response caused by the presence of H_2S.

Sensors like the SENSIT RAMP, are also known to produce data that is noisier than traditional reference method quality ambient air monitoring equipment. Per CDPHE's guidance[4] to mitigate this issue, the AirSense data management system will calculate rolling 1-hour averages to improve the signal-to-noise ratio of the instrument readings.

The AQM 65 units mitigate many of these issues by additional sensor module design. The typical temperature and humidity issues are mitigated by maintaining the temperature of the sensor modules at 30°C +/- 0.2°C and humidity equalizers or dryers. Each individual sensor module is designed specifically for weaknesses of the sensor itself. For example, the SO_2 module includes the sensor plus: a flow control orifice, solenoid, component scrubbers, humidity equalizer, and electronics. These additional components compensate for sensor drift, noise, humidity and cross interference, and greatly reduce the minimum detection limit in real world conditions. The scrubber works by analyzing the gas sample for SO_2, which will provide a response dictated by SO_2 and any present interferences. Then the sample is run through a selective scrubber that only removes SO_2 from the sample gas, the difference between the SO_2 reading before and after the scrubber is then reported as the true SO_2 concentration.

3.2 DEPLOYMENT PROCEDURES

The following procedures will be followed prior to deploying the sensors to monitoring locations. Any sensors not meeting all the requirements outlined below will be transferred to Montrose's facility and a technician will attempt to resolve the issue at the guidance of the manufacturer. If the issue cannot be resolved by Montrose the instrument will be returned to the manufacturer.

3.2.1 Sensor Deployment/Maintenance Log

Upon completion of the sensor pre-delivery checks, the sensors will be received by Montrose and a sensor deployment/maintenance log initiated. The log will be stored on Montrose's server which is only accessible by Montrose personnel and will contain the following minimum information:

- Sensor serial number
- Sensor model number
- Sensor batch ID
- AirSense key
- Results of the initial sensor calibration check out procedures
- Deployment location, date and time
- Sensor replacement schedule
- History of notes, issues and maintenance procedures organized by date

3.2.2 SENSIT RAMP PID Gas Calibration

A calibration will be performed on all SENSIT RAMP TVOC sensor during the initial deployment effort using zero air, 1 ppm, and 2 ppm isobutylene certified cylinders. These gas concentrations were chosen based on expected ambient concentration levels. A gas hood is installed over the top of the PID sensor and gas is flowed at approximately 0.5 L/min across the sensing portion of the PID face.

[4] https://www.colorado.gov/airquality/documents/CDPHESensorGuidanceFactSheet08262019.pdf

TABLE 3-1
MINIMUM PID GAS QUALITY CONTROL CRITERIA

PID Gas Concentration Input	Minimum Criteria[5]
1 ppm Precision	|3*Standard Deviation|<=50 ppb
Zero Air	±10% of span bottle value
1 ppm	±25% of span bottle value
2 ppm	±25% of span bottle value

Based on the response of the analyzer to each concentration of gas, a linear fit will be applied to the data to produce a slope and intercept that is applied to the raw pollutant parameter. PID detectors historically have a logarithmic response and only a small region of the sensors full range is considered linear. In the case of the PID that SENSIT uses, this linear range is from 0 to 3 ppm. Once the units are deployed to the field some minor adjustments are made to the unit's baseline reading, this adjustment is considered when evaluating if the calibration met the minimum criteria outlined above.

This is the same methodology and minimum criteria used for fugitive tVOC emission monitoring programs that Montrose manages for upstream oil and gas operators to comply with CDPHE's Regulation 7 VI.C and has been accepted by CDPHE for those programs.

3.2.3 SENSIT Criteria Pollutant and H_2S Gas Calibration

A calibration will be performed on the CO, NO_2, SO_2, and H_2S sensors during the initial deployment effort using certified gas cylinders. A gas hood is installed over the top of the sensor and gas is flowed at approximately 2.0 L/min across the sensing portion of the sensor's face. The tables below provide the approximate gas concentrations that will be used for initial calibrations. These gas values were chosen based on expected ambient concentrations.

TABLE 3-2
MINIMUM CO GAS QUALITY CONTROL CRITERIA

CO Gas Concentration Input	Minimum Criteria[4]
1 ppm Precision	|3*Standard Deviation|<=100 ppb
0 ppm	±10% of Mid-Gas
1 ppm	±30% of span value
10 ppm	±30% of span value

[5] Based on 1-minute readings

TABLE 3-3
MINIMUM NO_2 GAS QUALITY CONTROL CRITERIA

NO_2 Gas Concentration Input	Minimum Criteria[4]
0.1 ppm Precision	|3*Standard Deviation|<=20 ppb
0 ppm	±25% of Mid-Gas
0.1 ppm	±30% of span value
0.2 ppm	±30% of span value

TABLE 3-4
MINIMUM H_2S GAS QUALITY CONTROL CRITERIA

H_2S Gas Concentration Input	Minimum Criteria[4]
0.1 ppm Precision	|3*Standard Deviation|<=10 ppb
0 ppm	±25% of Mid-Gas
0.1 ppm	±30% of span value
0.4 ppm	±30% of span value

TABLE 3-5
MINIMUM SO_2 GAS QUALITY CONTROL CRITERIA

SO_2 Gas Concentration Input	Minimum Criteria[4]
0.1 ppm Precision	|3*Standard Deviation|<=40 ppb
0 ppm	±25% of Mid-Gas
0.1 ppm	±30% of span value
0.4 ppm	±30% of span value

Based on the response of the analyzer to each concentration of gas a linear regression will be fit to the data to produce a slope and intercept that will be applied to the pollutant parameter that is receiving the scaling correction if 30% of the minimum criteria is exceeded. Once the units are deployed to the field some minor adjustments are made to the unit's baseline reading, this adjustment is considered when evaluating if the calibration met the minimum criteria outlined above.

3.2.4 AQM 65 Gas Validation

The AQM 65 is supplied with an internal calibration system, the AirCal 8000, that includes a NIST traceable mass flow meter and controller allowing for dynamic dilution of calibration gas standards. The AirCal 8000 only provides space for two (2) calibration gases and a multipoint calibration will be performed on all sensors during the initial deployment effort. The onboard zero air scrubber will allow for nightly automated zeroing of the instrument. Due to the AirCal

8000 only having the ability to integrate two (2) gas cylinders and certain gases are not stable when mixed in a compressed gas cylinder, weekly quality control checks of the SO_2 and H_2S will occur. Monthly quality control checks of the CO, TVOC, and NO_2 will be conducted during the gas validation of the collocated SENSIT RAMP monitors. No gain or offset correction is made during these validation checks. Quarterly calibrations of the instrument will occur in accordance with the procedures linked to section 3.2.4.

FIGURE 3-1
AQM 65 INTERNAL CALIBRATION SYSTEM

TABLE 3-6
MINIMUM AQM 65 GAS VALIDATION CRITERIA

Gas Concentration Input	Minimum Criteria
SO_2, NO_2, and H_2S Zero	±0.015
CO Zero	±0.200
TVOC Zero	±0.100
CO, SO_2, NO_2, TVOC, and H_2S Span	±10% of Span

3.2.5 Wind Direction Siting

The sonic anemometers on each SENSIT RAMP monitor have a North orientation marker that will be aligned to magnetic north using a compass. The field personnel sites the monitor during the initial deployment and then confirms this reading during each subsequent monthly calibration checks. An acceptable check will verify that the North siting is within 10 degrees. If the verification check fails, the monitor will be adjusted and the data since the last verification check will be flagged on the data platform.

3.2.6 Co-Location Study

The near-FEM AQM 65 units used in this program will be collocated with each other prior to deployment in the field to determine system-to-system variability. During this time the data will be collected by the AirSense data platform. The minimum criteria that must be met before these monitors will be deployed in the field are listed in Table 3-7 below.

TABLE 3-7
MINIMUM NEAR-FEM CO-LOCATION CRITERIA

Parameter	Minimum Criteria*
Data Completeness	>95%
AQM 65 System-to-System Agreement $PM_{2.5}$ (Absolute Error from Average)	+/- 3 µg/m3
AQM 65 System-to-System Agreement H_2S, SO_2, and NO_2 (Absolute Error from Average)	+/- 0.02 ppm
AQM 65 System-to-System Agreement CO (Absolute Error from Average)	+/- 0.1 ppm

* Based on 60 min averaged data

SENSIT RAMP monitors will be received by Montrose in batches and collocated with a near-FEM AQM 65 unit. The co-location study will be conducted for a period of one week. During that time data will be collected by the AirSense data platform. The collected data will be summarized in the deployment/maintenance log. The purpose of this collocation is to demonstrate that the SENSIT RAMP units provide data within a reasonable error to the AQM 65 units and show the unit-to-unit agreement. This unit-to-unit agreement provides confidence in the data from the SENSIT RAMP units that will not be collocated with AQM 65 units during community monitoring. Before being deployed at a location, the sensors must meet the minimum criteria found in Table 3-8. One of the parameters that will be used for evaluating the co-location is root mean square error (RMSE). RMSE is the standard deviation of the residuals. Residuals are a measure of how far from the regression line data points are. In other words, it tells you how concentrated the data is around the line of best fit.

TABLE 3-8
MINIMUM SENSOR-NEAR-FEM CO-LOCATION CRITERIA

Parameter	Minimum Criteria*
Data Recovery	>95%
Error to near-FEM $PM_{2.5}$ (RMSE)	<10 µg/m3
SENSIT RAMP Sensor-to-Sensor Agreement $PM_{2.5}$ (Absolute Error from Average)	+/- 3 µg/m3

Parameter	Minimum Criteria*
Error to near-FEM H_2S, SO_2, and NO_2 (RMSE)	<0.05 ppm
RAMP Sensor-to-Sensor Agreement H_2S, SO_2, and NO_2 (Absolute Error from Average)	+/- 0.04 ppm
Error to near-FEM CO (RMSE)	<0.20 ppm
RAMP Sensor-to-Sensor Agreement CO (Absolute Error from Average)	+/- 0.15 ppm

* Based on 60-minute averaged data

3.2.7 FEM Co-Location Study

The near-FEM AQM 65 units used in this program were collocated with the Welby (AQS ID: 080013001) regulatory CDPHE air monitoring station prior to deployment in the field to better understand the error between the AQM 65 and FEM monitors. During this time the AQM 65 data was collected by the AirSense data platform, and the FEM data was provided by CDPHE.

Due to the number of studies done collocating the AQM 65 with reference monitors for CO, NO_2, and $PM_{2.5}$ and the fact that no CDPHE sites monitor for H_2S, SO_2 was the main driver for selecting a collocation site. Three CDPHE sites in Denver monitor for SO_2: Welby, La Casa, and CAMP. For accessibility reasons Welby was chosen. The study began on June 2, 2021 and completed on June 9, 2021. Compounds that the Welby station and the AQM 65 both monitor for are CO, NO, NO_2, and SO_2. The RMSE value from this study are report in table 3-9 below. Though no criteria were set prior to this study the results suggest the "Near-Reference" claim of the AQM 65 units is fair.

TABLE 3-9
WELBY VS AQM 65 COLLOCATION RESULTS

Compound	RMSE (ppm)
CO	0.096
NO[6]	0.012
NO_2	0.004
SO_2	0.000

3.3 ONGOING QUALITY ASSURANCE QUALITY CONTROL

The following procedures will be followed on an on-going basis to ensure the quality of collected data.

[6] NO was removed from the monitoring program in Q4 2022

Due to the nature of electrochemical sensors used in this program, adverse atmospheric conditions such as extreme humidity, extreme temperature, and other conditions can affect a monitor's ability to provide reliable data. Since these conditions are uncontrollable, it is not possible to mitigate their effects. Data invalidated due to adverse atmospheric conditions are excluded from data completeness calculations.

3.3.1 Data Platform Alerts

The AirSense data platform will alert Montrose and Suncor according to the table below. These alerts will trigger investigation and corrective actions by Montrose. Alerts will be in the form of an immediate e-mail notification.

TABLE 3-10
PLATFORM ALERT CRITERIA

Parameter	Minimum Criteria
Range Check	-2 to 100 ppm or µg/m^3
Flatline Check	Constant value for more than 60 1-minute data points
Communication Failure Alerts	When no data is received for more than 60 minutes emails alerts will be issued at a frequency of once per 6 hours

3.3.2 Daily Quality Assurance Checks

Montrose will review the morning reports generated as outlined in section 4.2.1 to verify that the deployment criteria in Table 3-11 is met.

TABLE 3-11
MINIMUM DEPLOYMENT CRITERIA

Parameter	Minimum Criteria
Data Recovery	>95%
Daily Maximum Value	As Necessary

If any of the criteria laid out in Table 3-11 fail the following procedures will be followed depending on the parameter in question and a back-up sensor will be ready to replace a failed sensor at all times.

Data Recovery: If the sensor fails to meet the data recovery minimum of 95% over 24 hours a technician will inspect the unit. Each day is defined as the 24-hour period spanning from midnight to midnight. Morning reports are received at approximately 9 am MT each day for review. The inspection will consist of checking for any loose connections within the unit that may be causing a power failure and that 12 volts of power is being generated by the solar panel and can be traced back to the barrel jack plugged in the device. If the technician cannot determine the cause of the data recovery, the unit will be returned to the manufacturer for a more in-depth review.

Maximum Value Criteria: If any of the hourly averages for the parameters being monitored for exceed the levels identified in Table 3-12 below Montrose personnel will review the lower temporal resolution data collected during that period to determine if any instrument issues may have occurred.

TABLE 3-12
MONTROSE REVIEW CRITERIA

Parameter	Montrose Data Review Level
NO_2	0.100 ppm
SO_2, H_2S	0.075 ppm
CO	3 ppm
TVOC	1 ppm
$PM_{2.5}$	35 ug/m^3

3.3.3 Monthly SENSIT RAMP Quality Assurance Checks

Montrose will visit each monitoring location monthly and run through validation checks on each of the SENSIT RAMP units. Similar to the initial calibration, a gas hood is installed over the top of the sensor and gas is flowed at approximately 0.5 L/min across the sensing portion of the sensor's face. Each of the initial calibration concentration levels will be reintroduced to the sensors. Tables in section 3.2.3 provide the minimum criteria that must be met for the data collected since the previous calibration or validation check was conducted. If a reason for the failed calibration cannot be found or the issue is irreparable then the sensor will be replaced.

If all of the units in the network fail the validation check then the raw data collected from the monitors (this is the data that was not run through the multivariable regression) will be post-processed using the average calibration results of the validation test before and after the sampling period and the data will be flagged and a description of the failed QA will be noted. The AQM65 units will then have a validation check done on the units to determine if the near-FEM data being supplied to the regression is valid. Additional data review will be conducted to determine if the regression is properly correcting the data or if adjustments to the regression need to be made.

During these monthly visits the instruments will be blown out with canned air to remove any accumulated dust from inside the units. The unit will also be visually inspected for any damage or signs of tampering with the unit.

The SENSIT system has an automated built-in quality assurance check that will flag data as described in Table 3-13.

TABLE 3-13
ENVEA AUTOMATED QUALITY ASSURANCE CODES

3.3.4 AQM Quality Assurance Checks and Calibration

Aeroqual recommends the maintenance schedule in Table 3-14. A detailed description of the procedures that will take place to complete these maintenance tasks can be found at: https://support.aeroqual.com/Wiki/Maintenance_Schedule

TABLE 3-13
AEROQUAL AQM65 MAINTENANCE SCHEDULE

Service activity	Service frequency
Change filter on gas inlet	Initially 4 weeks, then every 4-12 weeks. Later this can be modified to suit local conditions and data quality objectives.
Check flow of gas inlet	Initially 4 weeks, then every 4-12 weeks. Later this can be modified to suit local conditions and data quality objectives.
Adjust flow of gas inlet	As required following gas inlet flow check
Replace gas pump	When flow rate can't be set correctly
Check flow of gas modules	As required following gas inlet flow check
Check gas module for leaks	As required following gas module flow check
Remove gas module	As required and described below
Replace gas module	As required and described below
Field calibrate (zero and span) gas module	At least every 3 months (four times per year) but no more than once per week.
Change filter for particle monitor	Initially 4 weeks, then every 4-12 weeks. Later this can be modified to suit local conditions and data quality objectives.
Check flow of particle monitor	Initially 4 weeks, then every 4-12 weeks. Later this can be modified to suit local conditions and data quality objectives.
Adjust flow of particle monitor	Adjust as required following inlet flow check
Check particle monitor for leaks	Every 3 months
Check zero of particle monitor using external filter	Every 3 months
Check zero of particle monitor using auto cycle (AQM)	Every 3 months
Check laser and detector	Every month
Clean sharp cut cyclone	Every 3 months
Replace pumps in particle monitor	Every 12 to 18 months, or when flow rate can't be set correctly
Clean compressor cassette	As required
Refill compressor with gas	As required or when directed by Aeroqual technical support.
Factory calibrate particle monitor	Every 24 months (2 years)

3.3.5 Sensor Replacement Schedule

The electrochemical sensors and PID in the AQM 65 and SENSIT IT degrade over time. The lifespan of the sensors varies and is dependent on preventative maintenance and level of pollutant exposure. Degradation can be indicative of failed monthly (SENSIT RAMP) or weekly (AQM 65) data validation. The manufacturers specify the sensor lifespan for these systems is at least 12 months. Each sensor will be removed from the location and replaced when degradation characteristics are observed or after approximately 12-months of operation. After replacement, the sensors will be transferred to Montrose and the Co-Location study will be repeated. All QA/QC checks as outlined for initial deployment will be repeated and documented in the deployment/maintenance log.

4.0 REPORTING

A morning system report will be issued by the AirSense data platform and e-mailed to the principle parties at Suncor and Montrose. The system report will have at a minimum, the following 24-hour data summary of each parameters listed below. An example system report can be found in the Appendix.

- Sensor ID
- Minimum value
- Maximum value
- Average value
- Percent data capture

APPENDIX A
SENSIT RAMP/ENVEA
Specification Sheet

Cairsens© Micro-Sensors - Technical Specifications

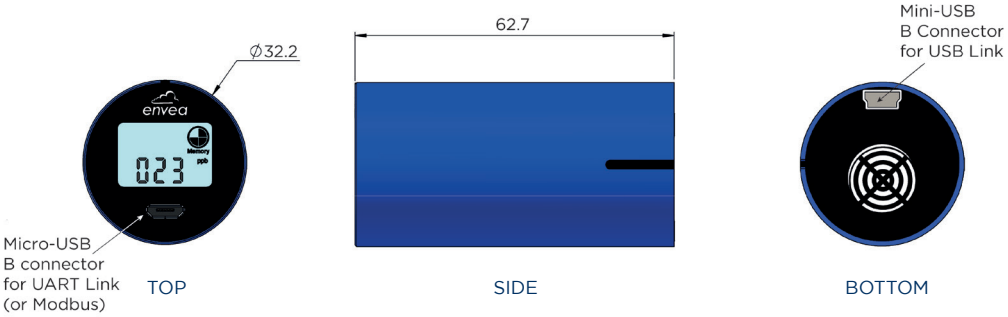
Most of the Cairsens© sensors use amperometric technology consisting of three electrodes: the working electrode (anode), the counter electrode (cathode) and the reference electrode. The gas to be analyzed is diffused through a permeable membrane towards the sensitive electrode. The function of the gas, oxidation takes place at the anode, or reduction at the cathode. The electrical signal generated between the two electrodes is proportional to the concentration.

* Cairsens® are manufactured in France and calibrated in our metrological laboratory using Standard Reference AQMS monitors. Every sensor shipped includes a calibration certificate. No maintenance and no need for recalibation for 1 year warranty.

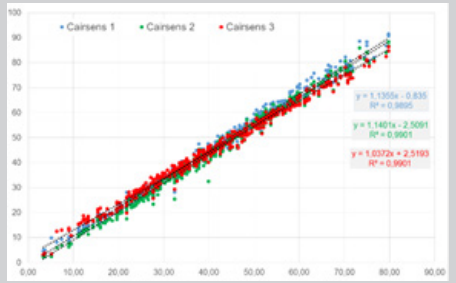
STORAGE CONDITIONS	
Temperature (°C)	+5 to +20
Relative Humidity (% HR)	> 15 (non-condensing)
Maximum Storage Duration	3 months for all gas sensors, 6 months for VOC sensors

COMPLIANCE TO ENVIRONMENTAL REGULATIONS	
Electrical safety	NF EN 61010-1: 2010
Electromagnetic Compatibility	NF EN 61326-1: 2013
Protection Index	IP 42 (according to IEC 60529)
European directive	2008/50/EC

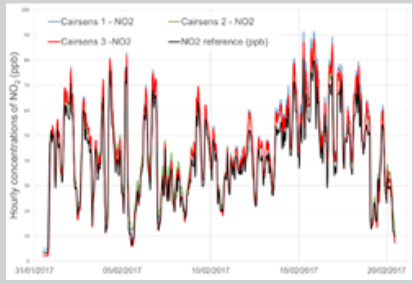
SYSTEM SPECIFICATIONS	
Power supply	5VDC / 500mA, USB port of a PC or Power bank (not provided)
Power Consumption	Less than 20 mA under 5VDC
Gas sampling method	Air sampling with a controlled micro-fan
I/O login & communications	USB, UART, Modbus
LCD Display	Concentration in ppb or ppm, life time of the sensor, operating status, memory available, ...
Control & data treatment board	Internal microprocessor for data acquisition and treatment, embedded timer
Data Storage	20 days for 1 min data, 303 days for 15 min data or 1212 days for 60 min data
Download data mode	Cairsoft (free download on our website), eSAM data acquisition



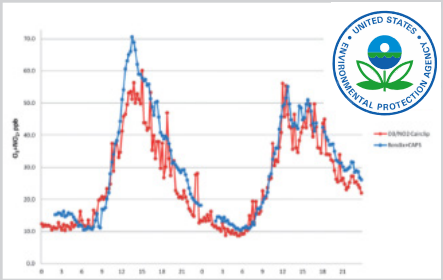
Excellent measurement accuracy is achieved by limiting the effect of humidity interference by using a specific and patented inlet filter combined with dynamic sampling.



Correlation of measurements:
Reference station vs Cairsens NO_2 (ppb)



NO_2 measurement comparison:
Traffic reference-station vs 3 Cairsens



O_3 monitoring, comparative test:
Cairsens vs Reference method

Metrological Performances[1]

	Criteria pollutants (Air Quality)				Odorous Compounds						
Measured Parameter	NO_2	$O_3 + NO_2$	SO_2	CO	H_2S / CH_4S			NH_3		nmVOC	
Measuring Range (ppm)	0 - 0.25	0 - 0.25	0 - 1	0 - 20	0 – 1	0 - 20	0 - 200	0 - 25		0 - 2	0 - 16
Certified* Detection Limit (ppm)	0.02	0.02	0.05	0.05	0.01	0.03	0.2	0.5		0.2	0.5
Resolution (ppm)	0.001				0.001						
Linearity	< ± 10 %				< ± 10 %						
Measurement Uncertainty[2]	± 25 %	± 30 %	± 25 %	± 25 %	± 30 %	± 30 %	± 30 %	± 30 %		± 30 %	± 30 %
Response Time	< 90 s	< 90 s	90 s	< 90 s	< 90 s	< 90 s	< 90 s	90 s		60 s	60 s
Calibration & Carrier gases	NO_2 + wet air	O_3 + wet air	SO_2 + wet air	CO + wet air	H_2S + wet air			NH_3 + wet air		Isobutylene (C_4H_8) + Synthetic Air	
Reference compound for the sensibility	NO_2 + wet air	O_3 + wet air	SO_2 + wet air	CO + wet air	H_2S + wet air			NH_3 + wet air		Isobutylene (C_4H_8) + Synthetic Air	
Quantification Limit (QL) (ppm)	0.04	0.04	0.1	0.1	0.02	0.06	0.4	1		0.4	1
Cross-Sensitivity	Cl_2 ~ 80%	Cl_2 ~ 80%	NO_2 & O_3 ~ -125% H_2S ~ 5% CO & H_2 <1 %	H_2 (4) < 60 %	Others VRSC[4] (SO_2, OCS, C_2H_6S, C2H6S2) < 100% Oxidant species negative interference (O_3, NO_2) ~ 30%			Interferent SO_2 H_2S NO NO_2 Cl_2	Concentration 20 ppm 20 ppm 20 ppm 20 ppm 20 ppm	Reading -7 ppm 7 ppm -1 ppm -20 ppm -55 ppm	Available list on request [6]
Exposure Limit to O_3	7.5 ppm/day[3]	N/A	N/A	N/A	N/A			N/A		N/A	N/A
Sensor Type	Electrochemical				Electrochemical					PID[5] lamp ionization potential = 10,6eV[6]	

Operating Temperature (°C)	-20 to +40	-20 to +40	-20 to +50	-20 to +50	-20 to +40	-20 to +40	-20 to +50
Operating Relative Humidity (HR%)	10 to 90 (non-condensing)				10 to 90 (non-condensing)		
Operating Pressure (mbar)	1013 ± 200				1013 ± 200		

(1) According to our operating conditions in laboratory: 20°C +/- 2°C / 50% RH +/- 10% / 1013 mbar +/- 5% (2) According to the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. (3) Beyond this limit, the ozone filter performance decreases. (4) VRSC = Volatile Reduced Sulfur Compounds (5) Photo-Ionization Detector (6) The Detector will respond to most common volatiles compounds that have an ionization potential less than 10.6eV.

Measurements meet European directive 2008/50/EC for indicators

ENVEA
111 Bd Robespierre / CS 80004
78300 Poissy Cedex 4 - FRANCE
☎ +33(0)1 39 22 38 00
✉ info@envea.global

OHSAS 18001:2007
ISO 14001:2015
ISO 9001:2015
CERTIFICATION

Visit us on:
www.envea.global

SENSIT® RAMP

REMOTE AIR QUALITY MONITORING PLATFORM

UP TO FIVE GASEOUS CHEMICAL POLLUTANTS

COMPATIBLE WITH

SENSIT Technologies

SENSIT® RAMP

REMOTE AIR QUALITY MONITORING PLATFORM

A REMOTE AIR QUALITY MONITORING PLATFORM & POLLUTION DATA MANAGEMENT SYSTEM

The **SENSIT® RAMP** is an easily deployable, low-cost air quality monitoring platform that is capable of monitoring up to five gaseous chemical pollutants, temperature, humidity, particulate matter, and meteorological conditions.

Electrochemical sensors offer PPB, parts per billion, resolution for CO, NO, NO_2 O_3, and SO_2 gases. An integrated PM2.5 particulate matter sensor measures pollutants in the atmosphere.

Other **SENSIT® RAMP** features include internal SD storage, optional solar charging and global cellular integration for remote operation. Additional instrumentation may be integrated via four I/O ports on the side of the unit.

STANDARD FEATURES

Durable, Weather Resistant Housing
Long Life, Low Cost Sensors
Local Or Remote Operation
Wireless Cellular
Sd Card Data Backup
Backup Battery

STANDARD SENSORS

CO_2 - Carbon Dioxide
CO - Carbon Monoxide
NO - Nitric Oxide
NO_2 - Nitrogen Oxide
O_3 - Ozone
SO_2 - Sulfur Dioxide
PM1, PM2.5, PM10 - Particulate Matter
TVOC (PID or MOS), Temperature, & Relative Humidity, Anemometer

APPLICATIONS

Natural Gas & Energy	Remote Air Quality Monitoring	**Environmental**	Environmental Impact Studies Pollutant Source Identification
Municipal Government Services	Traffic Pattern Optimization	**Emergency Response**	Wildlife Air Quality Monitoring
Industrial Health & Safety	Industrial Site Monitoring	**HVAC & Plumbing**	Remote Air Quality Monitoring

STANDARD KIT

USB Adapter
Charging Cable

OPTIONAL HARDWARE:

Solar Panel
Tripod
Mechanical Anemometer
Ultrasonic Anemometer
Outdoor Power Supply

PRODUCT SPECIFICATIONS

Size: Fully assembled without anemometer or antenna D x W x H (5" x 10" x 12")
Weight: Base unit: 7.5 lbs
Operational Temp: -20°C to 50°C
Mounting: Attached Mounting Flanges
Voltage Requirements: 18V – 24V DC Charging (wired adapter or solar panel)
Current Requirements: 1A Max Current Draw when Charging
Operating Runtime: 3-15 Days Battery Backup
Operating Temp: -20°C to 50°C
Data Outputs: Digital Wired Output (3.3V TTL - USB) | Wireless (Cellular Included) | SD Card Data Backup

SENSOR SPECIFICATIONS

SENSORS	DETECTION METHOD	RANGE (STANDARD)	ACCURACY (STANDARD)	RESPONSE TIME (STANDARD)	RANGE (HIGH)	ACCURACY (HIGH)	ACCURACY (STANDARD)
CO_2	NDIR Optical	100-2000ppm	±100 ppm min or 50%	30 sec	400-10,000ppm	±400 ppm min or 30%	30 sec
CO	Electrochemical	20ppb-25ppm	±20ppb min or 50%	60-90 sec	1-1000ppm	±2 ppm min or 10%	< 30 sec
NO	Electrochemical	20ppb-25ppm	±20ppb min or 50%	60-90 sec	1-1000ppm	±2 ppm min or 10%	< 30 sec
NO_2	Electrochemical	20ppb-25ppm	±20ppb min or 50%	60-90 sec	1-1000ppm	±2 ppm min or 10%	< 30 sec
O_3	Electrochemical	20ppb-25ppm	±20ppb min or 50%	60-90 sec	1-1000ppm	±2 ppm min or 10%	< 30 sec
SO_2	Electrochemical	20ppb-25ppm	±20ppb min or 50%	60-90 sec	1-1000ppm	±2 ppm min or 10%	< 30 sec
PM2.5	Laser Scattering	1-1000 µg/m3	±10 µg min or 50%	12-30 sec	1-1000 µg/m3	±10 µg min or 50%	15-30 sec

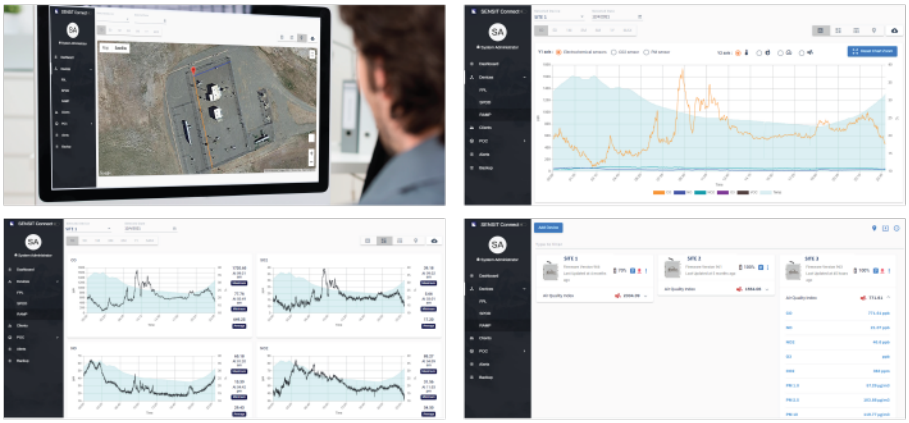
Periodic Maintenance
Periodic cleaning of sensor openings of dust. User replacement of sensors is easily performed as needed.

Additional Included Sensor
Additional sensors can be added (external ports)

SENSIT CONNECT.NET

is a web-based application portal for viewing and managing SENSIT environmental Monitors.

This portal allows remote access to: real-time and archived data, data visualization tools, sensor health and settings, device location and tracking information, notification options and parameters, and can assist with leak location identification and quantification estimates.



SENSIT® RAMP
Accessories & Replacement Parts

RAMP PM, CO_2, T, RH, CO	Part # 938-RAMP0-50
RAMP PM, CO_2, T, RH, CO, O_3	Part # 938-RAMP0-51
RAMP PM, CO_2, T RH, CO, O_3, NO_2	Part # 938-RAMP0-52
RAMP PM, CO_2, T, RH, CO, O_3, NO_2, SO_2	Part # 938-RAMP0-53
RAMP PM, CO_2, T, RH, CO, O_3, NO_2, NO	Part # 938-RAMP0-54
RAMP PM, ENVIRO, CO, O_3, NO_2, NO	Part # 938-RAMP0-55
RAMP PM, ENVIRO, T, RH, NO_2, O_3	Part # 938-RAMP0-56
RAMP PM, VOC, T, RH, CO, NO, NO_2, SO_2	Part # 938-RAMP0-57
RAMP PM, T, RH, CO, NO, NO_2, SO_2	Part # 938-RAMP0-58
RAMP PM, VOC, T, CO, O_3, NO_2, SO_2	Part # 938-RAMP0-59
RAMP PM, ENVIRO, CO, O_3, NO_2, SO_2	Part # 938-RAMP0-60
Solar Panel	Part # 870-00113
Tripod	Part # 870-00132
Mechanical Anemometer	Part # 870-00108
USB Adaapter	Part # 870-00116
Charging Cable	Part # 871-00071

OPTIONAL ELECTROCHEMICAL SENSORS:

H_2S - Hydrogen Sulfide
NH_3 - Ammonia
VOCs - Volatile Organic Compounds

Gas Sensors

Distributed by:

SENSIT Technologies
851 Transport Drive
Valparaiso, IN 46383-8432

Phone: 888 4SENSIT
888 473 6748
219 465 2700

Fax: 219 465 2701
www.GasLeakSensors.com

MADE IN THE USA
WITH GLOBALLY SOURCED COMPONENTS

SENSIT Technologies
is an ISO 9001:2015 certified company.

ISSUED: 7-1-2019 REV: 10-27-2023

APPENDIX B
Aeroqual AQM65 Specification Sheet

aeroqual

AQM65

Near reference real-time monitor for multiple gases plus particulate fractions

The AQM 65 is a fully integrated, temperature controlled air quality monitoring station that delivers 'near reference' levels of performance in real-time for multiple gases, particulates and environmental parameters.

Continuously measure air pollutants including ozone O_3, NO_2, NOx, CO, SO_2, VOC, H_2S, CO_2, TSP, PM_{10}, $PM_{2.5}$, PM_1, noise and meteorological parameters.

AQM 65 shown with Optional integrated Calibration system

What is it?

- Proven long term performance in extreme climates with purpose-built enclosure and advanced temperature and humidity control
- Reduce site visits using two-way communications – remotely troubleshoot, upgrade software, change settings, and calibrate
- Plug in all your devices – noise, weather, reference monitors – to the AQM 65 and view data in one software dashboard
- Enables automatic scheduling of calibrations with optional integrated calibration system
- Respond in real-time via configurable email / SMS alerts

What can it measure?

- Multiple gases, dust fractions, wind, weather and noise

Who is it for?

- Industrial operators who need a cost-effective and robust solution to manage and control dust and gas emissions from site activities within regulatory or permitted limits:
  - Industrial perimeter monitoring
  - Oil and gas facilities
  - Quarry and mine operators
  - Port and bulk handling authorities
  - Waste management sites
- Regulatory authorities who need to fill the gaps in the regulatory monitoring networks
- Environmental consultants and Researchers who want defensible data without the usual time and hassle of air monitoring projects
  - Research and consultancy projects
  - Environmental impact assessments
  - Short term hot spot monitoring
  - Roadside air monitoring

Specifications | AQM 65

Gas module	Range	Resolution	Noise Zero; Span % of reading	Lower Detection Limit (2σ)	Precision	Linearity (% of FS)	Drift 24 hour Zero; Span % of FS
Ozone O_3	0-500 ppb	0.1 ppb	1 ppb; 1 %	1 ppb	2 % of reading or 2 ppb	1.5 %	1 ppb; 0.2 %
Nitrogen dioxide NO_2	0-500 ppb	0.1 ppb	1 1 %	1 ppb	2 % of reading or 2 ppb	1 %	2 ppb; 1 %
Carbon Monoxide CO	0-25 ppm	0.001 ppm	0.02 ppm; 1 %	0.04 ppm	3 % of reading or 0.050 ppm	1 %	0.02 ppm; 0.2 %
Sulfur Dioxide SO_2	0-10000 ppb	1 ppb	4 ppb; 2 %	9 ppb	3 % of reading or 9 ppb	1 %	1 ppb; 0.2 %
Nitrogen Oxides NO_X	0-500 ppb	0.1 ppb	1 ppb; 1 %	1 ppb	3 % of reading or 3 ppb	1 %	1 ppb; 0.2 %
Hydrogen Sulfide H_2S	0-10000 ppb	0.1 ppb	6 ppb; 2 %	12 ppb	3 % of reading or 12 ppb	1 %	1 ppb; 0.6 %
Carbon Dioxide CO_2	0-2000	1 ppm	5 ppm; 1 %	10 ppm	3 % of reading or 10 ppm	2 %	1 ppm; 0.6 %
VOC (Low range)	0-500 ppb	0.1 ppb	1 ppb 1 %	1 ppb	2 % of reading or 2 ppb	1 %	1 ppb; 1 %
VOC (High range)	0-30 ppm	0.01 ppm	0.1 ppm; 1 %	0.05 ppm	2 % of reading or 0.05 ppm	2 %	0.1 ppm; 1 %

Particle module	Sizes	Range	Accuracy	Resolution	Lower Detectable Limit (2σ)
Nephelometer	PM_1, $PM_{2.5}$, PM_{10} OR TSP	0 to 60,000 µg/m³	±(2 µg/m³ + 5% of reading)	0.1 µg/m³	1 µg/m³
Profiler (Optical Particle Counter)	PM_1, $PM_{2.5}$, PM_{10} AND TSP	PM_1 200 µg/m³ $PM_{2.5}$ 2000 µg/m³ PM_{10} 5000 µg/m³ TSP 5000 µg/m³	±(5 µg/m³ + 15% of reading)	0.1 µg/m³	1 µg/m³
	Optional Particulate Counts: 0.3, 0.5, 0.7, 1.0, 2.0, 3.0, 5.0, 10 microns (counts range: 0-100,000 counts/L)				

System specifications	
Control system	Embedded fanless PC (Intel Celeron® N3350, 1.1GHz, dual core, 4GB RAM, 32GB SSD hard drive), Debian Linux Operating System
Communications[1]	Standard: WIFI, Ethernet (LAN) Optional modem: Cellular IP 3G HSPA or 4G LTE
Software	**Aeroqual Cloud** – Choose a plan that is right for you **Optimize:** Reduce site visits and improve data quality by managing your monitors and optimizing network performance remotely. **Plus**: Stay one step ahead with enhanced features for viewing and sharing data, real-time alerts, and analysis. Talk to our sales team to learn more about Aeroqual Cloud plans.
Data logging	32 GB Hard Drive (> 5 years data storage)
Averaging period	1 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, 12 hr, 24 hr
Power requirements[2]	90 - 264 Vac, 47 - 63 Hz Typical draw: 100 W (depends on configuration and ambient temperature)
Enclosure	Outer: IP65 rated aluminum skin with solar reflective coating Inner: 40 - 50 mm (1.6 - 2 “) layer of cross-linked PE foam insulation
Gas sampling system	Inlet: Teflon, glass-coated stainless-steel Pump: 12 V brushless DC diaphragm
PM sampling system	Inlet: Omni-directional 36 cm (14.1 inches) heated inlet; Optional sharp cut cyclones for PM_{10}, $PM_{2.5}$ or PM_1 size selection Pump: 12 V brushless DC diaphragm Optics: 670 nm laser, near-forward scattering nephelometer with sheath air protection
Dimensions[3]	Standard: 1310 H x 510 W x 280 D mm (51.6 H x 20 W x 11 D “) With AirCal 8000: Width = 655 mm (25.8 “)
Weight[4]	< 30 Kg
Operating range	-35 °C to +50 °C (-31 °F to 122 °F)
Mounting	Pole, tripod and wall mounting brackets included
47mm sample filter[5]	47 mm filter for particle loading analysis
Factory integrated sensors[5]	Gill WindSonic (ultrasonic wind sensor), Vaisala WXT536 (weather transmitter), Met One MSO (weather transmitter), Cirrus MK427 Class 1 (noise sensor), Novalynx Pyranometer (solar radiation)
Compatible tested sensors	BSWA 308 (sound level meter), Met-One BC-1060 (black carbon monitor), Met-One E-BAM PLUS (Beta-Attenuation Mass Monitor)

[1] 4G LTE not available in all markets.
[2,4] Configuration used for power and weight calculations: base unit, nephelometer, PM_{10} sharp cut, modem, heater on.
[3] Dimensions are for enclosure. PM sampling inlet with cyclone adds 360 mm (14.17") to total height.
[5] Optional

Sira MC130235/01

APPENDIX C
Example Morning System Report

AirSense

Suncor: 24 Hour (8/5/2021 12:00:00 AM - 8/6/2021 12:00:00 AM Mountain Standard Time)

Site	Instrument	Sensor	Last Updated	% Complete	01 AM	02 AM	03 AM	04 AM	05 AM	06 AM	07 AM	08 AM	09 AM	10 AM	11 AM	12 PM	01 PM	02 PM	03 PM	04 PM	05 PM	06 PM	07 PM	08 PM	09 PM	10 PM	11 PM	12 AM	Max Reading	Min	Ave
	Adams City High School (Mon_Dutch_005) (CM3)	PM2_5	08/06/21 07:59	1500	42.3	42.6	41.5	41.4	41.8	41.6	41.8	42.2	41.8	41.8	40.7	40.2	41.4	42.3	42.2	41.9	39.9	41.0	42.1	40.7	41.2	44.6	42.7	42.5	55.6	35.7	41.8
		TVOC			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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For questions, please use Table 1-3 to contact the individual that would be most prepared to answer your question.