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HSE Air Monitoring Program

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1. PURPOSE

This document establishes guidelines for conducting air monitoring around pre-production and production facility activities to protect public health, safety, welfare, the environment, and wildlife resources in accordance with CDPHE Regulation 7.

The document will be reviewed periodically and revised if necessary to adapt to changes in technology, operational and monitoring data, and regulatory guidelines.

The air monitoring program will be operated on behalf of Kerr McGee Onshore Oil & Gas LP ("Kerr-McGee") by Montrose Air Quality Services, LLC.

2. CDPHE REGULATION 7

This document follows the requirements set forth in CDPHE Regulation 7 VI.C. For each section, the applicable regulation reference is included in parenthesis as applicable.

3. APPLICABILITY

This document provides the overall monitoring plan guidelines for air monitoring at pre-production operations and production facilities. Specific guidelines, as outlined in this document, for the monitoring location are addressed in a document titled "Air Monitoring Location Details." The Monitoring Plan for each location includes the Kerr-McGee HSE Air Monitoring Program and the Air Monitoring Location Details. **(Reg. 7 VI.C.1.)**

4. MONITORING PLAN SUBMITTAL

The Monitoring Plan will be submitted to CDPHE and Local government with jurisdiction over the location of the operations and any other local government unit, where applicable, within 2,000 feet of the proposed operations at least sixty (60) days prior to beginning air quality monitoring. **(Reg. 7 VI.C.1.b.)**

- **Air Monitoring Location Details** will include whether the local government with jurisdiction over the location of the operations has air quality monitoring requirements applicable to pre-production and/or early production operations, a description of those requirements, and a local government contact for air quality monitoring purposes. **(Reg. 7 VI.C.1.b.(iv))**

5. BULK SEPARATOR PRODUCTION FACILITY

CDPHE Regulation 7 requires air monitoring at production facilities during early production. The bulk separator production facilities are designed to minimize or eliminate air emissions. Monitoring data collected during early production will be used to further support the design. Below are the design aspects of facilities focusing on minimizing or eliminating air emissions.

- Design
    - No condensate tanks
        - Condensate flows from the separator to a pressurize bulk separator into a pipeline. Condensate tanks are the largest source of potential volatile organic compound (VOC) and benzene emissions. This source is eliminated in the bulk separator facility design

- Instrument air
  - All pneumatic controllers at bulk separator production facilities are operated on instrument air. Natural gas-driven pneumatic controllers can be significant source of VOC emissions, which includes benzene due to the number of actuations and potential malfunctions

- Supervisory Control and Data Acquisition (SCADA)
  - Operating parameters on equipment at the bulk separator facilities are monitored continuously through Kerr McGee's Integrated Operations Center (IOC). Operating ranges or status are set for equipment to ensure safe operations and also minimizes or eliminate potential air emissions. The IOC is staffed 24 hours a day/7 days a week and can automatically send out notifications alerting an Operator of a trending parameter or initiate engineering controls, which may include shutting in a facility. Below are some of the parameters that are monitored continuously, and the engineering controls. Figure 3 in Section 18 of this document shows a typical Bulk Separator Facility layout and location of the equipment.

Equipment	Parameter	Description	Engineering Controls
Tanks - Temp and permanent Water Tanks, Maintenance Tank	Pressure	Monitor tank pressures to prevent over pressurizations causing venting	High Pressure - Automation will shut-in facility
	Liquid Level	Monitor liquid level on tanks to prevent spills and venting	High Level - Automation will shut-in facility
Bulk Separator	Pressure	Monitor vessel pressure to prevent over pressurization causing venting	High Pressure - Automation will shut-in facility
Separator	Temperature	Monitor high/low temperature for safe operations and prevent excess emissions	High Temperature - Automation will shut-in separator and well
	Pressure	Monitor vessel pressure to prevent over pressurization causing venting	High Pressure - Automation will shut-in separator and well
	Burner	Monitor pilot status to prevent raw gas from being vented	Loss of pilot - Automation shuts off pilot valve and main valve. Automation will shut-in well if separator reaches high pressure or low temperature
Emission Control Device (ECD)	Knock-out Pot Liquid Level	Monitor liquid level to prevent liquids from carrying over to the ECD potentially causing smoke	High liquid level - Automation will shut-in facility
	Pilot Light Status	Monitor pilot light to prevent venting of unburned hydrocarbons	Loss of pilot - Automation will shut-in facility
Pneumatic Controllers	Air Compressor Status	All pneumatic controllers are operated on instrument air. Monitor status of the electric air compressor for safe operation.	Air Compressor not operating - Automation will shut-in facility
Wellhead	Pressure	Monitor pressures for safe operation and preventing excess emissions	High/Low Pressure - Automation will shut-in well

6. AIR MONITORING

6.1 Pre-Operations Monitoring

- At least ten (10) days prior to beginning pre-production operations **(Reg. 7 VI.C.1.a.)**

6.2 Pre-Production and Production Facility Monitoring

- Drilling - Air monitoring conducted during drilling through the hydrocarbon bearing zones (i.e. Production rig drilling) **(Reg. 7 VI.C.1.a.)**
- Completions – Air monitoring conducted during hydraulic fracturing or refracturing, drill-out, and flowback of an oil and/or natural gas well. **(Reg. 7 VI.C.1.a.)**
- Production Facility - Air monitoring conducted for at least six (6) months after the last well on the pad is turned over to production (TOTP). **(Reg. 7 VI.C.1.a.)**

- The **Air Monitoring Location Details** includes:
    - The owner or operator name and the contact information of the owner or operator representative for monitoring purposes **(Reg. 7 VI.C.1.b.(i))**
    - The planned schedule for drilling and completions operation at the monitoring locations. **(Reg. 7 VI.C.1.b.(ii))**
    - The operations to be monitored including the API number of the well(s), location of the operations including latitude and longitude coordinates, and any associated facility or equipment AIRS number(s). **(Reg. 7 VI.C.1.b.(iii))**

7. MONITORING OBJECTIVES

- The purpose of the air monitoring around pre-production and production facility activities is to protect public health, safety, welfare, the environment, and wildlife resources. Kerr Mc-Gee has established Investigation Levels for the VOC analyzers and analytical results with an associated investigation response. See Sections 14 and 15 for more details on Investigation Levels and Investigation Level Response. One component of an Investigation Level Response is an on-site investigation into the cause of the elevated reading. If the source is identified further analysis will be conducted into the cause, which could lead to the reduction in air emissions. Gas streams at pre-production operations and production facilities typically contain methane, VOCs, and BTEX (benzene, toluene, ethyl benzene and xylenes). Any emissions reduction would potentially reduce all listed pollutants. Kerr Mc-Gee's monitoring objectives covers all three (3) objectives listed below. The monitoring program does not directly monitor methane, but methane is part of the gas stream that is being monitored and, thus, indirectly monitored. Any evaluation for VOCs and BTEX to reduce emissions will in most cases have a corresponding reduction in methane emissions. In addition, Kerr-McGee will review the monitoring program periodically and revise if necessary to adapt to changes in technology and operational and monitoring data. **(Reg. 7 VI.C.1.b.(v))**
    - Detect, evaluate, and reduce as necessary hazardous air pollutant emissions. **(Reg. 7 VI.C.1.b.(v)(A))**
    - Detect, evaluate, and reduce as necessary ozone precursor emissions. **(Reg. 7 VI.C.1.b.(v)(B))**
    - Detect, evaluate, and reduce as necessary methane emissions. **(Reg. 7 VI.C.1.b.(v)(C))**
- The continuous monitoring equipment employed in this program uses photoionization detector (PID) technology. A PID sensor contains a lamp that produces photons

which carry enough energy to break molecules into ions. The PID will only respond to molecules that have an ionization energy at or below the energy of the lamp, the PID used in this program contains a 10.6 electron-volt (eV) lamp. Any VOC that has an ionization energy less than 10.6 eV will be ionized as it passes across the lamp. The produced ions then generate an electrical current that is measured as the output of the detector. While methane has an ionization energy above 10.6 eV, hazardous air pollutants and ozone precursors have an ionization energy below 10.6 eV allowing for detection of elevated emissions. Carbon sorbent tubes and SUMMA® canisters will be used to quantify BTEX emissions. Monitoring equipment will be sited as described in Section 10 and actual locations monitoring location will be included in the site plan as part of the Air Monitoring Location Details. Investigation Levels and Response as described in Sections 14 and 15 are established to protect public health and welfare and to evaluate operations and reduce VOC, BTEX and methane emissions as deemed appropriate. The monitoring program is setup to meet all the objectives in section. **(Reg. 7 VI.C.1.b.(xi))**

8. POLLUTANTS MONITORED

- Air pollutants monitored at pre-production and production facility operations will include VOCs (continuous analyzers), benzene (carbon sorbent tubes) and BTEX (24-hr SUMMA® Canisters). **(Reg. 7 VI.C.1.b.(vi))**

9. MONITORING EQUIPMENT

- Below are the monitoring equipment that will be used at pre-production and production facility operations. **(Reg. 7 VI.C.1.b.(vii))**

9.1 Continuous VOC Analyzer

- SENSIT SPOD Ion Science Photo Ionization Detector (PID)

- Lunar Output Canary-S Photo Ionization Detector (PID)

- Data Collection
  - 15-minute block averages based on 1 minute readings
- Data Acquisition
  - Dashboard
    - Airsense is a web-based system used to acquire, manage, and display real-time air quality data. The platform has a private and public website (if necessary) allowing for viewing data, getting insights into high values, and sending alerts based on preset thresholds. Site personnel can access all data via a password-protected website for viewing recent data, setting up alerts, conducting analyses, downloading data, building automated reports, and maintaining complete oversight of the network.
    - Real-time display of monitoring data
      - 1-minute readings and selected averaging periods (e.g. Investigation Levels)
- Notifications
  - E-mails sent when a monitor reading exceeds an Investigation Levels set in Section 14
- Equipment selection description **(Reg. 7 VI.C.1.b.(vii))**
  - The PID technology that will be used for continuous monitoring in this program is a tried-and-true VOC monitoring technology that is approved for use in Leak Detection and Repair programs as described in EPA Method 21 Section 6.1 and as a detector for gas chromatography as described in EPA Method 18 Section 2.0. The PIDs ability to respond to hazardous air pollutants and ozone precursors at low concentrations, consume little power, provide data continuously, and scale across a large network are the reasons why the technology was chosen for this program. The specific instrument models that will be used are the Sensit SPOD and Lunar Outpost Canary-S, though other models may be used if these vendors cannot provide instruments in a timely manner, specifics about these monitors can be found in the attached Quality Assurance Project Plan. The only data correction applied to these units is a linear regression between the sensors raw voltage output and known

concentration of calibration gas, as described in the Quality Assurance Project Plan. The operating range for the SPOD and Canary-S unit is 0-40 ppm.

- Manufacturer's Specification Sheets - SENSIT SPOD PID and Lunar Outpost Canary-S PID, See Section 19

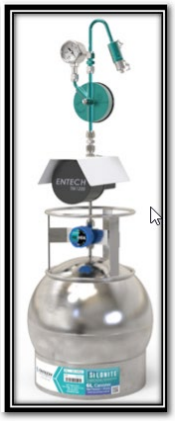
- Quality Assurance Project Plan – SENSIT SPOD PID and Lunar Outpost Canary-S PID, See Section 19
    - The standard operating procedures that will be employed, to include at minimum **(Reg. 7 VI.C.1.b.(x)):**
        - The continuous monitors used in this program sample every second, and provide 1-minute averaged data to the data platform. The minimum detection limit and precision is calculated as three times the standard deviation, providing a confidence level of 99.7%, of 7 consecutive 1-minute averages with a 1 ppm isobutylene gas. **(Reg. 7 VI.C.1.b.(x)A)**
        - The Investigations and Response Levels for each pollutant monitored and/or sampled and the response procedures or actions that will be taken if elevated levels are observed can be found in Sections 14 and 15. **(Reg. 7 VI.C.1.b.(x)B)**
        - Quality Assurance Project Plan includes:
            - The precision and bias are determined during each monthly calibration, and data quality indicators. **(Reg. 7 VI.C.1.b.(x)C)**
            - Quality control and quality assurance procedures, including calibration intervals and frequency, which will be used to ensure proper operations of the monitoring equipment. **(Reg. 7 VI.C.1.b.(x)D)**
        - 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 stability of the detector. The hydrophobic filters are also known to deteriorate over approximately 6-8 weeks of field use, as part of the Quality Assurance Project Plan these filters are replaced during monthly calibrations. If this filter is not replaced, not only will the humidity interference not be mitigated but dust and dirt can enter the ionization chamber dampening the total VOC readings. **(Reg. 7 VI.C.1.b.(x)E)**
        - The data system and operating protocol to be used for data collection, including, but not limited to, data logging, data processing, recording, downloading, backup and storage, and reporting is outlined in Section 12. **(Reg. 7 VI.C.1.b.(x)G)**
        - The methods used for collecting and analyzing speciated or other samples of chemical constituents identified by the Division when indicated necessary based on site-specific concentration thresholds, if applicable, can be found in the attached Standard Operating

Procedures for Carbon Sorbent Tube and Summa Canister Collection and Analysis in Section 19. **(Reg. 7 VI.C.1.b.(x)H)**

9.2 Passive Samplers – Carbon Sorbent Tubes

- 14-day deployment schedule
- Analyzed for Benzene
- Tubes located around the pad sited and analyzed in accordance with EPA Method 325
- Equipment description **(Reg. 7 VI.C.1.b.(x)H):**
    - The passive sorbent tube sampling portion of this test program, EPA Method 325A/B entitled “Volatile Organic Compounds from Fugitive and Area Sources” will be followed for both sampling and analysis methodology.
    - The monitoring program will use passive sampling for Benzene utilizing Carbopack X™ tubes. The tube is a stainless-steel net cylinder, with 100 mesh grid opening and 5.8 mm diameter, packed with 530 ± 30 mg of activated charcoal with particle size 35-50 mesh. Volatile organic compounds are trapped by adsorption. The tube is desorbed using a thermal desorber and the extract is analyzed using GC/MS. Benzene concentrations are calculated using the mass of each compound found, the validated Carbopack X™ uptake rates, time sampled, and average field temperature.
    - Field-ready passive samplers will be provided by Enthalpy Analytical in a background-free cooler. Tubes will be individually packaged in sealed vials to prevent against contamination. The cooler includes ice packs to keep the sampled tubes cool throughout the shipping process back to Enthalpy for analysis. Enthalpy’s typical schedule is to provide analytical results for the carbon sorbent tubes on a 7-business day schedule.
- Standard Operating Procedures for collection and analysis can be found in Section 19

9.3 Summa Canisters



- 24-hour time weighted sample
- Analyzed according to EPA Method TO-15
    - Benzene, Toluene, Ethylbenzene, Xylene (BTEX)
- Equipment description **(Reg. 7 VI.C.1.b.(x)H):**
    - For the summa canister sampling portion of this test program, EPA Compendium Method TO-15 entitled “Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)” will be followed for both sampling and analysis methodology.
    - Entech Instruments Silonite™ CS1200E Passive Canister Samplers will be used to collect samples over each 24-hour period. The Entech canisters used will be six-liter stainless-steel canisters lined with ultra-inert surface coatings. The canisters will be cleaned and blanked for use according to laboratory standard operating procedures.
    - The sample inlet height will be approximately one and one half (1.5) meters above ground.
    - The canister samples will be provided by and shipped to Enthalpy. . Enthalpy’s typical schedule is to provide analytical results for the carbon sorbent tubes on a 7-business day schedule.

- Standard Operating Procedures for collection and analysis can be found in Section 19

9.4 Meteorological Station

- Co-located with an analyzer
- Wind speed, wind direction, temperature, barometric pressure, and relative humidity are monitored at 1-minute frequency **(Reg. 7 VI.C.1.b.(viii))**
- The meteorological equipment installed on the Sensit SPOD units is the Airmar 110WX WeatherStation, and the Lunar Outpost Canary-S uses a RM Young ResponseONE. Both monitors collect wind data via ultrasonic anemometers. The anemometers are installed onsite with the proper side of the anemometer facing North to provide valid

wind direction data. **(Reg. 7 VI.C.1.b.(viii))**

- One meteorological station is co-located and directly tied into a continuous total VOC monitor onsite. The total VOC monitor that is furthest away from any structures that have the potential to interfere with the wind data, and therefore provides the data most representative of site conditions, is chosen to co-locate the meteorological station with. The data from the meteorological station is provided at the same time resolution as the total VOC data and is included in the monitors payload. **(Reg. 7 VI.C.1.b.(x)F)**
- Standard Operating Procedures for the meteorological station can be found in Section 19

10. MONITORING LOCATION SETUP

- The monitoring equipment will be placed on tripods and no additional surface disturbance is required for air monitoring, in alignment with the Colorado Oil and Gas Conservation Commission's site preparation requirements. **(Reg. 7 VI.C.1.b.(ix)D)**
- Drilling and Completions Operations
    - Monitoring Stations
        - Continuous VOC analyzers
            - 4 monitors located roughly in each cardinal direction approximately 300 feet from the pad wall. Depending on locations of building units, occupancy building units or other emission sources, additional monitors may be sited.
        - Meteorological station (1 per pad) co-located with a monitor
    - Carbon sorbent tubes
        - Sited around the Pad approximately 165 feet from wall
            - Siting is determined based on requirements in EPA Method 325
                - 12 tubes plus duplicate and blank
                - 14-day deployment schedule
        - Co-located with each monitor
            - 14-day deployment schedule
        - Depending on locations of building units, occupancy building units or other emission sources, additional tubes may be sited
    - SUMMA® canisters
        - 24-hour samples
            - Monitor readings over Investigation Levels, as needed
            - SUMMA® canisters will be deployed during different phases based results from the analyzers, carbon tubes and SUMMA® canisters results from previous locations during the same phase.

        - Periodic sampling, as needed
    - Typical site layout in Section 16
- Production Facility
    - Some pads may have more than 1 production facility. The monitoring site plan included in the Air Monitoring Location Details will identify the number and layout of all production facilities associated with the pad.
    - Monitoring Stations
        - Continuous hydrocarbon analyzer
        - Meteorological station (1 per pad)
        - Monitors in each cardinal direction approximately 300 feet from the facility
            - 4 total monitors
    - Carbon sorbent tubes
        - Co-locate one tube with each monitor
        - 14-day deployment schedule
    - SUMMA® canisters
        - 24-hour samples
        - Monitor reading over trigger or action level, as needed
        - Periodic sampling, as needed
    - Typical site layout in Section 17
- The **Air Monitoring Location Details** will include:
    - Monitoring site plan **(Reg. 7 VI.C.1.b.(ix))**
        - The number of monitors and/or sensors to be deployed. **(Reg. 7 VI.C.1.b.(ix)A)**
        - The location and height of the monitoring equipment, including for each phase of operations if location and height of the equipment will change (e.g., monitoring placement impacted by sound walls). **(Reg. 7 VI.C.1.b.(ix)B)**
        - A topographic map and plan of the site, showing the expected equipment layout, including air quality and meteorological monitor locations and their distance from preproduction and production operations. The map must indicate any obstructions to air flow to the monitor(s) and also show all roads and access ways within a half-mile of the facility and any contiguous structures, whether or not they are part of the production operations. **(Reg. 7 VI.C.1.b.(ix)C)**
        - An explanation of how the number and placement of monitoring equipment will be adequate to achieve the desired air quality monitoring objectives, considering the monitoring equipment's detection limit and other limitations. **(Reg. 7 VI.C.1.b.(ix)E)**

11. HEALTH GUIDANCE VALUES

- Health Guidance Values (HGVs): The health-based guidelines are based on *Exposures and Health Risks from Volatile Organic Compounds in Communities Located near Oil and Gas Exploration and Production Activities in Colorado* published by the Colorado Department of Public Health and Environment (CDPHE) on July 16, 2018, in the International Journal of Environmental Research and Public Health. The CDPHE study identified volatile organic compounds VOCs associated with oil and gas operations through review of previous studies conducted in the state of Colorado.
- The HGV for benzene is much lower than other analytes common to the oil and gas industry. Previous air sampling at oil and gas facilities show benzene is the main driver of potential health risk. Focus of the air sampling will be benzene but will include ethylbenzene, Toluene and xylene analysis for some samples. Below are the acute and chronic HGVs for each analyte.

Analyte	Acute Guideline Values (ppb)	Chronic Guideline Values (ppb)
Benzene	9	9 and 3
Toluene	2,000	1,327
Ethylbenzene	5,000	230
m, p, o -Xylene	2,000	23

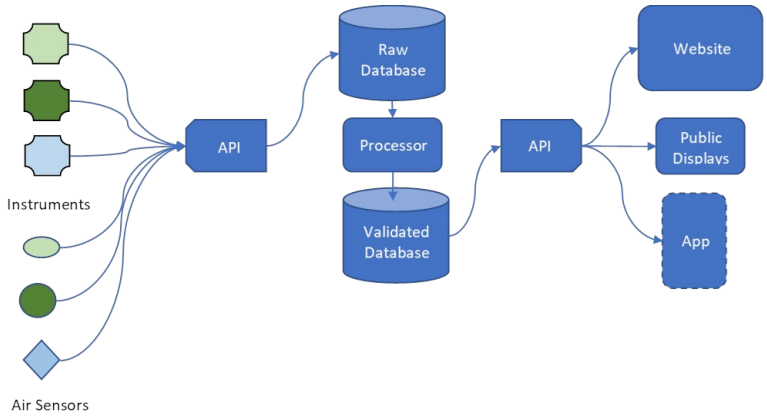
- Acute exposure: An acute health exposure is a short-term exposure to a substance that results in biological or physical harm to the person exposed. For example, the 9 ppb acute guideline for benzene is the estimate of the daily human exposure without appreciable risk of adverse, non-cancer health effects over 1 to 14 days of exposure. For comparison to the acute guideline for SUMMA® canisters, 24-hour samples will be taken per recommendation from a Certified Industrial Hygienist. Letter from Kahuna Ventures included in Section 19.
- Chronic exposure: A chronic health exposure is a repeated or continuous exposure over a much longer period of time to a substance that results in biological or physical harm to a person exposed. In their study, the CDPHE defined a chronic exposure as a scenario in which a person breathes the outdoor air continuously (24 hours per day, 365 days per year) for a lifetime (average of 70 years) and the measured concentrations of the compounds in the air remain constant over the entire lifetime. Production facilities will be in operation beyond one (1) year. Therefore, the sampling results are compared to the acute and chronic HGVs. The evaluation against the chronic HGVs will be based on the mean of all samples taken.
- Pre-production activities (Drilling and Completions operations) will be short in duration (i.e. less than 6 months), the results from each 24-hour SUMMA® canister sample and

carbon sorbent tube result will be evaluated against the acute HGVs for each compound.

- Production facilities will be in operation beyond one (1) year. The sampling results will be compared to the acute and chronic HGVs. The evaluation against the chronic HGVs will be based on the mean of all 24-hour SUMMA® canister samples and carbon sorbent tube results. The evaluation for acute exposure will follow the Pre-production process.

12. MONITOR DATA AND REPORTING

- Monitoring Data
  - The data platform used for this monitoring program, AirSense, does not allow for data to be edited or modified. Users can tag and invalidate data but not directly edit data. In addition, as described in the diagram below, all data sent by instruments are stored in the Raw Database that is only inserted by the API and only can be read by the processor. The Airsense site gives users no direct access to the Raw dDatabase. When calibrating sensors, the data is saved to a new data point leaving both the raw and processed data points. All calibration or scaling adjustments are logged and date-stamped to identify when settings have changed. Even if changes are made, no actual data is modified. These settings allow for scaling and truncating, but the data is never directly modified, they are for viewing and alerting purposes only. All monitors data is delivered to AirSense via cellular communication. The monitors also have local data storage so in the event of a cell tower going down all data collected during that time period can be recovered. All records and documents pertinent to the perimeter monitoring program will be stored indefinitely on back-up computer servers and backed up onto offsite disk storage.



- Reporting

Monthly reports of monitoring conducted will be submitted to the Division by the last day of the month following the previous month of monitoring (e.g., by June 30 for the previous May 1-31), including **(Reg. 7 VI.C.2.b.)**:

- The month and year of the monitoring period. **(Reg. 7 VI.C.2.b.(i))**
- A description of the monitoring equipment and the pollutant(s) monitored. **(Reg. 7 VI.C.2.b.(ii))**

- A description of the monitored operations including **(Reg. 7 VI.C.2.b.(iii))**:
  - The phase of operation (e.g., prior to pre-production, during pre-production operations, early production) and activities occurring during the monitored period. **(Reg. 7 VI.C.2.b.(iii)(A))**
  - API number of the well(s). **(Reg. 7 VI.C.2.b.(iii)(B))**
  - Location of the operations, including latitude and longitude coordinates. **(Reg. 7 VI.C.2.b.(iii)(C))**
  - Any associated facility or equipment AIRS number(s). **(Reg. 7 VI.C.2.b.(iii)(D))**
  - The date, time, and duration of any monitoring equipment downtime. Downtime will be considered any 15-minute block average where less than 75%[1] of the 1-mintue data points within that block are recorded. **(Reg. 7 VI.C.2.b.(iii)(E))**
  - The date, time, and duration of the operations malfunctions and shut-in periods or other events investigated for influence on monitoring. **(Reg. 7 VI.C.2.b.(iii)(F))**
- For the first monthly report after beginning monitoring during preproduction operations, a summary of air quality condition results monitored prior to beginning pre-production operations, including time series of the results at 15-minute block average time resolution and a statistical summary of the air quality results monitored prior to beginning preproduction operations, including number of observations, maximum concentrations or levels, periodic averages, and data distributions including 5th, 25th, median, 75th and 95th percentile values. **(Reg. 7 VI.C.2.b.(iv))**
- A summary of monitored air quality results, including time series plots at 15-minute block average time resolution and a statistical summary including number of observations, maximum concentrations or levels, periodic averages, and date distributions including 5th, 25th, median, 75th and 95 percentile values. **(Reg. 7 VI.C.2.b.(v))**
- A description of responsive action(s) taken as a result of monitoring results, including the date; concentration or level measured; correlations with specific events, activities, and/or monitoring thresholds; and any additional steps taken as a result of the responsive action. **(Reg. 7 VI.C.2.b.(vi))**
- The results of any speciated or other samples of chemical constituents identified by the Division and collected when site-specific concentrations indicate such samples are necessary. **(Reg. 7 VI.C.2.b.(vii))**
- A summary of meteorological data, including in the time intervals identified for concentration readings in this air quality monitoring plan during the time period of responsive action(s). The meteorological data will be assessed in the same intervals as the sampling and/or measurement intervals. **(Reg. 7 VI.C.2.b.(viii))**
- A description of how the only processing and correction that is applied to the raw data is a linear regression that is determined during calibrations. A description of

[1] Per EPA's *QA Handbook Volume II, Appendix D, January 2017* common recommendation for data completeness

why any, if any, data is missing and that any data below the detection limit will be reported as the detection limit. **(Reg. 7 VI.C.2.b.(ix))**

- In the last monthly report, a certification by the company representative that supervised the development and submission of the monitoring reports that, based on information and belief formed after reasonable inquiry, the statements and information in the monthly reports are true, accurate, and complete. **(Reg. 7 VI.C.2.b.(x))**

- Recordkeeping

The following records will be kept for a minimum of three (3) years, unless otherwise specified, and upon request make records available to the Division. Local governments identified in the Air Monitoring Location Details may request those records from the Division. If the Division has not requested the records and a local government(s) identified in the Air Monitoring Location Details requests the records from the Division, the Division shall request the records from the owner or operator. **(Reg. 7 VI.C.2.a.)**

- The air quality monitoring plan. **(Reg. 7 VI.C.2.a.(i))**
- Monthly reports and the data necessary to inform the monthly reports, as provided in the Reporting Section above. **(Reg. 7 VI.C.2.a.(ii))**
- Activity logs to inform the description of the monitored operations in the monthly report. **(Reg. 7 VI.C.2.a.(iii))**
- At a minimum, for a period of one year after the monthly report, the underlying raw data associated with each monitor. **(Reg. 7 VI.C.2.a.(iv))**
- At a minimum, for a period of one year after the monthly report, the meteorological data in the time intervals as close to the sampling and/or measurement intervals as possible. **(Reg. 7 VI.C.2.a.(v))**

13. OPERATIONS RECORDS

- During air monitoring operations, daily activity will be recorded at the facility.

14. INVESTIGATION LEVELS

14.1 Continuous Analyzers

- At previous pre-production monitoring locations with air monitoring, co-located benzene and VOC data were collected. In comparing the data, the VOC ppm to benzene ppb correlation is approximately 1 ppm VOC = 1 ppb benzene. This correlation will continue to be updated as more data is gathered. Kerr-McGee has established three Investigation Levels that equate to benzene levels well below the 9 ppb guideline value, but at levels previous monitoring indicate a potential change in emissions at the location.
    - Level 1
        - 15 minute VOC block average (based on 1 minute readings) over 3 ppm VOC
    - Level 2
        - 2 readings over Level 1 reading in a 2 hour period
        - 15-minute VOC block average (based on 1-minute readings) reading over 5 ppm VOC

- Level 3
  - 12-hour average readings (based 15-minute block averages) over 2 ppm VOC

14.2 Analytical Data

- SUMMA® canister
  - Level 2
    - 24-hour result greater than 9 ppb benzene
  - Level 3
    - Subsequent 24-hour results greater than 9 ppb benzene
- Carbon sorbent tubes
  - Level 3
    - 14-day average result greater than 9 ppb benzene
  - Data and Operations Review
    - 14-day average result greater than 2 ppb benzene

15. INVESTIGATION LEVEL RESPONSE

15.1 Continuous Analyzer

- Investigation responses will be coordinated through Kerr McGee's Integrated Operations Center (IOC).
  - The air monitoring program will be operated by Montrose Air Quality Services, LLC. Airsense software will be used to manage the data from the monitors. In the event there is a monitor reading above an Investigation Level, an e-mail notification will be sent to the IOC.
  - Monitor readings greater than the Investigation levels will require an investigation into the potential cause(s) of the high reading(s) including any corrective action, as necessary.
  - Responsibilities during an investigation response:
    - IOC:
      - Notify the monitoring location (Drilling or Completions) of the elevated reading requiring an immediate investigation.
      - Notification of event sent to internal distribution list including management and HSE
      - Document event and send out follow-up notifications
      - Levels 2 and 3 – Dispatch IR team to location for inspection.
      - Level 3 – Notify HSE
    - Monitoring location:

- As soon as it is safe conduct an on-site investigation
  - Report investigation findings and any corrective action to IOC
- Formal Incident response from facility within 24 hours

- IR team (Levels 2 and 3)
  - Conduct IR inspection at monitoring location
    - Contact IOC after completion of inspection to report findings
    - If abnormal emissions noted contact monitoring location

- HSE
  - Level 1 or 2 - Evaluate the need for 24-hour SUMMA® canister sampling.
  - Level 3 – Deploy 24-hour SUMMA® canister sampling within 24 hours of receiving the final results.
    - 4 SUMMA® canisters in each cardinal direction at monitor location or other locations, as deemed appropriate
      - Sample(s) analyzed EPA Method TO-15 for BTEX
  - Review monitoring data, meteorological data, distance to nearest downwind receptor
  - Review investigation findings and make any necessary notifications.
  - Level 3
    - Activate Emergency Response Team (ERT). The ERT includes:
      - President & General Manager
      - Director Operations
      - Director HSE
      - Director Drilling Completions and Well Servicing
      - Director Regulatory
      - Director Communications and Public Affairs
      - Managing Counsel
    - ERT will evaluate facility operations to ensure protection of public health and welfare
  - COGCC, CDPHE, and Local Government with jurisdiction over the location of the operations, will be contacted within forty-eight (48) hours of receiving notification of Level 3. **(Reg. 7 VI.C.1.b.(ix)B)**

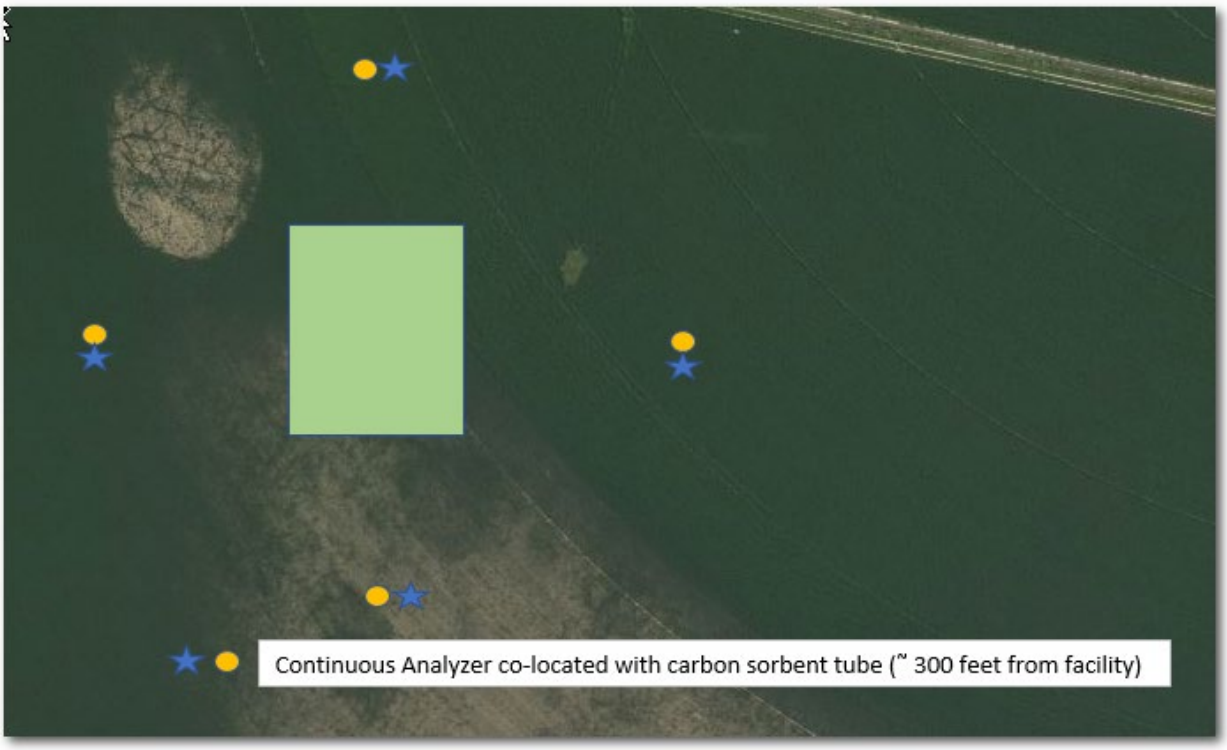
15.2 Analytical Data

- SUMMA® canisters and carbon sorbent tubes samples will be sent to a lab to be analyzed. If results show a benzene level over an Investigation Level, the Investigation Response process is as follows:

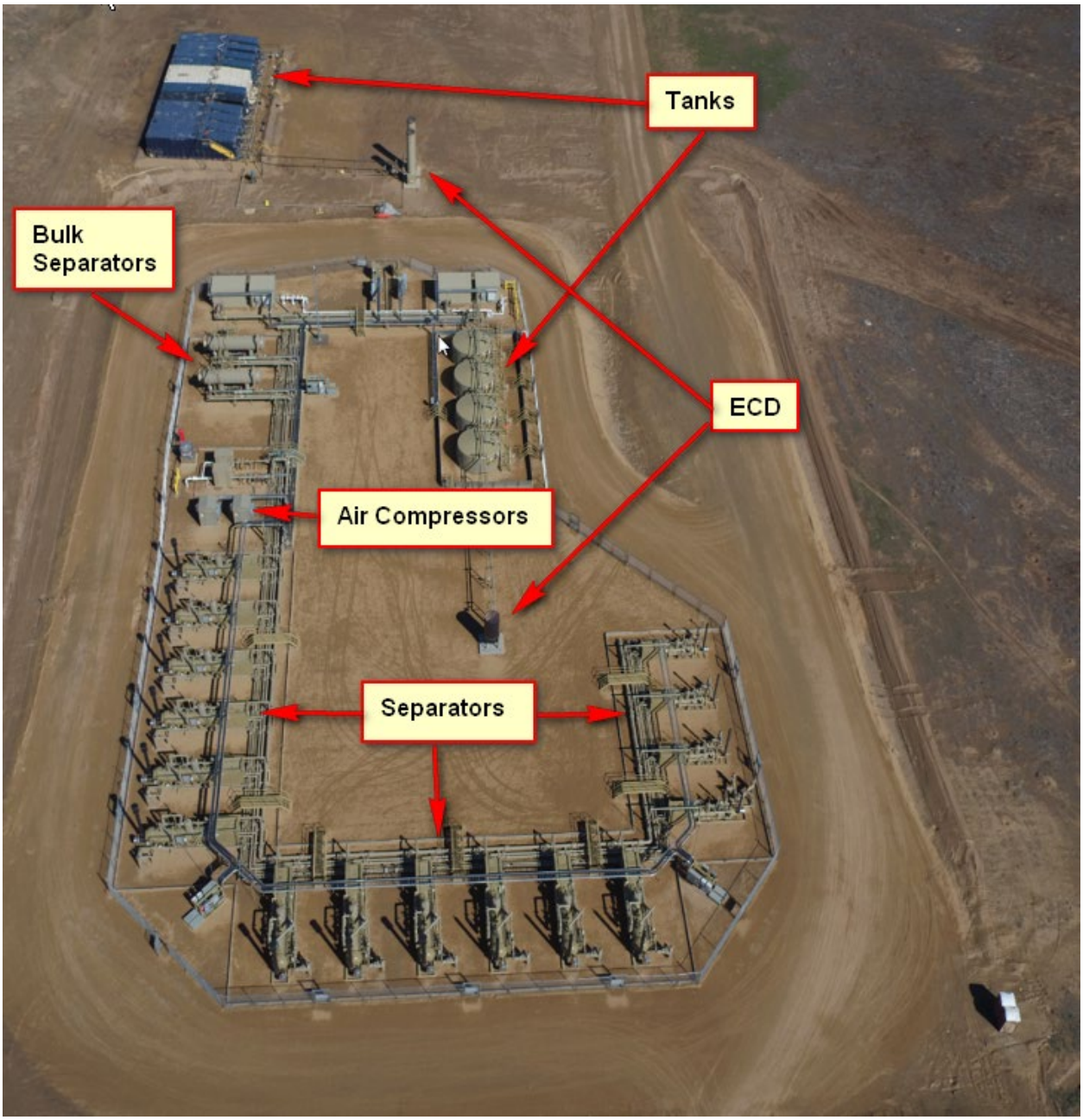
- 24-hour SUMMA® canisters less than 9 ppb benzene, Kerr McGee will follow the Investigation Response for the continuous analyzers in Section 15.1, as appropriate.
- 24-hour sample - SUMMA® canister greater than 9 ppb benzene
    - Level 2 Investigation response for continuous analyzers in Section 15.1
    - Follow Agency for Toxic Substances and Disease Registry (ATSDR) guidance
        - The acute inhalation MRL for benzene is 9 ppb. An MRL is a health-based value developed to protect the health of the general population. MRLs are derived for acute (1 to 14 days), intermediate (>14 to 364 days), and chronic (365 days and longer) exposure durations. MRLs are intended to serve as a screening tool to help professionals decide if to conduct additional investigations
    - Conduct additional 24-hour SUMMA® canister sampling
        - 4 – SUMMA® canister in each cardinal direction at monitor location or other locations, as deemed appropriate
            - Sample(s) analyzed EPA Method TO-15 for BTEX
    - If subsequent 24-hour SUMMA® canister sampling results greater than 9 ppb benzene, Kerr McGee will follow the Level 3 Investigation Response for continuous analyzers in Section 15.1.
- 14-day carbon sorbent tube greater than 9 ppb benzene, Kerr McGee will follow the Level 3 Investigation Response for continuous analyzers in Section 15.1.
- Carbon sorbent tubes - 14-day average greater than 2.0 ppb benzene
    - Based on the results from carbon sorbent tube sampling at previous pre-production monitoring locations, a result greater than 2 ppb benzene indicates a potential change in emissions at the location. If there is a tube result greater than 2 ppb, operations during the 14-day period will be reviewed and corrective action employed, as necessary
- COGCC, CDPHE, and Local Government with jurisdiction over the location of the operations, will be contacted within forty-eight (48) hours of receiving notification of Level 3. **(Reg. 7 VI.C.1.b.(ix)B)**

16. FIGURE 1 – PRE-PRODUCTION SITE TYPICAL MONITORING CONFIGURATION

17. FIGURE 2 – PRODUCTION FACILITY SITE TYPICAL MONITORING CONFIGURATION



18. FIGURE 3 – BULK SEPARATOR FACILITY TYPICAL LAYOUT



19. ATTACHMENTS

Quality Assurance Project Plan – PID Analyzers

QUALITY ASSURANCE PROJECT PLAN
OCCIDENTAL PETROLEUM

Prepared For:

Occidental Petroleum
1099 18th St #1800
Denver, CO 80202

Prepared By:

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

Document Number: **928ET-772315-PP-19**
Date: **January 8, 2021**

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1.0 OBJECTIVES AND SUMMARY OF TEST PROGRAM

1.1 BACKGROUND

Occidental Petroleum's (Oxy) air quality (AQ) monitoring network to be deployed around pre-production well pads will provide real-time AQ data. The network will utilize low-cost cutting-edge air pollution sensor technology, redeveloped with solar, battery storage and data connectivity to make it useful for widescale deployment and replicable in any oil and gas facility. Each participating well pad will receive a minimum of four (4) sensors and data access via a data platform dashboard. The dashboard will display real time data and recent alerts, while the backend data platform will create insights for AQ patterns near each pad, leading to operational improvements, as well as generate automated alerts for stakeholders.

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. Two different sensor manufactures will be used in the quality assurance program as outlined in Table 1-1:

TABLE 1-1
MONITORING SENSORS

Manufacturer	Model	Manufactured State
Sensit	SPOD	Indiana
Lunar Outpost	Canary-S	Colorado

The sensors measure volatile organic compounds (VOCs) in the air. A specification sheet on the sensors can be found in Appendix A. As part of this program, an AQ data platform, developed by AirSense, manages, quality controls, and reports the sensor data.

1.3 PROJECT CONTACTS

1.3.2 Personnel

A list of project participants is included below in Table 1-2:

TABLE 1-2
PROJECT PERSONNEL

Occidental Petroleum

Project Contact:	Chad Schlichtemeier
Title:	Rockies HSE Manager
Address:	1099 18th St #1800 Denver, CO 80202
Telephone:	720-929-6867
Email:	chad_schlichtemeier@oxy.com

Montrose Air Quality Services, LLC Information

Project Contact:	Austin Heitmann	Patrick Clark, PE, QSTI
Title:	Project Manager	VP Ambient and Emerging Tech.
Address:	990 W. 43rd Ave. Denver, CO 80211	990 W. 43rd Ave. Denver, CO 80211
Telephone:	303-670-0530	303-670-0530
Email:	aheitmann@montrose-env.com	pclark@montrose-env.com

1.3.2 Responsibilities

Table 1-3 below details the roles and responsibilities of the project team.

TABLE 1-3
PERSONNEL RESPONSIBILITIES

Person/Company	Primary Assignment
Chad Schlichtemeier (Oxy)	Overall Project Coordinator
Austin Heitmann (Montrose)	Sensor deployment, sensor operations, sensor maintenance and QA/QC, data platform management

2.0 EQUIPMENT DESCRIPTION

2.1 SENSORS

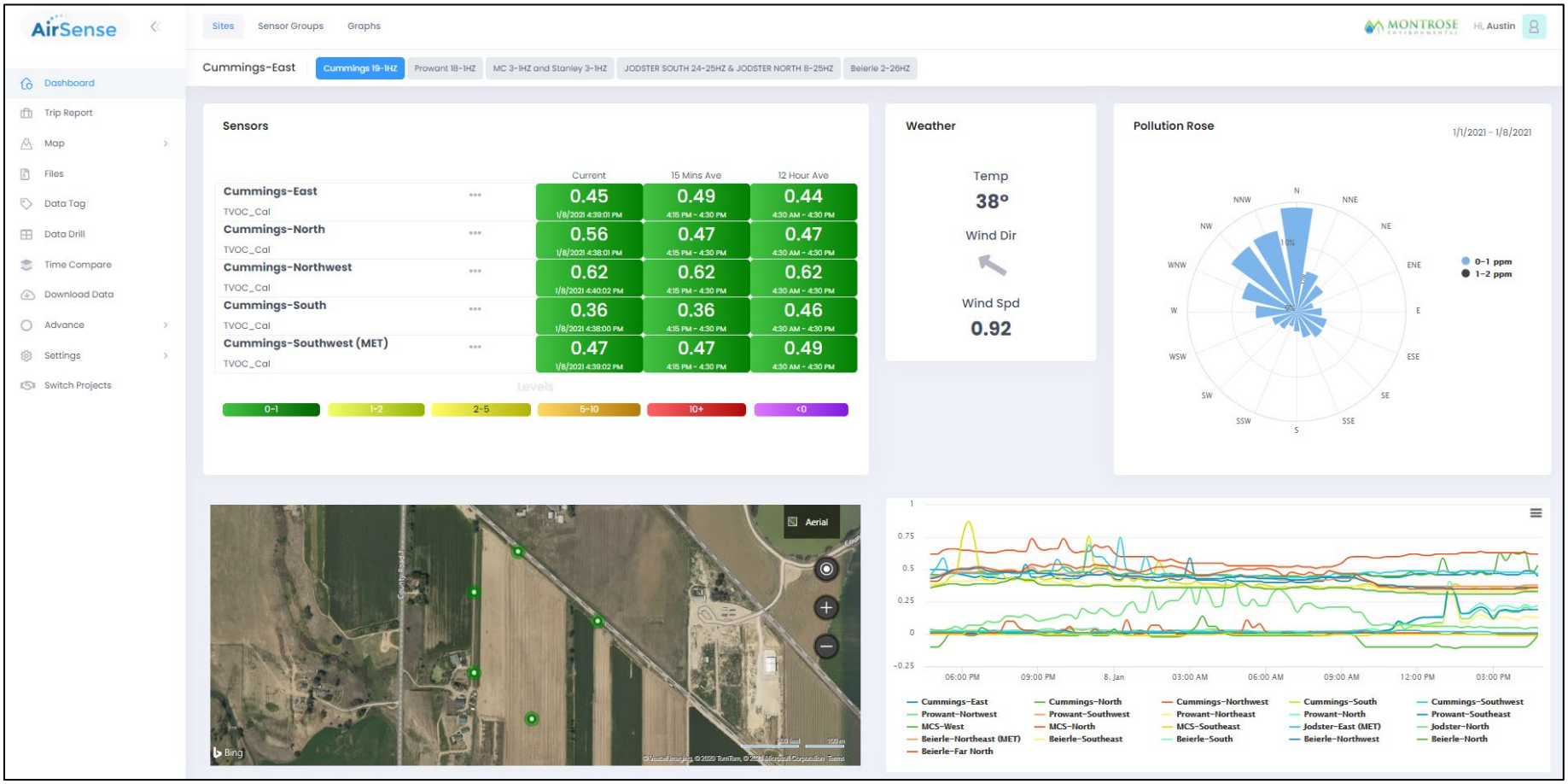
The Sensit's SPOD and Lunar Outpost's Canary-S are air quality monitoring systems equipped with a single Ion Science photoionization detector (PID), cellular communication, and powered via a solar panel and battery. A multitude of units can be deployed to create a network of real-time, localized data focusing on air quality and meteorological measurements. The sensors can monitor VOCs, wind speed, wind direction, temperature, relative humidity and barometric pressure. A complete datasheet summarizing the specifications of the SPOD and Canary-S can be found in the Appendix of this test plan. Both units communicate via a cellular back haul directly to the data platform.

2.2 DATA PLATFORM

The AirSense data management platform handles traditional air monitoring data and next generation air sensor data. The AirSense system is a cloud based system that ingests data, performs quality control, calibrates air sensor data, and distribution of air sensor data. AirSense handles up to 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 Oxy and Montrose personnel AirSense's dashboard provides a summary of the operational status of network. For each well pad, AirSense provides a display showing 1-minute, 15-minute, and 12-hour average readings, site maps, and meteorological data.

FIGURE 2.2
SCREEN SHOT OF THE AIRSENSE DASHBOARD



3.0 QUALITY ASSURANCE QUALITY CONTROL

3.1 DEPLOYMENT PROCEDURES

The following procedures will be followed prior to deploying a sensor to a pad. Any sensors not meeting all the requirements outlined below will be returned to the manufacturer.

3.1.1 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
- AirSense key
- Results of the initial sensor calibration check out procedures
- Deployment location, date and time
- Filter replacement schedule
- History of notes, issues and maintenance procedures organized by date

3.1.2 Gas Calibration

A calibration would be performed on all equipment during the initial deployment effort. Montrose personnel would complete monthly calibration checks on each PID sensor using a 1 ppm, 3 ppm, and 5 ppm isobutylene certified cylinder. 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.

TABLE 3-1
MINIMUM GAS CALIBRATION CRITERIA

Parameter	Minimum Criteria[1]
1 ppm Precision	|3*SD[2]|<=50 ppb
1 ppm Error (Bias)	<30% of bottle value
3 ppm Error (Bias)	<25% of bottle value
5 ppm Error (Bias)	<20% of 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 VOC parameter. Once the units are deployed to the field some minor adjustments are made to the unit's baseline reading,

[1] Based on 1-minute readings
[2]Standard Deviation

this adjustment is considered when evaluating if the calibration met the minimum criteria outlined above.

3.1.3 Wind Direction Siting

The sonic anemometers North orientation marker's stated direction is conducted using a Brunton pocket transit. 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 this will be noted in the monthly report.

3.2 ON GOING QUALITY ASSURANCE QUALITY CONTROL

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

3.2.1 Data Platform Alerts

The AirSense data platform will alert Montrose and Oxy according to the table below. Alerts will be in the form of an immediate e-mail notification.

TABLE 3-2
PLATFORM ALERT CRITERIA

Parameter	Minimum Criteria
Range check	-1 to 100 ppm
Sticking check	Constant value for more than 15 1-minute data points
No data alerts	When no data is received for more than 15 minutes emails alerts will be issued at a frequency of once per 6-hours

3.2.2 Montrose Quality Assurance Checks

Montrose will review the nightly reports generated as outlined in section 4.0 to verify that the field criteria in Table 3-3 is met.

TABLE 3-3
MINIMUM FIELD CRITERIA

Parameter	1-Minute Average Minimum Criteria
Data Recovery	>90% over 48 hours

Baseline Variation Over 24 Hours	+/- 0.2 ppm

If any of the criteria laid out in Table 3-3 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 minimums as laid out in Table 3-3 a technician will inspect the unit. Each day is defined as the 24-hour period beginning when the nightly reports are generated at approximately midnight mountain time. 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.

Baseline Variation Over 24 Hours: It is expected that there will be slight baseline variation over 24 hours due to environmental conditions. If this baseline fluctuates more than 0.2 ppm in either direction from the average baseline over a 24-hour period a field technician will inspect the unit. If the technician cannot determine the cause of the baseline fluctuation the unit will be returned to the manufacturer for a more in-depth review.

3.2.3 Electrode Stack Replacement Schedule

The hydrophobic filter is built into an electrode stack on each Ion Science detector and will be replaced once per month at the monthly calibration. This electrode stack produces the PIDs voltage output. Prior to replacing the electrode stack a final bump test will be done on the detector to verify that the data collected during the month prior is quality data. This final bump test will consist of a different 3 ppm isobutylene gas then was used for the initial calibration and to pass the reading must be within +/- 25% of the gas bottle value.

If the unit fails a bump test:

A full three-point calibration will be done on the unit, as outlined in section 3.1.2, and a full inspection will be performed to determine why the bump test failed. If a reason for the failed bump test cannot be determined the unit will be returned to the manufacturer for inspection and another unit will be deployed in its place.

If the unit passes a bump test:

Either the electrode stack will be replaced and the PID will be recalibrated in the field after the sensor has time to warmup or the PID detector in the SPOD or Canary-S unit will be replaced with a pre-calibrated PID sensor. All QA/QC checks as outlined for initial deployment will be repeated and documented in the deployment/maintenance log.

4.0 REPORTING

A nightly system report will be issued by the AirSense data platform and e-mailed to the principle party's at Oxy 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 B.

- Sensor ID
- Minimum value
- Maximum value
- Average value
- Percent data capture
- Alerts that occurred

APPENDIX A
Example Nightly System Report

AirSense

Denver: 24 Hour (10/15/2019 7:30:44 AM - 10/16/2019 7:30:44 AM/UTC)

Site Name	Instrument Name	Parameter Name	Last Updated	Percent Complete	Max Value	Min Value	Average Value
	Bruce Randolph (CS19)	PM2_5	10/16/2019 5:57:06 AM	94.1	15.5	1.9	5.9
	CAMP Collo (CS13)	PM2_5	10/16/2019 5:57:10 AM	92.78	13.9	2.1	5.2
	Canary-S-DU1	PM2_5	10/16/2019 5:57:08 AM	93.4	10.5	1.1	4.8
	Canary-S-DU2	PM2_5	10/16/2019 5:57:08 AM	93.47	38.9	1.5	5.4
	Canary-S-DU3	PM2_5	10/16/2019 5:57:10 AM	93.54	12.2	1.1	4.7
	Fairview Elementary (CS9)	PM2_52	10/16/2019 5:57:06 AM	93.54	204.2	2.4	26.5
	Garden Place (CS8)	PM2_5	10/16/2019 5:57:08 AM	93.54	17.8	1.8	6.8
	Gust (CS15)	PM2_5	10/16/2019 5:57:03 AM	94.44	12.8	1.0	5.5
	I-25 Denver Collo (CS16)	PM2_5	10/16/2019 5:57:06 AM	94.24	60.9	1.6	10.0
	I-25 Glo Collo (CS2)	PM2_5	10/16/2019 5:57:07 AM	93.54	43.4	1.9	8.8
Canary-S	I-25 Glo Collo (CS3)	PM2_52	10/16/2019 5:57:05 AM	93.54	43.7	2.1	8.8
	I-25 Glo Collo (CS4)	PM2_52	10/16/2019 5:57:07 AM	93.54	45.9	2.2	9.4
	La Casa Collo (CS5)	PM2_5	10/16/2019 5:57:05 AM	93.54	53.8	2.2	9.6
	NJH CS Collo (CS1)	PM2_5	10/16/2019 5:57:05 AM	93.54	17.8	1.8	6.1
	Northeast Early (CS10)	PM2_5	10/16/2019 5:57:06 AM	93.54	17.7	1.5	6.0
	Prep Academy (CS17)	PM2_5	10/16/2019 5:57:04 AM	94.17	11.9	1.4	5.4
	Sabin (CS11)	PM2_5	10/16/2019 5:57:08 AM	92.64	72.9	1.5	8.1
	Sanderson Gulch II (CS12)	PM2_5	10/16/2019 5:57:07 AM	92.29	47.2	1.6	7.3
	South High (CS18)	PM2_5	10/16/2019 5:57:07 AM	94.24	57.6	1.1	5.7
	Swansea Elementary Collo (CS7)	PM2_5	10/16/2019 5:57:07 AM	93.54	26.5	2.6	7.9
	University Prep-Steele (CS20)	PM2_5	10/16/2019 5:57:05 AM	92.71	11.3	1.2	4.5
Clarity	La Casa Collo (CN A0051F54) Updated-Clarity	pm2_5ConcMass	10/16/2019 7:21:24 AM	18.12	13.2	0.2	4.8
sFTP	SAMS	PM2.5 - Local Conditions	10/16/2019 5:59:00 AM	85.56	12.7	1.3	4.4

Adjustment	Intercept	x1Coef	x2Coef	x3Coef	r2	Last Updated
CS5	1.84162191	0.58013888	0.02001846	0.00062910	0.35354714	10/11/2019

TD Enviromental
(707) 310-5541
TD Enviromental

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

Standard Operating Procedure – Collection and Analysis of Carbon Sorbent Tubes

STANDARD OPERATING PROCEDURE

SOP Title: Passive Tube Sampling	**Implementation Date:** September 9, 2020
Document Number: 928ET-772315-SP-2	**SOP Owner (Department):** AQS
Revision Number: R0	**SOP Approval:** Austin Heitmann, CPM

EPA Method 325 Sample Tube Deployment:

1. Remove ice packs from passive sampler (PS) cooler. Freeze them in a horizontal position in a dedicated, contaminant-free freezer until ready for use in the return shipment.
2. Allow the PS to equilibrate to ambient temperature at the sampling location for 1 hour prior to deployment
3. Inspect sample shelter for damage or indication of insect infestation. Replace if damaged or infested. DO NOT spray sample shelter with any type of insect repellant.
4. Complete data sheet/chain-of-custody with required information:
   - Name of sample shelter
   - PS identification number etched on exterior of PS, and whether PS is a primary sample, duplicate sample, or field blank (S,D, or B)
   - Date and time
   - Any abnormal conditions in the vicinity (e.g., operation of a portable generator, evidence of tampering with sample shelter)
5. Don powder-free nitrile gloves to prevent contamination with body oils, hand lotions, perfumes, etc.
6. Remove PS cartridge from sample shelter (if applicable)
7. Remove PS from vial. Check that the fittings of the PS are not loose – do not use if loose.
8. Remove brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug from the grooved end of the PS. The grooved end will be on the origin side of the arrow etched on the tube. This indicates it is the inlet end of an active sample. Do not use tube if media leaks when opened.
9. Insert PS in cartridge, and install a diffusion cap on the open end
10. The diffusion cap has two o-rings that seal against the sample tube. Slide the sample tube until both o-rings have sealed against the tube and the inlet end of the tube is just against the diffusion cap screen. The sampler must ensure that the diffusion cap has been pushed on far enough to seal both o-rings. It may take some force with a twisting action to slide the tube far enough into the diffusion cap to seal properly
11. Place the brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug into the original glass vial, cap the vial, and return to the sample cooler
12. Install field blank or duplicate PS, as applicable
    - Note: diffusion caps are not placed on field blanks. Leave brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug secure.
    - Per Section 9.3.2 of EPA Method 325A, field blanks must be placed in two separate sampling quadrants respective to the geometric center of the facility
    - Duplicate samples are installed in a manner identical to primary samples

STANDARD OPERATING PROCEDURE

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2. Allow the PS to equilibrate to ambient temperature at the sampling location for 1 hour prior to deployment
3. Inspect sample shelter for damage or indication of insect infestation. Replace if damaged or infested. DO NOT spray sample shelter with any type of insect repellant.
4. Complete data sheet/chain-of-custody with required information:
   - Name of sample shelter
   - PS identification number etched on exterior of PS, and whether PS is a primary sample, duplicate sample, or field blank (S,D, or B)
   - Date and time
   - Any abnormal conditions in the vicinity (e.g., operation of a portable generator, evidence of tampering with sample shelter)
5. Don powder-free nitrile gloves to prevent contamination with body oils, hand lotions, perfumes, etc.
6. Remove PS cartridge from sample shelter (if applicable)
7. Remove PS from vial. Check that the fittings of the PS are not loose – do not use if loose.
8. Remove brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug from the grooved end of the PS. The grooved end will be on the origin side of the arrow etched on the tube. This indicates it is the inlet end of an active sample. Do not use tube if media leaks when opened.
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11. Place the brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug into the original glass vial, cap the vial, and return to the sample cooler
12. Install field blank or duplicate PS, as applicable
    - Note: diffusion caps are not placed on field blanks. Leave brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug secure.
    - Per Section 9.3.2 of EPA Method 325A, field blanks must be placed in two separate sampling quadrants respective to the geometric center of the facility
    - Duplicate samples are installed in a manner identical to primary samples

13. Install PS shelter cartridge with PS in sample shelter and confirm that the end of the PS with the diffusion cap installed is pointed directly downward

14. Remove powder-free nitrile gloves and discard

15. Repeat this sequence of steps for next PS installation

Sample Recovery and Re-deployment:

Samples will be recovered after 14 consecutive days of sampling, or at another frequency as dictated by the site specific sampling program. Sample recovery should be conducted in the same location sequence as deployment and ideally at clock times that corresponds to exactly 14-days.

1. Inspect sample shelter for damage or indication of insect infestation. Replace if damaged or infested. DO NOT spray sample shelter with any type of insect repellant.
    - If sample shelter is replaced, document height of replacement shelter from the ground and confirm new location coordinates
2. Complete data sheet/chain-of-custody with required information:
    - Name of sample shelter
    - PS identification number etched on exterior of PS, and whether PS is a primary sample, duplicate sample, or field blank (S, D, or B)
    - Date and time
    - Any abnormal conditions in the vicinity (e.g., operation of a portable generator, evidence of tampering with sample shelter)
    - Don powder-free nitrile gloves to prevent contamination with body oils, hand lotions, perfumes, etc,
    - Remove PS cartridge from sample shelter
3. Remove diffusion cap from the end of the and slide PS from cartridge, and replace the original brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug on the open end.
4. Ensure that the brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug on both ends of the PS are secure using one quarter turn past finger-tight with the 9/16” and ½” wrenches. Do not over tighten the brass fittings as this could damage the Teflon® ferrule inside the fitting and compromise the seal. Note: Loose caps discovered at the analytical laboratory following shipment could invalidate the sample.
5. Place the sealed PS in the original glass vial, cap the vial, and secure in the original sample cooler
6. Inspect diffusion cap and remove from service if dirty
7. Remove powder-free nitrile gloves and discard

13. Install PS shelter cartridge with PS in sample shelter and confirm that the end of the PS with the diffusion cap installed is pointed directly downward

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    - Don powder-free nitrile gloves to prevent contamination with body oils, hand lotions, perfumes, etc,
    - Remove PS cartridge from sample shelter
3. Remove diffusion cap from the end of the and slide PS from cartridge, and replace the original brass Swagelok® nut with Teflon® ferrule and brass Swagelok® plug on the open end.
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5. Place the sealed PS in the original glass vial, cap the vial, and secure in the original sample cooler
6. Inspect diffusion cap and remove from service if dirty
7. Remove powder-free nitrile gloves and discard

8. If immediately installing new PS at the sample location, perform the sequence of steps described in Sample Deployment

9. Repeat this sequence of steps for next PS recovery

Sample Packaging and Shipping:

Once all PS are collected and secured in the original sample cooler, the sample cooler must be shipped priority overnight to the analytical laboratory. Per Section 8.5.4 of EPA Method 325B, PS must be analyzed within 30 calendar days of the end of sample collection.

1. If shipping is not done on the same day as sample recovery, samples may be placed in a contaminant-free refrigerator for storage and the ice packs frozen to be placed in the shipping cooler. Per Section 8.5.4 of EPA Method 325B, PS must be stored below 23°C (73.4°F).

2. Each set of samples will contain their own unique chain-of-custody form that is included in the sample cooler. Relinquish the samples by signing the chain-of-custody in the "Relinquished by" section and indicate the selected shipping agency in the "Received by" section. Place the original chain-of-custody form inside a plastic baggie in the corresponding

3. Ensure that at least one temperature blank glass vial is included in the sample cooler.

4. Place the original two frozen ice packs into the sample cooler when ready for shipping.

Note: Do not write, etch, or place labels anywhere on the weatherproof sample shelter, glass vial or PS itself. The lids of the glass vials may be marked with a shelter ID to facilitate sample collection. However, do not use permanent marker, paint, or any other marking tool that contains a high level of VOC to write the sample IDs on the sample label.

Note: Sampled sorbent tubes MUST NOT be placed in the same container (e.g., shipping cooler, refrigerator) as clean conditioned, sampling tubes.

Standard Operating Procedure – Collection and Analysis of Summa Canister

STANDARD OPERATING PROCEDURE

SOP Title: Summa Canister Sampling	**Implementation Date:** September 9, 2020
Document Number: 928ET-772315-SP-1	**SOP Owner (Department):** AQS
Revision Number: R1	**SOP Approval:** Austin Heitmann, CPM

Summa Canister Sampling Standard Operating Procedure:

1. Remove canister from box.
2. Check plug on canister is on tight
3. Confirm the valve on the canister is closed
4. Remove the plug from the inlet of the canister and reserve for after sample collection. If there is an additional fitting attached to the valve, make sure to hold the hex below the plug still with a ½" wrench to remove the plug. Failure to do this may cause the canister to lose vacuum.
5. Remove the cap from the bottom of a sample regulator. (Note: There is a removable graphite/vespel ferrule on this fitting – take care to make sure it is not lost when removing.)
6. If the ferrule falls out, place the ferrule on the tubing stub of the regulator with the taped end facing the connection to be made.
7. Connect the regulator to the sample canister. Tighten the nut on the regulator ¼ turn past finger-tight. Make sure to hold the hex of the additional fitting still (if present) with a ½" wrench to ensure that it's snug.
8. Check and note if the needle is not on zero on the vacuum gauge.
9. Ensure the inlet nut on the inlet filter to the regulator is on and tight.
10. Mount the canister on a tripod (same tripod as a continuous monitor, if applicable) approximately 4-7 feet off the ground.
11. Open the valve on the canister and note the vacuum in the canister. The canister has acceptable vacuum if the gauge reads between 23-28 InHg – please add or subtract any zero offset noted.
12. Allow the regulator to equilibrate for 30 seconds then close the valve on the regulator.
13. To check for leaks, observe the vacuum gauge for 30 seconds to make sure the needle does not move toward zero.
14. If leaking repeat steps above after tighten the fittings an additional 1/8 of a turn. Do this systematically one at a time starting at the canister and moving toward the inlet of the regulator.
15. When ready to sample remove the nut from the inlet of the regulator and open canister. Record sampling information on the COC – Sample ID, Can #, Regulator #.
16. When finished sampling each canister, make sure 2 to 10 InHg of vacuum remains in canister. Note this value on the COC.
17. Close the canister valve
18. Remove regulator from canister
19. Replace nut on top of canister and tighten ¼ turn past finger-tight
20. Replace cap on the bottom of the regulator and plug at inlet. Tighten both ¼ turn past finger-tight.

Manufacturer's Specification Sheets – PID Analyzers and Meteorological Sensor

WX Ultrasonic WeatherStation® Instruments for Land Applications

Delivering a Compact, Affordable Instrument for Informed Decision-Making

Available Models:
110WX, 150WX, 200WX

Whether you are harvesting crops, operating equipment, preparing for bad weather or responding to a hazardous event; understanding the weather is important. The WX Series allows users to make informed decisions based on site specific information, resulting in improved efficiency, reduced risks and overall cost savings. Various model options are available depending on the application and requirements.

The WX Series WeatherStation Instruments offer a truly best-in-class solution at a better price point compared to any other weather monitoring system on the market today!

Actual Size

FEATURES

- Model 110WX – Measures apparent wind speed and angle, barometric pressure, air temperature, relative humidity, calculated dew point, heat index and wind chill temperature
- Models 150WX and 200WX – Includes all 110WX functionality plus internal compass and GPS (for true wind speed and direction), GPS position, speed over ground, course over ground
- Model 200WX – Best-in-class dynamic stabilization via three-axis compass and three-axis rate gyro
- UV stabilized, compact housing is fully waterproof and resistant to chemicals and sunlight

AIRMAR® TECHNOLOGY CORPORATION
Sensing Technology

Product Models to Satisfy Multiple Weather Needs

Now available on iTunes — OnSiteWX
The innovative App for real-time weather data!

110WX

150WX

200WX

	Apparent Wind Model	Apparent & True Wind Models	
	Recommended for Stationary Applications	**Recommended for Moving Vehicle Applications**	**Recommended for Dynamic Moving Vehicle Applications**
Apparent wind speed and angle	✓	✓	✓
True wind speed and direction		✓	✓
Barometric Pressure	✓	✓	✓
Ultrasonic wind readings up to 90 mph (78 knots, 40 m/s)	✓	✓	✓
Air temperature plus calculated wind chill	✓	✓	✓
		✓	✓
10 Hz GPS (Position, COG, SOG)		✓	✓
Two-axis solid state compass		✓	
Three-axis accelerometer for pitch and roll		✓	✓
Three-axis solid-state compass with dynamic stabilization: Better than 1° static compass accuracy Best-in-class 2° dynamic compass accuracy			✓
Three-axis rate gyros provide rate-of-turn data			✓
Best-in-class pitch and roll accuracy			✓
Optional field-serviceable relative humidity Calculated dew point Calculated heat index	✓	✓	✓
Output options include: NMEA 0183 (RS422) and NMEA2000® (CAN Bus) NMEA 0183 (RS232) and NMEA2000® (CAN Bus)	✓	✓	✓

WeatherCaster™ Software

Developer Assistance

- Enable/disable functionality
- Optimize communications bandwidth NMEA 0183 (RS232, RS422)
- Change sampling rate (output interval)

Field Installation Assistance

- Enable/disable functionality
- Sensor orientation
- Compass calibration
- Temperature offset
- Select specific device on a NMEA2000® network
- Alarms for wind speed and barometric pressure
- Altitude offset
- More accurate GPS position in 2D mode
- More accurate BP reading

Achieving Best-in-Class Product Specifications

SPECIFICATIONS

Wind Speed Range:
— 0 knots to 78 knots (0 MPH to 90 MPH, 0 m/s to 40 m/s)
Wind Speed Resolution:
— 0.1 knot (0.1 MPH, 0.1 m/s)
Wind Speed Accuracy @ 0°C to 55°C (32°F to 131°F), no precipitation*:
— Low Wind Speeds:
0-10 knots; 1 knot RMS +10% of reading
(0 MPH to 11.5 MPH; 1.1 MPH + 10% of reading)
(0 m/s to 5 m/s; 0.5 m/s + 10% of reading)
— High Wind Speeds:
10-78 knots; 2 knots RMS or 5%, whichever is greater
(11.5 MPH to 90 MPH; 2.3 MPH or 5%, whichever is greater)
(5 m/s to 40 m/s; 1 m/s or 5%, whichever is greater)
Wind Speed Accuracy in wet conditions:**
— 5 knots RMS (5.7 MPH RMS, 2.5 m/s RMS)
Wind Direction Range: 0° to 360°
Wind Direction Resolution: 0.1°
Wind Direction Accuracy @ 0°C to 55°C (32°F to 131°F), no precipitation*:
— Low Wind Speeds (5° RMS typical):
4-10 knots (4.6 MPH to 11.5 MPH, 2 m/s to 5 m/s)
— High Wind Speeds (2° RMS typical):
>10 knots (>11 .5 MPH, >5 m/s)
Wind Direction Accuracy in wet conditions (8° RMS Typical):**
>8 knots (>9.2 MPH, >4 m/s)
Compass Accuracy:
— 1° RMS when level—(150WX only)
— 1° static heading accuracy; 2° dynamic heading accuracy—200WX only
Pitch and Roll Range / Accuracy: ±50° / <1°—150WX & 200WX
Air Temperature Range: -40°C to 55°C (-40°F to 131°F)
Air Temperature Resolution: 0.1°C (0.1°F)
Air Temperature Accuracy:
±1.1°C (±2°F)* @ >4 knots wind (>4.6 MPH wind) (>2 m/s wind)
Barometric Pressure Range:
300 mbar to 1100 mbar (24 inHg to 33 inHg, 800 hPa to 1100 hPa)
Barometric Pressure Resolution: 0.1 mbar (0.029 inHg, 0.1 hPa)
Barometric Pressure Accuracy:
±1 mbar (±0.029 inHg, ±1 hPa) when altitude correction is available
Relative Humidity Range: 10% to 95% RH
Relative Humidity Accuracy*: ±5% units RH
GPS Position Accuracy:
3 m (10′) with WAAS/EGNOS (95% of the time)—150WX & 200WX
Operating Temperature Range: -25°C to 55°C (-13°F to 131°F)
Supply Voltage: 9 VDC to 40 VDC
Supply Current (@ 12 VDC):
— (<50 mA) <0.6W —110WX
— (<85 mA) <1.0W —150WX
— (<105 mA) <1.25W —200WX
Weight: 300 grams (0.8 lb)
Communication Interface: NMEA 0183 (RS422 or RS232) and NMEA2000® (CAN bus)***
Mounting Thread Size on Base: 1″-14 UNS or 3/4″ NPT
Certifications and Standards:
CE, IPX6 (Relative Humidity/IPX4), RoHS, IEC61000-4-2, IEC60945
IEC60950_1C, IEC60950_22A, EN55022, EN55024, EN15014982

RMS—Root Mean Square
***When the wind speed is less than 2 m/s (4.6 MPH) and/or air temperature is below 0°C (32°F), wind, temperature, and relative humidity readings will be less accurate.**
****Wet conditions include moisture, rain, frost, dew, snow, ice and/or sea spray in the wind channel.**
*****Airmar has made the address claiming modifications to enable compatibility with the ISO 11783 communication protocol for the agriculture industry – that is based on the SAE J1939 protocol.**

PART NUMBERS

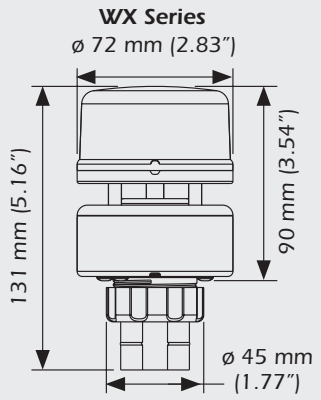
110WX: 44-820-1-01, RH, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
110WX: 44-823-1-01, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
110WX: 44-843-1-01, RH, NMEA 0183 (RS232) and AG (CAN Bus)

150WX: 44-832-1-01, RH, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
150WX: 44-833-1-01, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
150WX: 44-834-1-01, RH, NMEA 0183 (RS232) and AG (CAN Bus)

200WX: 44-835-1-01, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
200WX: 44-837-1-01, RH, NMEA 0183 (RS422) and NMEA2000® (CAN Bus)
200WX: 44-847-1-01, NMEA 0183 (RS232) and NMEA2000® (CAN Bus)

* Cables sold separately
RH— Relative Humidity

DIMENSIONS



DATA OUTPUT PROTOCOL

NMEA 0183 Sentence Structure

$GPDTM	GPS Datum Reference
$GPGGA	GPS Fix Data
$GPGLL	Geographic Position—Latitude and Longitude
$GPGSA	GNSS DOP and Active Satellite
$GPGSV	Satellites in View
$GPRMC	Recommended Minimum GNSS
$GPVTG	COG and SOG
$GPZDA	Time and Date
$HCHDG	Heading, Deviation, and Variation
$HCHDT	True Heading
$HCTHS	True Heading and Status
$TIROT	Rate of Turn
$WIMDA	Meteorological Composite
$WIMWD	Wind Direction and Speed
$WIMWV.	Wind Speed and Angle
$WIMWR	Relative Wind Direction and Speed
$WIMWT	True Wind Direction and Speed
$YXXDR	Transducer Measurements

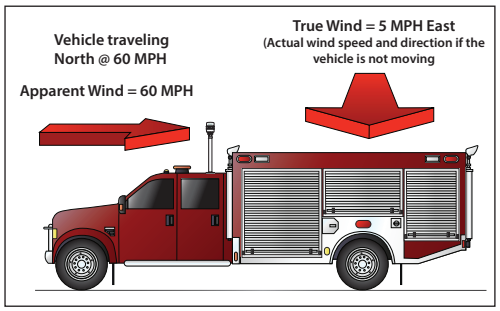
NMEA2000® Output Message Structure

59392	ISO Acknowledgement
060928	ISO Address Claim
126208	Acknowledge Group Function
126464	PGN List
126992	System Time
126996	Product Information
126998	Configuration Information
127250	Vessel Heading
127251	Rate of Turn
127257	Attitude
127258	Magnetic Variation
129025	Position and Rapid Update
129026	COG and SOG, Rapid Update
129029	GNSS Position Data
129033	Time and Date
129044	Datum
129538	GNSS Control Status
129539	GNSS DOPs
129540	GNSS Sats in View
130306	Wind Data
130310	Environmental Parameters
130311	Environmental Parameters
130312	Temperature
130313	Humidity
130314	Actual Pressure
130323	Meteorological Station Data

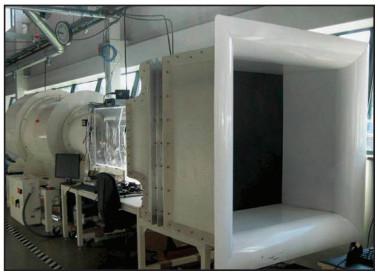
Understanding True and Apparent Wind

Virtually all mechanical and ultrasonic anemometers report apparent wind speed and direction. The Airmar WX Series is unique because it calculates both true and apparent wind speed and direction. These wind readings are the same if the unit is mounted in a fixed location. However, if the WX Series is mounted on a moving vehicle, the apparent wind is the wind you would feel on your hand if you held it out the window while going down the highway. Since the WX Series has a built in GPS and compass, it calculates the true wind based upon the apparent wind, speed of the vehicle, and compass heading.

True wind information is significant for numerous applications on hazardous response vehicles. True wind speed and direction is also mission-critical. When en route to an emergency situation, first responders can use the true wind readings to predict wind conditions at the disaster site before they even arrive, giving vital information for planning operations and staging apparatus.

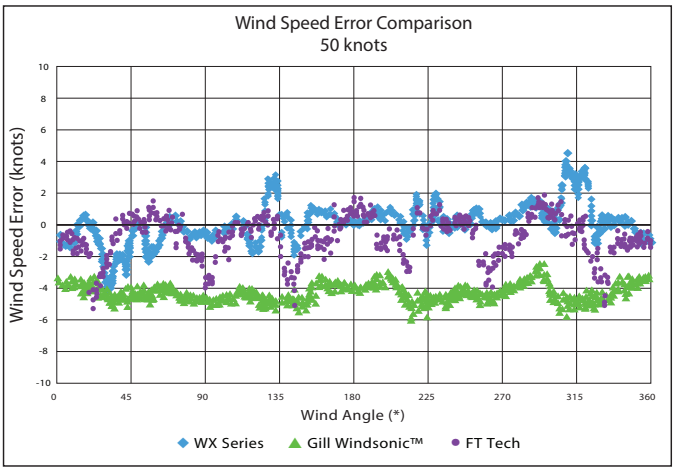


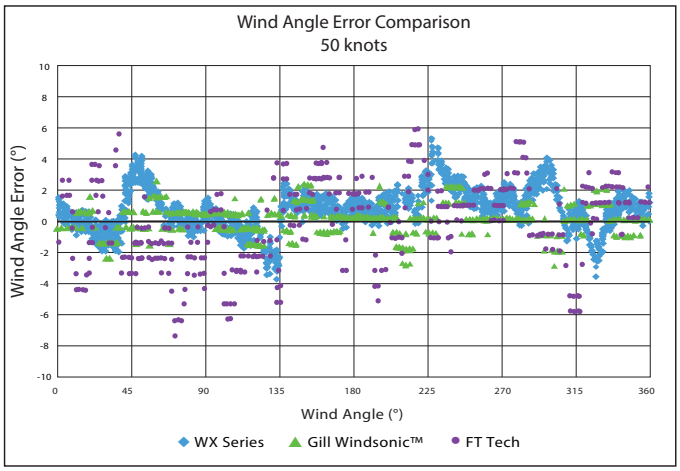
Airmar's WX Series products are the only all-in-one unit to offer true and apparent wind speeds without additional sensors.



Each WeatherStation Instrument is factory calibrated in a wind tunnel at our state-of-the-art facility located in Milford, New Hampshire, USA.

Performing Above and Beyond Competitive Products on the Market





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Sensing Technology

WX_Series_LAND_APP_rA 09/21/15

wind

YOUNG

Model 91000

ResponseONE™ Ultrasonic Anemometer

YOUNG Model 91000 *ResponseONE*™ Ultrasonic Anemometer

The YOUNG ***ResponseONE***™ Ultrasonic Anemometer is designed to reliably measure wind speed and direction. The ***ResponseONE***™ is wind tunnel calibrated and will accurately measure wind speeds up to 70 m/s (156 mph). The high sampling rate of the Model 91000 provides for fast response to changing wind conditions and wind data may be updated as fast as 10 times per second. An easy-to-use Windows setup program is provided with each sensor. The program allows the user to customize device settings such as sampling rates and communication parameters.

The compact IP-66 rated design features durable, corrosion-resistant construction. A variety of useful standard serial output formats are provided including SDI-12, NMEA, and ASCII text. The sensor installs on readily available 1 inch (IPS) pipe and wiring connections are made in a convenient weather-proof junction box. Special connectors and cables are not required. The Model 91000 is available in black or white.

Specifications

Wind Speed	Range:	0 – 70 m/s (156 mph)
	Resolution:	0.01 m/s
	Starting Threshold:	<0.01 m/s
	Accuracy:	±2% or 0.3 m/s (0 – 30 m/s)
		±3% (30 – 70 m/s)
	Response Time:	<0.25 seconds
Wind Direction	Azimuth Range:	0 - 360 degrees
	Resolution:	0.1 degree
	Starting Threshold:	<0.01 m/s
	Accuracy:	±2 degrees
	Response Time:	<0.25 seconds
Electronic Compass	Range:	0 – 360 degrees
	Resolution:	1 degree
	Accuracy:	± 2.0 degrees
Serial Output (selectable)	Interface:	RS-232, RS-485/422, SDI-12
	Formats:	NMEA, SDI-12, ASCII (polled or continuous)
	Baud Rates:	1200, 4800, 9600, 19200 and 38400
	Wind Units:	m/s, knots, mph, kmph
	Output Update Rate:	0.1 to 10 HZ
Power	Voltage:	10 – 30 VDC
	Current:	7 mA @ 12 VDC typical, 80 mA max
General	Protection Class:	IP66
	EMC Compliance:	FCC Class A digital device, IEC Standard 61326-1
	Dimensions:	22.0 cm high x 13.5 cm wide
	Weight:	0.5 kg (1.1 lb)
	Shipping Weight:	1.4 kg (3.1 lb)
	Operating Temperature:	-40 to +60 °C
	Removable Bird Spikes:	Included

The ***ResponseONE***™ is compatible with a broad range of data loggers and displays, including the YOUNG Model 06206 Marine Wind Tracker.

Ordering Information

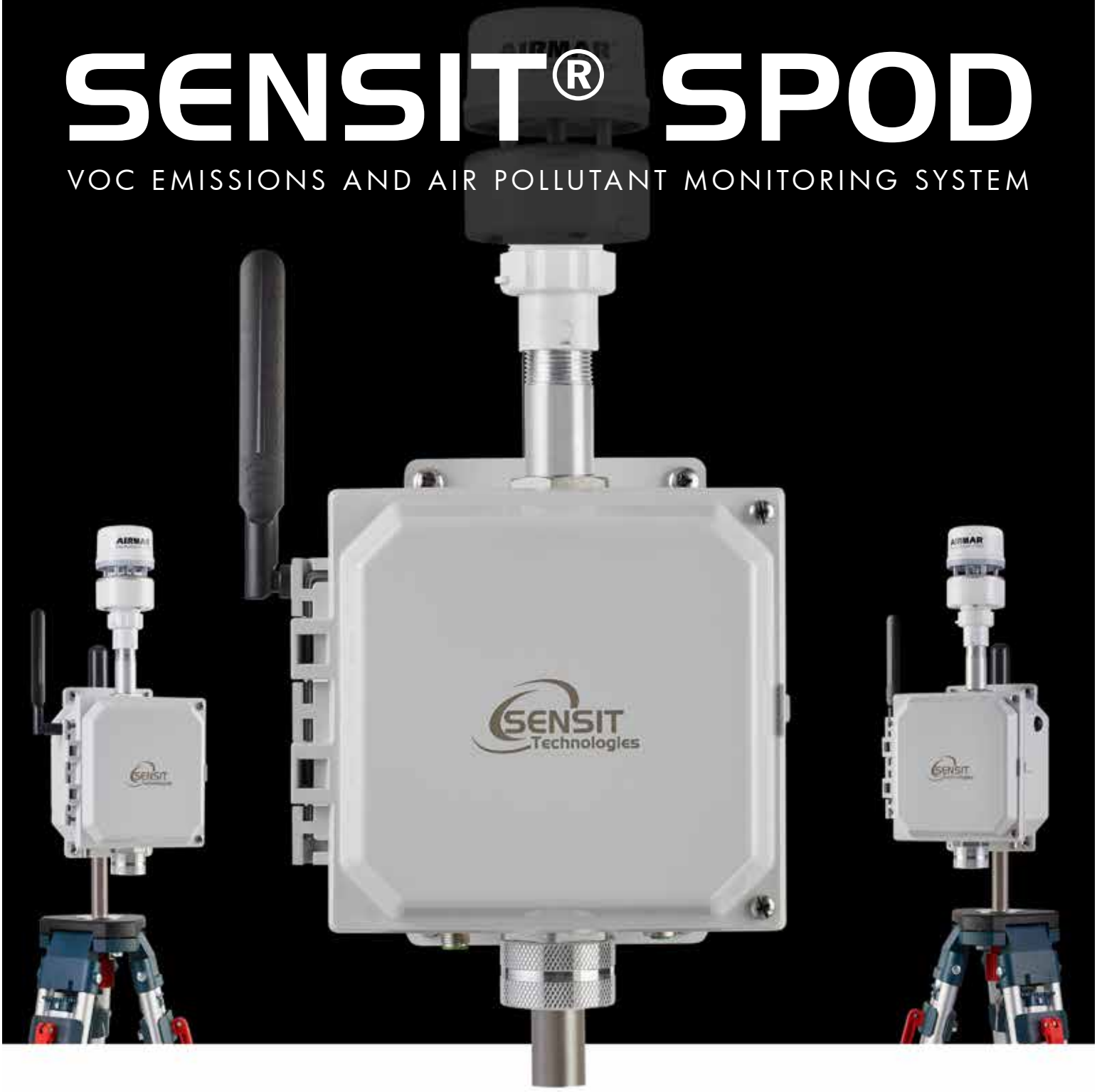
	MODEL
ResponseONE™ Ultrasonic Anemometer – White	**91000**
ResponseONE™ Ultrasonic Anemometer – Black	**91000B**

CE Complies with applicable CE directives.

R.M. YOUNG COMPANY
2801 Aero Park Drive
Traverse City, Michigan 49686 USA
TEL: (231) 946-3980 FAX: (231) 946-4772
E-mail: met.sales@youngusa.com
Web Site: www.youngusa.com

SENSIT® SPOD

VOC EMISSIONS AND AIR POLLUTANT MONITORING SYSTEM



SENSIT® SPOD sensors help detect, locate and continuously monitor air pollutant sources.

MADE IN THE USA
WITH GLOBALLY SOURCED COMPONENTS

SENSIT Technologies

Innovative Detection Solutions

www.gasleaksensors.com

SENSIT® SPOD

A remote air quality monitoring platform and pollution data management system

The SENSIT® SPOD is a low-cost, solar-powered sensor system that combines wind and air pollutant concentration measurements to detect VOC emission plumes and help locate the source of emissions.

With a small footprint, the user-friendly SENSIT® SPOD is designed for near-fenceline applications where localized emissions may be present. This Next Generation Air Measurement (NGAM) sensor offers real-time continuous monitoring and direct-reading, without laboratory analysis at a lower cost than traditional methods.

The SENSIT® SPOD features solar charging and global cellular integration for remote operation.

SENSIT® SPOD includes an Ultrasonic weather station for wind speed, direction, temperature, humidity, and pressure.

Standard Features

- Real-time Continuous Monitoring
- Modular Data Transmission
- Cellular (4G IoT default)
- Local RF (Optional)
- Total VOC Output: (Variable range)
- Auxiliary Port for Automated Sampling
- Solar Compatible with Integrated Battery Backup

Applications

- Fenceline emissions monitoring
- Large-scale outdoor air monitoring
- Community stations

Accessories

- 4 Port Canister Valve Controller
- Canister Pressure Monitors
- 4 Port Sorption Tube Sampler

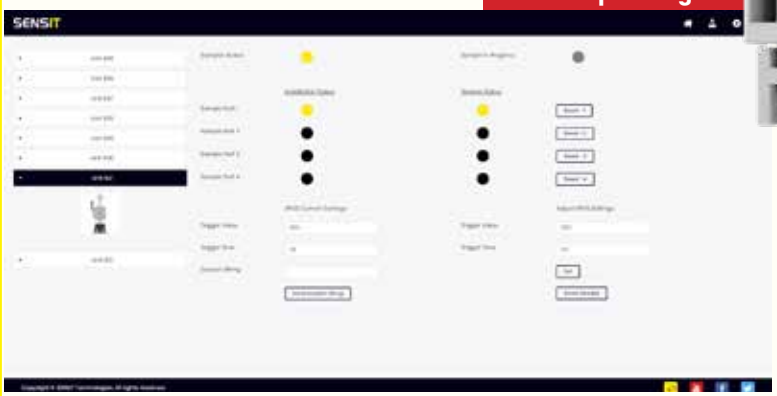
PRODUCT SPECIFICATIONS

Weight	Base unit:
Dimensions	6x8x16" (Fully assembled with anemometer and antenna)
Mounting	Attached mounting flanges
Voltage Requirements	18-24 DC Charging (wired adapter or solar panel)
Current Requirements	2A max current draw when charging
Operating Runtime	2-3 days battery backup
Operating Temp	-20°C to 50°C
Data Outputs	Digital wired output (3.3V TTL - USB)
	4G NB-IoT or Cat M1 Wireless
	SD card data backup

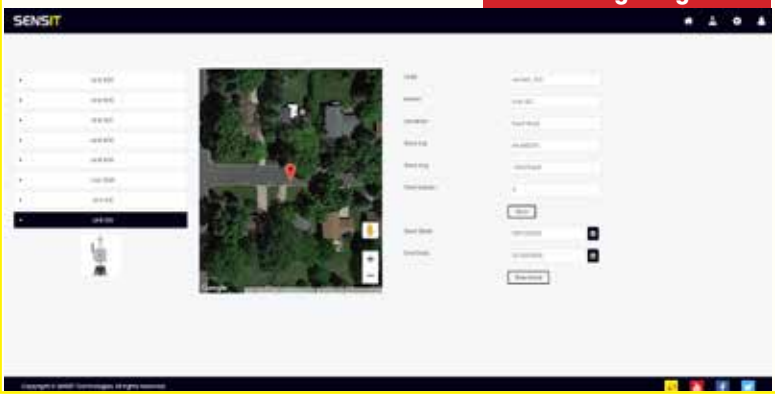
Periodic Maintenance
Periodic cleaning of sensor openings of dust, zero point calibration, and single point span calibration. User replacement of sensors is easily performed as needed.

Data Page

Sampler Page



Settings Page



SENSIT Technologies

851 Transport Drive
Valparaiso, IN 46383-8432

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 REV: 2-1-2020

Kahuna Ventures Letter

KAHUNA VENTURES
MIDSTREAM PROJECT EXECUTION

January 13 2020

Chad Schlichtemeier
HES Manager
Occidental Petroleum Corp.
1099 18th Street, Suite 1800
Denver, Colorado 80202

RE: Air Monitoring Procedure and Duration Guideline

Dear Mr. Schlichtemeier:

Occidental Petroleum Corp. (Oxy) has asked Kahuna Ventures (KAHUNA) to recommend sampling procedure and duration guidelines for air monitoring in the vicinity of their operations in Northeastern Colorado. This recommendation will allow for Oxy to best compare air sampling results to the Agency for Toxic Substances and Disease Registry (ATSDR) acute inhalation Minimum Risk Levels (MRL), especially the acute inhalation MRL for benzene. The acute inhalation MRL for benzene is 9 parts per billion (ppb). MRLs are derived when reliable and sufficient data exists to determine an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse, non-cancer health effects over a specified duration of exposure. Acute inhalation MRLs are derived for a 1 to 14-day inhalation exposure duration. Additionally, MRLs are generally based on the most sensitive chemical-induced end point considered to be of relevance to humans and ATSDR uses a conservative approach in determining the specific MRL in order to address any uncertainty related to the population considered to be most sensitive (infants, elderly, nutritionally or immunologically compromised). Therefore, it is my opinion Oxy should collect a 14-day air sample to compare to the acute inhalation MRL for benzene (9 ppb) and best assess potential impacts to surrounding populations.

Sampling should follow the US Environmental Protection Agency (EPA) Method 325A—Volatile Organic Compounds from Fugitive and Area Sources. This Method has been established by the EPA to screen average airborne VOC concentrations at facility property boundaries or monitoring perimeters over an extended period of time. The duration of each sampling period is normally 14 days. This method allows for the collection of volatile organic compounds (VOCs) using passive (diffusive) tube samplers (Supelco Radiello 130 passive badges). This method also requires the collection of local meteorological data (wind speed and direction, temperature, and barometric pressure) in order to effectively determine emission sources and potential impact areas.

In addition, Oxy should continuously monitor the sampling locations for Total Organic Vapors (TOCs). This will provide Oxy the data necessary to evaluate potential high emission periods and design further sampling actions.

Oxy can then use data obtained as screening levels for potential impacts to surrounding populations. In the event that the average airborne benzene concentration exceeds the acute inhalation MRL for benzene (9 ppb), additional sampling should be conducted. This additional sampling may include

evaluation of the continuous VOC monitoring data in order to collect additional samples related to a specific event, such as initial flowback. I would then recommend a 24-hour air sample be collected during this specific event using a SUMMA canister, to further evaluate potential impacts to surrounding populations.

If anyone has questions regarding this guideline, please contact me. KAHUNA looks forward to working with Oxy on any future projects relating to this guideline.

Sincerely,

Jeffrey Citrone, CIH, CSP
Manager Health & Safety Compliance
11400 Westmoor Circle, Suite 325
Westminster, CO. 80021
303-407-3150 (Direct)
720-822-3298 (Cell)