Quarterly Report for Phillips 66 Denver Terminal Fenceline Monitoring Plan-Q1 2026

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Document Number: 317AA-062420-RT-1209
Submittal Date: April 15, 2026

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II. Executive Summary

This report summarizes the findings related to the Phillips 66 fenceline monitoring plan during the period of January 1st of 2026 to March 31st of 2026 (Q1 of 2026). The data collected during this period were validated following all procedures described in the Phillips 66 fenceline monitoring plan. This report includes tables with the validated and invalidated data, statistical analysis results and timeseries of the compounds of interest and meteorological parameters.

III. Contact Information

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IV. Methods

A. Site Description

Phillips 66 operates a bulk fuel storage and distribution terminal at 3960 East 56th Avenue, Commerce City (Adams County), Colorado. Gasoline, Ethanol, Jet and Diesel fuel products are received from a pipeline and are stored and distributed to market by tank trucks. The principal components of the facility are as follows:

- Gasoline aboveground storage tanks
- Butane aboveground storage tanks
- Jet aboveground storage tanks
- Diesel aboveground storage tanks
- Additive aboveground storage tanks
- Ethanol aboveground storage tank
- Vapor combustor unit (VCU)

The facility lies in an industrial area near the Suncor refinery, another bulk terminal, two asphalt plants, a wastewater treatment facility and other nearby industrial sources of Covered Air Toxics.

B. Instrument Description

1. Open-Path Monitors

The Phillips 66 Denver Terminal fenceline air monitoring system includes both open-path tunable diode laser spectrometers (TDLAS), and open-path ultraviolet Doppler optical absorption spectrometers (UVDOAS). Open-path monitors operate by projecting a beam of light through open air to retroreflectors that reflect the light back to the monitor where spectral absorption characteristics are measured. As the light travels along the path length, a certain amount of this light will be absorbed by the various chemical species present in the air. Because all gases absorb light differently according to their own unique spectral characteristics, it is possible to use measurements of absorption intensity at specific wavelengths as a proxy for measuring a target gas' concentration in the air. Therefore, along a known path length, an absorption measurement taken at the appropriate wavelength for the target molecule can easily be used to solve for its average concentration over the length of the beam.

The Phillips 66 open-path system will consist of four analyzers at the locations shown in Figure 1 and as outlined in Table 2. The light is transmitted to a retroreflector and back to a detector co-located with the transmitter. The analyzer software will provide five-minute and hourly-average concentration measurements for each path.

- ***Open Path (OP) Ultraviolet Differential Optical Absorption Spectroscopy (UVDOAS)***

For the monitoring of benzene, the Phillips 66 Denver Terminal uses Open Path (OP) Ultraviolet Differential Optical Absorption Spectroscopy (UVDOAS). This technology quantifies concentrations of gaseous compounds by measuring the absorption of ultraviolet light by chemical compounds in the air and applying the Beer-Lambert Law. UVDOAS typically uses unique absorptions of specific wavelengths of ultraviolet light in a wavelength range of 245 to 380 nanometers (nm). Benzene peaks are found close to the 253 nm wavelength.

Open path UVDOAS instrumentation consists of a light source, transmitting and receiving optics (telescopes), a spectrometer, a reflector, a detector, and a data processing computer. A Xenon light source provides light, which is focused in a collimated beam before it is sent through a transmitting telescope and into the measurement path. A receiving telescope collects the light and directs it to the spectrometer which diffracts the light onto the detector. The detector is typically a solid-state array such as a charge-coupled device (CCD). This allows the detector to collect light of different wavelengths without moving parts. The spectra bands can be extracted from the spectrum and compared to reference spectra to determine which compounds were present along the path and at what concentrations.

Monostatic (as opposed to bistatic) open path instruments have been selected to reduce the need for substantial power at the retroreflector sites and improve detection limits by increasing effective path lengths. Thus, only the light-source/detector end of the monitoring path requires substantial power, communications equipment, and a large shelter.

The Phillips 66 Denver Terminal uses the UV Sentry Open Path Multi-Gas Analyzer (UV Sentry) manufactured by Cerex Monitoring Solutions, LLC for the monitoring of benzene. The UV Sentry should not fail nor require calibration due to having no moving parts, therefore keeping maintenance and consumables to a minimum.

The UV Sentry has an on-board computer and saves raw spectral data independent of calibration. These spectra may be used at any time to verify real time measurements. Additionally, the UV Sentry records signal intensity and minimum detection limits (MDLs) for benzene in real time as data quality indicators. Real time MDL output supports both American Society for Testing and Materials (ASTM) and U.S. Environmental Protection Agency (USEPA) methods. The UV Sentry also has a flow through calibration cell to allow for regular QA audits and bump tests.

- ***Open Path (OP) Tunable Diode Laser Absorption Spectroscopy (TDLAS)***

For the monitoring of Hydrogen Sulfide and Hydrogen Cyanide[1], an Open Path (OP) Tunable Diode Laser Absorption Spectroscopy (TDLAS) is used. OP-TDLAS offers some significant operational and cost advantages over other measurement technologies such as Fourier Transform Infrared Spectroscopy (FTIR). Tunable diode lasers (TDL) are designed to focus on single absorption wavelengths specific to a compound of concern in the gaseous form. They can achieve low detection limits and are generally interferent-free. Similar to UVDOAS, quantitative measurements in direct gas phase laser absorption spectroscopy are based on the Beer-Lambert Law. A TDL uses a diode to generate light within a narrow frequency range that contains a relatively unique absorption wavelength of the chemical of interest. The laser frequency is "tuned" by changing the temperature of the diode or the current being fed to the diode or both so that it matches the spectral absorption line of interest.

Similar to the UVDOAS system, the OP-TDLAS system consists of a light source, a spectrometer, a reflector, a photodiode detector, and a data processing computer. Monostatic (as opposed to bistatic) open path instruments have once again been selected to reduce the need for substantial power at the retroreflector sites and improve detection limits by increasing effective path lengths.

The Phillips 66 Denver Terminal uses the LasIR™ Fence Line Monitoring Gas Analyzer manufactured by Unisearch Associates Inc. for the monitoring of Hydrogen Sulfide and Hydrogen Cyanide.[1] The LasIR™ allows one laser to send beams at two different wavelengths down each path length (one for each compound). Additionally, the beam can be split allowing it to monitor two path lengths with one laser. The controller uses a near infrared (NIR) Tunable Diode Laser Absorption Spectrometer System utilizing a single mode laser mounted in a thermoelectric cooler. A Windows based software package displays the data on a host laptop PC. The LasIR™ also has a flow through calibration cell to allow for regular QA audits and bump tests.

2. Meteorological Monitors

The meteorological instrumentation is installed on a 10m, heavy-duty aluminum tower. The 3-sided, open latticework tower is fabricated using a high-strength aluminum alloy in three 10-foot sections and is engineered for the specified wind load per EIA RS-222G. The tower is designed not to twist, rotate or sway, providing a rigid platform for mounting the sensors. It features hinged base leg brackets that permit the tower to be pivoted down into a horizontal position for easy servicing of the sensors. The tower incorporates a lightning rod with a full height ground cable and ground rod.

The meteorological monitoring tower is located at the west end of the Phillips 66 property. This tower is outfitted with high quality meteorological instruments as outlined in Table 1 and is capable of continuous and accurate real time measurements. All sensors will be connected to a datalogger which will store the data, as well as broadcast it out to a cellular modem so that data can be viewed or downloaded at anytime from anywhere. The specific meteorological instruments chosen meet EPA specifications for accuracy,

[1] These two compounds are neither used, stored, nor are they emitted from the Phillips 66 Denver Terminal. Therefore, the facility does not have the potential to emit either of these compounds, which comprise "Covered Air Toxics" under HB21-1189. In the event an Alert Threshold (Table 1-2 of the Fenceline Monitoring Plan) for either of these compounds is monitored, the monitored concentrations will be assigned a NS qualifier code and attributed to one or more of the near-by facilities described in Section 2.1 and Table 2-1 of the Fenceline Monitoring Plan titled "Other Industrial Facilities near the Phillips 66 Facility".

range and resolution (Table 1) and have been deemed appropriate for use in the fenceline monitoring system. Data from these sensors will be used to calculate 1-hour rolling averages updated every five minutes.

Table 1: Performance Specifications for Installed Meteorological Sensors

Parameter	Sensor Make and model	Reporting units	Accuracy	Range
Horizontal wind speed	Met One 010C	Meters per second (m/s)	± 0.1	0 to 55
Horizontal wind direction	Met One 020D	Degrees (°)	± 3	0 to 360
Temperature	Met One 065	Degrees of Celsius (°C)	± 0.15	-30 to +50
Relative humidity	Met One 083F/0/35	Percentage (%)	± 2	0 to 100
Barometric pressure	Met One 0192	Atmospheres (atm)	± 0.001	0.3 to 1.09

C. System Design

The fenceline monitoring system utilizes four primary shelters to house the open path analyzers, identified as the orange and blue pins in Figure 1. Each orange pin shelter houses one (1) monostatic open-path tunable diode laser 4-channel H_2S (TDL) analyzer, one (1) monostatic open-path tunable diode laser 4-channel HCN (TDL) analyzer, and two (2) monostatic open-path ultraviolet differential optical absorption (UV-DOAS) analyzers. Each blue pin shelter houses one (1) fiber optic line from the monostatic open-path tunable diode laser 4-channel H_2S (TDL) analyzer in the orange pin shelter, one (1) fiber optic line from the monostatic open-path tunable diode laser 4-channel HCN (TDL) analyzer in the orange pin shelter, and one (1) monostatic open-path ultraviolet differential optical absorption (UV-DOAS) analyzer.

Each open-path analyzer location has multiple paths identified numerically 1 through 6. At the end of each path there is a retroreflector opposite the analyzer. For example, the line from the analyzer shelter to the retroreflector forms the path. The specific locations for all open path equipment were selected to provide coverage of all facility emission sources within the constraints of the facility footprint.

For the hydrogen cyanide[2] and hydrogen sulfide[2] northwest path (Path 6) and northeast path (Path 1), laser light is transmitted from the most local orange pinned shelters under or above ground via fiber optic cable to the blue pinned shelters, then transmitted above ground to monitor the northwest path (Path 6) and northeast path (Path 1). The laser light reflects to a telescope mounted on the northwest path (Path 6) and northeast path (Path 1) instrument shelters then transmits back underground to the detector in the most local orange pinned shelter that the laser light originated from.

This monitoring program also includes meteorological monitoring as required in HB21-1189. Meteorological monitoring allows for the characterization of wind patterns for understanding the movement of the three covered air toxins and potential sources of emissions, and whether they are from the Phillips 66 bulk terminal or a neighboring facility. Since the Phillips 66 Denver Terminal does not store, emit, nor have the potential to emit hydrogen cyanide or hydrogen sulfide, the source of any potential detection by the Phillips 66 fenceline monitoring system will likely indicate emissions from a neighboring facility or source. A 10-meter meteorological tower will be installed near the Path 6 instrument shelter (Figure 1), so that power can be shared.

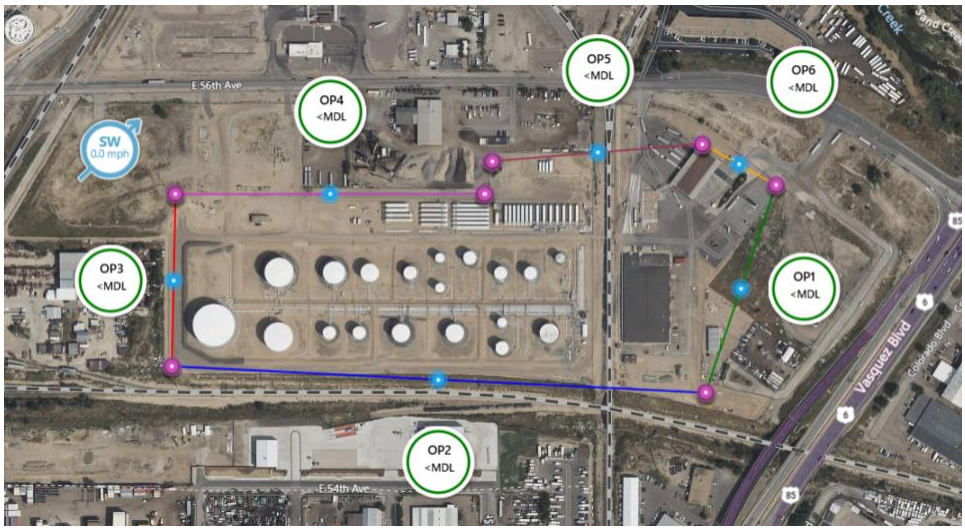

Figure 1: Approximate Layout of the Open-Path Analyzers, Retroreflector Locations, and Meteorological Station

[2] These two compounds are neither used, stored, nor are they emitted from the Phillips 66 Denver Terminal. Therefore, the facility does not have the potential to emit either of these compounds, which comprise "Covered Air Toxics" under HB21-1189.

Table 2: Descriptions of Each Individual Path

Path	Path Length	Compounds
1	226 meters	Hydrogen sulfide Hydrogen cyanide Benzene
2	550 meters	Hydrogen sulfide Hydrogen cyanide Benzene
3	165 meters	Hydrogen sulfide Hydrogen cyanide Benzene
4	315 meters	Hydrogen sulfide Hydrogen cyanide Benzene
5	222 meters	Hydrogen sulfide Hydrogen cyanide Benzene
6	138 meters	Hydrogen sulfide Hydrogen cyanide Benzene

D. Data Validation and QA/QC Procedures

-Automated Quality Control Procedures

Many Quality Control procedures for the fenceline monitoring network are integrated directly into the AirSense data platform and are outlined as follows. These automated procedures allow for the ability to screen data not suitable for public display due to atmospheric or operational issues. These automated quality control checks include:

- Inspection of daily reports generated by the AirSense platform which summarize data recovery for each analyzer/sensor and suspect data flags;
- Monitoring of real time alerts and daily reports generated by the AirSense data platform that flag:
    - No data;
    - Data sticking – if values are repeated for a number of sampling intervals (does not apply to data below the detection limit);
    - Range exceedances – if values are outside a reasonable minimum or maximum value;

- Data recovery;
- Monitoring instrument parameters that may indicate equipment degradation/failure or a need for maintenance and/or cleaning;
- Signal intensity (open path instruments);
- Instrument or sensor alarms or error codes;
- Analyzer and shelter temperatures; and
- Laser parameters (TDL instruments)

Table 3: List of Automated Quality Control Parameters and Corresponding Evaluation Criteria

Instrument	Automated Quality Control Parameter	Definition	Units	Evaluation criteria
UV-DOAS	MDL	Minimum detection limit	PPB	< 25% of alert threshold
	R^2	Percentage peak match	%	> 64
	Signal intensity	Signal intensity at full scale	%	> 40
	UV spectrometer temperature		^oC	35
TDL	MDL	Minimum detection limit	PPB	< 25% of alert threshold for all paths except H2S Paths 3,4 and 6 where the threshold is set to <50% of alert threshold
	Absolute Signal	Detector Signal	mA	> 0.1
	Laser temperature stability	Absolute value of (laser temperature- laser temperature in long average) *100/ laser temperature in long average	%	< 5
	R	Peak correlation		> 0.8

-Instrument Quality Control Checks

Both the UV-DOAS and TDL systems are designed to require only modest service and maintenance. Section 5.4 of the FLMP summarizes the UV-DOAS and TDL maintenance activities as recommended by the manufacturer. These activities will help ensure data integrity and maximize up-time. For the UV-DOAS system, a calibration verification bump test is performed on a quarterly basis using a flow through cell. For the UV-DOAS system, precision is calculated by evaluating the variance of pollutant concentrations during a period of low atmospheric variability. Five-minute data are selected when concentrations are well above

the minimum detection limit (MDL) during periods of low variability. The precision can then be determined by calculating the coefficient of variation (CV). For the UV-DOAS, robustness can be determined by calculating the desired signal intensity in order for the benzene minimum detection limit to be lower than 25% of the notification threshold. If the measured signal intensity is found to be below the desired value, corrective action will be required (e.g., replace light source, instrument alignment, etc.). The QC checks for the UVDOAS are summarized in Table 4.

Table 4: UV DOAS QC Checks

QA/QC Check	Frequency	Acceptance Criteria
Accuracy and precision (Bump Test)	Quarterly	Accuracy: ≤ 30% of reference gas value Precision: ± 25%
Baseline Stability	Continuous	± 5%
Signal intensity	Continuous	>60%
Robustness	Continuous	Compound MDL lower than 25% of notification threshold

For the TDL system, a calibration verification bump test is performed on a quarterly basis. The bump test simulates system-observed gas content at the required path average concentration and is used to verify that the system can detect concentrations at or below the levels of concern. For the TDL system, precision will be calculated by evaluating the variance of pollutant concentrations during a period of low atmospheric variability. Five-minute data will be selected when concentrations are well above the minimum detection limit during periods of low variability. The precision can then be determined by calculating the coefficient of variation (CV). If there are no periods of low variability with concentrations above the minimum detection limit, bump test data will be used for the precision determination. For the TDL system, robustness can be determined by calculating the desired signal intensity for the hydrogen sulfide and hydrogen cyanide minimum detection limit to be lower than 25% of the corresponding notification thresholds. If the measured signal intensity is found to be below the desired value, corrective action will be required (e.g., replace laser, instrument alignment, etc.). The QC checks for the TDL are summarized in the table as follows.

Table 5: TDL QC Checks

QA/QC Check	Frequency	Acceptance Criteria
Accuracy and precision (Bump Test)	Quarterly	Accuracy: ≤ 30% of reference gas value Precision: ± 25%

Baseline Stability	Continuous	± 5%
Signal intensity (Absolute Power)	Continuous	>0.1 mA
Robustness	Continuous	Compound MDL < 25% of alert threshold for all paths except H2S Paths 3,4 and 6 where the threshold is set to <50% of alert threshold

Wind speed, wind direction, temperature, relative humidity and barometric pressure measurement systems will be aligned, tested and calibrated at the time of installation and at six-month intervals thereafter using test equipment traceable to NIST or other authoritative standards and following standard operating procedures. Calibrations are performed immediately following scheduled semi-annual meteorological audits and performance of scheduled preventive and/or corrective maintenance for the monitoring instruments. Following initial startup calibrations and continuing throughout the monitoring program, the field operator performs quarterly site checks on the meteorological monitoring systems. During these checks, sensors will be observed for proper operation. The monitoring instruments and support equipment are visually inspected to confirm operational integrity. The current data logger readings are assessed for agreement with prevailing conditions.

-Data Quality Assurance

All continuous data from the monitoring equipment are transferred to the cloud-based servers every five minutes. Each business day, a data technician checks the data files to ensure that all data were successfully transmitted and stored in the database. If data are missing, they are manually retrieved from the computers that control each piece of equipment or the on-site data logger for the meteorological equipment. This data is the raw data collected from the instrument computers or data logger and is considered “Level 1” data. These data are used to monitor instrument operations on a regular basis but are not used for reporting until subject to further review and validation. Level 1 (raw) data files are kept intact and unedited. These data are not subject to reduction or reformatting.

“Level 1” data are “raw” data, i.e., data obtained directly from the instrument computers or data logger that have not yet been subjected to quality assurance review. Electronic files of the raw data record are archived "as is"; no alteration is made to the raw data files. All data processing, editing and validation work is accomplished by working with copies of the raw data files produced by the data management system software upon request. Level 1 data are manually reviewed for reasonableness and completeness. Initial (daily) review of the data occurs no more than four days after sample acquisition because of weekends and holidays. Daily data review includes checking for status or event flags, reasonableness of reported averaged data values (out-of-range, inconsistent or excessive transition values) and any missing data periods. The operating status of each instrument is also reviewed (e.g., sample flow rates; other internal operating parameters). Meteorological data are reviewed for agreement with local seasonal and prevailing conditions and internal consistency. These daily reviews support “Level 2” validation of the data and provide a decision basis for investigative actions, instrument adjustment and calibration. The data analyst annotates the separate data processing file (i.e., an electronic copy of the original raw data file) and produces a summary report of any suspect data or out-of-tolerance operating conditions. Any situation requiring investigative and/or corrective action is immediately brought to the attention of the Project Manager and

Technical Lead. A “Non-Conformance/Corrective Action” (NC/CA) report documenting all pertinent information regarding suspect data, a non-conformance event or out-of-tolerance operating condition is generated and updated with further information as it becomes available until the problem is fully resolved.

All data reporting forms and activity logs completed during the previous month are stored in Onterris’s local Denver office and are reviewed against the electronic data record on a monthly basis in support of data processing and validation. Monthly review of the field monitoring documentation will include:

- All completed routine site check forms;
- Documentation of the QC tests performed on the monitors during the previous month;
- Documentation of any maintenance activities performed on the monitors during the previous month;
- Documentation of any quality assurance audits performed on the meteorological sensors during the previous month; and
- Documentation of any Non-Conformance/Corrective Action (NC/CA) events that occurred during the previous month.

During “Level 2” data validation, the data file of each monitored parameter is processed at monthly intervals to develop an initial data report to be reviewed for completeness and correctness. Any corrections or additions to the raw “Level 1” data file are annotated in the processing data file with explanatory comments. Any hours incorporating a test, calibration or other quality control check, corrective or preventive maintenance, instrument malfunction, power failures, weather event, etc. are removed from the data set and annotated with the appropriate null data code (for detail on null data codes and corresponding descriptions see Table 11 of Appendix F). Results of this review, including any data losses equal to or greater than one hourly block average, are documented and dated by the data technician in “Level 2” data files. The data technician enters and annotates any null data codes or corrections required in the “Level 2” electronic data file. When all entries or corrections are complete, the data are designated as “Level 2 - Final” data and are archived for subsequent final data validation review.

“Level 3” data validation review is performed by senior project personnel other than the data processing analyst. During the Level 3 data validation process, data losses due to activity or instrument malfunction are corroborated against documentation noted by the station field operators on completed field forms. The field form record identifying data affected by these activities and events are compared with corresponding status flags entered by the operator in the digital data record. Documented results of QA/QC checks performed on each analyzer are evaluated with respect to relevant acceptance and performance criteria outlined in the fenceline monitoring plan. Reports documenting unacceptable operating conditions or non-conformance/corrective action (NC/CA) events that may have adversely impacted data quality are also reviewed. If discrepancies or questionable data values are identified during the validation process, the entire data record is reviewed (including all annotated corrections made for Level 2 data). Any additional corrections or revisions made to the data report file during the data validation review are documented, dated and signed by the validation reviewer. The corrections are then entered into the electronic data file and re-processed. A separate file containing the corrections is checked for accuracy against the documented corrections. When all corrections are complete and checked, a final “Level 3 - Validated” data file is produced.

V. Results

A. Monthly Data Summary

Table 6: Monthly Data Summary

Month	Path	Compound	Number of Exceedances[1]	0th[2]	25th[2]	50th[2]	75th[2]	100th[2]	Avg	Pct Detect[3]	Pct Valid[4]	Median 1hr DL[5]
Jan-26	1	Benzene	0	0.19	0.34	0.51	0.88	71.84	0.92	0.00%	95.88%	0.72
Feb-26	1	Benzene	0	0.16	0.31	0.37	0.48	7.41	0.43	0.00%	99.57%	0.53
Mar-26	1	Benzene	0	0.09	0.20	0.31	0.52	2.68	0.40	0.00%	99.74%	0.44
Jan-26	1	H2S	0	0.66	4.51	8.02	13.25	59.25	10.31	0.06%	90.46%	11.42
Feb-26	1	H2S	0	0.54	3.46	6.59	11.39	47.33	8.55	0.00%	99.26%	9.39
Mar-26	1	H2S	0	0.40	3.50	6.38	10.90	55.47	8.48	0.00%	93.03%	9.09
Jan-26	1	HCN	0	0.01	0.48	1.13	2.12	12.74	1.56	0.20%	87.85%	1.61
Feb-26	1	HCN	0	0.02	0.24	1.03	1.86	10.25	1.30	0.06%	100.00%	1.47
Mar-26	1	HCN	0	0.00	0.10	0.25	1.05	12.93	0.73	0.00%	95.70%	0.36
Jan-26	2	Benzene	0	0.05	0.09	0.10	0.13	0.36	0.11	0.00%	99.28%	0.15
Feb-26	2	Benzene	0	0.06	0.11	0.13	0.14	0.27	0.13	0.00%	99.40%	0.18
Mar-26	2	Benzene	0	0.07	0.11	0.14	0.16	0.43	0.14	0.00%	98.89%	0.19
Jan-26	2	H2S	0	1.49	9.37	13.62	20.32	58.52	15.98	1.02%	84.50%	19.11
Feb-26	2	H2S	0	1.68	9.67	14.70	23.08	67.94	17.55	1.96%	91.20%	20.72
Mar-26	2	H2S	0	0.29	9.65	16.11	24.81	67.12	18.28	1.04%	84.79%	23.16
Jan-26	2	HCN	0	0.01	0.25	0.77	1.33	9.13	0.96	6.97%	91.62%	1.05
Feb-26	2	HCN	0	0.01	0.12	0.52	1.06	4.48	0.69	2.24%	93.04%	0.71
Mar-26	2	HCN	0	0.01	0.04	0.11	0.42	3.87	0.33	0.31%	92.94%	0.16
Jan-26	3	Benzene	0	0.27	0.61	0.86	1.35	55.89	1.43	3.71%	99.41%	1.14
Feb-26	3	Benzene	0	0.26	0.50	0.65	0.96	246.92	1.36	8.03%	95.62%	0.86
Mar-26	3	Benzene	0	0.37	0.68	0.93	1.43	67.83	1.73	5.10%	98.84%	1.25
Jan-26	3	H2S	0	1.20	9.84	16.21	26.69	100.15	20.68	0.00%	94.87%	23.24
Feb-26	3	H2S	0	1.92	11.10	17.85	29.47	111.97	22.72	0.47%	95.78%	25.62
Mar-26	3	H2S	0	1.30	7.36	11.89	19.01	105.33	15.40	0.10%	96.06%	16.95
Jan-26	3	HCN	0	0.42	2.30	3.39	4.83	15.16	3.74	7.96%	97.12%	4.41
Feb-26	3	HCN	0	0.34	2.35	3.37	4.68	17.38	3.68	16.09%	98.15%	4.45
Mar-26	3	HCN	0	0.01	2.32	3.54	5.14	15.62	3.89	4.62%	98.85%	4.69
Jan-26	4	Benzene	0	0.06	0.15	0.21	0.33	16.21	0.42	16.69%	99.27%	0.26
Feb-26	4	Benzene	0	0.09	0.18	0.23	0.36	7.01	0.36	15.68%	99.47%	0.30
Mar-26	4	Benzene	0	0.07	0.16	0.22	0.36	12.02	0.41	20.35%	99.32%	0.27
Jan-26	4	H2S	0	7.54	34.04	45.81	61.47	123.89	48.85	0.30%	88.78%	65.33
Feb-26	4	H2S	0	10.27	32.45	44.03	59.79	141.02	49.53	0.50%	89.72%	62.72

Mar-26	4	H2S	0	7.12	32.60	46.93	64.97	129.38	49.53	0.52%	78.16%	67.52
Jan-26	4	HCN	0	0.05	0.84	2.07	3.89	17.33	2.71	0.19%	93.97%	2.94
Feb-26	4	HCN	0	0.05	1.00	2.21	4.37	18.91	3.01	0.08%	98.74%	3.15
Mar-26	4	HCN	0	0.03	0.54	1.32	2.62	14.00	1.95	0.00%	94.41%	1.88
Jan-26	5	Benzene	0	0.09	0.22	0.34	0.53	7.04	0.46	23.01%	44.63%	0.39
Feb-26	5	Benzene	0	0.09	0.20	0.28	0.41	5.15	0.38	25.42%	99.54%	0.33
Mar-26	5	Benzene	0	0.10	0.28	0.39	0.57	9.13	0.51	23.48%	99.34%	0.44
Jan-26	5	H2S	0	1.29	13.14	20.11	28.26	56.92	21.34	0.08%	69.69%	29.12
Feb-26	5	H2S	0	1.01	10.16	17.23	26.71	59.47	19.39	0.00%	78.00%	25.00
Mar-26	5	H2S	0	1.09	10.92	19.10	28.65	57.53	20.53	0.00%	78.86%	27.87
Jan-26	5	HCN	0	0.03	2.09	4.22	6.70	22.88	4.81	6.57%	90.41%	5.47
Feb-26	5	HCN	0	0.08	1.31	3.79	6.84	28.12	4.66	6.66%	98.55%	4.84
Mar-26	5	HCN	0	0.09	0.71	1.74	3.70	14.96	2.65	0.90%	94.84%	2.42
Jan-26	6	Benzene	0	0.22	0.41	0.52	0.69	8.56	0.63	2.89%	98.82%	0.71
Feb-26	6	Benzene	0	0.22	0.47	0.56	0.77	7.67	0.78	14.95%	99.11%	0.75
Mar-26	6	Benzene	0	0.16	0.37	0.81	2.20	28.13	1.81	55.56%	98.81%	0.64
Jan-26	6	H2S	0	0.00	0.05	20.02	39.25	103.24	24.36	0.08%	84.24%	29.09
Feb-26	6	H2S	0	0.00	0.02	0.02	0.04	61.39	0.22	0.69%	84.18%	0.03
Mar-26	6	H2S	0	0.00	0.02	0.02	0.03	49.81	0.19	0.50%	76.46%	0.03
Jan-26	6	HCN	0	0.04	0.80	1.36	2.24	10.81	1.74	0.28%	91.55%	1.94
Feb-26	6	HCN	0	0.03	0.54	1.13	2.06	9.72	1.53	0.58%	100.00%	1.62
Mar-26	6	HCN	0	0.01	0.27	0.69	1.71	17.14	1.38	0.26%	98.84%	0.97

[1] number of 1-hour measurements above the notification threshold value
[2] data quartiles = the value at which a defined percentage of data existing below this value (valid data only)
[3] the percentage of hourly averages above the detection limit (DL) as compared to the total possible hourly averages (excluding data collected during QA/QC activities, calibration, or maintenance).
[4] the proportion of the 1h measurements that pass all data verification measures compared to the possible hourly averages.
[5] the median 1-hr detection limit observed across validated measurements per compound for the month specified.

B. Summary of Invalidated Data

The invalidated data can be found in file “P66 FLMP Data Packet_Q1 2026”. All 5min data have been validated based on the procedures described in the P66 fenceline monitoring plan.

C. Discussion of Invalidated Data

The data was validated based on the procedures mentioned in the fenceline monitoring plan. There was a high data invalidation rate for benzene Path 5 for the month of January of 2026. All instrument parameters were normal (integration time, peak match percentage, system temperature and pressure) but the minimum detection limit was zero which caused the data to be invalid. Onterris is investigating the reason for this issue. A Onterris scientist troubleshooted the instrument by adjusting the internal lenses and replacing the internal fan. Based on the findings, the internal fan malfunction was causing ozone buildup inside the UVDOAS head which caused issues to the MDL. The Onterris scientist managed to resolve the issue. A non-conformance report has been created regarding this issue. Additionally, a new QA/QC check has been applied to all UVDOAS instruments through Onterris’s online platform which will send alerts to the Onterris team in case an instrument MDL appears to be zero.

D. Discussion of Results

As shown in the summary plots, the concentrations of the three compounds of interest were below detection limit in most cases. There were no threshold exceedances during this period of the fenceline monitoring for any of the compounds. For benzene, the average median MDL value was 0.5 ppb, for H2S the average median MDL value was approximately 25.9 ppb, and for HCN the corresponding average median MDL was around 2.5 ppb. As discussed in Section C, the higher H2S MDL values are related to the path lengths being shorter than 500 meters. Phillips 66 does not store nor emit H2S and HCN.

E. Summary Plots

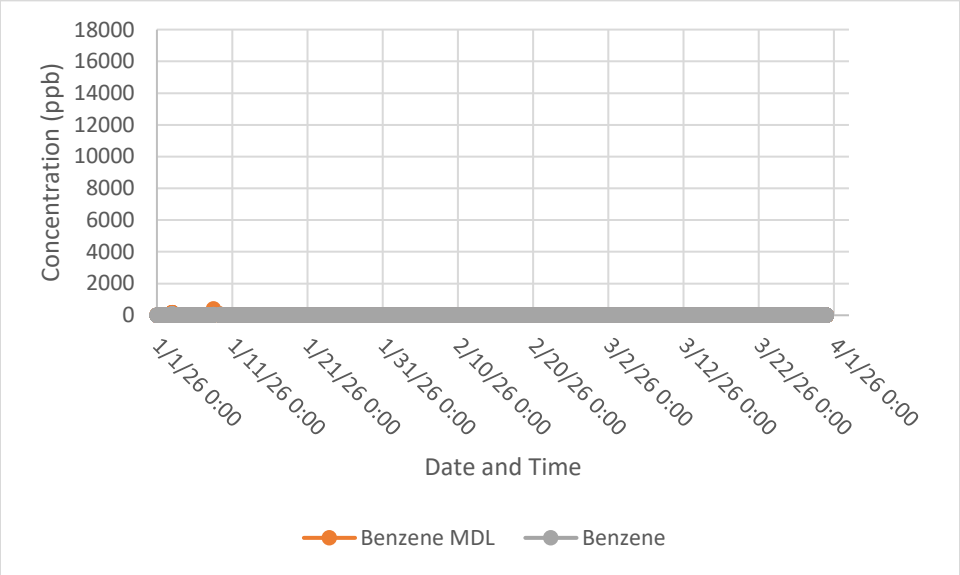

Figure 2. Timeseries of Benzene Path 1

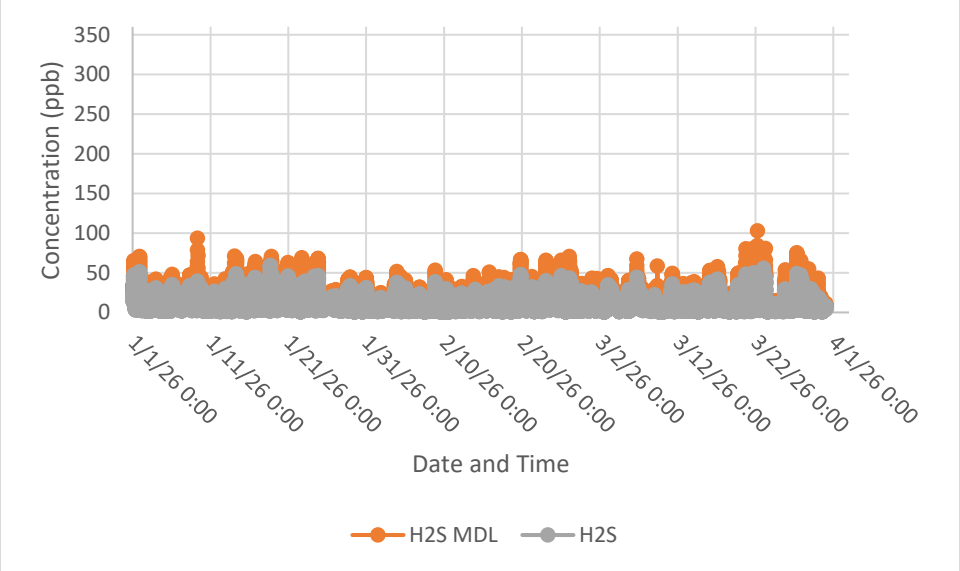

Figure 3. Timeseries of H_2S Path 1

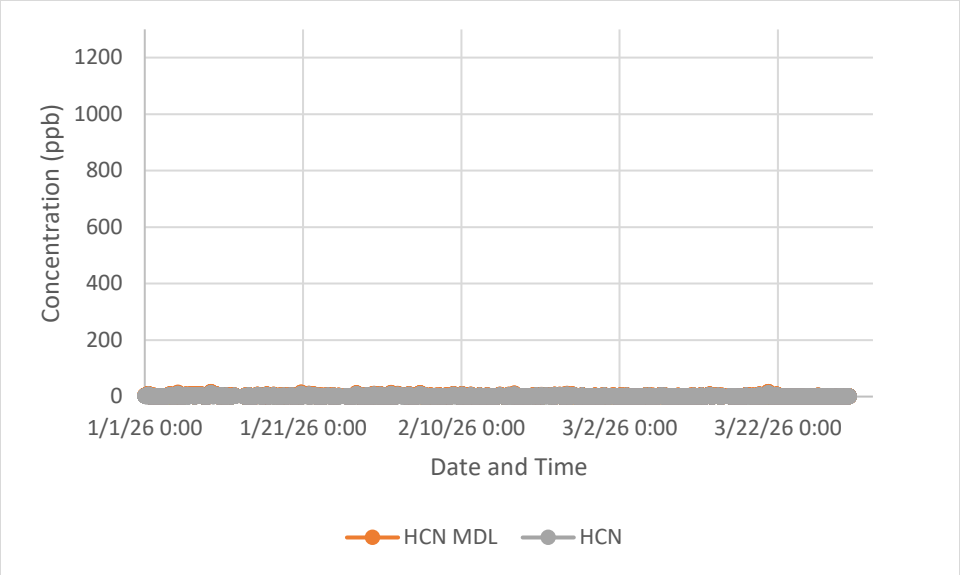

Figure 4. Timeseries of HCN Path 1

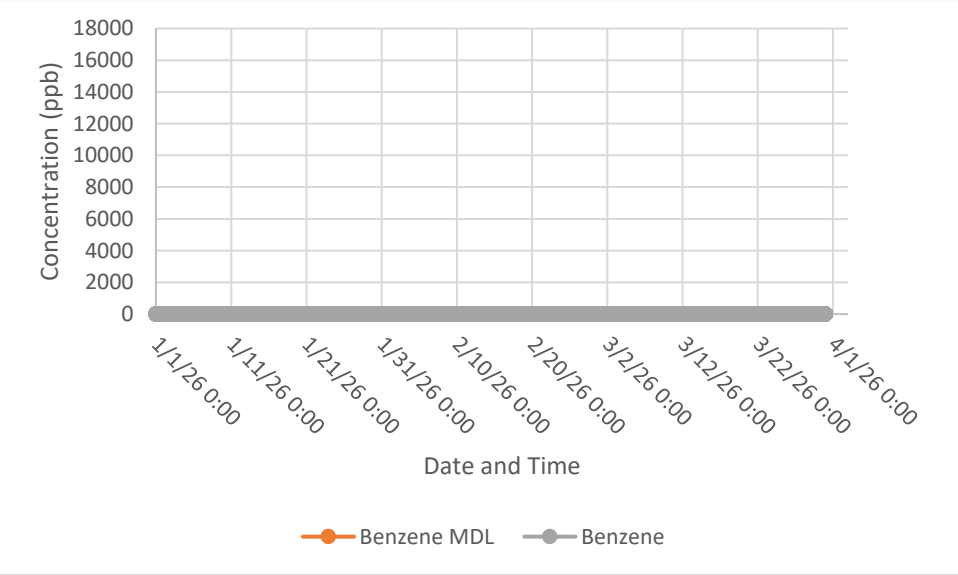

Figure 5. Timeseries of Benzene Path 2

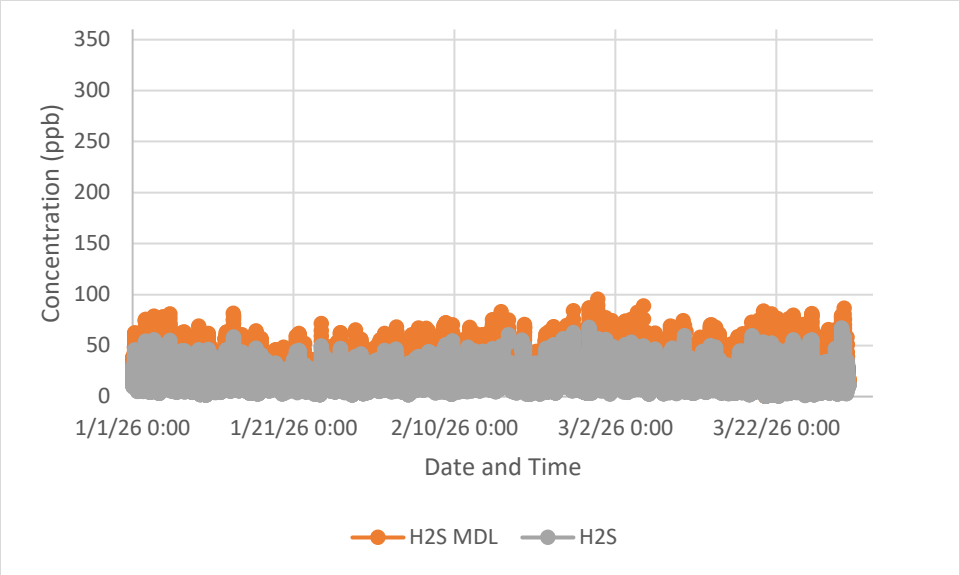

Figure 6. Timeseries of H_2S Path 2

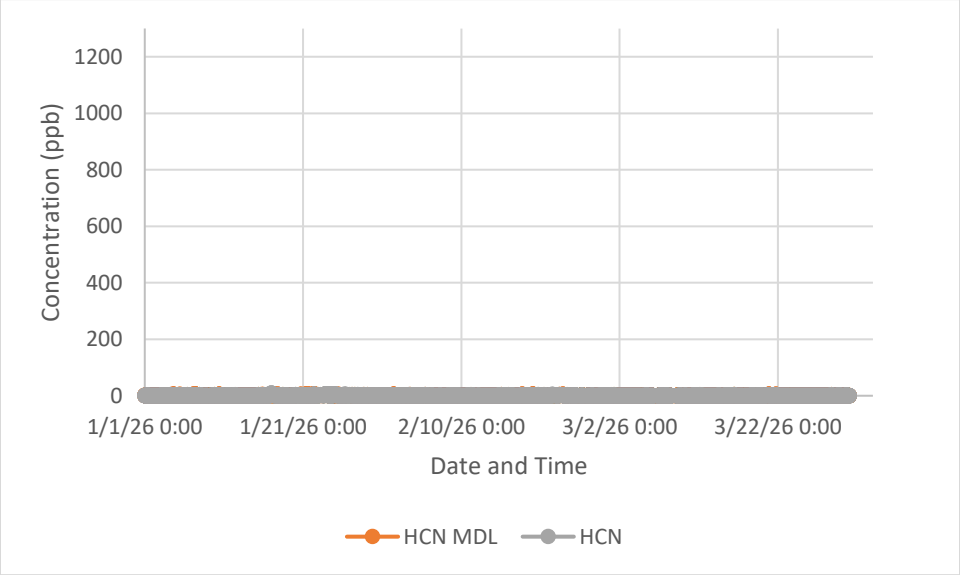

Figure 7. Timeseries of HCN Path 2

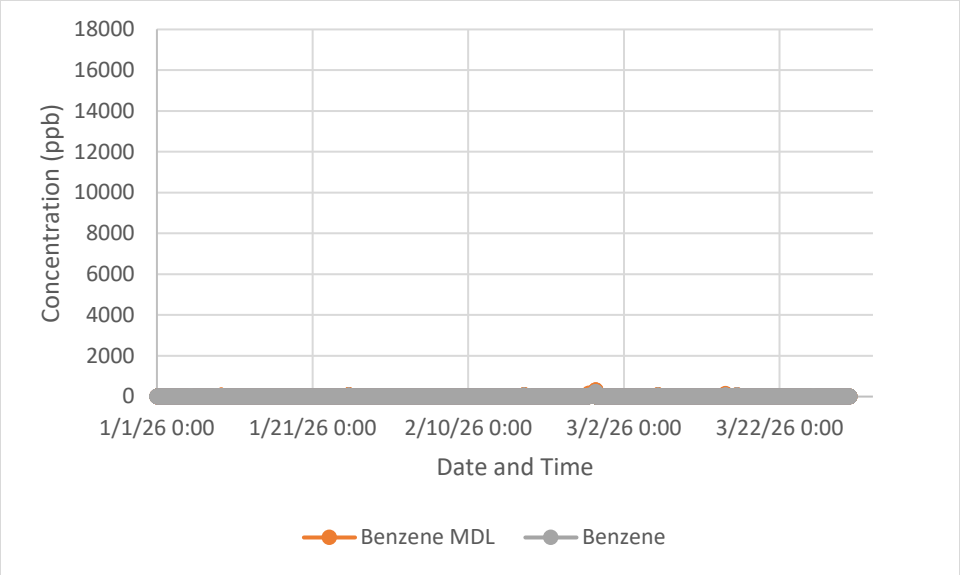

Figure 8. Timeseries of Benzene Path 3

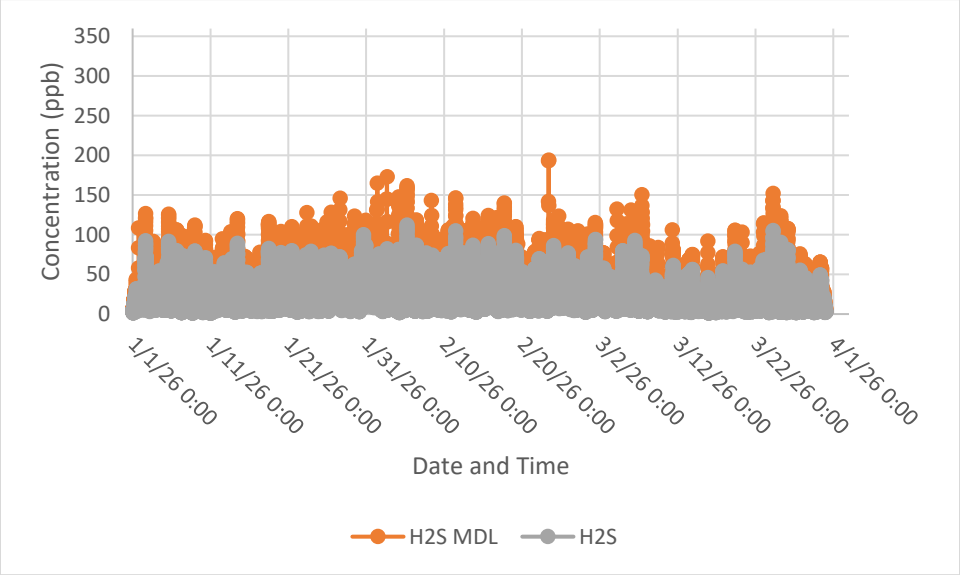

Figure 9. Timeseries of H_2S Path 3

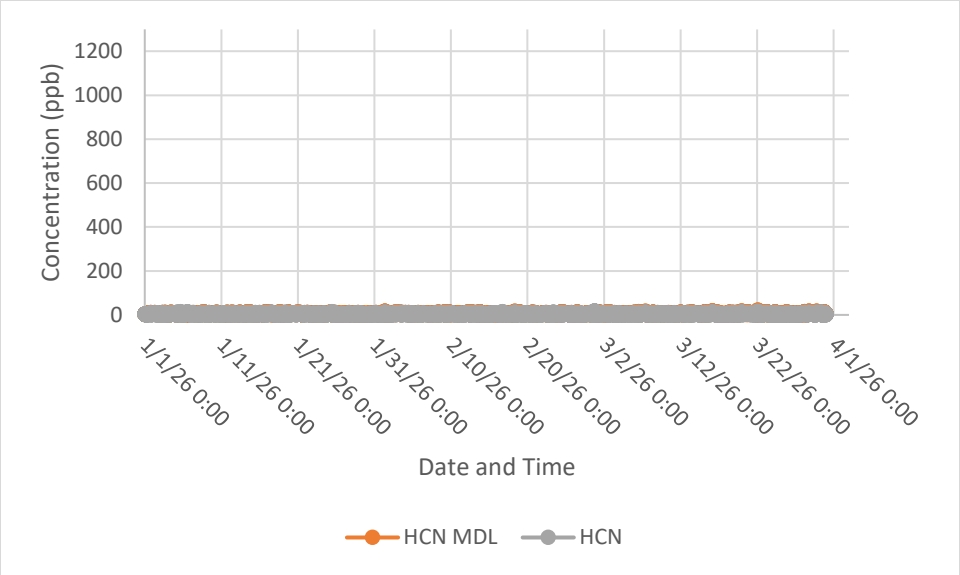

Figure 10. Timeseries of HCN Path 3

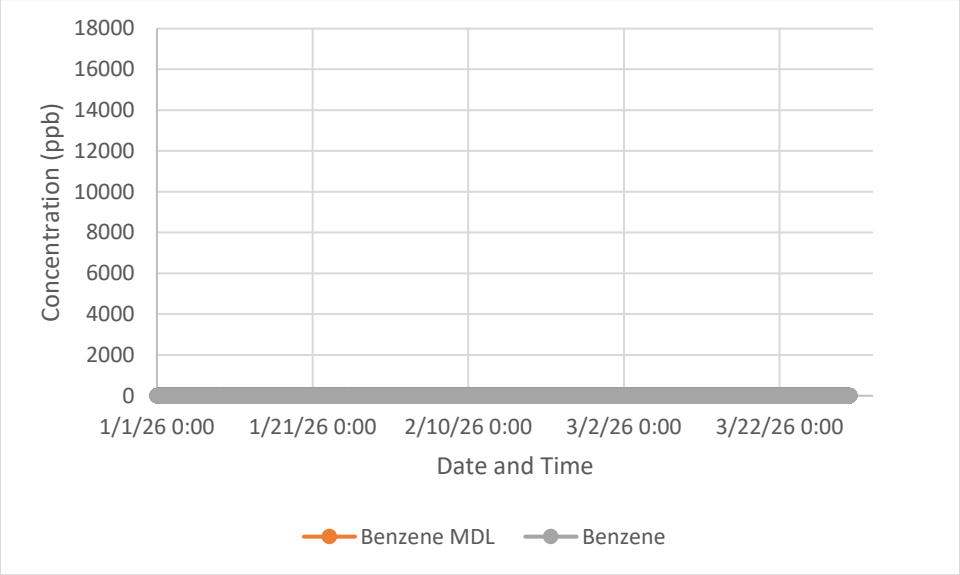

Figure 11. Timeseries of Benzene Path 4

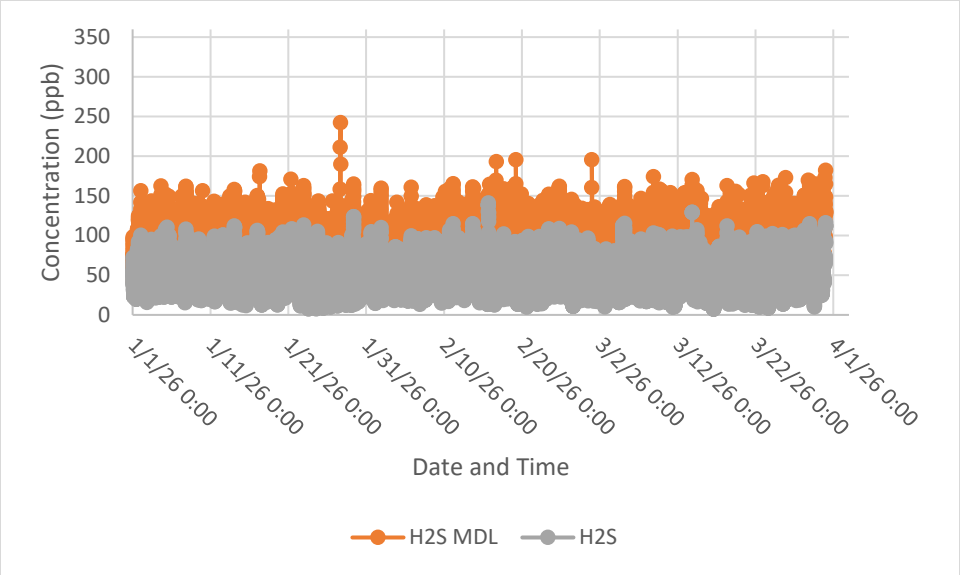

Figure 12. Timeseries of H_2S Path 4

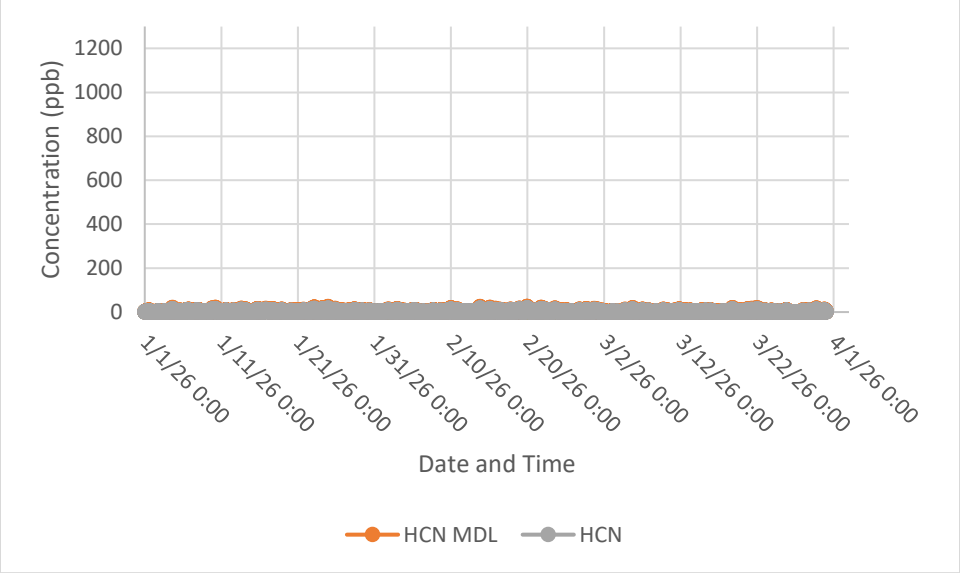

Figure 13. Timeseries of HCN Path 4

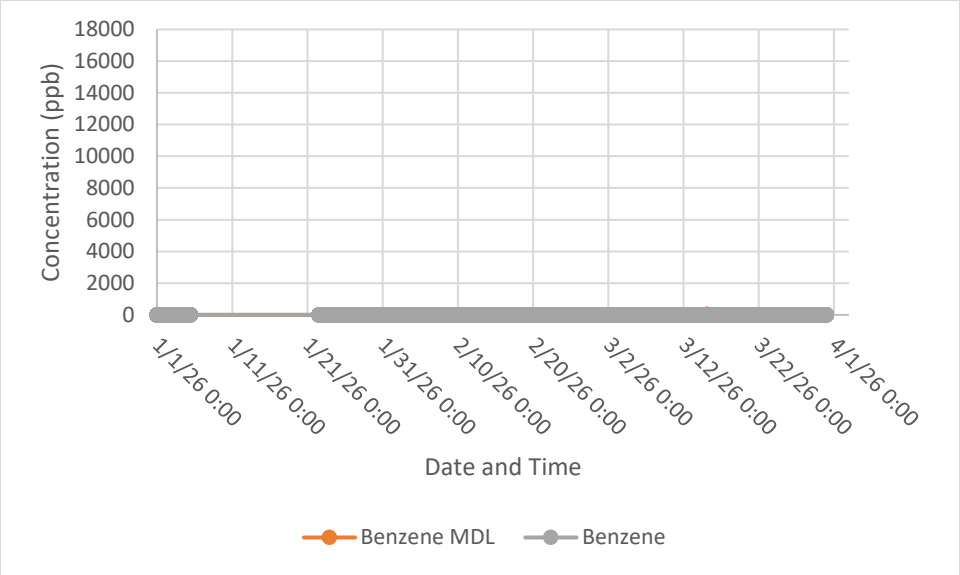

Figure 14. Timeseries of Benzene Path 5

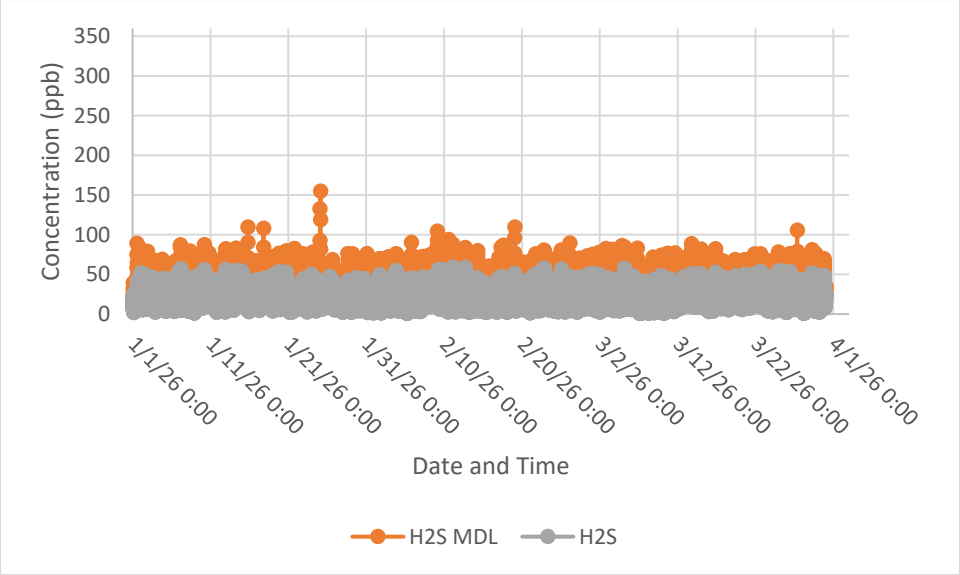

Figure 15. Timeseries of H_2S Path 5

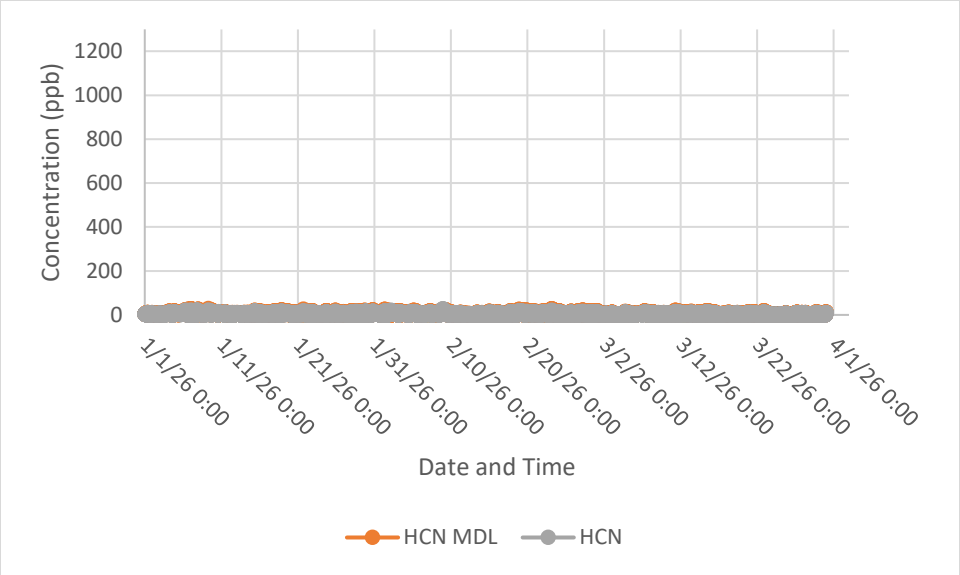

Figure 16. Timeseries of HCN Path 5

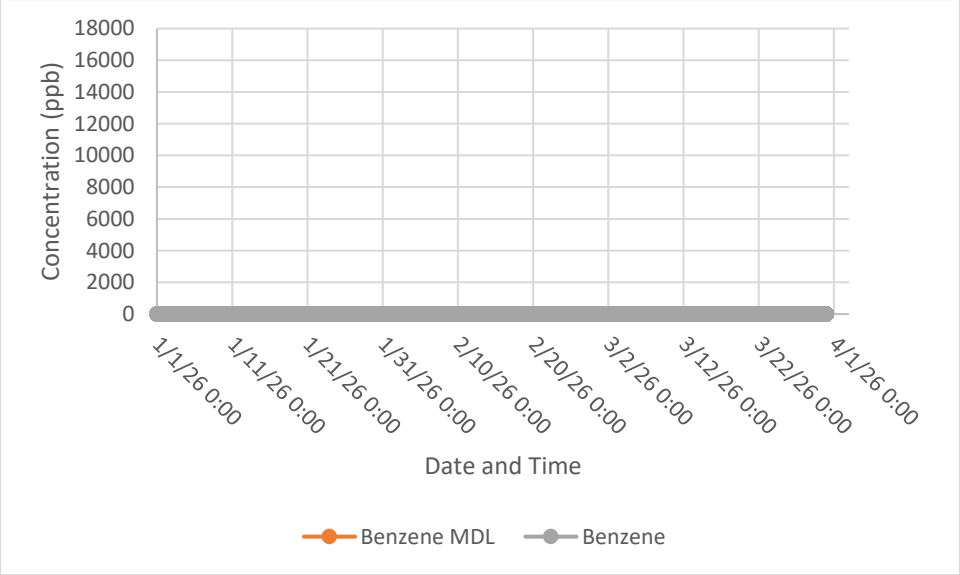

Figure 17. Timeseries of Benzene Path 6

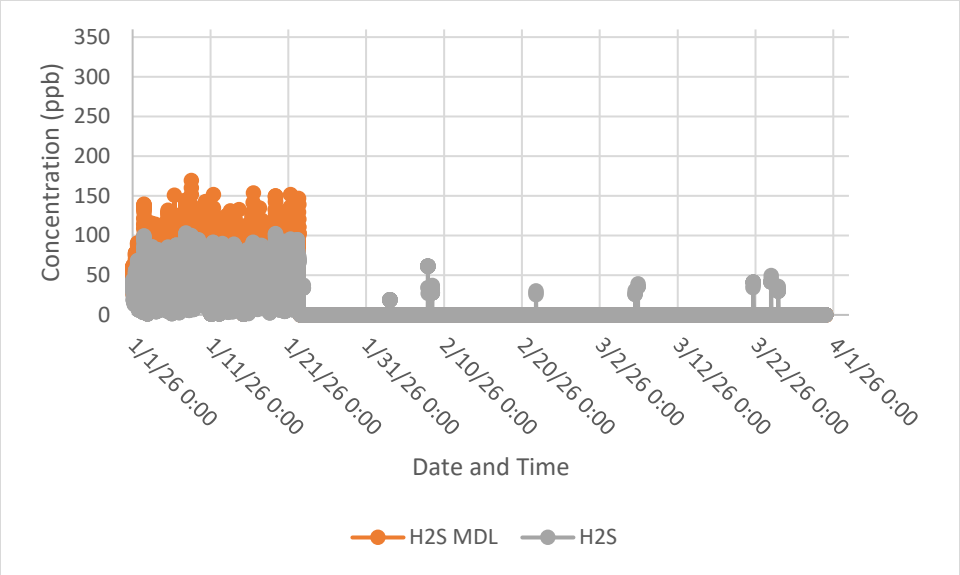

Figure 18. Timeseries of H_2S Path 6

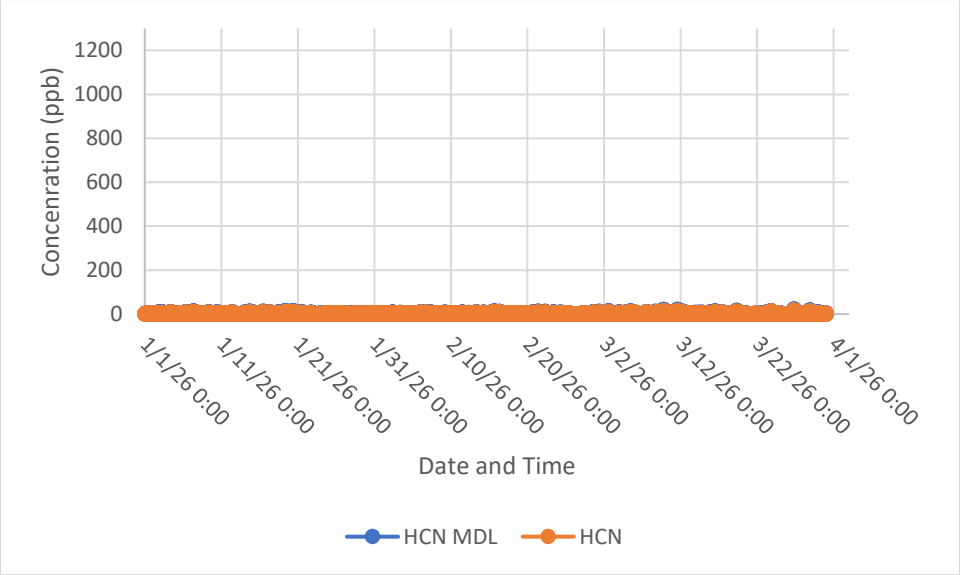

Figure 19. Timeseries of HCN Path 6

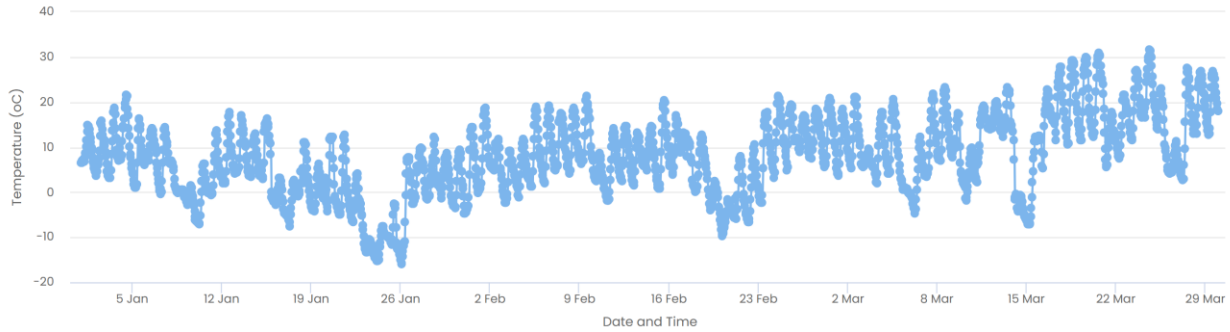

Figure 20. Temperature Timeseries (2026)

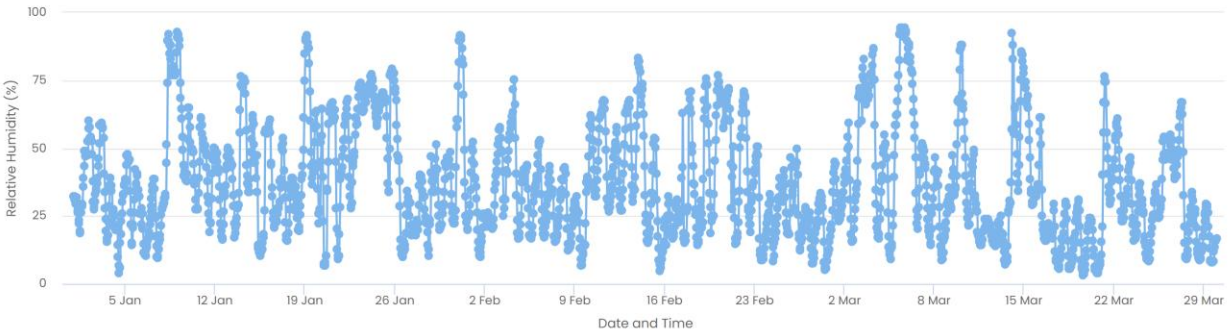

Figure 21. Relative Humidity Timeseries (2026)

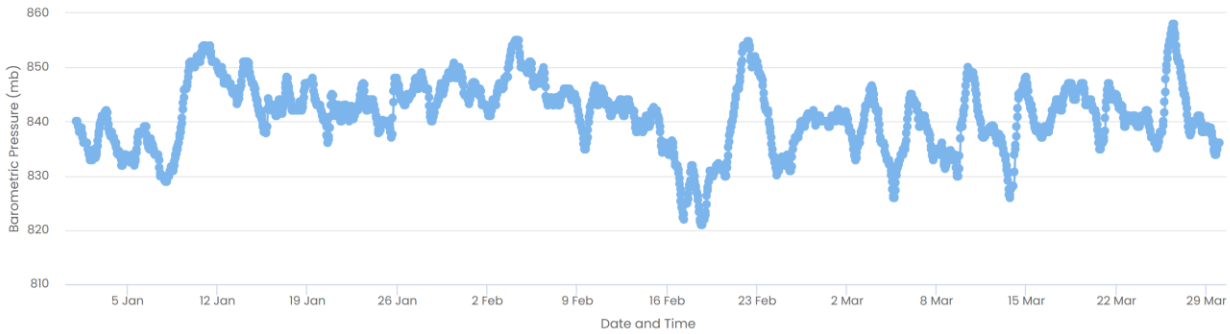

Figure 22. Barometric Pressure Timeseries (2026)

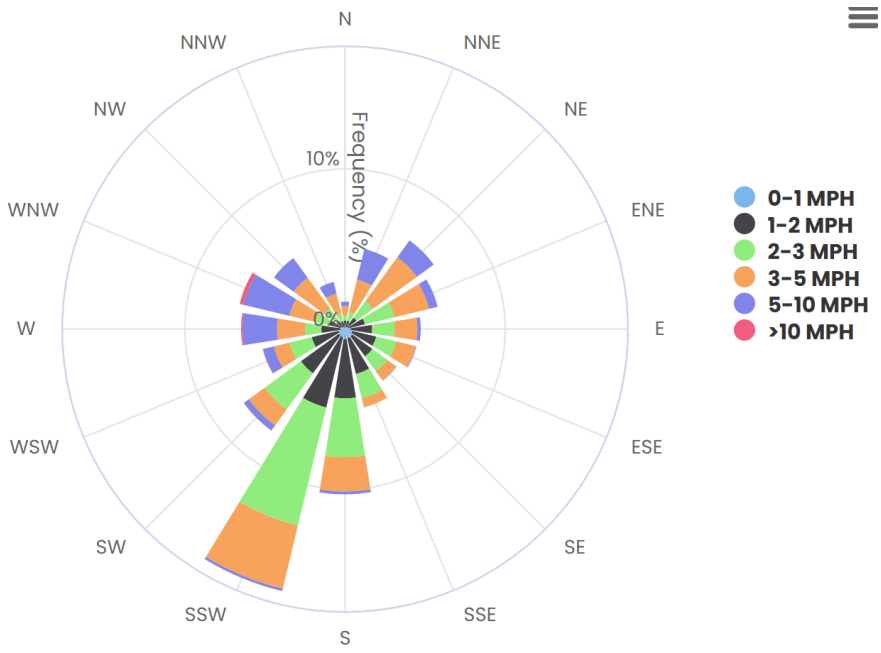

Figure 23. Wind Rose Plot

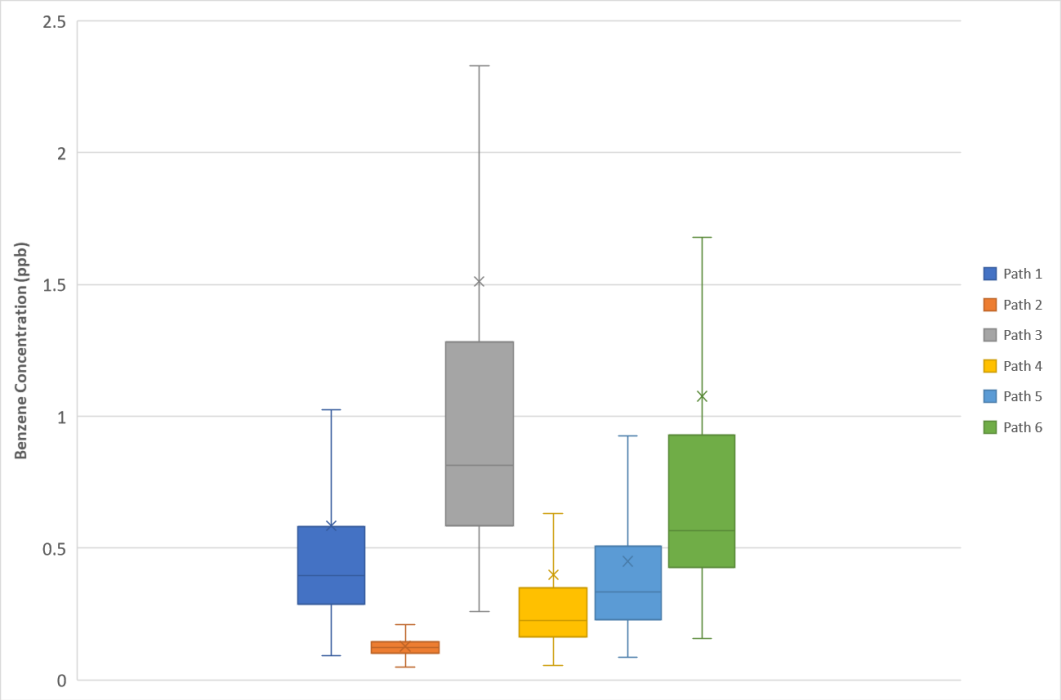

Figure 24. Benzene Box Plots for Paths 1 to 6

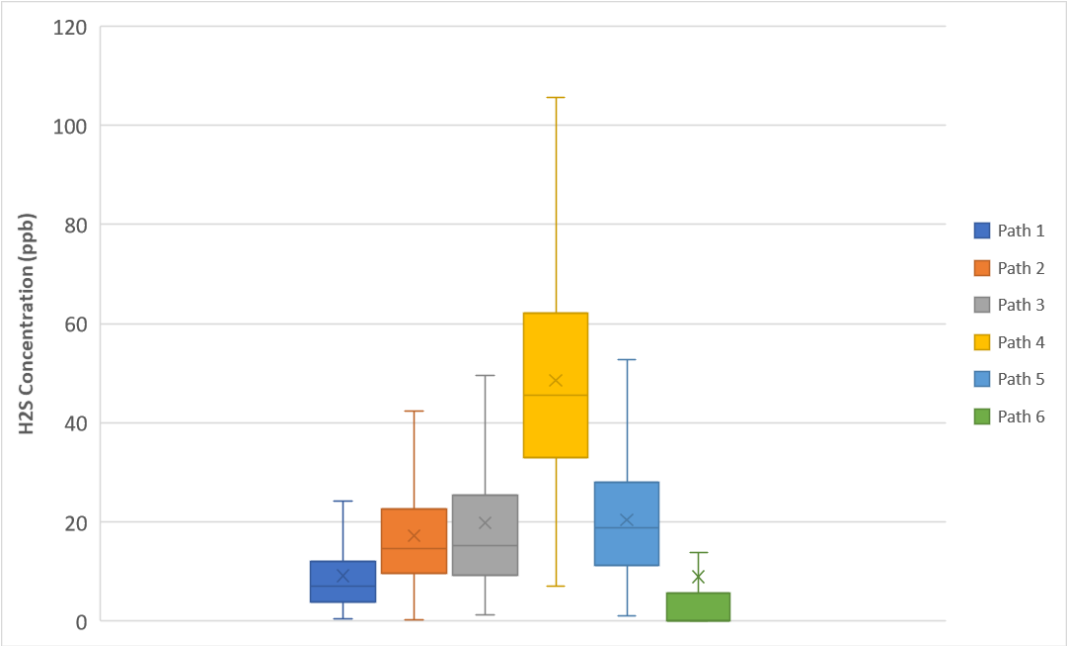

Figure 25. H_2S Box Plots for Paths 1 to 6.

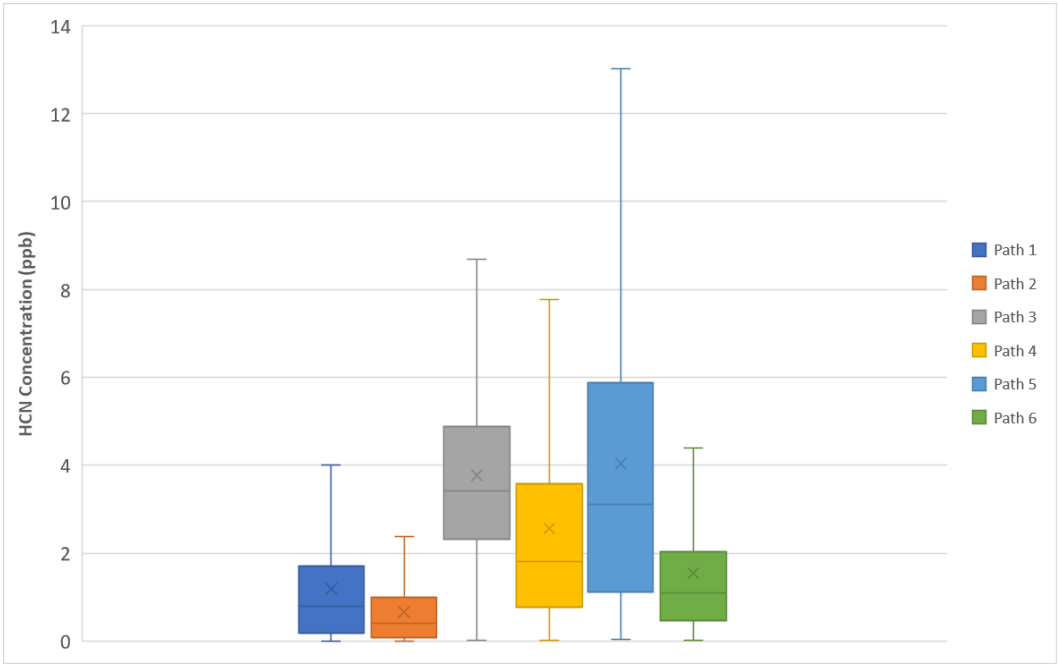

Figure 26. HCN Box Plots for Paths 1 to 6.

F. Discussion of Changes to Monitoring System, Operations and/or Procedures

Three main changes were performed to the fenceline monitoring plan procedures which are related with the automated QA/QC checks:

1. UV spectrometer temperature: the UV spectrometers were calibrated by the manufacturer at 35^{o}C instead of the 39^{o}C that the older models were calibrated at. Thus, for the automated QA/QC checks, we changed the acceptance criteria to accommodate the updated spectrometer calibration conditions.
2. TDL signal intensity: the manufacturer recommended to monitor the absolute detector power instead of the signal intensity. The reason was related to the fact that the laser signal intensity is affected by multiple instrument parameters (I/O Gain, Signal Gain, signal collimation etc.). Due to these interferences, the signal intensity values that are reported by the analyzer could potentially not be representative of the actual signal power that is measured by the detector. To avoid these issues, we replaced the “signal intensity” parameter on the automated QA/QC checks with the parameter “absolute detector power”. For the data to be considered valid, the absolute detector value must be >0.1mA.
3. MDL for H2S Paths 3,5 and 6: The minimum detection limit was set to 50% of the threshold for H2S for these three paths due to these paths being shorter than the rest.

VI. Appendices

A. Appendix A: Calibration and QA/QC Data

Table 7: Verification Activities

Date	Type of Verification	Path	Path Length[1]	Analyzer	Compound	Expected Concentration	Measured Concentration	Accuracy (%)	Precision (%)
3/9/2026	Bump test	1	452	UVDOAS	Benzene	100 ppm	113	12.6	5.5
3/9/2026	Bump test	1	452	UVDOAS	Benzene	200 ppm	204	5.4	7.5
3/9/2026	Bump test	2	1100	UVDOAS	Benzene	100 ppm	95	5.4	4.2
3/9/2026	Bump test	2	1100	UVDOAS	Benzene	200 ppm	183	8.1	1.3
3/9/2026	Bump test	3	330	UVDOAS	Benzene	100 ppm	111	12.6	12.3
3/9/2026	Bump test	3	330	UVDOAS	Benzene	200 ppm	208	5.4	5.8
3/9/2026	Bump test	4	630	UVDOAS	Benzene	100 ppm	91	8.8	4
3/9/2026	Bump test	4	630	UVDOAS	Benzene	200 ppm	180	10	4.3
3/9/2026	Bump test	5	444	UVDOAS	Benzene	100 ppm	99	3	3.9
3/9/2026	Bump test	5	444	UVDOAS	Benzene	200 ppm	180	9.8	1.9
3/9/2026	Bump test	6	276	UVDOAS	Benzene	100 ppm	103.6	3.6	1.8
3/9/2026	Bump test	6	276	UVDOAS	Benzene	200 ppm	215	7.7	5
3/9/2026	Audit Module	1	452	TDL	H2S	500 ppmm	368	26.3	2.1
3/9/2026	Audit Module	1	452	TDL	H2S	625 ppmm	543	13.1	2.8
3/9/2026	Audit Module	2	1100	TDL	H2S	500 ppmm	357	28.6	1.8
3/9/2026	Audit Module	2	1100	TDL	H2S	625 ppmm	515	17.6	1.8
3/9/2026	Audit Module	3	330	TDL	H2S	500 ppmm	487	6.2	6.9
3/9/2026	Audit Module	3	330	TDL	H2S	625 ppmm	472	24.5	7.3
3/9/2026	Audit Module	4	630	TDL	H2S	500 ppmm	511	4.6	5.7
3/9/2026	Audit Module	4	630	TDL	H2S	625 ppmm	458	26.7	6.2
3/9/2026	Audit Module	5	444	TDL	H2S	500 ppmm	379	24.2	3.6
3/9/2026	Audit Module	5	444	TDL	H2S	625 ppmm	483	22.8	3.3
3/9/2026	Audit Module	6	276	TDL	H2S	500 ppmm	366	26.9	2
3/9/2026	Audit Module	6	276	TDL	H2S	625 ppmm	452	27.6	1
3/9/2026	Audit Module	1	452	TDL	HCN	1010 ppmm	1003	0.7	0.1
3/9/2026	Audit Module	1	452	TDL	HCN	445ppmm	453	1.8	0.3
3/9/2026	Audit Module	2	1100	TDL	HCN	1010 ppmm	996	1.4	0.6
3/9/2026	Audit Module	2	1100	TDL	HCN	445ppmm	457	2.7	0.3
3/9/2026	Audit Module	3	330	TDL	HCN	1010 ppmm	996	13.9	99.9
3/9/2026	Audit Module	3	330	TDL	HCN	445ppmm	456	2.5	0.5
3/9/2026	Audit Module	4	630	TDL	HCN	1010 ppmm	980	3	0.3
3/9/2026	Audit Module	4	630	TDL	HCN	445ppmm	457	2.7	1.1
3/9/2026	Audit Module	5	444	TDL	HCN	1010 ppmm	1018	0.8	0
3/9/2026	Audit Module	5	444	TDL	HCN	445ppmm	452	1.7	0.2

3/9/2026	Audit Module	6	276	TDL	HCN	1010 ppmm	1021	1.1	0.1
3/9/2026	Audit Module	6	276	TDL	HCN	445ppmm	462	3.7	0.2

[1]path length in meters

Table 8: Percent Recovery for Meteorological Parameters

Parameter	Percent Data Recovery
Wind Speed	100%
Wind Direction	100%
Temperature	100%
Humidity	100%
Pressure	100%

B. Appendix B: Qualifier Codes

Table 9: List of Data Invalidation Codes

Qualifier Code	AQS Definition *(additional information added in parentheses)*	Type or Related Action
AB	Technician Unavailable. *(use if this affects scheduled QA/QC or necessary maintenance)	Null Data Qualifier
AD	Shelter Storm Damage.	Null Data Qualifier
AG	Sample Time out of Limits. *(e.g., use if integration time is out of manufacturer recommended range and signal intensity and MDL cannot meet the critical criteria mentioned in the FLMP)	Null Data Qualifier
AI	Insufficient Data. (cannot calculate)	Null Data Qualifier
AL	Voided by Operator. *(e.g., Datum rejected by data validators)	Null Data Qualifier
AM	Miscellaneous Void.	Null Data Qualifier
AN	Machine Malfunction *(can be used for issues such as an instrument being out of alignment, or an analyzer being offline due to connection problems or instrument failure)	Null Data Qualifier
AO	Bad Weather. *(Use if weather impacts open-path instrument operation/function)	Null Data Qualifier
AP	Vandalism. *(Use if vandalism impacts open-path instrument operation/function)	Null Data Qualifier
AQ	Collection Error. *(use specifically for low analyzer signal events, or when a low analyzer signal prevents the reported data from meeting the critical criteria, while the calculated MDL is lower than 25% of notification threshold)	Null Data Qualifier
AT	Calibration.	Null Data Qualifier
AU	Monitoring Waived.	Null Data Qualifier
AV	Power Failure.	Null Data Qualifier

AW	Wildlife Damage. *(Use if damage impacts open-path instrument operation/function)*	Null Data Qualifier
AX	Precision Check.	Null Data Qualifier
AY	QC Control Points (zero/span).	Null Data Qualifier
AZ	QC Audit.	Null Data Qualifier
BA	Maintenance/Routine Repairs.	Null Data Qualifier
BH	Interference/co-elution/misidentification.	Null Data Qualifier
BJ	Operator Error.	Null Data Qualifier
BK	Site computer/data logger down.	Null Data Qualifier
BL	QA Audit.	Null Data Qualifier
BM	Accuracy check.	Null Data Qualifier
DA	Aberrant Data (Corrupt Files, Spikes, Shifts).	Null Data Qualifier
DL	Detection Limit Analyses.	Null Data Qualifier
EC	Exceeds Critical Criteria. *(use when data exceeds critical criteria, such as for MDL)*	Null Data Qualifier
IA	African Dust. *(use for any dust event)*	Informational
IT	Wildfire-U.S. *(use for any wildfire event)*	Informational
J	Construction/Repairs in Area.	Informational
LJ	Identification of Analyte Is Acceptable; Reported Value Is An Estimate.	Quality Assurance Qualifier
MD	Value less than MDL.	Quality Assurance Qualifier
NS	Influenced by nearby sources. *(e.g., in the event of emissions influenced by nearby sources)*	Quality Assurance Qualifier
QP	Pressure Sensor Questionable. *(e.g., use if cell pressure is out of range, indicating malfunction)*	Quality Assurance Qualifier
QT	Temperature Sensor Questionable. *(e.g., use if cell temperature is out of range, indicating malfunction)*	Quality Assurance Qualifier
QV	Quality Control Multi-Point Verification.	Null Data Qualifier
QX	Does not meet QC criteria. *(e.g., data exceeds automatic criteria for rejection)*	Quality Assurance Qualifier
SC	Sampler Contamination.	Null Data Qualifier
ST	Calibration Verification Standard.	Null Data Qualifier
TC	Component Check & Retention Time Standard. *(use this code for additional instrument checks, e.g., a robustness tests)*	Null Data Qualifier

C. Appendix C: Field Data Sheets

1:30 PM 1/5/2026 Montrose Onsite ML

Aligned UV path 1

Aligned UV path 5

10:58 AM 1/9/2026 Montrose Onsite ML

Aligned UV path 1

12:33 PM 1/12/2026 Montrose Onsite ML

Data back up UV path 1 & UV path 6

Cleaned shelter 1

1:49 PM 1/13/2025 Montrose Onsite ML

Aligned UV path 6

Aligned H2S & HCN TDL path 1

Aligned HCN path 6

Data Backup UV path 5

12:40 PM 1/22/2026 Montrose Onsite ML MF

Swapped filters on reflector and UV head for Path 1 & 6

Aligned UV path 1 & 6

Swapped filter in UV head for path 5

Aligned TDL Path 6 H2S

1:48 PM 1/22/2026 Montrose Onsite ML MF

Aligned H2S & HCN path 5 TDL

3:45 PM 1/22/2026 Montrose Onsite ML

Replaced fan in UV path 5 head

Aligned UV path 5

11:02 AM 1/26/26 MONTROSE ONSITE CF

ALIGNED, CLEANED RETRO PATH 5 TDLS

11:14 AM 2/9/26 MONTROSE ONSITE CF, EO

ALIGNED, CLEANED RETRO PATH 5 TDLS

12:30 PM 2/11/26 MONTROSE ONSITE EO

ALIGNED BOTH TDLS FOR PATH 5

12:20 PM 2/17/2026 Montrose Onsite ML

Aligned UV path 6

1:30 PM 2/23/26 MONTROSE ONSITE CF

REPLACED BULBS FOR PATHS 1,5,6 UVS, ALIGNED

CLEANDED RETRO PATH 5 TDLS

ALIGNED PATH 5 TDLS

1:52 PM 3/2/2026 Montrose Onsite ML

Aligned UV path 6

1:57 PM 3/2/2026 Montrose Oniste ML

Alinged TDL H2S & HCN path 5

12:45 PM 3/9/26 MONTROSE ONSITE CF,ML

QUARTERLY CAL FOR UVS & TDLS PATHS 1,5,6

ALIGHT PATH 5 UV

1:46 PM Montrose onsite ML

Aligned TDL H2S and HCN path 1

2:30 PM 3/17/26 MONTROSE ONSITE CF

ALIGNED PATH 1 & 6 TDLS

12:15 PM 3/23/26 MONTROSE ONSITE CF

CLEAN RETRO & ALIGNED PATH 5 TDLS

1:32 PM 1/5/2026 Montrose Onsite ML

Fixed NA data on Sensor tab UV path 2 (Switched Port)

1:04 PM 01/22/26 Montrose Onsite ML MF

Swapped reflector filters for UV Path 2, 3, & 4

Swapped UV head filter UV Path 2, 3, 4

Aligned UV Path 2 & 3

Aligned TDL Path 3 H2S

11:20am 01/22/26 Montrose Onsite KL

TROUBLESHOOTED UV P5

1:35 PM 1/22/2026 Montrose Onsite ML

Aligned UV path 4

Swapped filter in UV path 4

Aligned TDL path 4 HCN & H2S

1:15 PM 2/2/2026 Montrose Onsite

data backup UV path 3

Switched arduino ports Uv path 2

2:58 PM 2/3/2026 Montrose Onsite

UV path 2 Data Backup

11:15 AM 2/9/26 MONTROSE ONSITE CF,EO

BACKUP UV 4

ALIGNED PATH 2 HCN

12:22 PM 2/17/26 Montrose Onsite ML

Aligned H2S & HCN TDL path 2

Aligned H2S & HCN TDL path 4

Aligned UV path 3

Data Backup TDL shelter 3

3:34 pm 2/19/2026 Montrose onsite MF

aligned UV P3

aligned H2S P2

1:30 PM 2/23/26 MONTROSE ONSITE CF

REPLACED BULBS FOR PATHS 2,3,4 UVS, ALIGNED

2:09 PM 3/2/2026 Montrose Onsite ML

Aligned TDL H2S and HCN path 4

2:14 PM 3/2/2026 Montrose Onsite ML

Aligned H2S path 2 TDL

12:45 PM 3/9/26 MONTROSE ONSITE CF,ML

QUARTERLY CAL ON UVS & TDLS PATHS 2,3,4

ALIGHED PATH 2 TDLS, CLEANED RETRO

ALIGHED PATH 3 H2S

2:08 PM Montrose ONsite ML

Aligned UV path 3

2:50 pm 3/17/26 MONTROSE ONSITE CF

ALIGNED PATH 2 TDLS

12:15 PM 3/23/26 MONTROSE ONSITE CF

ALIGNED PATH 2 TDLS

ALIGNED PATH 3 UV

D. Appendix D: Non-Conformance/Corrective Action Data Sheets

Form Title: Non-Conformance Report
Document Number: 331AA-QMS-FM-13
Revision Number: R0
Implementation Date: February 07, 2024
Form Owner (Department): MAQS
Form Approval: AHeitmann

Non-Conformance Report

Project: PROJ-029623	**Month: January 2026**

LOCATION/SITE: P66 Denver Terminal	**Parameter(s) Affected: Benzene P5**
Begin Date and Time (LST): 1/5/2026 13:00	**End Date and Time (LST): 1/22/2026 10am**
Equipment: UVDOAS Path 5	**S/N#:** N/A

Description of Malfunction or Problem: Make specific reference to Assignable Cause(s). All tests results should be documented on appropriate form(s).

Benzene MDL at P5 was zero for the period of January 5th to January 22nd of 2026.

Investigative Actions: Describe Assignable Cause(s). Make specific reference to all dates, times and performance test results. All tests results should be documented on appropriate form(s).

All instrument parameters were within normal range.

Corrective Action Taken: Make specific reference to all dates, times and performance test results.

Montrose troubleshooted the instrument by readjusting the internal lenses to try and get better signal at the 290-300nm range. The internal fan was not working which caused ozone build up inside the instrument and was causing the signal to drop and the MDL to be zero. Montrose ordered a new fan and replaced it. Additionally, a new QA/QC check was introduced in which Montrose will receive alerts in case the MDL of a UVDOAS goes to zero.

Is Problem Fully Resolved? **Yes** __x__ **No** ____ If "NO", Describe Further Action Required: (File updated NC/CA Report when problem is fully resolved)

Additional Attachments or Information? **Yes** _____ **No**__X___ Client Notified? **Yes** ____ **No**__X____If so, **date**_____

Field Operator's Assessment of Data Status: (Check One)	☐ **Valid**	☐ **Suspect**	☒ **Invalid**

Additional notes on Data Validity Status: The data during this time is considered invalid.

Originator's Signature: A.Liangou

QA Review: Aricia Boyd

E. Appendix E: Calibration Verification Forms

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	226 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	500	368	26.4
2	500	354	29.2
3	500	368	26.4
4	500	384	23.2
5	500	368	26.4
Averages	500	368	26.3

	Calculated Values	Expected Values
Overall Percent Precision	97.9%	**≥ 80%**
Overall Percent Error	26.3%	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	226 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	625	530	15.2
2	625	528	15.5
3	625	554	11.4
4	625	536	14.2
5	625	568	9.1
Averages	625	543	13.1

	Calculated Values	**Expected Values**
Overall Percent Precision	97.2%	**≥ 80%**
Overall Percent Error	13.1 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s): 

Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	550 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	500	356	28.8
2	500	342	31.6
3	500	358	28.4
4	500	364	27.2
5	500	364	27.2
Averages	500	357	28.6

	Calculated Values	**Expected Values**
Overall Percent Precision	98.2 %	**≥ 80%**
Overall Percent Error	28.6 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

Montrose Air Quality Services
5120 Northshore Dr. North Little Rock, AR 72218
T: (501-)900-6400
www.montrose-env.com

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 9/3/26

Instrument Model: H2S Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	550 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	625	516	17.4
2	625	504	19.4
3	625	508	18.7
4	625	534	14.6
5	625	514	17.8
Averages	625	515	17.6

	Calculated Values	**Expected Values**
Overall Percent Precision	98.2 %	**≥ 80%**
Overall Percent Error	17.6 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	165 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	500	536	7.2
2	500	462	7.6
3	500	506	1.2
4	500	456	8.8
5	500	468	6.4
Averages	500	487	6.2

	Calculated Values	**Expected Values**
Overall Percent Precision	93.1 %	**≥ 80%**
Overall Percent Error	6.2 %	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	165 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	625	454	27.4
2	625	544	13
3	625	488	21.9
4	625	440	29.6
5	625	434	31
Averages	625	472	24.5

	Calculated Values	Expected Values
Overall Percent Precision	92.7 %	**≥ 80%**
Overall Percent Error	24.5 %	**≤ 30%**

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Operator Signature(s):  Witness Signature(s): 

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	315 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	500	472	5.6
2	500	548	9.6
3	500	514	2.8
4	500	524	4.8
5	500	498	0.4
Averages	500	511	4.6

	Calculated Values	**Expected Values**
Overall Percent Precision	94.3 %	**≥ 80%**
Overall Percent Error	4.6%	**≤ 30%**

TDL Calibration Form

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	315 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	625	456	27
2	625	510	18.4
3	625	430	31.2
4	625	480	23.2
5	625	414	33.8
Averages	625	458	26.7

	Calculated Values	Expected Values
Overall Percent Precision	93.8 %	**≥ 80%**
Overall Percent Error	26.7 %	**≤ 30%**

TDL Calibration Form

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	222 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	500	358	28.4
2	500	386	22.8
3	500	382	23.6
4	500	404	19.2
5	500	366	26.8
Averages	500	379	24.2

	Calculated Values	**Expected Values**
Overall Percent Precision	96.4%	**≥ 80%**
Overall Percent Error	24.2 %	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	222 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	625	510	18.4
2	625	460	26.4
3	625	496	20.6
4	625	468	25.1
5	625	480	23.2
Averages	625	483	22.8

	Calculated Values	**Expected Values**
Overall Percent Precision	96.7 %	**≥ 80%**
Overall Percent Error	22.8%	**≤ 30%**

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	138 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	500 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	500	366	26.8
2	500	374	25.2
3	500	374	25.2
4	500	364	27.2
5	500	350	30
Averages	500	366	26.9

	Calculated Values	**Expected Values**
Overall Percent Precision	98%	**≥ 80%**
Overall Percent Error	26.9%	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: H2S Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	138 m
Compound (H2S/HCN)	H2S

Standard Information	
Compound External Audit Cell Concentration (PPMM)	625 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	625	460	26.4
2	625	454	27.4
3	625	456	27
4	625	444	29
5	625	448	28.3
Averages	625	452	27.6

	Calculated Values	**Expected Values**
Overall Percent Precision	99 %	**≥ 80%**
Overall Percent Error	27.6 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	226 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	454	2
2	445	454	2
3	445	452	1.6
4	445	452	1.6
5	445	452	1.6
Averages	445	453	1.8

	Calculated Values	**Expected Values**
Overall Percent Precision	99.7 %	**≥ 80%**
Overall Percent Error	1.8%	**≤ 30%**

TDL Calibration Form

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

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Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	226 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	1010	1002	0.8
2	1010	1004	0.6
3	1010	1002	0.8
4	1010	1004	0.6
5	1010	1004	0.6
Averages	1010	1003	0.7

	Calculated Values	Expected Values
Overall Percent Precision	99.9 %	**≥ 80%**
Overall Percent Error	0.7 %	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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TDL Calibration Form

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Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	550 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	456	2.5
2	445	456	2.5
3	445	456	2.5
4	445	458	2.9
5	445	458	2.9
Averages	445	457	2.7

	Calculated Values	**Expected Values**
Overall Percent Precision	99.7 %	**≥ 80%**
Overall Percent Error	2.7 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s): 

Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	550 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	1010	1006	3.9
2	1010	994	1.6
3	1010	992	1.8
4	1010	994	1.6
5	1010	994	1.6
Averages	1010	996	1.4

	Calculated Values	Expected Values
Overall Percent Precision	99.4%	**≥ 80%**
Overall Percent Error	1.4 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	165 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	458	2.9
2	445	458	2.9
3	445	456	2.5
4	445	454	2
5	445	454	2
Averages	445	456	2.5

	Calculated Values	**Expected Values**
Overall Percent Precision	99.5%	**≥ 80%**
Overall Percent Error	2.5%	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	165 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	1010	998	11.9
2	1010	996	13.9
3	1010	996	13.9
4	1010	994	15.8
5	1010	996	13.9
Averages	1010	996	13.9

	Calculated Values	Expected Values
Overall Percent Precision	99.9%	**≥ 80%**
Overall Percent Error	13.9 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): 

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TDL Calibration Form

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Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	315 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	454	2
2	445	460	3.4
3	445	462	3.8
4	445	458	2.9
5	445	450	1.1
Averages	445	457	2.7

	Calculated Values	**Expected Values**
Overall Percent Precision	98.9 %	**≥ 80%**
Overall Percent Error	2.7 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	315 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	1010	984	2.6
2	1010	982	2.8
3	1010	976	3.4
4	1010	978	3.2
5	1010	978	3.2
Averages	1010	980	3

	Calculated Values	**Expected Values**
Overall Percent Precision	99.7 %	**≥ 80%**
Overall Percent Error	3 %	**≤ 30%**

TDL Calibration Form

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s): 

Witness Signature(s): James Garrett

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	222 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	452	1.6
2	445	452	1.6
3	445	452	1.6
4	445	452	1.6
5	445	454	2
Averages	445	452	1.7

	Calculated Values	**Expected Values**
Overall Percent Precision	99.8%	**≥ 80%**
Overall Percent Error	1.7 %	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	222 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	1010	1018	0.8
2	1010	1018	0.8
3	1010	1018	0.8
4	1010	1018	0.8
5	1010	1018	0.8
Averages	1010	1018	0.8

	Calculated Values	**Expected Values**
Overall Percent Precision	100 %	**≥ 80%**
Overall Percent Error	0.8 %	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

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TDL Calibration Form

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	138 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	445 PPMM

File #	**Compound Concentration (PPMM)**	**Measured Concentration (PPMM)**	**Error (% Reading)**
1	445	460	3.4
2	445	462	3.8
3	445	462	3.8
4	445	462	3.8
5	445	462	3.8
Averages	445	462	3.7

	Calculated Values	**Expected Values**
Overall Percent Precision	99.8 %	**≥ 80%**
Overall Percent Error	3.7%	**≤ 30%**

TDL Calibration Form

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Notes:
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Operator Signature(s):  Witness Signature(s): James Garrett

TDL Calibration Form

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Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: HCN Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path separation(meters-one-way)	138 m
Compound (H2S/HCN)	HCN

Standard Information	
Compound External Audit Cell Concentration (PPMM)	1010 PPMM

File #	Compound Concentration (PPMM)	Measured Concentration (PPMM)	Error (% Reading)
1	1010	1022	1.2
2	1010	1022	1.2
3	1010	1022	1.2
4	1010	1020	1
5	1010	1020	1
Averages	1010	1021	1.1

	Calculated Values	Expected Values
Overall Percent Precision	99.9%	**≥ 80%**
Overall Percent Error	1.1%	**≤ 30%**

TDL Calibration Form

Form Title: TDL Calibration Form	**Implementation Date:** August 8, 2024
Document Number: 331AA-OPS-FM-15	**Form Owner (Department):** MAQS
Revision Number: Rev. 1	**Form Approval:** Katia Liangou

Notes:
Calibration verification passed.

Operator Signature(s):  Witness Signature(s): James Garrett

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	452 m/ 0.047m
Maximum Intensity (%)	96.7
Integration Time (ms)	23

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	103	3
2	100	114	14
3	100	115	15
4	100	114	14
5	100	117	17
Averages	100	113	12.6

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Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	94.5	**≥ 75%**
Overall Percent Error	12.6	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 9/3/26

Instrument Model: UV Mono Path 1 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	452 m/ 0.047m
Maximum Intensity (%)	96.7
Integration Time (ms)	23

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	175	12.5
2	200	199	0.5
3	200	208	4
4	200	209	4.5
5	200	211	5.5
Averages	200	204	5.4

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Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	92.5%	**≥ 75%**
Overall Percent Error	5.4%	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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UVDOAS Calibration Form

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	1100 m/ 0.047m
Maximum Intensity (%)	88
Integration Time (ms)	53

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	89	11
2	100	92	8
3	100	100	0
4	100	96	4
5	100	96	4
Averages	100	95	5.4

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	95.8	**≥ 75%**
Overall Percent Error	5.4	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 2 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	1100 m/ 0.047m
Maximum Intensity (%)	88
Integration Time (ms)	53

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	188	6
2	200	181	9.5
3	200	183	8.5
4	200	183	8.5
5	200	184	8
Averages	200	183	8.1

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Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	98.7	**≥ 75%**
Overall Percent Error	8.1	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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UVDOAS Calibration Form

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	330 m/ 0.047m
Maximum Intensity (%)	85
Integration Time (ms)	38

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	95	5
2	100	108	8
3	100	104	4
4	100	121	21
5	100	125	25
Averages	100	111	12.6

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	87.7	**≥ 75%**
Overall Percent Error	12.6	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/2026

Instrument Model: UV Mono Path 3 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	330 m/ 0.047m
Maximum Intensity (%)	85
Integration Time (ms)	38

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	192	4
2	200	200	0
3	200	221	10.5
4	200	211	5.5
5	200	214	7
Averages	200	208	5.4

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	94.2	**≥ 75%**
Overall Percent Error	5.4	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	630 m/ 0.047m
Maximum Intensity (%)	92
Integration Time (ms)	18

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	91	9
2	100	93	7
3	100	88	12
4	100	87	13
5	100	97	3
Averages	100	91	8.8

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	Calculated Values	**Expected Values**
Overall Percent Precision	96	**≥ 75%**
Overall Percent Error	8.8	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

UVDOAS Calibration Form

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 4 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	630 m/ 0.047m
Maximum Intensity (%)	92
Integration Time (ms)	18

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	168	16
2	200	175	12.5
3	200	182	9
4	200	189	5.5
5	200	186	7
Averages	200	180	10

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	95.7	**≥ 75%**
Overall Percent Error	10	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	444 m/ 0.047m
Maximum Intensity (%)	85
Integration Time (ms)	32

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	106	6
2	100	99	1
3	100	99	1
4	100	97	3
5	100	96	4
Averages	100	99	3

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	96.1	**≥ 75%**
Overall Percent Error	3	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 9/3/26

Instrument Model: UV Mono Path 5 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	444 m/ 0.047m
Maximum Intensity (%)	85
Integration Time (ms)	32

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	175	12.5
2	200	182	9
3	200	183	8.5
4	200	178	11
5	200	184	8
Averages	200	180	9.8

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UVDOAS Calibration Form

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	98.1	**≥ 75%**
Overall Percent Error	9.8	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

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UVDOAS Calibration Form

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	276 m/ 0.047m
Maximum Intensity (%)	96
Integration Time (ms)	15

Standard Information	
Benzene Standard Concentration (PPM)	100

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	100	103	3
2	100	104	4
3	100	106	6
4	100	101	1
5	100	104	4
Averages	100	103.6	3.6

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Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	98.2	**≥ 75%**
Overall Percent Error	3.6	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

Montrose Air Quality Services
5120 Northshore Dr. North Little Rock, AR 72218
T: (501-)900-6400
www.montrose-env.com

UVDOAS Calibration Form

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

Operator Name(s): Katia Liangou Test Date (YYYY/MM/DD): 3/9/26

Instrument Model: UV Mono Path 6 Instrument Serial Number: _____

Instrument Parameters	
Optical Path Length (meters)	276 m/ 0.047m
Maximum Intensity (%)	96
Integration Time (ms)	15

Standard Information	
Benzene Standard Concentration (PPM)	200

File #	**Benzene Concentration (PPM)**	**Measured Concentration (PPM)**	**Error (%)**
1	200	200	0
2	200	211	5.5
3	200	223	11.5
4	200	223	11.5
5	200	220	10
Averages	200	215	7.7

Montrose Air Quality Services
5120 Northshore Dr. North Little Rock, AR 72218
T: (501-)900-6400
www.montrose-env.com

Form Title: UVDOAS Calibration Form	**Implementation Date:** July 10, 2024
Document Number: 331AA-OPS-FM-13	**Form Owner (Department):** MAQS
Revision Number: Rev. 0	**Form Approval:** Katia Liangou

	Calculated Values	**Expected Values**
Overall Percent Precision	95	**≥ 75%**
Overall Percent Error	7.7	**≤ 30%**

Notes:
Calibration verification passed.

Operator's Signature Katia Liangou

Witness's Signature James Garrett

F. Appendix F: Audits

Air Monitoring Program Audit Report
First Quarter 2026 Performance Audit
Phillips 66
Commerce City, Colorado
Meteorological Tower Met 1

Prepared For:

Phillips 66

3960 W 56th Ave.
Commerce City, CO 80022

Prepared By:

Montrose Air Quality Services, LLC

9100 2nd ST NE, Suite 200
Albuquerque, Colorado 87114

Audit Date: January 29, 2026

Submittal Date: February 06, 2026

Table of Contents

Executive Summary

Montrose Air Quality Services (MAQS) conducted a field performance audit on the meteorological tower at Phillips 66 on January 29, 2026. The tower is located in Denver, Colorado, and measures wind direction, wind speed, temperature, precipitation, relative humidity, solar radiation and barometric pressure.

Site coordinates for the meteorological tower are provided in Table E.1 and the tower location is shown in Figure E.1.

Table E.1 Site Information for Phillips 66 Meteorological Tower

Site ID	North Latitude, deg	West Longitude, deg	Elevation, feet
Met 1	39.796738	-104.945296	5,167

Brief results summaries are presented in the following text.

Wind Direction:	Sensor responded within audit criteria for torque, linearity and alignment.
Sigma Theta:	Sigma theta test responded within audit criteria.
Wind Speed:	Sensor responded within audit criteria for the synchronous motor and the bearing torque tests.
Temperature:	Sensors responded within audit criteria.
Realative Humidity:	Sensor responded within audit criteria.
Barometric Pressure:	The sensor responded within audit criteria.

Figure E.1 Phillips 66 Met Tower Location

1.0 Introduction

Montrose Air Quality Services (MAQS) conducted a field performance audit on the Phillips 66 Met 1 meteorological tower on January 29, 2026. The purpose of the performance audit was to check the accuracy of the meteorological sensors against calibrated equipment.

The Phillips 66 meteorological tower is located on Phillips 66 property in Denver, Colorado. MAQS provided the auditor and audit assistant for the field audit. MAQS provided all test instrumentation and tools required to conduct audits of each sensor. The above measures ensure the requirements for independence as specified by the EPA Quality Assurance Guidelines.

The Phillips 66 meteorological station collects data for wind direction, wind speed, temperature, relative humidity, and barometric pressure. Table 1.1 details the parameters measured at the tower, along with technical details of sensor placement and specifications.

Table 1.1 Phillips 66 Meteorological Sensors Technical Data

Parameter	Sensor Height Above Ground Level, m	Manufacturer	Model Number	Serial Number	Operating Range
Wind Direction	10.0	Met One	020D	D14548	0^{o} to 360^{o}
Wind Speed	10.0	Met One	010C	D14298	0 m/s to 50 m/s
Temperature	2.0	Met One	065	D15619	-30°C to 50°C
Relative Humidity	2.0	Met One	083F-0-35	D14154	0% to 100%
Barometric Pressure	2.0	Met One	092	C18610	600 – 1100 mbar

The procedures followed by the auditors conform to those specified in the following technical references:

- Title 40 CFR, Part 58, Appendix B: Quality Assurance Requirements for Prevention of Significant Deterioration (PSD) Air Monitoring
- EPA Quality Assurance Handbook for Air Pollution Measurement Systems: "Volume IV: Meteorological Measurements Version 2.0" (EPA-454/B-08-002, March 2008)

Each meteorological sensor was evaluated based on the comparison of performance versus the guidelines above.

The audit results and supporting documentation are presented in the remainder of this report. Section 2.0 presents the detailed sensor readings, audit values, and accuracy criteria. Section 3.0 presents a summary of results and recommendations for the meteorological tower. Appendix A contains the criteria used to determine the accuracy of response of each sensor, per EPA PSD criteria and manufacturer's specifications. Quality assurance procedures are contained in Appendix B. The audit field logs are presented in Appendix C. The audit equipment calibration certifications are located in Appendix D.

2.0 Performance Results

The following tables present the performance results for each sensor at the Phillips 66 Met 1 tower.

Table 2.1 Wind Direction Linearity and Torque

Data Point	Calibration Wheel Direction, deg	Sensor Output, deg	Difference [1], deg	CW Bearing Torque[2], g-cm	CCW Bearing Torque[2], g-cm
1	0	3	-	< 3	< 3
2	30	33	0		
3	60	63	0		
4	90	93	0		
5	120	123	0		
6	150	153	0		
7	180	183	0		
8	210	214	1		
9	240	244	0		
10	270	274	0	**Slope:**	1.0108
11	300	304	0	**Intercept:**	9.1282
12	330	334	0	**R^2:**	0.9999

Notes: [1] The difference at a given data point (n) is calculated as
[Sensor Output at Data Point (n+1)] – [Sensor Output at Data Point (n)] – 30°,
where 30° represents the ideal difference between each sequential Data Point. Acceptance criteria is ± 5°

[2] Acceptance criteria is ≤ 6.45 g-cm

Table 2.2 Wind Direction Alignment Accuracy

Reference Point	Audit Output, deg	Sensor Output, deg	Difference [1], deg	Acceptance Criteria, deg	Magnetic Declination, deg
Cross Arm	90	89	-1	± 5	8.1
Reciprocal	270	272	2	± 5	8.1
Method Used for Audit Wind Direction Bearing:			X Compass __ Transit/Compass __ Transit/Solar Angles		

Note: [1] Difference = (Sensor Output) – (Audit Output).

Table 2.3 Sigma Theta of Wind Direction

Start-End Times:	915-920
Sigma Theta	
Sensor Output, deg	15.10
Calculated, deg	15.00
Difference (Sensor – Calculated), deg	**0.1**
Acceptance Criteria, deg	± 5
Average Wind Direction	
Sensor Output, deg	19.01
Calculated, deg	17.00
Difference (Sensor – Calculated), deg	**2.01**
Acceptance Criteria, deg	± 5

Table 2.4 Wind Speed Synchronous Motor and Torque Test

Synchronous Motor Test					Bearing Torque Test		
Audit Motor Speed, rpm	**Expected Speed, m/s**	**Sensor Speed, m/s**	**Difference[1], %**	**Acceptance Criteria**	**CW Torque, g-cm**	**CCW Torque, g-cm**	**Acceptance Criteria, g-cm**
0	0.27	0.27	0.00	0.25 m/s at wind speeds < 5 m/s	< 0.2	< 0.2	≤ 0.216
600	16.27	16.27	0.00	± 5% at wind speeds ≥ 5 m/s			
1800	48.27	48.27	0.00				

Note: [1] Percent difference = [(Sensor Speed – Expected Speed)/Expected Speed] *100%

Table 2.5 Temperature

Type of Comparison	Collocated Audit Thermometer Output, °C	Sensor Output, °C	Difference (Sensor – Audit), °C	Acceptance Criteria, °C
1	4.4	4.4	0.0	± 1.0
2	4.5	4.4	-0.1	± 1.0
3	4.5	4.4	-0.1	± 1.0

Table 2.11 Relative Humidity

Repetition Number	Collocated Audit Output, %RH	Sensor Output, %RH	Absolute Difference, %RH	Acceptance Criteria, %RH
1	30.0	30.2	0.3	± 7
2	30.0	30.3	0.3	± 7
3	30.0	30.2	0.1	± 7

Table 2.13 Barometric Pressure

Repetition Number	Audit Pressure, mbar	Sensor Pressure, mbar	Absolute Difference, mbar	Acceptance Criteria, mbar
1	846.2	846.5	0.3	± 3.0
2	846.2	846.5	0.3	± 3.0
3	846.2	846.5	0.3	± 3.0

3.0 Summary and Recommendations

Below is a summary of the results of Phillips 66 meteorological tower performance audit and recommendations for fut

Wind Direction:	Sensor responded within audit criteria for torque, linearity. Sensor responded outside of audit criteria for alignment. Sensor was realigned to within audit criteria. No recommendations at this time.
Sigma Theta:	Sigma theta test responded within audit criteria. No recommendations at this time.
Wind Speed:	Sensor responded within audit criteria for the synchronous motor and the bearing torque tests. No recommendations at this time.
Temperature:	Sensors responded within audit criteria. No recommendations at this time.
Realative Humidity:	Sensor responded within audit criteria. No recommendations at this time.
Barometric Pressure:	Sensor responded within audit criteria. No recommendations at this time.

Appendix A
EPA Accuracy Criteria and Manufacturer's Specifications

Table A.1 contains the EPA PSD accuracy criteria and manufacturer's specifications used to determine the accuracy of each sensor response.

Table A.1 Summary of Accuracy Criteria and Manufacturers Specifications

Parameter	PSD / Modeling Criteria	Manufacture Specifications (Varies Depending on Model)
Horizontal Wind Direction		
Accuracy	± 5°	--
Bearing Torque	--	≤ 6.45 gram-cm
Sigma Theta of Wind Direction	± 5°	--
Horizontal Wind Speed		
Accuracy	±0.25 m/s at wind speeds < 5 m/s ± 5% at wind speeds ≥ 5 m/s (Maximum error 2.5 m/s)	--
Bearing Torque	--	≤ 0.216 gram-cm
Temperature	± 1 °C	--
Relative Humidity	± 7%	--
Barometric Pressure	± 3.0 mbar	--

Appendix B
Audit Procedures

Quality Assurance Procedures for Meteorological Stations

Each meteorological sensor is evaluated based on the comparison of performance versus the EPA guidelines and manufacturer specifications. If any performance values are outside the recommended ranges, the results are immediately reported to field personnel so that any field repair and/or re-calibrations can be performed expeditiously. The formal written report will include these results for documentation purposes.

Each meteorological sensor is calibrated using procedures specifically designed to test its accuracy of response. General descriptions are given below. The procedures used by MAQS to audit the meteorological sensors reflect the requirements described in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems: "Volume IV: Meteorological Measurements Version 2.0."

Upon arrival at the site, each variable is observed for reasonableness. Next the appropriate channels are taken offline and the audit manipulations to each sensor are conducted. While manipulating each sensor, the data logger sensor outputs are recorded and compared to audit input values. If the bias between the audit and site values exceeds the prescribed limits, the appropriate troubleshooting is conducted to determine the cause of the discrepancy. At the completion of the field performance audit, the sensors are put back on line and are checked for reasonableness.

B.1 Check of Sensor Heights

The height of each sensor above ground is measured with a standard tape measure. The auditor may use a tripod mounted transit in conjunction with a tape measure for taller towers. The measured heights are then compared to those stated in the air monitoring program plan.

B.2 Wind Direction

B.2.1 Vane Calibration

The wind vane orientation marker's stated azimuth is checked using the following technique. The solar azimuth angle technique is used to determine a known direction (solar azimuth). This measurement is conducted using a surveyor's transit mounted either on a field tripod or directly onto the wind direction sensor mounting plate. The auditor records the solar azimuth, elevation, date and time to verify accuracy. The auditor determines solar azimuth (sun angle) in degrees from true north based on solar ephemeris tables. The solar tables are specific to the site for current date and time. The transit is then used to measure the angle to a local topographical point or the sensor on the crossarm. This point will become the reference marker. The difference between that value and the known solar azimuth is used to determine a calculated azimuth angle for the reference marker. The now known azimuth for the reference marker is then used in a like manner to determine the orientation of the set pin of the sensor mounting plate. The solar azimuth check is normally done only once to establish a known direction for measurement of the orientation of the reference marker. A minimum of two reference points are taken for this test. In the event the solar azimuth angle technique cannot be used or simultaneous compass readings have been verified, the azimuth angles will be measured with compass bearings.

For determining compass bearings, the auditors utilize a Brunton pocket transit to measure the azimuth of each wind direction cross arm. The pocket transit compass is set to the local magnetic declination in degrees to establish the cross arm bearing from true north.

The wind direction sensor azimuth bearings are recorded with the wind vane aligned with the cross arm in both directions. The sensor outputs are compared to the measured true north bearings to determine accuracy.

B.2.2 Sensor Linearity and Overall Accuracy

The wind sensor's ability to measure winds from any direction is tested by visually aligning the sensor with the reference markers established above. The sensor output values from the data logger are recorded and compared to the previously determined azimuths. An additional check for accuracy is conducted by checking the cross-arm alignment to ensure further accuracy. In order to perform the cross-arm alignment, the wind vane is aligned with the cross arm and the corresponding sensor output is recorded.

The horizontal wind direction sensor is checked for accuracy of response by aligning the wind vane with the crossarm. The crossarm bearings are measures with a pocket transit compass set to a local magnetic declination in degrees to establish the cross arm bearing from true north.

Sensor linearity is checked by removing the wind vane and replacing the vane with a protractor and vane angle fixture whenever available and is the preferred method. The sensor will be manipulated on the vane angle fixture and protractor at 30-degree intervals. The sensor manipulation will start at the zero-degree value and end at the 360-degree value for a total of twelve points.

B.2.3 Sigma Theta Test

The wind direction sigma theta check is a test of the data logger sigma theta calculation. Any system errors attributable to the program algorithm and/or the signal from the sensors would be detected in the sigma theta output to the data logger. The sigma theta test is conducted by fixing the wind vane at a given direction for a given period of time and then moving the vane approximately 30 degrees for the same period of time. This interval is selected to correspond to one averaging period of the data logger. During this time, the wind speed sensor is set to a constant non-zero output on the logger. Installations that have a zero (0.0) wind speed output when the cups are removed will be set at a constant rotation of 300 to 600 rpm depending on the sensor transfer standard. Sensor output of the sigma theta and average wind direction are recorded from the data logger and compared to the expected calculated values.

B.2.4 Starting Threshold Torque

The wind vane's starting threshold torque is measured using a NIST calibrated torque gauge. The gauge is applied to the wind vane shaft at the sensor’s center of rotation and then a constant force is applied. The test is repeated 3-4 times, beginning at different points for a 360-degree rotation. The highest value (grams-cm) observed during the test is recorded as the torque of the sensor.

B.3 Horizontal Wind Speed

B.3.1 Sensor Calibration

The sensor is audited by removing the anemometer cups and applying a constant rate of rotation in the normal direction of spin, using a synchronous motor. This is done by connecting the motor shaft to the anemometer shaft using a non-rigid, non-slip connector. Using the anemometer specifications, the rpm is converted to wind speed and is compared to the sensor instantaneous output values recorded by the data logger.

B.3.2 Starting Threshold Torque

The starting threshold torque measurement of the anemometer shaft follows the same procedure as that described for the horizontal wind direction. Due to the lower resistance of the wind speed sensor, a more sensitive torque watch is used.

B.4 Temperature

The tower-mounted temperature sensor is audited using a single point ambient collocation with a NIST-traceable digital thermometer. This thermometer has a range of -40 to 150 °C in 0.1 °C graduations. The equilibrated thermometer reading is compared to the instantaneous sensor output on the data logger. In addition, the aspirator is checked for proper ventilation by inspecting operation of the fans, if applicable, and checking the air pathway for obstructions.

B.5 Relative Humidity

The relative humidity sensor is checked for accuracy with a collocated digital sensor. The collocated test is performed by placing a second relative humidity sensor adjacent to and at the same level as the sensor located on the tower. The collocated sensor is carefully placed to match the exposure and setting of the tower sensor.

Appendix C
Audit Field Logs

Wind Direction Audit Log

Client: Phillips 66	Site: Met 1		Date: 29-Jan-26
Sensor Manufacturer: Met One	Height: 10	Model: 020D	S/N: D14548
Start Time:	Stop Time:		
Bearing Check	Torque Watch Manufacturer:		
Clockwise: < 3.0	Counter Clockwise: < 3.0	Acceptable Reading: ≤ 6.45	

Solar Reference/Azimuth Check

Reference Point	Compass Degrees	Sensor Output (Degrees)	Solar Angle/Azimuth	Degrees Difference
Cross Arm Align.	90	89		-1
Reciprical	270	272		2

Sigma Theta Test

Datalogger Start Time: 915	Sensor Output: 2		Wheel Output: 0
Datalogger Stop Time: 920	Sensor Output: 32		Wheel Output: 30
Sigma Theta Sensor: 15.10	Sigma Theta Calc: 15.00	Avg. WD Sensor: 19.01	Avg WD Calc: 17.00

Linearity Check

Dial	Degrees	Delta Degrees	Dial	Degrees	Delta Degrees
0	3	-	210	214	1
30	33	0	240	244	0
60	63	0	270	274	0
90	93	0	300	304	0
120	123	0	330	334	0
150	153	0	360	3	-1
180	183	0	r = 0.9999	m = 1.0041	b = 2.7436

Data Verification Check		**Verified By:**	
Datalogger Start Time (MST)	Datalogger Stop Time (MST)	Avg. Wind Direction Sensor	Avg. Wind Direction Database

Wind Speed Audit Log

Client: Phillips 66	Site: Met 1		Date: 29-Jan-26
Sensor Manufacturer: Met One	Height: 10	Model: 010C	S/N: D14298
Start Time:		Stop Time:	

Bearing Check		**Torque Watch Manufacturer:**
Clockwise: < 0.2	Counter Clockwise: < 0.2	Acceptable Reading: ≤ 0.216

Synchronous Motor Test

RPM	AC Frequency of Motor	Sensor Output (volts)	Sensor Output (m/s)	Expected Output (m/s)	Percent Difference (sensor-exp)/exp
0			0.27	0.27	0.00
100					
300					
600			16.27	16.27	0.00
900					
1200					
1500					
1800			48.27	48.27	0.00

Synchronous Motor

Manufacturer:	Model No.:	S/N:	Date of Last Calibration:

Data Verification Test

Time of Test	Max Wind Speed	Max Wind Speed (DB)	Verified By

Temperature Co-Located Audit Log

Client: Phillips 66	Site: Met 1	Date: 29-Jan-26	
Sensor Manufacturer: Met One	Height: 2	Model: 065	S/N: D15619
Start Time:	Stop Time:		

Co-Located Test

	Repetition #1	Repetition #2	Repetition #3	Repetition #4
Time				
Co-Located NIST (A)	4.4	4.5	4.5	
Sensor Output °C (B)	4.4	4.4	4.4	
Difference % (B-A)	0.0	-0.1	-0.1	

Time Averaged Test				
Start Time	End Time	Audit Average Temp	Sensor Average Temp	Measured Difference °C

Auditor Notes and Comments

Relative Humidity Co-Located Audit Log

Client: Phillips 66	Site: Met 1	Date: 29-Jan-26	
Sensor Manufacturer: Met One	Height: 2	Model: 083F-0-35	S/N: D14154
Start Time:	Stop Time:		

Co-Located Test

	Repetition #1	Repetition #2	Repetition #3	Repetition #4
Time				
Co-Located NIST (A)	30.0	30.0	30.0	
Sensor Output % (B)	30.2	30.3	30.2	
Difference % (B-A)	0.3	0.3	0.1	

Time Averaged Test				
Start Time	End Time	Audit Average RH %	Sensor Average RH %	Measured Difference %

Auditor Notes and Comments

Barometric Pressure Audit Log

Client: Phillips 66	Site: Met 1		Date: 29-Jan-26
Sensor Manufacturer: Met One	Height: 2	Model: 092	S/N: C18610

NIST Barometer Comparison		
Field Barometer Manufacturer:	Model:	S/N:
Date of last comparison to NIST Barometer:		

Co-Located Ambient Test			
Time	Audit Pressure (A)	Sensor Pressure (B)	Absolute Difference
	846.2	846.5	0.3
	846.2	846.5	0.3
	846.2	846.5	0.3

Auditor Calculations

Auditor Comments and Notes

Appendix D
Audit Equipment Certifications

Instrument Service Laboratories
8340 Washington Street NE
Albuquerque, New Mexico 87113
Phone (505) 842-1107 FAX (505) 842-9329

CERTIFICATE of CALIBRATION

Report No. 118520

I S L

Submitted by :

MONTROSE AIR QUALITY SERVICES
3500 COMANCHE RD NE
ALBUQUERQUE, NM 87107
PO#080949

Description

SPEED CALIBRATOR

Manufacturer YOUNG	**Model No.** 18802 / 18820A
Serial No. CA03127/CA03127	**Inventory No.** NONE
As Received: Instrument was : **Within Tolerance**	**As Returned:** Instrument was : **Within Tolerance Specifications** Limitations : **NONE**
Comments : ☒ No adjustment required ☐ Adjustment(s) required ☐ Functional repairs required	**Calibration Environment** Procedure : ISL/YNG18802.001 Temperature : 71 ° Humidity : 28 %
Calibration Date : February 28, 2025	Recall Date : February 28, 2026

Instrument Service Laboratories certifies that the above listed instrument was calibrated in compliance with the requirements of **MIL-STD 45662A** and **ANSI/NCSL Z540-1-1994.** Instrument Service Laboratories measurement standards are traceable to the National Institute of Standards and Technology (NIST). Unless specifically noted, the calibration procedures used provide for a measurement uncertainty of less than or equal to one quarter of the specification of the instrument under test.

S. Linde Technician
Certified by

Instrument Service Laboratories

DATA REPORT NO. 118520
PAGE 1 of 1
02-28-2025

ITEM CALIBRATED : YOUNG SELECTABLE SPEED CALIBRATING UNIT -- MODEL 18802
: SERIAL NO. CA03127/CA03127
: CUSTOMER CONTROL NO. NONE

SUBMITTED BY : MONTROSE AIR QUALITY SERVICES
3500 COMANCHE ROAD NE.
ALBUQUERQUE, N.M. 87107

PROCEDURE : ISL/YNG18802.001 06-01-96

FUNCTION	AS RECEIVED	ERROR	AS RETURNED	ERROR	TOLERANCE
DISPLAY ACCURACY					
**** 1 RPM ADDED TO TOLERANCE FOR DISPLAY RESOLUTION ****					
300 RPM	300.0	+0.0		+/-	1.1 RPM
600 RPM	600.1	+0.1		+/-	1.1 RPM
900 RPM	900.1	+0.1		+/-	1.1 RPM
1800 RPM	1800.5	+0.5		+/-	1.1 RPM
3600 RPM	3600.5	+0.5		+/-	1.1 RPM
7200 RPM	7200.6	+0.6		+/-	1.1 RPM
9000 RPM	9000.6	+0.6		+/-	1.1 RPM
12000 RPM	n/a			+/-	1.1 RPM

CERTIFIED Dan L

DATE 02/28/2025

Instrument Service Laboratories
8340 Washington Street NE
Albuquerque, New Mexico 87113
Phone (505) 842-1107 FAX (505) 842-9329

CERTIFICATE of CALIBRATION

Report No. 118522

I S L

Submitted by :

MONTROSE AIR QUALITY
3500 COMANCHE RD NE
ALBUQUERQUE, NM 87107
PO# 080949

Description

TEMP/HUMIDITY SENSOR

Manufacturer VAISALA	**Model No.** MI70/HMP75
Serial No. A4110035/A4220004	**Inventory No.** NONE
As Received: Instrument was : **Within Tolerance**	**As Returned:** Instrument was : **Within Tolerance Specifications** Limitations : ___
Comments : ☒ No adjustment required ☐ Adjustment(s) required ☐ Functional repairs required	**Calibration Environment** Procedure : ISL/VAIMI70.001 Temperature : 70 ° Humidity : 26 %
Calibration Date : March 14, 2025	Recall Date : March 14, 2026

Instrument Service Laboratories certifies that the above listed instrument was calibrated in compliance with the requirements of **MIL-STD 45662A** and **ANSI/NCSL Z540-1-1994.** Instrument Service Laboratories measurement standards are traceable to the National Institute of Standards and Technology (NIST). Unless specifically noted, the calibration procedures used provide for a measurement uncertainty of less than or equal to one quarter of the specification of the instrument under test.

P. Linde Technician
Certified by

CALIBRATION CERTIFICATE

Instrument Details
Instrument: Handheld Digital Barometer
Serial Number: 1825000048
Calibration Certificate No: 250221-2P

Model No: ZM202N-A10038
NovaLynx P/N: 230-M202

Customer Details
Montrose Air Quality Services

RA# 502901 Ref PO# PO-080176

Environmental Details
Temperature: 23˚C Relative Humidity: 37% Barometric Pressure: 925 hPa (mb)

Calibration/Checking Procedure: Document 230-M202-A06

Date Received: Feb. 19, 2025
Cal Date: Feb. 21, 2025

Calibration Results , after adjustment

Test Value millibars (mb)	Expected Value	Observed Reading millibars (mb)	Acceptable Limit
650.0 mb	650.0 mb	650.1 mb	± 0.2 mb
750.0 mb	750.0 mb	750.1 mb	± 0.2 mb
850.0 mb	850.0 mb	850.1 mb	± 0.2 mb
925.0 mb	925.0 mb	925.0mb	± 0.2 mb
1050.0 mb	1050.0 mb	1049.9 mb	± 0.2 mb

Comments: Unit was received in mb and calibration testing was done in mb for best resolution.
The As Received Readings were compared to the Standards for Actual Pressure,
The AS Found readings were reading were 0.6 mb high, Verified Original Factory Zero Settings,
A minor adjustment was needed to correct the readings. All readings are now within tolerance .

The M202 Batteries Tested Ok at 1.46 Volts ~

This device has been tested with the following calibration devices:

Fluke Model 87 SN50501646	ZM2000-A1000 SN2029000030
Cal Due: January 11, 2026	Cal Due: Sept. 18, 2025

All calibration standards have an accuracy ratio of 2:1 or better unless otherwise stated.
Calibration performed at the NovaLynx Factory, Grass Valley, CA.

NovaLynx Corporation certifies that the above referenced products were calibrated and tested using standards whose calibrations are traceable to the National Institute of Standards and Technology. Work was completed according to the manufactures calibration procedures and specifications and complies with ANSI-Z540 and Former MIL-STD-45662A. This report shall not be reproduced except in full without the written approval of NovaLynx Corporation.

Technician: _____ Date: February 21, 2025
William Begg, Service Manager, NovaLynx