Ambient air monitoring data summary report

Platteville, CO

Air Toxics and Ozone Precursor program [ATOPs]

07.28.2025

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

1. Executive Summary

1.1. Report Purpose

The purpose of this report is to summarize the air data observed by the Colorado Department of Public Health and Environment (CDPHE) for the period of 11/13/2024 to 4/30/2025 within Platteville, CO in response to an odor and health concern reported to the Oil and Gas Health Information and Response (OGHIR) Program.

1.2. Background Information

- An SPOD was deployed at a residential location in Platteville to monitor for total volatile organic compound (tVOC) concentrations from November 13, 2024 to April 30, 2025.
- A summa canister was included to collect a sample at the time of increased tVOC levels.

Monitoring Asset	Monitoring Type	Compounds Measured	Deployment Dates	Sampling Duration
SPOD[a]	Stationary	Total VOCs[b], meteorology	Nov 11,2024 - Apr 30, 2025	1 second

(a) Sensor Pod

(b) Total VOCs = sum of all volatile organic compounds (VOCs) present that ionize at ≤ 10.6eV

1.3. Key Findings

- TVOC levels were found to range from 0.01 ppm to 0.75 ppm, resulting in a median tVOC value of 0.06 ppm.
- Average tVOC values compared per month did not exceed 0.10 ppm.
- A summa canister was triggered on 3/24/2025 and evaluated using the EPA Method TO-15. This analysis showed concentrations below the Colorado Oil and Gas Health Information and Response program's short-term health guideline values (HGVs).

2. Introduction

Odor and health concerns were reported to the Oil and Gas Health Information and Response (OGHIR) Program which prompted the deployment of a monitoring sensor within Platteville, CO by the Colorado Department of Public Health and Environment (CDPHE). The Sensor Pod (SPOD) was used to perform measurements of tVOCs in real time, provide information on higher than usual concentrations, and to determine a potential source direction. This study also provides information regarding the seasonal variability of tVOC concentrations within the measured area. The monitoring began on 11/13/2024 and it ended on 04/30/2025 which encompasses a nearly six month period.

This monitoring was performed at a residential location which had oil and gas well sites as close as 400 feet from the monitoring location and larger oil and gas plants approximately 1.5 miles in the SW direction and 2 miles in the NE direction., Additional sources include a poultry farm approximately 1.5 miles in the S direction and industrial activity approximately 2 miles in the SE direction.

3. Methods

3.1. SPOD

The SPOD is a low-cost sensor that measures tVOC concentrations and meteorological parameters on a continuous 1-second time resolution. The SPOD operates using a photoionization detector (PID) to measure VOCs. VOCs enter the detector as an air mass moves across the sensor and are bombarded by the high-energy photons. Through the process of ionization, the VOCs absorb the light energy and the molecules break apart into positively and negatively charged ions. The positively charged ions create an electric current which is read by the detector as the signal output. The more VOCs there are, the more ions are created, and consequently, the greater the electric current produced. The strength of the current determines how many VOCs are present in the air. For simplicity, the output of the SPOD is identified as total VOCs, but please note that this output only represents the concentration of those VOCs present that are ionized at or below 10.6 eV. There may be other VOCs present that are not captured by these measurements.

While this sensor cannot identify specific VOCs within an air mass, it allows for a canister sample to be triggered when the tVOC concentration is larger than a set threshold concentration for more than 1-minute in duration. The canister sample that can be sent to a laboratory for further analysis. Triggered samples are collected for approximately 1 hour when programmed for a specific event or when the SPOD detects

a VOC reading from the PID at or above a set threshold for at least 60 seconds. The triggering threshold used during this deployment was 0.08 ppm for 1 minute. The automatically triggered canister sample is sent to a laboratory to be analyzed for 59 VOCs by EPA Method TO-15, and these results provide speciated concentrations for each VOC detected.

The SPOD is powered through the use of a solar panel (50W) to offer continuous measurements without interruption and expanding the capability to operate in remote locations.

The SPOD monitoring objectives for this deployment were:

1. Continuously measure tVOC concentrations.
2. Collect a summa canister sample during a period of increased tVOC concentrations.

Links to additional technical details and data about the SPOD can be found on the CDPHE air toxics website.

3.2. Meteorology

The SPOD is equipped with a weather station that has an ultrasonic anemometer which determines the wind direction and wind speed at the time of the tVOC measurement, therefore allowing for the determination of the direction of the emission.

3.3. Data Processing

Data collected includes the tVOC concentrations along with temperature, humidity, wind speed and wind direction at 1-second resolution. The data was processed into 1 minute averages to better understand the trends in the data. These 1 minute averages capture the rapid change in concentration without any compromise in data and reduce the noise coming from the device. Invalidated data was removed from the dataset. This was identified as any data collected during maintenance procedures and outliers.

3.4. Data Evaluation

All data from measurements performed by the monitoring device are managed with the same method for statistical analyses. Any negative values are replaced with zero to indicate that the compound was not detected at that time. Values that are greater than

zero but less than the detection limit, the lowest value the instrument can reliably detect, are replaced with half of the detection limit value of 0.01 ppm.

Canister sample results are compared to short-term health guideline values (HGVs), which represent the concentrations of pollutants in air below which no harmful health effects are expected to occur during a short-term exposure. If a pollutant is measured above a HGV, it does not mean that harmful health effects will occur, but that more investigation is needed.

3.5. Quality Control & Assurance

Manual bump checks are performed monthly in which a known concentration of isobutylene is flowed directly to the PID. A comparison of the instrument response is performed to ensure that the concentration is within ±20% of the expected value; the data gaps due to the monthly bump checks are invalidated, which is about six hours of data at the end of each month. If the error is greater than ±20%, a full multi-point calibration is performed and any impacted data is flagged accordingly. Data is downloaded from the SPOD on a weekly basis and assessed for validity. There have been very rare instances of coverage drop due to connectivity or power loss.

4. Results

TVOC concentrations were measured over a six-month period and showed values ranging from 0.01 ppm to 0.75 ppm (Fig. 1 and Table 1). The observed variation in the baseline (typically observed) values is due to maintenance of the instrument to update the calibration parameters creating a minimal influence on the baseline values. The largest concentrations occurred during the month of March in which three plumes were identified and resulted in the collection of a canister sample.

Table 1: Total VOC statistics (ppm) observed throughout the duration of the measurement period and separated per month.

Statistic	Cumulative	Nov. 2024	Dec. 2024	Jan. 2025	Feb. 2025	Mar. 2025	Apr. 2025
Min	0.01	0.04	0.01	0.01	0.03	0.05	0.05
Max	0.75	0.17	0.14	0.09	0.10	0.75	0.16
Med	0.06	0.11	0.07	0.03	0.05	0.06	0.07

Avg	0.06	0.10	0.07	0.03	0.05	0.06	0.07
Stdev	0.03	0.02	0.03	0.01	0.01	0.01	0.01

Monthly statistics (Table 1) indicate that:

- November recorded the highest average tVOC concentration with 0.10 ppm.
- January had the lowest average concentration level of 0.03 ppm.
- March recorded the highest overall tVOC concentration of 0.75 ppm averaged over 1-minute.

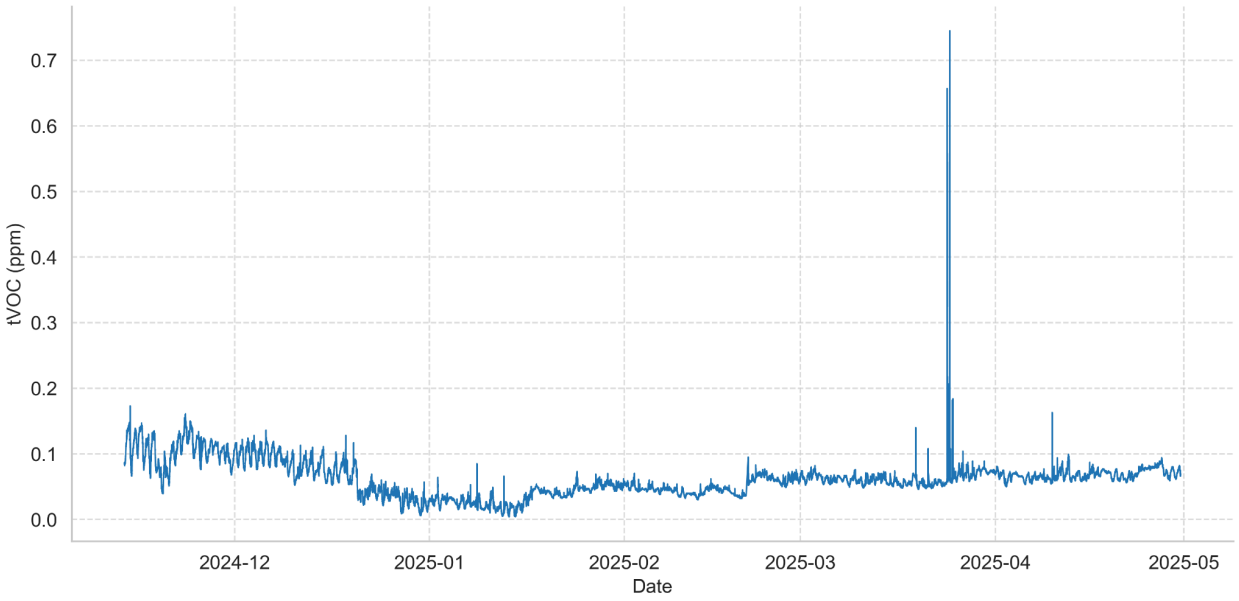

Figure 1: Time series showing SPOD tVOC concentrations (ppm) observed for the duration of measurements from Nov 13, 2024 to Apr 30, 2025.

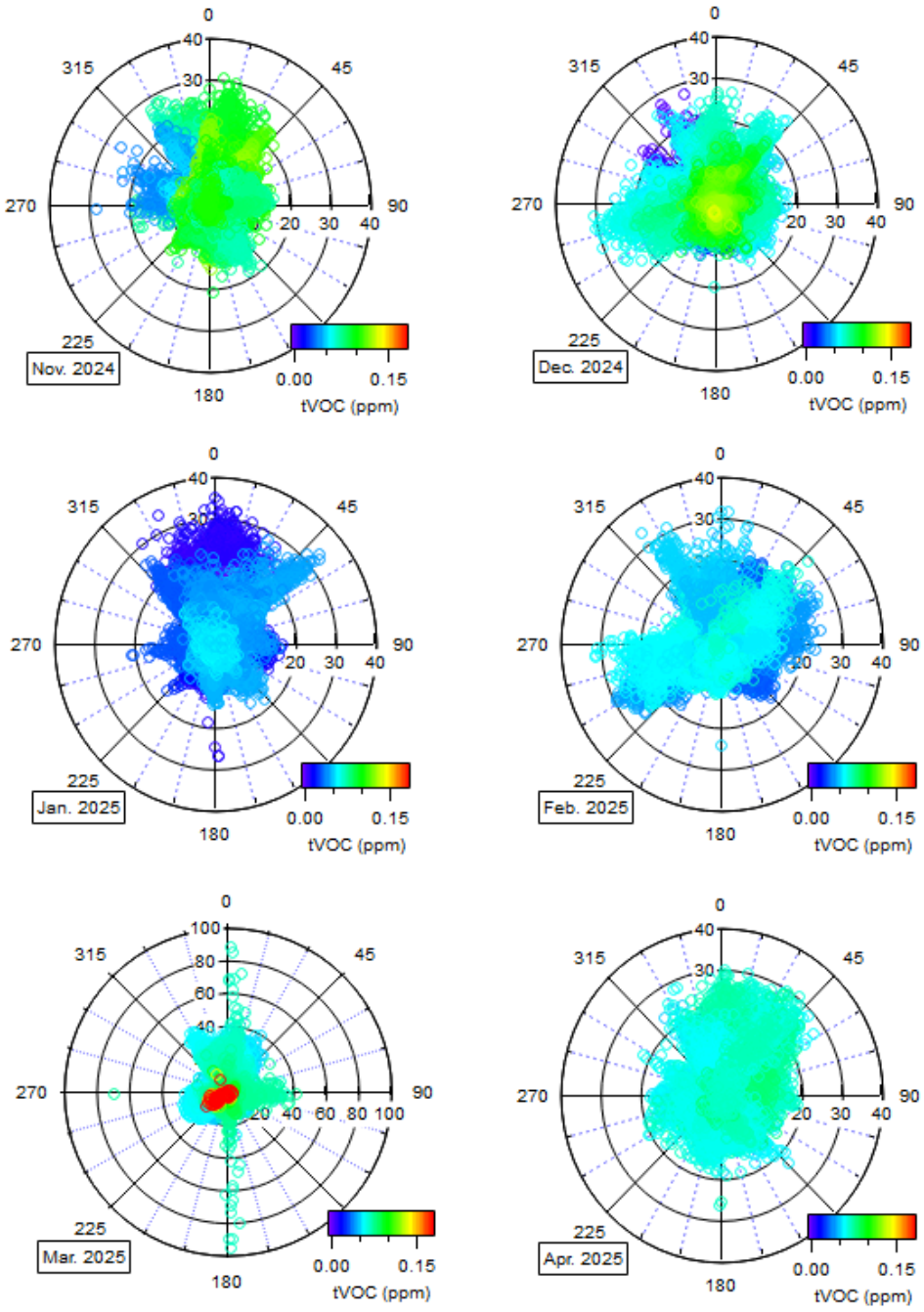

Figure 5: Six panels showing polar plots of wind direction, wind speed, and tVOC concentration (ppm) observed at the Platteville monitoring site for individual months during the 11/13 to 4/30 measurement period. The wind directions are indicated by the direction around the compass, the radial distance from the center indicates the wind

speed, and the colors indicate the tVOC concentration observed as described in the legend.

Throughout the measurement period, wind speeds ranged from 0-90 mph with the majority occurring in the range of 0-20 mph. Elevated tVOC (above 0.2 ppm) concentrations occurred primarily with wind speeds below 10 mph with the majority of these points from the S-SW sector, indicating local accumulation at these times due to stagnant air (Fig. 5). The monthly evaluation indicates:

- Winds from the south and east show lower wind speeds thus indicating that higher concentrations from these directions are likely due to accumulation from sources within a closer proximity.
- The high concentration events throughout the measurement period occurred at lower wind speeds indicating stagnation.
- No seasonal dependence was observed.

4.1 Canister Sample

On March 24, three instances of increased tVOC concentrations were observed. The first plume reached a maximum value of 0.657 ppm at 7:51 am and lasted for 17 minutes. The summa canister was triggered during this event which led to the collection of a 1-hour sample collection. This canister sample was analyzed by a third party laboratory using EPA Method TO-15. The laboratory analysis (Table A1) showed values for all compounds to be below health guideline values.

A pollution rose plot for the 1 hour canister sample window (Figure 6) indicates that the wind direction was relatively consistent, primarily from the south (150 to 195 degrees) with average wind speeds of 1.79 mph. Low wind speeds, such as this, can suggest low dispersion and lead to elevated concentrations due to pollutants accumulating in the slow moving air mass.

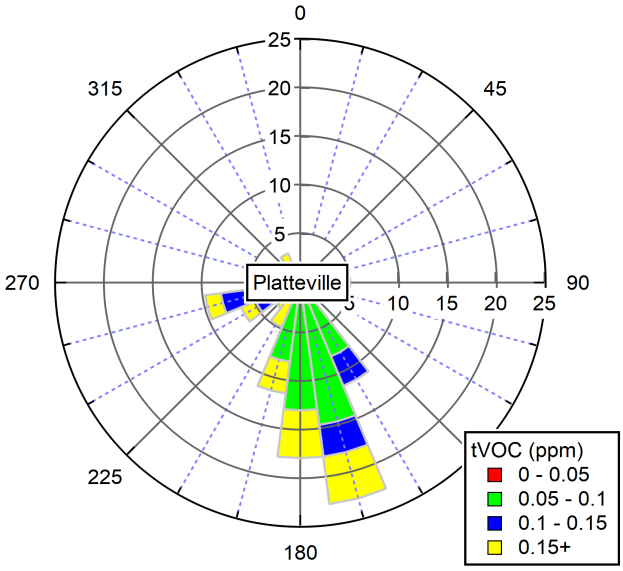

Figure 6: Pollution rose plot showing measurements of wind direction and tVOC concentration (ppm) observed at the Platteville monitoring site during the 1 hour canister sample period. The wind directions are indicated by the direction around the compass, the frequency of the wind direction is indicated by the radial distance from the center, and the colors indicate the tVOC concentration observed as described in the legend.

Time series plots (Figures 7 and 8) were used to evaluate this event and identified the following:

- There was a 12 hour window in which five distinct plumes were identified, with the first plume triggering the canister. The increased concentrations which led to the canister trigger were isolated, such that the values before the trigger were at baseline level.
- During the period in which the canister sample was collected, the wind direction shows rapid changes during the plume event which likely resulted in the two distinct peaks. The canister sampled for 1 hour which resulted in capturing the first plume and the beginning of the second plume.
- The low wind speeds with a primarily southerly direction (average of 1.79 mph) during the plume event, suggest a source within a closer proximity to the sensor.

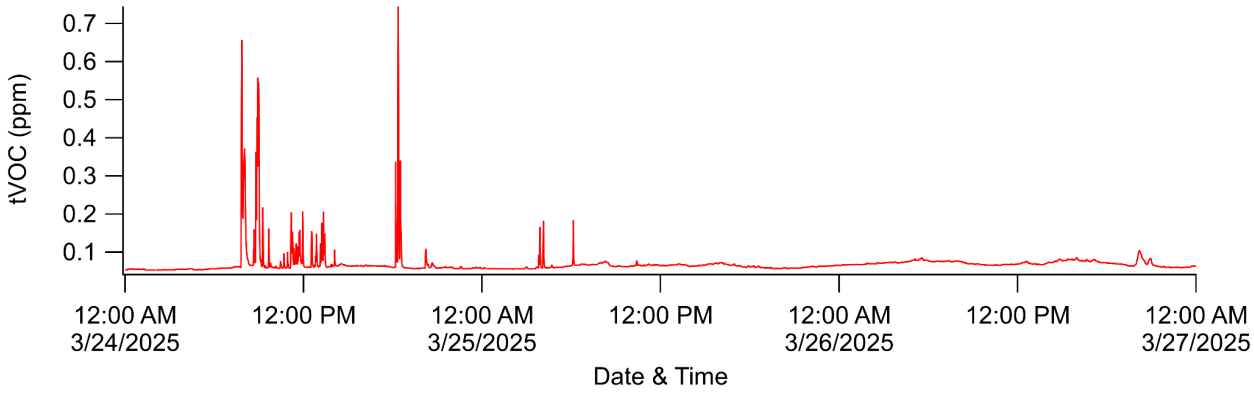

Figure 7: Time series plot of 1-minute tVOC (ppm) concentrations observed March 24, 2025 highlighting the plume events which resulted in the highest concentrations observed throughout the deployment.

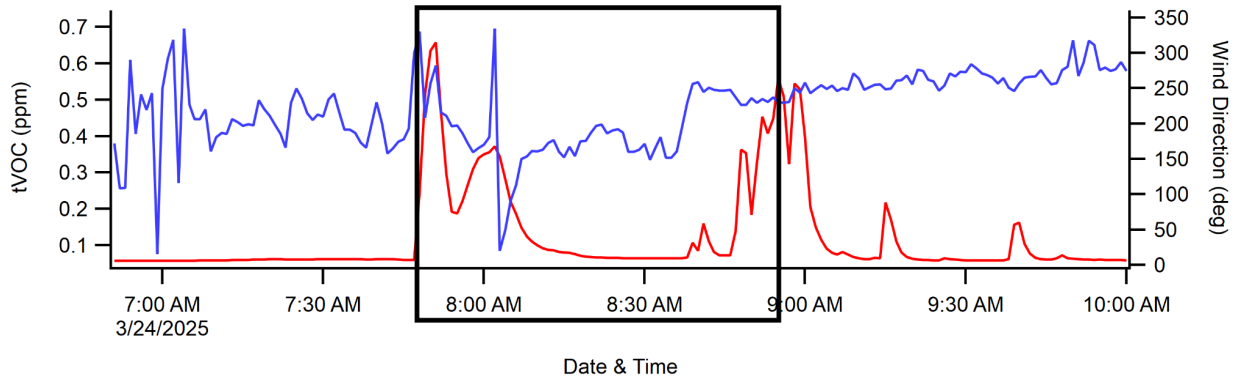

Figure 8: Time series plot of 1-minute tVOC (ppm) concentrations (red, left axis) and wind direction (degrees) (blue, right axis) with a box highlighting the time of the sample collection.

5. Deployment Summary

5.1. SPOD

The SPOD was deployed from Nov 13, 2024 to Apr 30, 2025 in response to a resident's concerns. Typical values observed ranged from 0.03 ppm to 0.1 ppm. The six month measurement period showed few tVOC events above this range with the most notable events occurring on March 24, reaching a maximum level of 0.75 ppm. A 1-hr canister sample was collected during the first plume event observed on this day and was evaluated by a third party laboratory using the EPA TO-15 method of analysis. The primary wind direction observed during the canister sample showed winds coming from

the south. This combined with low wind speeds suggests a nearby source. The results of the canister sample showed all detected compounds to be below the short-term health guideline values.

Appendix A

Table A1: Laboratory analysis results for all compounds present in the canister sample taken on 3/24/2025 that were above the EPA TO-15 method detection limit.

Analyte	Result	Units	Reporting Limit
Propylene	180	ppbv	4.0
Freon 12	0.53	ppbv	0.40
Chloromethane	0.70	ppbv	0.40
Butane	400	ppbv	4.0
Acetone	6.9	ppbv	2.0
n-Pentane	87	ppbv	4.0
n-Hexane	23	ppbv	0.40
Benzene	3.2	ppbv	0.40
Cyclohexane	3.8	ppbv	0.40
n-Heptane	4.3	ppbv	0.40
Toluene	3.0	ppbv	0.40

Table A2: November 2024 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.04	10.6	12.5	0.2	0.1
Max	0.17	61.3	81.3	30.9	360
Med	0.11	29.5	57.3	2.9	179
Avg	0.10	31.5	54.0	4.4	180

Stdev	0.02	11.01	18.12	4.16	104

Table A3: December 2024 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.01	9.3	13.7	0.2	0.1
Max	0.14	62.4	83.9	31.1	360
Med	0.07	29.5	52.7	3.1	176
Avg	0.07	31.3	51.3	4.3	179
Stdev	0.03	11.39	17.11	3.81	93

Table A4: January 2025 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.01	-23.8	15.3	0.2	0.1
Max	0.09	58.6	83.9	35.6	360
Med	0.03	19.6	63.3	3.6	173
Avg	0.03	19.0	58.5	4.8	170
Stdev	0.01	13.71	16.89	4.05	91.5

Table A5: February 2025 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.03	-17	8.6	0.2	0.1
Max	0.10	70.2	87.0	33.3	360
Med	0.05	24.8	59.8	4.3	161
Avg	0.05	25.9	55.0	5.5	160
Stdev	0.01	18.24	18.96	4.43	88.6

Table A6: March 2025 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.05	14.5	8.1	0.2	0.1
Max	0.75	83.1	90.0	96.0	360
Med	0.06	40.6	37.8	4.9	176
Avg	0.06	42.8	41.7	6.9	181
Stdev	0.01	14.3	21.5	6.14	99

Table A7: April 2025 monthly statistics observed by the SPOD for all the parameters measured.

	tVOC (ppm)	Temp (F)	RH(%)	WS (mph)	WD (deg)
Min	0.05	20.7	9.5	0.2	0.1
Max	0.16	88.2	89.0	30.7	360
Med	0.07	43.9	48.8	4.7	162
Avg	0.07	46.2	50.1	5.9	161
Stdev	0.01	14.7	22.76	4.5	99