Ambient air monitoring data summary report

Longmont Residential Community

Air Toxics and Ozone Precursor Program [ATOPs]

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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) in response to odors observed by the Longmont community

1.2. Background Information:

- A Pyxis micro gas chromatograph (mGC), deployed as a stationary air quality monitor, was positioned at the northwest corner of theLongmont community (Fig. 1). The Pyxis mGC was accompanied by a Gill Maximet meteorological station. Both devices sampled from 11/13/25 to 12/16/25.

1.3. Air Monitoring Objective:

- The Air Toxics and Ozone Precursors Program (ATOPs) within the Air Pollution Control Division (APCD) of the CDPHE deployed one air monitoring asset (Table 1) in response to the request of the OGHIR (Oil & Gas Health Information and Response) Program.
- Stationary monitoring was performed with a Pyxis mGC and Remote Air Tracking Trailer for Localized Emissions Recording (RATTLER) in order to evaluate the air concentration of compounds that may be harmful to residents within the Longmont residential community.

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Table 1. Summary table showing air monitoring deployments conducted by CDPHE within the Longmont community.

Monitoring Asset	Monitoring Type	Compounds Measured	Deployment Dates	Sampling Duration
RATTLER[a]	Stationary	Benzene	November 13 – December 16, 2025	10 minutes
Gill Maximet[b]	Stationary	Meteorology	November 13 – December 16, 2025	1 second

(a) Remote Air Tracking Trailer for Localized Emissions Recording
(b) A meteorological station, which measures wind speed and wind direction.

1.4.   Key Findings:

- The Pyxis mGC measurements, between November 13 and December 16, 2025 showed a deployment average benzene concentration of 0.10 pbbV, which is similar compared to typical regional benzene concentrations for this region of 0.16 ppbV.
- The maximum deployment 10-minute value observed was approximately 4.02 ppbV and was measured from the southwest. The wind speed was relatively high (18.43 mph), indicating a possible source of emission.
- Potential sources surrounding the Longmont community include four oil and gas sites and a food processing facility. Two oil and gas sites and the food processing facility are located within roughly 1 mile southwest of the Pyxis mGC sampling location. The remaining two oil and gas sites are located roughly 0.5 to 0.75 miles northwest of the Pyxis mGC.

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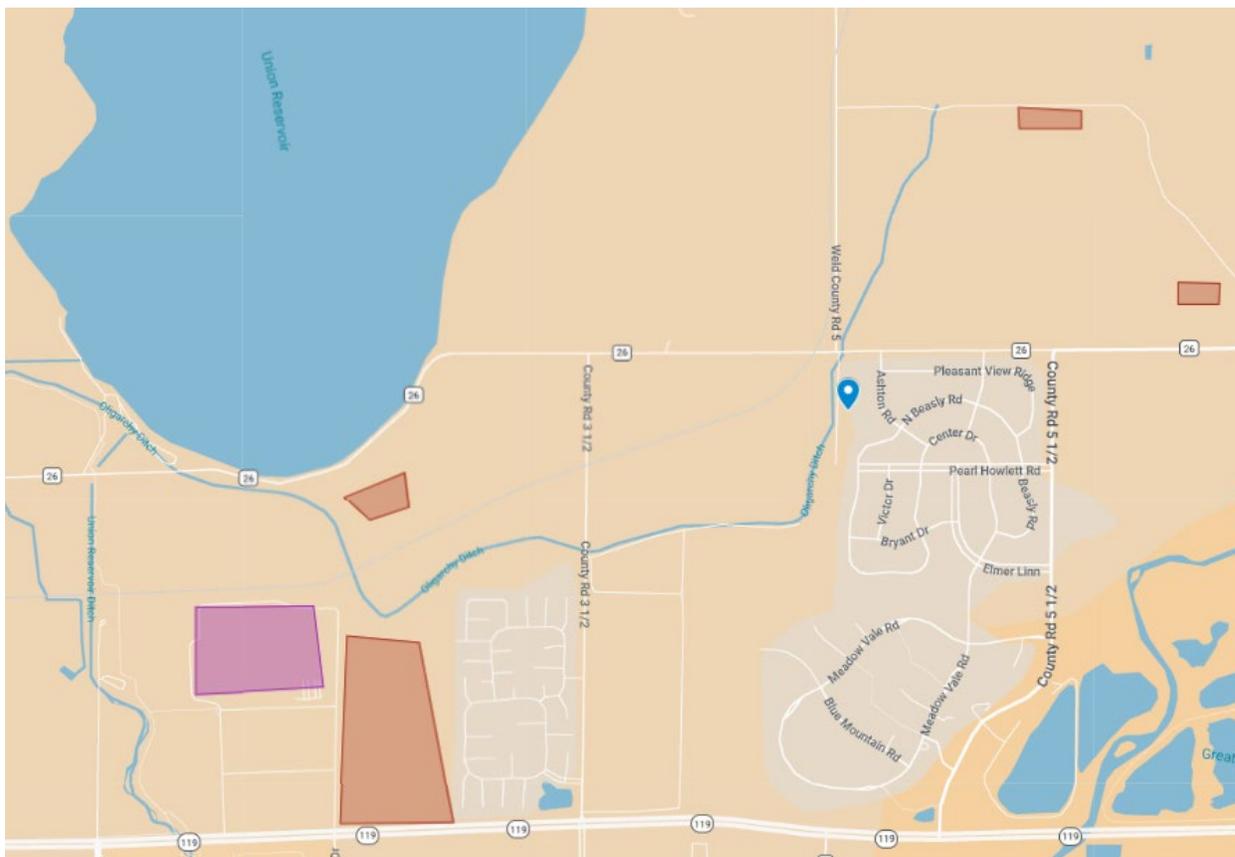
2. Introduction

Figure 1. Aerial image of the Longmont, Colorado community. The Remote Air Tracking Trailer for Localized Emissions Recording (RATTLER) air quality monitor is identified by the blue pin. Potential sources include the food processing plant (purple rectangle to the southwest) and oil and gas facility locations (red rectangles to the northeast and southwest).

CDPHE-APCD-ATOPs deployed the RATTLER on November 13, 2025 and concluded sampling on December 16, 2025. The RATTLER was deployed at the northwest corner of the Longmont community and approximately 240 feet to the west of the nearest resident (Fig. 1). This location, within the Longmont community, was specifically chosen based upon access and approval from the HOA community representative.

The RATTLER was equipped with a Pyxis mGC to measure benzene emissions and a Gill Maximet anemometer to measure wind speed and wind direction. The RATTLER measured continuously from November 13, 2025 to December 16, 2025.

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3.   Methods

3.1.   Stationary Measurements

The Pyxis mGC was deployed on November 13 through December 16, 2025 for continuous monitoring within the residential community located in Longmont, Colorado. The RATTLER was located at the northwest corner of the Longmont community and approximately 240 feet to the west of the nearest resident.

3.1.1.   Micro Gas Chromatography

The Pyxis mGC has the ability to separate benzene from other compounds within an air sample on a near real-time resolution of approximately 10 minutes. It operates similarly to a gas chromatograph, but on a much smaller scale. The system uses a preconcentrator to adsorb VOC compounds and then separates these compounds with a column. As each compound emerges from the column, it passes over a photoionization detector (PID) to identify VOCs through high-energy photons of light produced by a 10.6 electron volt (eV) lamp to determine the concentration of the individual compound.

This Pyxis mGC offers continuous measurements and versatility in monitoring locations. This instrument is powered by a mobile, solar-powered trailer, the RATTLER, which contains an onboard battery bank and two 365-watt (W) solar panels, allowing for enough power for the Pyxis mGC and its temperature-regulated case to operate without interruption. This means the Pyxis mGC is not limited by where it can be deployed.

The Pyxis mGC monitoring objectives for this deployment were:
1. Continuously measure benzene concentrations within the Longmont community, which is surrounded by several oil and gas operations, as well as other industry production.
2. Determine if any period of measurement increases above values typically observed in this region (background levels) of roughly 0.16 ppbV.

These measurements consist of downwind emissions from potentially multiple sources within the surrounding area, including oil and gas facilities to the northeast and southwest and a food processing facility to the southwest. Winds would need to pass over these potential sources and towards the direction of the monitor to capture the potential emission.

3.1.2.   Gill Maximet

The Gill Maximet is a sensor that measures meteorological parameters on a continuous 1-second time resolution. The measured meteorological parameters include wind

speed, wind direction, barometric pressure, humidity, and temperature. The weather station operates by continuously emitting a series of electronic outputs. Multiple pairs of receiving sensors are arranged around a central mast and measure the wind speed and wind direction based upon the time of flight difference between when those ultrasonic pulses are received. Additional sensors within the anemometer record temperature, humidity, and barometric pressure. The weather station is powered through the use of a 50W solar panel to offer continuous measurement without interruption and expand the capability of the weather station to operate in remote locations.

3.2.   Data Processing

Data processing was performed for the measurements collected during this monitoring period to organize the data into a useful format. One species of interest is provided in this report: benzene. The Pyxis mGC measurements occurred continuously while deployed throughout the sampling period (November 13 – December 16, 2025). Data collected includes benzene concentrations at a 10-minute time resolution along with meteorological parameters, including temperature, humidity, wind speed, and wind direction, at a 1-second time resolution. The meteorological data was averaged to match the benzene measurement sample times. Any invalid data was removed from the dataset. This was identified if the Pyxis mGC did not pass its routine calibrations.

3.3.   Data Evaluation

All data 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. These values are filtered in this way to account for variability within an instrument response and to limit bias from being overly high or low. The detection limit for benzene is 0.05 ppbV. To assess emissions from the surrounding area, only measurements collected when the wind direction was coming from the direction of either the pump jack or storage tank relative to the location of the instrument are included in the following analyses.

3.4.   Quality Control & Assurance

To ensure reliability and validity of field measurements, proper quality control (QC) and quality assurance (QA) must be carried out before, during, and after data collection. QC processes ensure instruments are operating under the same parameters throughout a measurement period to maintain consistency. QA processes implement checks and validation of the collected data to ensure completeness and accuracy. By carrying out proper QC and QA, confidence in the data is established. QC/QA procedures for individual monitoring assets are briefly described in the sections below.

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3.4.1. Pyxis mGC

Manual bump checks occur bi-weekly in which a known concentration of benzene gas is flowed to the Pyxis mGC. After the instrument response is received, a percent error is calculated to ensure that benzene is within +/-30% of the expected value for all bump checks and calibrations. If the error is greater than 30%, a full multi-point calibration is performed and any previous data is flagged accordingly. In addition, routine evaluations are performed bi-weekly to ensure proper flow rates and adequate temperatures are achieved. Data is downloaded from the Pyxis mGC on a weekly basis and assessed for validity.

3.4.2. Gill Maximet

Prior to sampling, the anemometer is manually oriented due north by referencing a compass. This ensures accurate wind direction data throughout the sampling period.

4. Results

4.1. Pyxis mGC

Measurements from the Pyxis mGC were conducted at the northwest corner of the Longmont community and approximately 240 feet west of the nearest resident from November 13 to December 16, 2025. Any missing benzene data is attributed to when the RATTLER trailer lost power and needed a supplemental power source to charge its batteries (Fig. 2).

The deployment average of 0.10 ppbV is similar to values typically observed for regional benzene concentrations for this area (0.16 ppbV). The highest 10-minute concentrations of benzene recorded during the measurement period are as follows: 4.02 ppbV, 1.33 ppbV, 1.18 ppbV, 1.11 ppbV, 1.03 ppbV, 1.37 ppbV, and 1.32 ppbV (Table 2, Fig. 2). These benzene concentrations were observed from directions of the potential sources located to the southwest and northeast (Table 2). The maximum 1-hour rolling benzene average observed throughout the deployment was 1.08 ppbV and occurred from the northeast.

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Table 2. Summary table showing notable benzene concentrations, the time and date of the observation, the wind direction, and the wind speed.

Date/Time	10-minute benzene concentration (ppbV)	Wind Direction (degrees)	Wind Speed (mph)
11/17 @ 11:16	4.02	214.0	19.1
11/26 @ 16:01	1.33	32.0	6.9
11/26 @ 16:11	1.18	67.3	9.8
11/26 @ 16:21	1.11	76.5	11.1
11/26 @ 16:31	1.03	83.2	9.8
12/9 @ 9:29	1.37	219.2	26.9
12/9 @ 13:47	1.32	220.4	22.3

These benzene concentrations above 1 ppbV were observed intermittently throughout the measurement period. The highest benzene concentration observed coming from the southwest direction was 4.02 ppbV (Fig. 3). The remaining higher benzene concentrations showed wind directions that came mostly from the northeast to east and southwest. During these benzene measurements, wind speeds ranged from 6.9 to 26.9 mph (miles per hour), suggesting that emissions could have potentially come from the oil and gas facility or food production plant located to the southwest or other oil and gas facilities located to the northeast. The relatively high wind speeds during these measured benzene concentrations indicate a greater certainty in which direction the benzene emissions occurred.
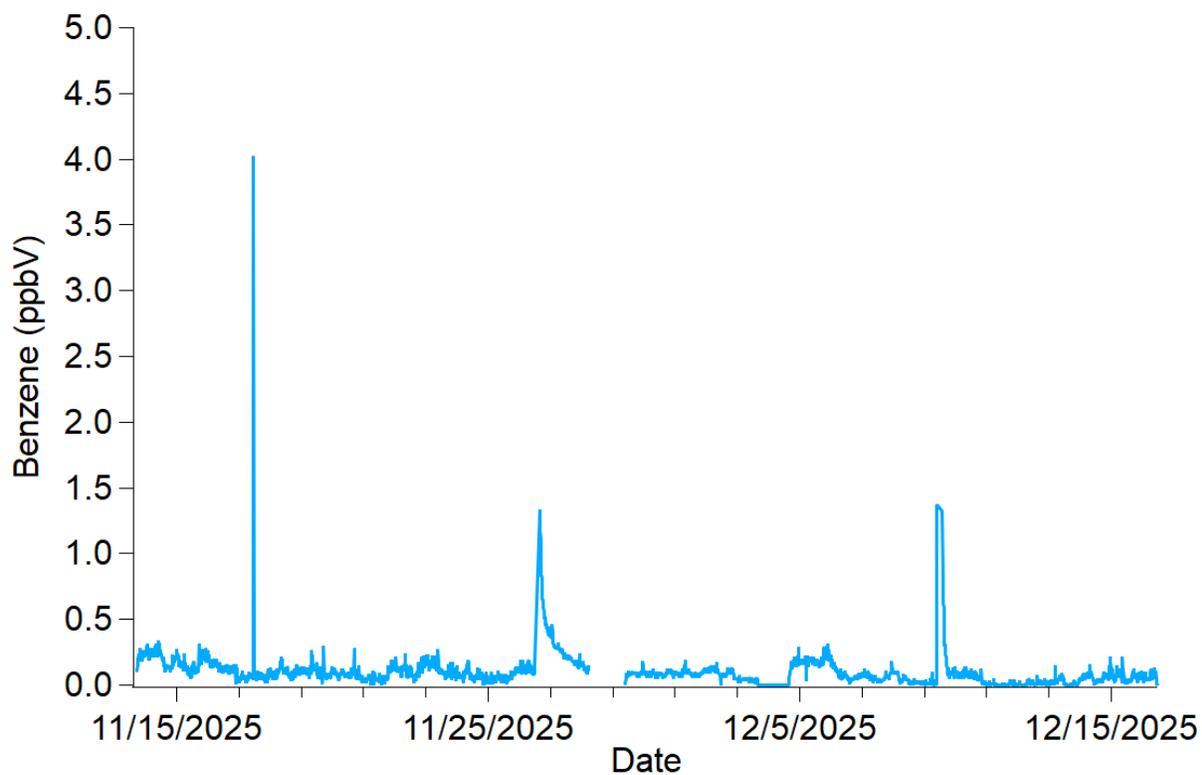
Figure 2: Time series showing 10-minute Pyxis mGC benzene concentrations in ppbV observed throughout the measurement period (November 13 – December 16, 2025).
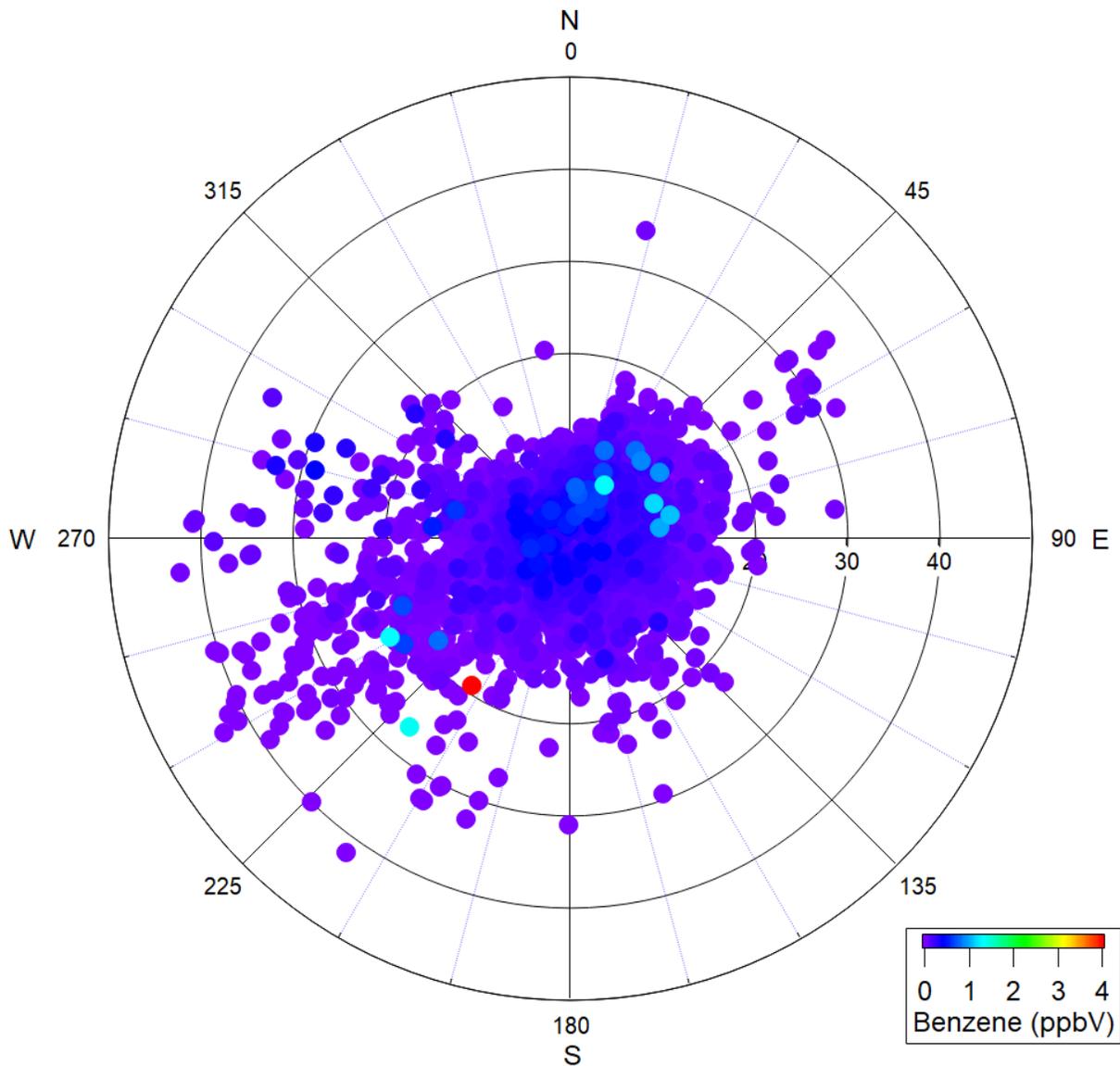
Figure 3: Polar plot showing 10-minute averaged wind speed and wind direction data collected from the Gill Maximet weather station. The wind direction is identified by the angle (degrees, where 0 degrees indicates North) and the wind speed is indicated by the radial value (mph). Each marker is colored by the benzene concentration observed from the Pyxis mGC at the time of a given wind speed and direction measurement to demonstrate the potential source winds of the pollution.

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5. Summary

CDPHE-APCD-ATOPs began monitoring in the Longmont community in response to an odor complaint within the neighborhood. A stationary asset (Pyxis mGC and RATTLER) was deployed in order to evaluate the air concentrations of benzene that may be harmful to nearby residents. The deployment began on November 13, 2025 and concluded on December 16, 2025. There are potential sources within approximately 1 mile that surround the Longmont community, including oil and gas operations and a food processing facility.

Measurements from the stationary Pyxis mGC instrument found deployment average benzene concentrations to be 0.10 ppbV, which is consistent with typical regional concentrations observed within this region. The maximum 1-hr deployment rolling average concentration of benzene was 1.08 ppbV. Increased benzene concentrations above typical values were observed intermittently throughout the sampling period, coming from the southwest and north to northeast directions.

The highest benzene concentration was recorded at 4.02 ppbV when winds were coming from the southwest at 19.1 mph. Since the wind speed measured was relatively high, it provides greater certainty on the direction of the emissions. A food processing plant and oil and gas facility are both located to the southwest of the community within roughly 1 mile.

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Appendix A

Table A1: Benzene (ppbV) statistics collected by the Pyxis mGC from all measurements collected at the Longmont residential community from 11/13/25-12/16/25.

Statistics	Benzene (ppbV)
Maximum	4.02
Minimum	0.00[a]
Average	0.10
Median	0.08
Standard Deviation	0.11
Number of Observations	4,362

(a) Non-detect

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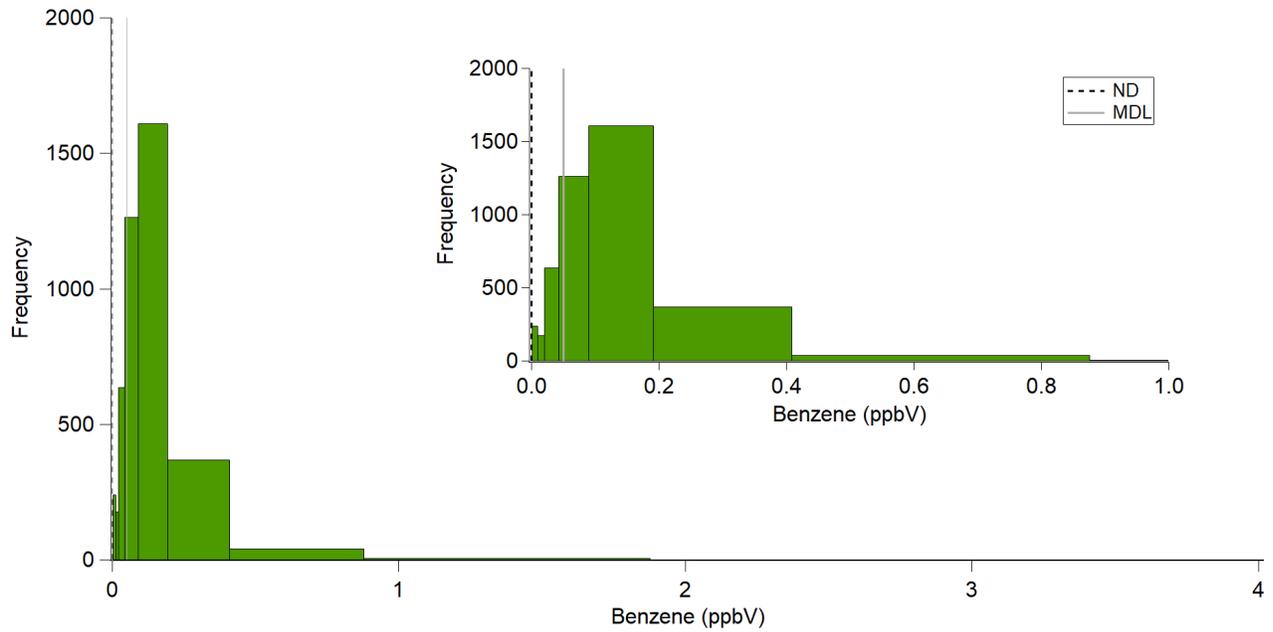Department of Public Health & Environment

Figure A1: Histogram of benzene (ppbV) observations from the Pyxis mGC from November 13 to December 16, 2025. Data shows that 5.53% of the total observations are non-detects (ND, black dashed line) and 25.5% are below the detection limit (MDL, grey solid line).

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