Ajax Analytics

with

Colorado State University

2024 TOWN OF ERIE SUMMARY REPORT

PROGRAM GOALS

The Town of Erie is experiencing unprecedented community growth. The town implemented an air quality monitoring program as part of a strategy focused on creating a high quality of life for residents. With 90 producing oil and gas wells spread throughout the town limits, new oil and gas development just beyond the town's borders, and a centralized regional landfill, air quality is an important topic amongst the community.

The monitoring program has been carefully designed to include multiple technologies that complement each other. The monitoring network provides excellent spatial coverage, excellent time coverage, high-quality data, and enables accurate modeling at a reasonable cost.

The comprehensive monitoring approach includes:

- Internet connected sensor systems with 1-minute time resolution – useful for air quality event detection and spatial analysis
- 1-minute whole air canister samples automatically triggered by the real-time sensor systems upon recognition of an air quality event – useful for short-term impact assessment during pollutant events
- 1 week-long whole air canister samples at select sites, deployed on set schedules – useful for high-quality long-term data with continuity throughout the program
- A mobile plume tracker deployed during operations and calm conditions designed to capture increased levels of pollutant concentrations in the community and assist with finding plume sources

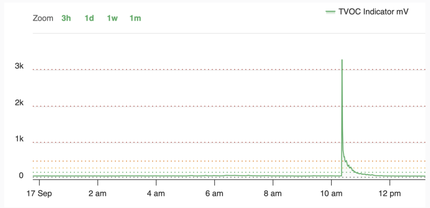
With these combined technologies, we have been able to identify pipeline leaks, quantify emission rates, identify VOC hotspots amongst both oil and gas areas and urban communities, and provide complementing data for community construction plans.

PROGRAM ACTIVITY SUMMARY

10
Sites
Deployed

10 Paid Subscriptions
5 Weekly Canister Sampling Sites

14
2024
Triggered Canisters



As of September 30th 2024
74 Triggered Samples in the Program

2
Plume Tracker
Deployments

135
2024 Weekly
Canister Samples

As of September 30th 2024
630 Weekly Samples in the Program

Triggered Canister Samples Show Heavily Concentrated Plume Events

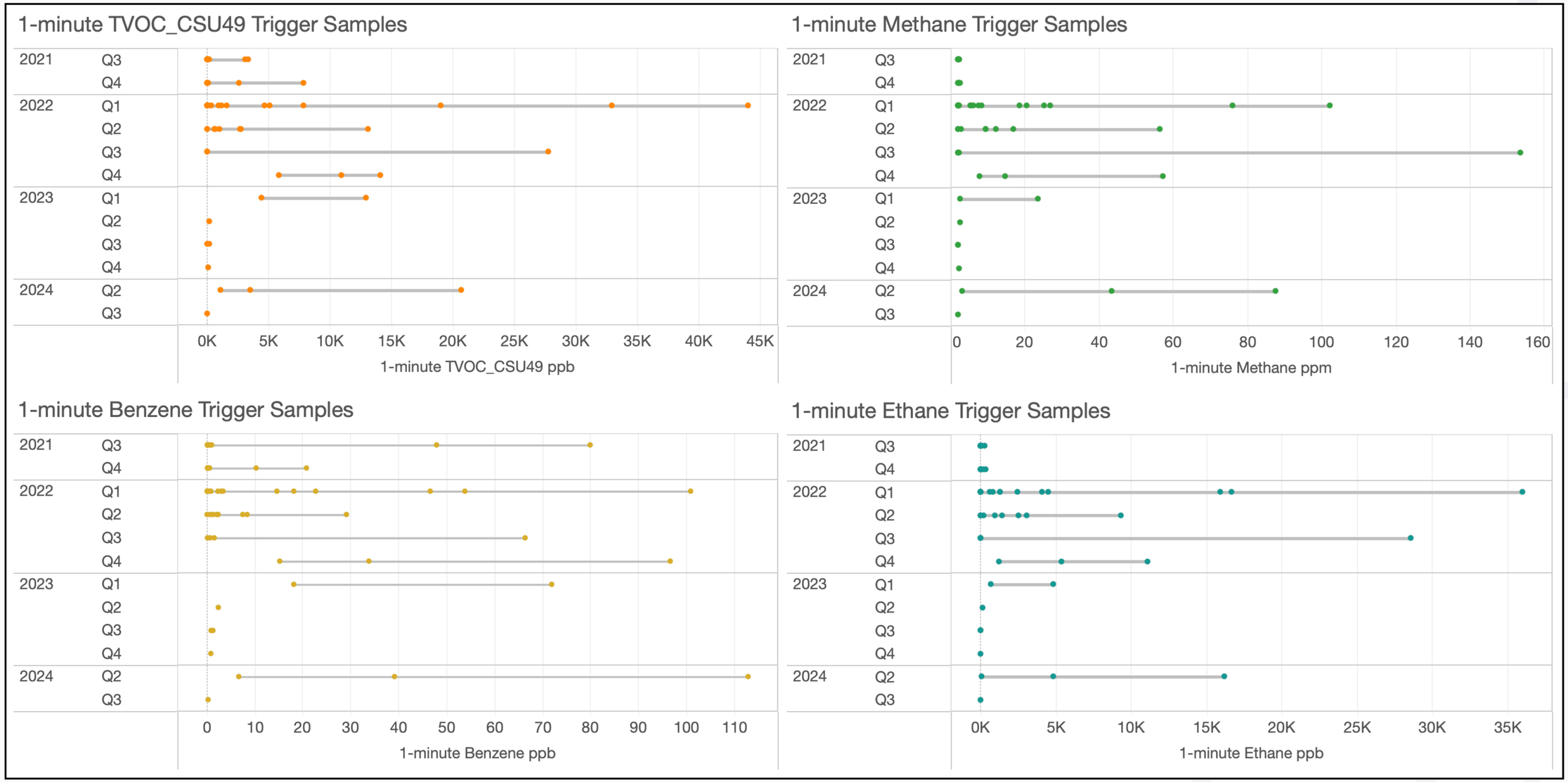


Figure 1: Triggered Canister Data from Erie Triggered Canisters throughout the History of the Network

2024 Triggered Canisters Highlight Oil and Gas Sources Near Landfill

Event Date	Monitoring Site	Triggering TVOC Indicator (mV)	Event Max TVOC Indicator	Observed Duration	Triggered TVOC (ppb)	Triggered BTEX (ppb)	Triggered Benzene (ppb)	1-hr Benzene Estimate (ppb)
5/31/24 6:40	**Landfill South**	500	1,591	9 min	20,688.8	291.2	112.8	17.2
6/17/24 7:35	**Landfill South**	500	1,946	40 min	3,530.9	113.8	39.1	16.9
6/17/24 14:26	**Landfill South**	500	717	30 min	1,120.0	257.6	6.7	3.3
7/8/24 9:04	**Upland West**	500	500	5 min	23.15	4.44	0.52	0.16
7/13/24 6:03	**Upland South**	500	2,146	30 min	15.50	2.18	0.28	0.17
7/20/24 20:23	**Cosslett Southeast**	500	3,269	5 min	23.2	5.12	0.69	0.39
7/23/24 9:11	***Erie Highlands**	500	567	20 min	N/A	N/A	N/A	N/A
7/23/24 16:13	**Landfill Northeast**	500	1,049	4 min	19.96	1.75	0.23	0.17
8/9/24 12:33	**Landfill South**	500	1,647	15 min	7,942.29	157.84	64.6	5.82
8/12/24 16:43	**Upland South**	500	732	2 min	7.29	0.51	0.11	0.16
8/21/24 7:32	**Landfill East**	500	731	30 min	1,119.07	144.2	15.12	3.27
9/15/24 21:19	**Landfill North**	500	3,254	5 min	17.154	0.34	0.1	0.15
9/15/24 21:19	**Landfill North**	800	3,254	5 min	940.22	14.27	3.54	0.62
9/29/24 06:12	**Landfill South**	500	1,189	90 min	3,716.31	42.95	15.17	6.38

Table 1: Triggered Canister Data from 2024 Erie Triggered Canisters

* *This canister could not be analyzed due to a lack of sample volume during lab analysis*

TVOC Elevations at Landfill South Skew Weekly 2024 Data

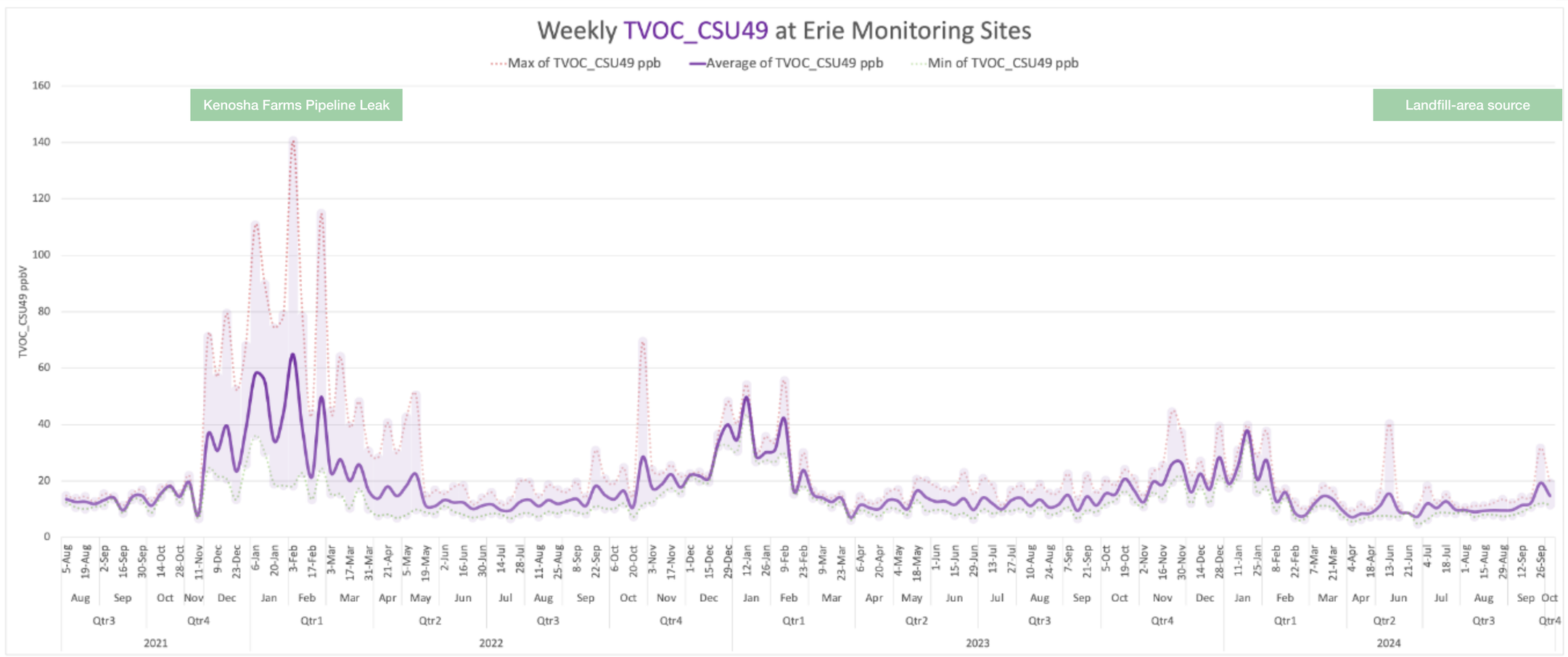


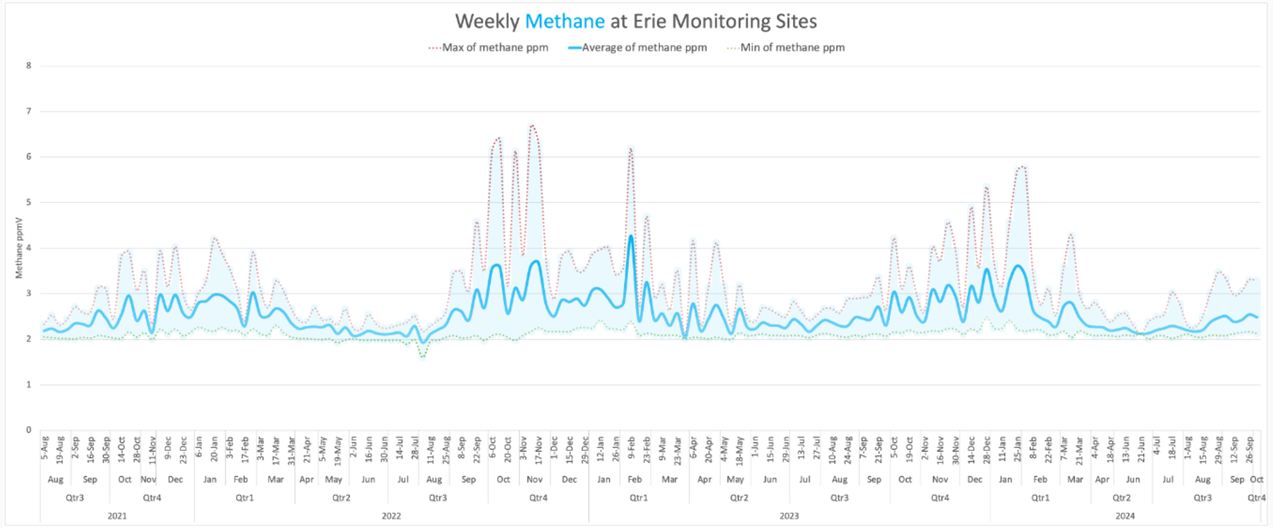
Figure 2: Weekly TVOC_CSU49 Canister Data throughout the History of the Erie Monitoring Program

Activities at the Front Range Landfill produce elevated emissions in the region. There are several oil and gas pads situated within the landfill area that are probable sources for the elevated TVOC_CSU49 concentrations measured in our weekly and triggered canisters. Source attribution relies on wind analyses and spatial distribution data.

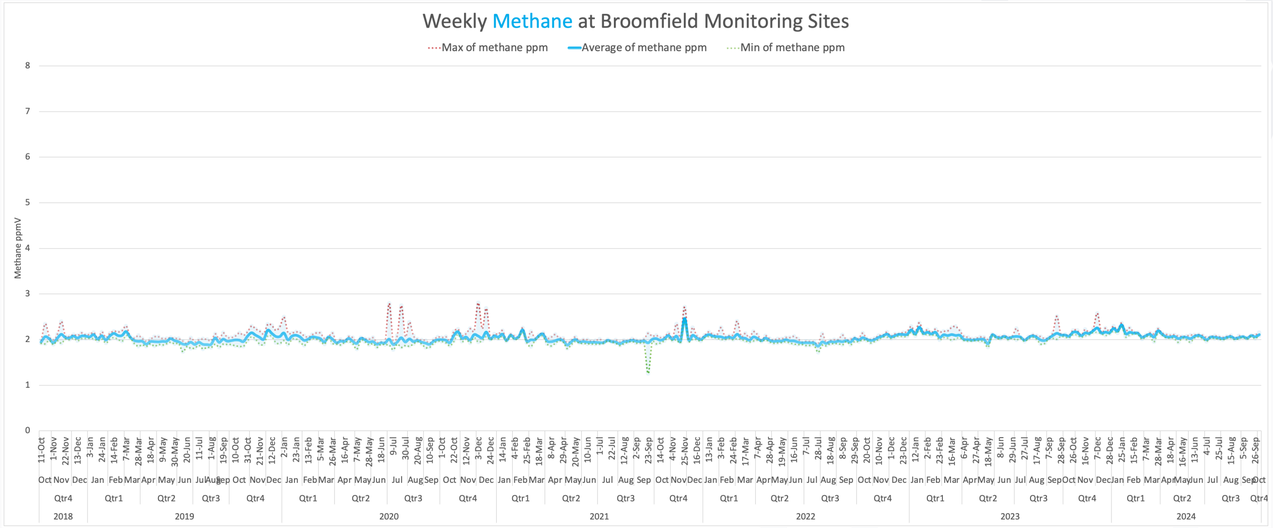
We are working to re-locate monitoring systems, dependent on land access, in order to help collect data in closer proximity to some of the probable sources in the Landfill region.

Erie Measures Higher Methane than Neighbor Broomfield

Erie



Broomfield



Erie

Average Methane	*Maximum Methane*
2022: **2.65 ppm**	2022: **6.66 ppm**
2023: **2.84 ppm**	2023: **6.662 ppm**
2024: **2.54 ppm**	2024: **5.76 ppm**

Broomfield

Average Methane	*Maximum Methane*
2022: **2.00 ppm**	2022: **2.41 ppm**
2023: **2.08 ppm**	2023: **2.58 ppm**
2024: **2.09 ppm**	2024: **2.37 ppm**

Figure 3: Timeline of weekly canister sample methane concentrations for Erie (left) and Broomfield (right). Global average methane is estimated at ~2.2 ppm.

TAKEAWAYS THROUGH Q3 2024

Monitoring Network and Public Portal Upgrades in 2024

- New systems have higher uptime percentages and higher time resolution data across all parameters

Erie Highlands Success

- Air monitoring at unplugged wellhead in Erie Highlands Community
- Monitoring data confirmed background average VOCs, allowing the continuation of construction at the Erie Highlands Community
- Wellhead was plugged by a contractor hired by the developer in Q3 2024

Source Attribution

- Erie's background VOCs are elevated higher than in neighboring Broomfield largely due to sources within the Front Range Landfill region
- By combining Broomfield and Erie data and resources we aim to help determine the source of the VOC elevations measured at the Landfill South monitoring station

Generally Average Background VOCs with Short Term 'Plume' Events

- VOC concentration levels are within those expected for the Colorado Front Range
- Continued analyses with these datasets will help to provide evidence for regulatory standards, such as those outlined by the EPA and Colorado's Air Pollution Control division, as well as providing insights for improvements to best practices within private industries.
- Datasets like these can help to facilitate effective and efficient actions to reduce overall emissions from the oil and gas industry and other urban sources.