



Final Report

Helping Low-Income Families Identify &
Address Hazardous Air Pollutants that Impact Health

EPA Grant #01D15120

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LaTrece James, 1st Vice President of Programs
Pastor Debreita “Brei” Taylor, 2nd Vice President of Fund Development
Yudaa Gandhi-Capio, Treasurer



*Helping Low-Income Families Identify & Address
Hazardous Air Pollutants that Impact Health*

Project Geography within Orlando, Florida included three historic Black communities: Parramore, Holden Heights and Mercy Drive. Community members are

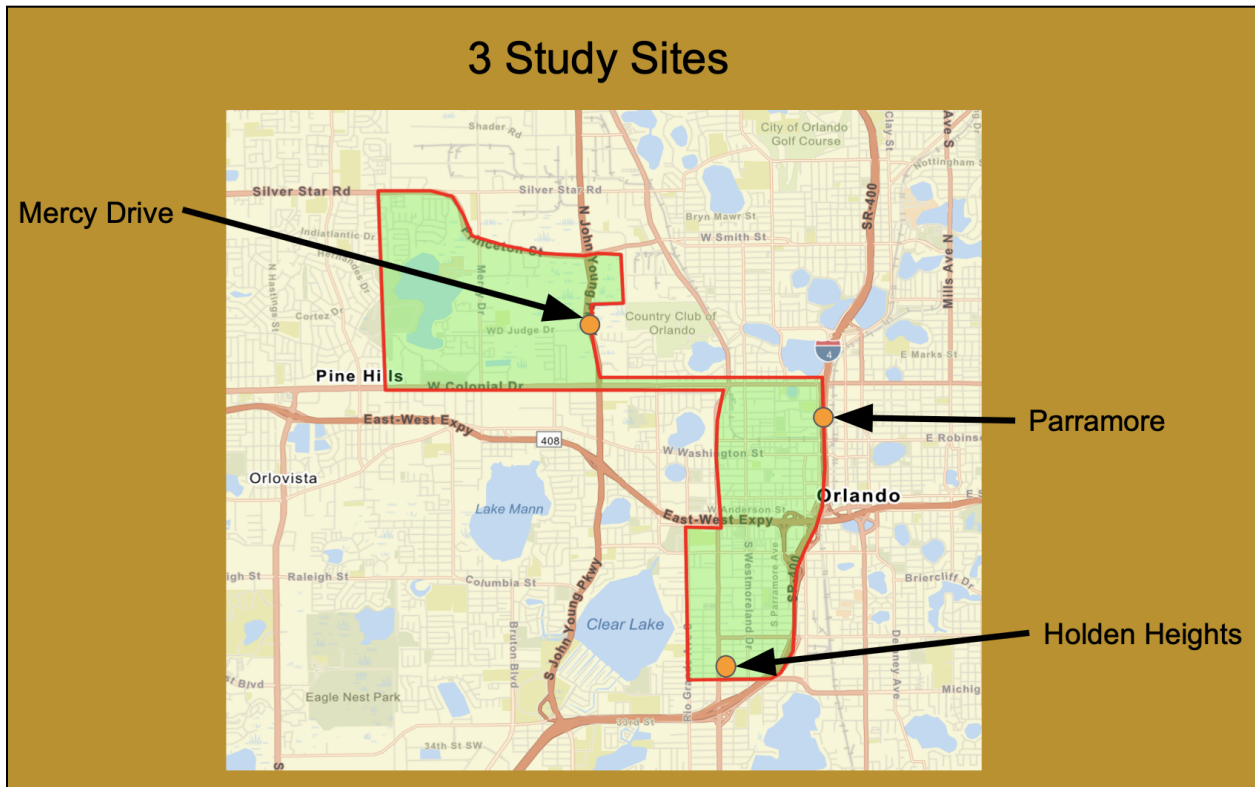




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Introduction

The project that is the subject of this report was undertaken to mitigate the negative health impacts of air pollution. It promoted Community Science and opened dialogue and information-sharing regarding air quality. Project partners included community organization Community Empowerment Partnership, Inc., environmental non-profit Save the Wekiva River and Headwaters, Inc., State Representative Bruce Antone, faith organization Unitarian Universalist Justice Florida, and academic institution University of Central Florida. Residents learned to use AirNow.gov to plan their activities to reduce exposure to air pollutants and Community Scientists learned how to monitor air quality with high quality hand held devices.

The neighborhoods that participated in this project have heavy traffic, deforestation, a paucity of green space and aggressive gentrification. State, county and city roads encircle and pass through these neighborhoods, directing commercial traffic into residential areas. Interstate 4, the 408, North John Young Pkwy (a major thoroughfare used by diesel semi-trucks to go from Interstate 4 to the 408), and major commuting thoroughfares serve as prolific sources of vehicle emissions, when vehicles often idle at a standstill. These emissions are at their worst when sports events bring large volumes of traffic to idle in and near residential streets. The three neighborhoods are underserved, and both the environment and the infrastructure are degraded. Mercy Drive, located by wetlands at the headwaters of the Wekiva River, is having an incremental 700 semi-truck trips a day added through the community due to the paving over of the wetlands, the removal of over 6,000 trees, and the construction of an industrial warehouse complex that comes within 75 ft of homes. Warehouse tenants will not be restricted from having hazardous materials on premises. Deforestation is also causing an increase in standing water and mosquitoes.

This report is focused on the air quality monitoring aspects of the project. The Table of Contents that follows has links to PDFs of reports on the results of the two surveys, the slide presentations that were presented at community events and training sessions, and links to appendices with data processing details.

Recommendations

1. The monitoring protocol must be simplified to increase reliability of data collected by Community Scientists. It would be advisable to have a real time monitor with continuous data capture using monitors that are directly connected to a computer interface with an online air quality management account.
2. Time stamps and geospatial positioning of monitors should be captured on autofill.
3. Budget must be increased to improve the accuracy and precision of the monitors.
4. Obtain more authoritative guidance on permissible levels of non-criteria air pollutants.





Kickoff

The project [Kickoff](#) took place on December 3, 2020.

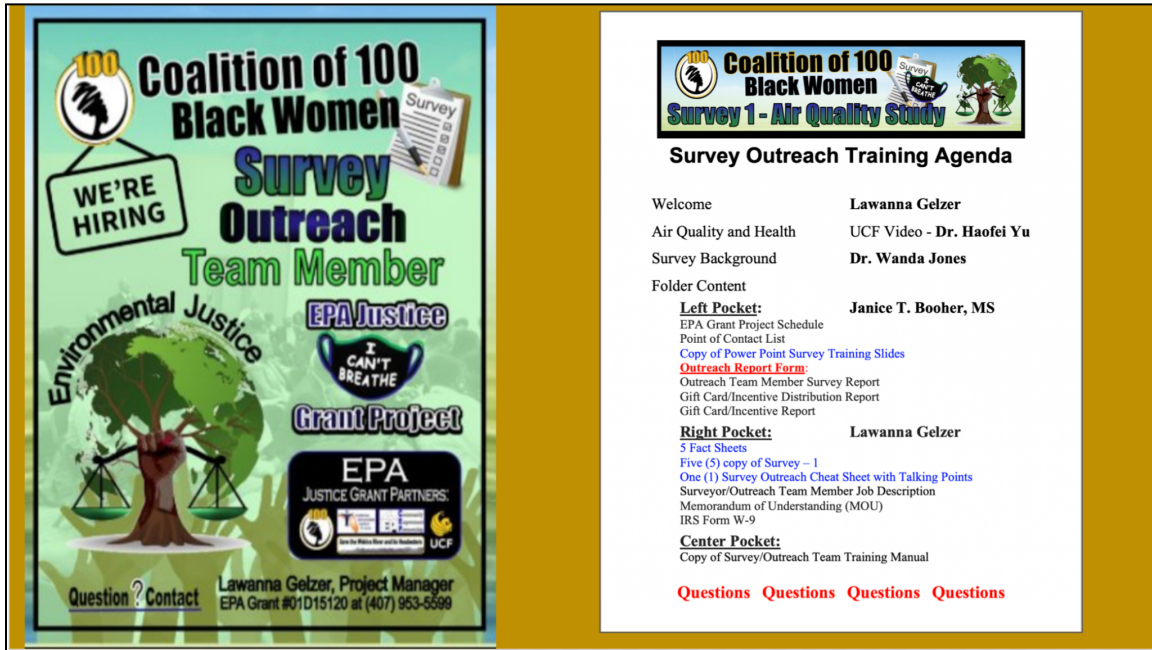
<p>Coalition of 100 Black Women Presents:</p> <p>ENVIRONMENTAL JUSTICE</p> <p>I CAN'T BREATHE VIRTUAL COMMUNITY FORUM</p> <p>Thursday, December 3rd at 6:30PM</p> <p>EPA Grant Project KICKOFF</p> <p>Be part of the solution, not part of the problem</p> <p>Environmental Justice</p> <p>ZOOM LINK: https://us20web.zoom.us/j/9576189905?pwd=ZlBka3ZlbnlnbTlmpkZmZlMmV1NGp1UT09 MEETING ID: 857 6118 9805 PASSCODE: 577663 JOIN BY PHONE: 1 (929) 205-6099</p> <p>EPA JUSTICE GRANT PARTNERS:</p> <p>Question? Contact Lawanna Gelzer, Project Manager EPA Grant #01D15120 at (407) 953-5599</p> <p>I CAN'T BREATHE I CAN'T BREATHE</p>	<p>ENVIRONMENTAL JUSTICE COMMUNITY FORUM</p> <p>Agenda</p> <p>Welcome</p> <p>EPA Grant Team</p> <p>Purpose of the Community Forum</p> <p>EPA Grant Partners</p> <p>Timeline and Overview</p> <p>Questions?</p> <p>Speakers: Dr. Wanda Jones Dr. Haofei Yu</p> <p>Call to Action</p> <p>Opportunities</p> <p>Closing Remarks</p>
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EPA Final Report**

The Kickoff was followed by the Survey 1 Training on January 5, 2021.





Coalition of 100 Black Women
Survey Outreach Team Member

WE'RE HIRING

Environmental Justice
EPA Justice
I CAN'T BREATHE
Grant Project
EPA JUSTICE GRANT PARTNERS:
Lawanna Gelzer, Project Manager
EPA Grant #01D15120 at (407) 953-5599

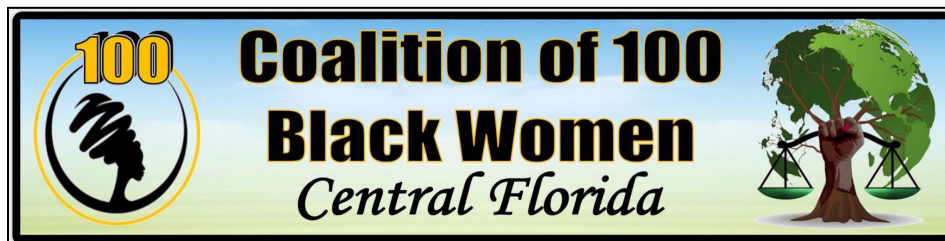
Coalition of 100 Black Women
Survey 1 - Air Quality Study

Survey Outreach Training Agenda

Welcome	Lawanna Gelzer
Air Quality and Health	UCF Video - Dr. Haofei Yu
Survey Background	Dr. Wanda Jones
Folder Content	
Left Pocket:	Janice T. Booher, MS
EPA Grant Project Schedule	
Point of Contact List	
Copy of Power Point Survey Training Slides	
Outreach Report Form:	
Outreach Team Member Survey Report	
Gift Card/Incentive Distribution Report	
Gift Card/Incentive Report	
Right Pocket:	Lawanna Gelzer
5 Fact Sheets	
Five (5) copy of Survey - 1	
One (1) Survey Outreach Cheat Sheet with Talking Points	
Surveyor/Outreach Team Member Job Description	
Memorandum of Understanding (MOU)	
IRS Form W-9	
Center Pocket:	
Copy of Survey/Outreach Team Training Manual	

Questions Questions Questions Questions

Survey 1



Coalition of 100 Black Women
Central Florida

Coalition of 100 Black Women - Central FL Air Quality Study

By completing this survey, you acknowledge that you are under no pressure to respond to the survey. If at any point you do not wish to continue, you may stop the survey.

This survey is part of an air quality study in the Parramore, Holden Heights and Mercy Drive communities funded by U.S. Environmental Protection Agency Grant #01D15120





The [Presentation on Survey 1 Results](#) took place on June 24, 2021.

Coalition of 100 Black Women
Air Quality Survey Results
Presentations Community Meeting
Thursday, June 24th @ 7PM
Virtual and Socially Distanced Event
Callahan Neighborhood Center
 101 North Parramore Ave.
 Orlando, FL 32801
Environmental Justice
I CAN'T BREATHE
EPA Justice Grant Project
EPA JUSTICE GRANT PARTNERS:
 UCF
 Question? Contact Lawanna Gelzer, Project Manager
 EPA Grant #01D15120 at (407) 953-5599

ENVIRONMENTAL JUSTICE COMMUNITY FORUM Agenda

Welcome
 EPA Grant Team
 EPA Grant Partners
 Timeline and Overview

Survey #1 Results

Speakers: Janice T. Booher, MS
 Dr. Wanda Jones

Call to Action for Community Scientists
 Opportunities
 Closing Remarks

The [Survey 1 Results Report](#) was posted on the [Central Florida Dashboard](#) shortly thereafter.

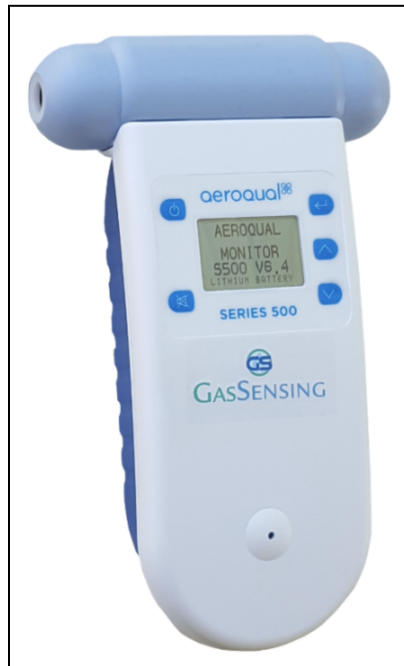
Survey 1
Survey Tool
Survey Outreach Team Training
Presentation on Survey 1 Results
Survey 1 Results Report





Monitoring

Two Community Monitoring trainings for the Spring Air Quality monitoring were conducted at the Callahan Community Center in Parramore, Florida between February 7th and and March 31, 2022, with COVID protocols in place to protect participants. The protocol required Community Scientists to record monitor readings on paper and on tablets, and to take pictures of the digital monitor readings. Additional Training took place for new Community Scientists prior to Summer Air Quality monitoring.



Aeroqual Series 500 Air Quality Monitor

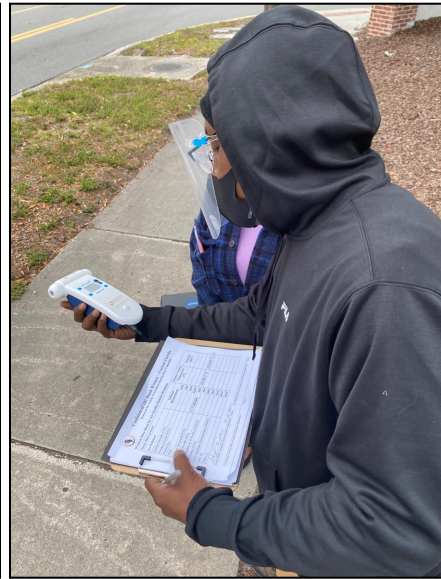
Monitoring
Community Science Training
Presentation on Monitoring Results



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Air Quality monitoring training had indoor and outdoor components, where Community Scientists learned about air pollution, how to use the monitors and how to record data.





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Measurements were taken using Aeroqual Series 500 handheld Air Quality Monitors with removable sensor heads. The monitors have digital readouts for the concentration of the gas, the temperature and the relative humidity. The sensors were purchased with sensors for the Criteria Air pollutants and other gases associated with emissions from vehicles, such as Carbon Dioxide (CO₂), Methane (MH₄), volatile organic compounds (VOCs), non methane hydrocarbons (NMHC), and formaldehyde (CH₂O).



Monitoring took place in Parramore, Mercy Drive and Holden Heights in Orlando, Florida with COVID protocols in place.

Additional Community Science Images



The banner features a circular logo on the left with the number '100' and a stylized figure. The text 'Coalition of 100 Black Women' is in black, and 'EPA Final Report' is in large blue letters. On the right is an illustration of a tree with a globe as its canopy and scales of justice at its base.

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Air quality monitoring undertaken in African American communities in Orlando, Florida included measurement of primary Criteria Air Pollutants and additional air pollutants present in vehicle emissions.. Authoritative air quality monitors that can be used to make decisions about necessary action are more expensive than this project could afford. The objective of this Air Quality Monitoring Community Science project was to determine if at any time during the monitoring program in any of the three communities either the National Ambient Air Quality Standards were exceeded for criteria air pollutants or if any of the additional vehicular emissions pollutants were at or exceeded the high end of ambient typical ranges of the pollutants to guide future Air Quality Monitoring within the community.

The EPA has established national ambient air quality standards (NAAQS) for six of the most common air pollutants called criteria air pollutants to protect public health. These six gases included Particulate Matter (2.5 and 10 microns), Ozone (O₃), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO) and Sulfur Dioxide (SO₂).

Primary standards are national ambient air quality standards designed to protect public health with an adequate margin for safety. Secondary standards are national ambient air quality standards designed to protect the public welfare from adverse effects, including those related to effects on soils, water, crops, vegetation, man-made (anthropogenic) materials, animals, wildlife, weather, visibility, weather, visibility, and climate; damage to property; transportation hazards; economic values, and personal comfort and well-being. Primary NAAQS were used to determine thresholds for the Criteria Air Pollutants.

Holden Heights was the only location where one of the six Criteria Air Pollutants exceeded its National Air Quality Standard concentration as measured by the Aeroqual hand held monitors. That pollutant was carbon monoxide, which exceeded the National Air Quality Standard concentration in 1 reading.





Table 1. Incidence of Critical Air Pollutant Readings Exceeding Primary Standards NAAQS

	PM _{2.5}	PM ₁₀	O ₃	NO ₂	CO	SO ₂
	2.5 micron particulate matter	10 micron particulate matter	Ozone	Nitrogen Dioxide	Carbon monoxide	Sulfur Dioxide
Parramore	0	0	0	0	0	0
Mercy Drive	0	0	0	0	0	0
Holden Heights	0	0	0	0	1	0
Overall	0	0	0	0	1	0

Table 2. National Air Quality Standards from the [EPA NAAQS Table](#)

Criteria Pollutant	NAAQ Thresholds
Carbon monoxide (CO)	35ppm (1 hr average)
Nitrogen dioxide (NO ₂)	0.1 ppm
Fine particulate matter (2.5 microns) (PM _{2.5})	35 µg/m ³ (24 hrs)
Particulate Matter (10 microns) (PM ₁₀)	150 µg/m ³
Ozone (O ₃)	0.070 ppm
Sulfur Dioxide (SO ₂)	0.075 ppm





Across the three communities, Carbon Dioxide (CO₂) readings were high 35 times, Methane (MH₄) readings exceeded the MH₄ global average concentration 12 times, 2 of the readings of volatile organic compounds (VOCs) exceeded the OSHA VOC permissible exposure level, 9 of the readings of non methane hydrocarbons (NMHC) exceeded the EPA hydrocarbons primary and secondary air quality standard. All 5 of the additional air pollutants emitted by vehicles that were measured were at the top of typical ranges or exceeded them on more than one occasion in each of the communities.

Table 3. Incidence of Additional Air Pollutants Measured Exceeding Typical Ambient Concentrations

	CO ₂	CH ₄	VOCs	NMHC	CH ₂ O
	Carbon dioxide	Methane	Volatile Organic Compounds	Non Methane Hydrocarbons	Formaldehyde
Parramore	10	7	0	5	3
Mercy Drive	14	3	0	2	2
Holden Heights	11	2	0	2	1
Overall	35	12	0	9	6





Because there are no National Ambient Air Quality Standards for these pollutants, the typical or usual concentrations were researched, and the following values from authoritative sources were used.

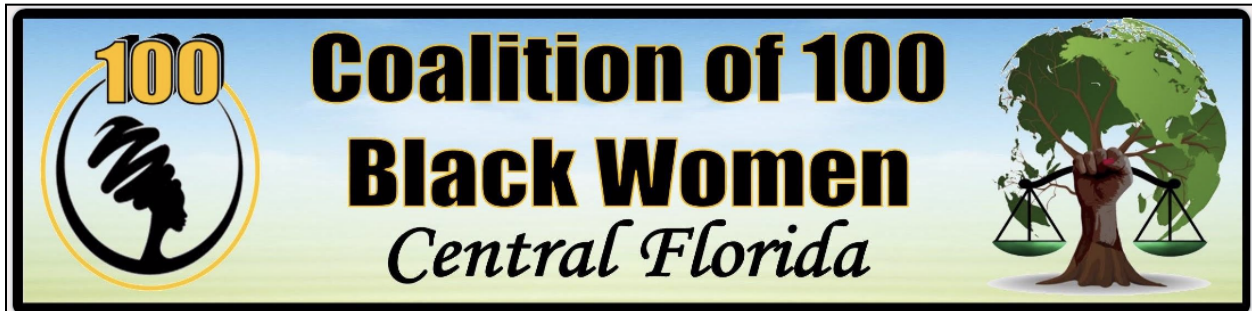
Vehicle Emissions Other than Criteria Air Pollutants

Vehicle Emission Air Pollutant	Concentrations Above Typical Levels
Carbon Dioxide (CO ₂)	FSIS - USDA : CO ₂ levels in outdoor air typically range from 300 to 400 ppm (0.03% to 0.04%) but can be as high as 600-900 ppm in metropolitan areas
Methane (CH ₄)	World Meteorological Organization Global Atmosphere Watch Programme , methane's current average global background level is 1824 ppb = 1.824 ppm
Volatile Organic Compounds (VOC)	OSHA (quoted by NAU) has adopted a Permissible VOC Exposure Level (PEL) of 75 ppm , and an action level of 0.5 ppm
Non Methane Hydrocarbons (NMHC)	Journal of Air Pollution Control Association : The primary and secondary air quality standard for hydrocarbons promulgated by the U. S. Environmental Protection Agency is 100 µg/m ³ (0.24 ppm) not to be exceeded more than once a year.
Formaldehyde	ATSDR : Formaldehyde levels in outdoor air range from 0.0002 to 0.006 ppm in rural and suburban areas and 0.001 to 0.02 ppm in urban areas.





Survey 2



Coalition of 100 Black Women - Central FL Air Quality Study 2

By completing this survey, you acknowledge that you are under no pressure to respond to the survey. If at any point you do not wish to continue, you may stop the survey.

This survey is part of an air quality study in the Parramore, Holden Heights and Mercy Drive communities funded by U.S. Environmental Protection Agency Grant #01D15120

Survey 2

[Survey 2 Tool](#)

[Survey 2 Results Report](#)





Appendix

Findings in Detail

The findings below are based on data that can be viewed in detail in [this spreadsheet](#). Physical Measurements included PM2.5, PM10

Acceptable Data and Information

Type of Measurement	Acceptable Measurements Reported	Total Measurements Reported	% Valid Submission of Monitor Data
Geospatial (latitude/longitude)	126	252	50.0%
Physical	864	1,638	52.7%
Chemical	500	938	53.3%

Acceptable Data from Each Community

Community	% Valid Physical Measurements	% Valid Chemical Measurements
Holden Heights	25.2%	25.4%
Mercy Drive	39.6%	39.6%
Parramore	35.2%	35.0%

In total for Latitude and Longitude, we had data approximately 50% valid submission of monitor data, however this may be off due to some of the [Fulcrum PDF Processing Records](#). As such, the percentages below are approximations.

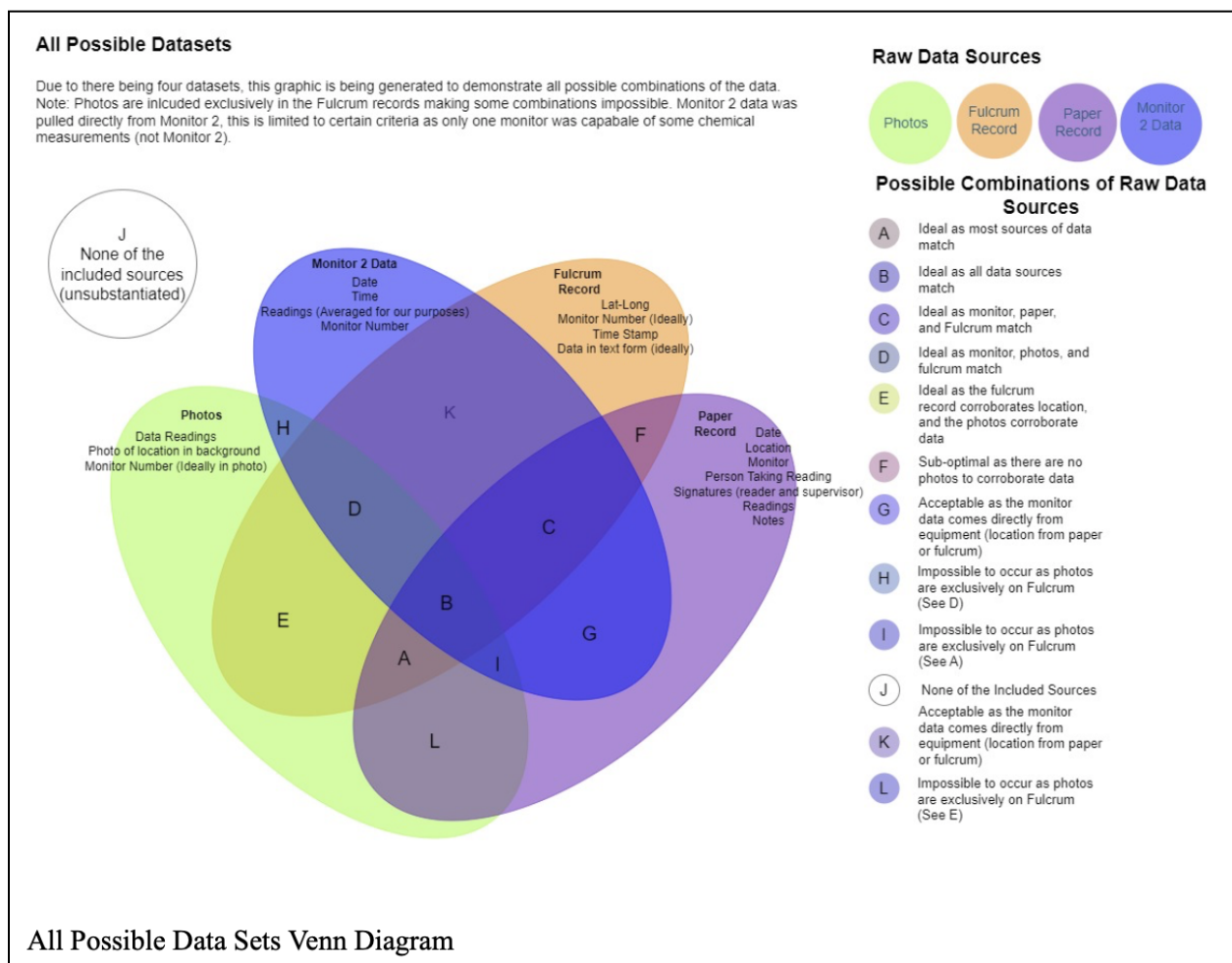




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There were ultimately 126 Latitude and Longitude Readings Collected.

There were 635 total readings that appeared as spreadsheet rows. These rows were typically data collected on a single date with the same monitor, of which 440 were eligible based on QAPP criteria for acceptability.



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There were 1364 total eligible readings collected that were Chemical and Physical, of which 500 were Chemical and 864 Physical Readings. If you were to include ineligible readings there were 2,576 total Chemical and Physical Readings, 938 Chemical and 1638 Physical respectively.

There are some interesting location-based findings in the data. The number of readings prior to data exclusion has approximately 47% of the data coming from Mercy Drive and approximately 27-28% coming from Parramore and Holden Heights. However, once the data was processed to be in compliance with the QAPP for Chemical Readings the Mercy Drive percentage of overall chemical readings drops to 39.6 percent followed by 35% in Parramore and 25.4% in Holden Heights. For Physical readings the percentages remain about the same prior to data exclusion to comply with the QAPP with Mercy Drive at 46%, Parramore at 25.4%, and Holden Heights at 28.2%. However, it is of note that Mercy Drive Physical and Chemical Readings makeup over 50% of the ineligible or excluded readings followed by Holden Heights then Parramore.

Additionally, the “no reading”, or no known attempt to gather data for any number of reasons shows some interesting findings. Mercy Drive consistently has readings from 45-51%, whereas Parramore ranges from 15-25% and Holden Heights ranges from 28-33%. This may indicate an issue with conditions such as rain or other factors affecting data collection.

For Parramore Data, approximately 70% of Latitude, Longitude, Record IDs, Server Updated, and Time data were admissible. These fields are auto-generated by Fulcrum upon submission indicating a 70% submission rate from Parramore. For Chemical Readings, 45.5% were eligible, 24.4% were ineligible, and 30.1% were not taken at all. For Physical Readings, 43.4% were eligible, 23.7% were ineligible, and 32.9% were not taken at all.

For Mercy Drive Data, approximately 45% of Latitude, Longitude, Record IDs, Server Updated, and Time data were admissible. These fields are auto-generated by Fulcrum upon submission indicating a 45% submission rate from Mercy Drive. Of the total Chemical Readings, 31% were eligible, 35.6% were ineligible, and 33.4% were not taken at all. Of the total Physical Readings, 29.5% were eligible, 34.5% were ineligible, and 36% were not taken at all.

For Holden Heights Data, approximately 38% of Latitude, Longitude, Record IDs, Server Updated, and Time data were admissible. These fields are auto-generated by Fulcrum upon submission indicating a 38% submission rate from Holden Heights. For total Chemical



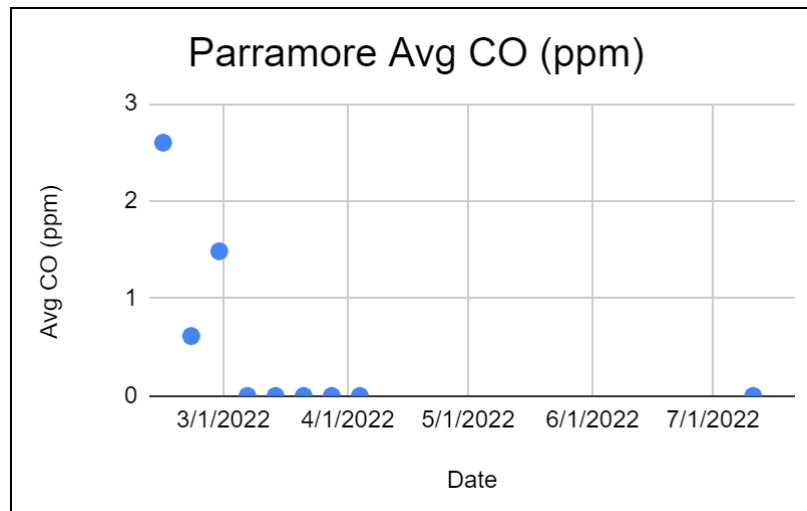


Readings, 34% were eligible, 31.3% were ineligible, and 34.8% were not taken at all. For total Physical Readings, 32.1% were eligible, 30.6% were ineligible, and 37.4% were not taken at all.

Criteria Pollutants

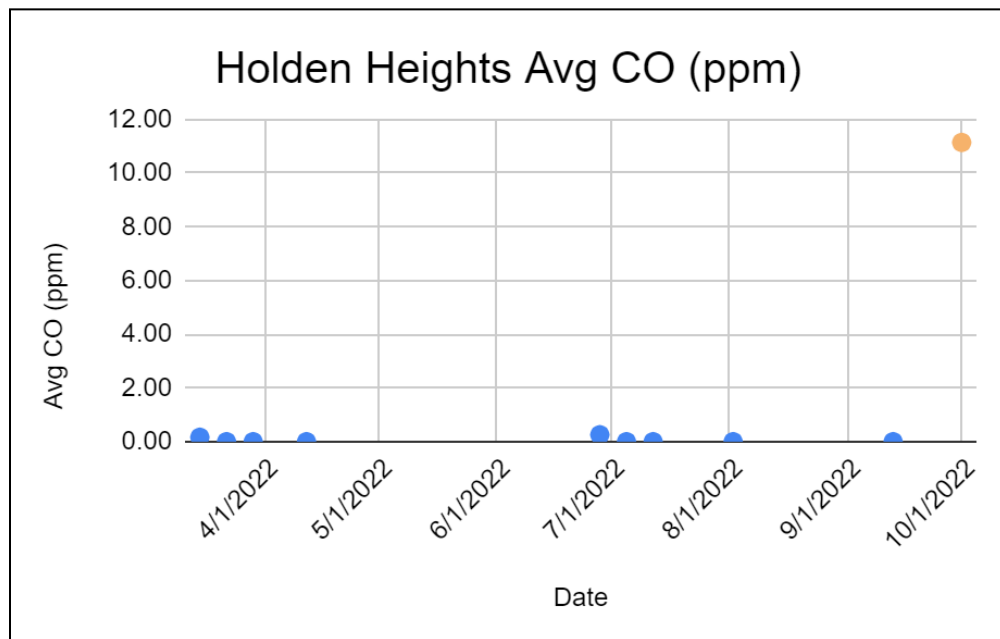
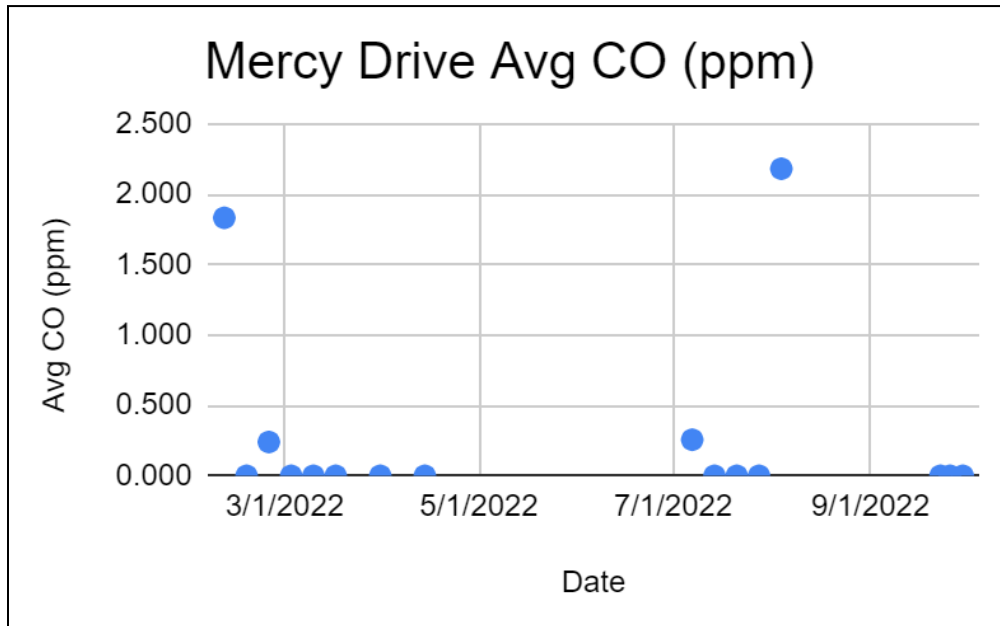
CO

Carbon Monoxide (CO) is a critical pollutant that has a series of ranges. Carbon monoxide (CO) is a colorless, odorless gas that can increase the severity of lung ailments, cause dizziness, fatigue, nausea, and even death. EPA has defined the national ambient air quality standard (NAAQS) for carbon monoxide as nine parts per million averaged over an eight-hour period, and this threshold cannot be exceeded more than once a year or an area would be violating the standard. ([Source](#)) According to the NAAQS Table if measured over 8 hours the levels should not exceed 9 ppm. If the pollutants is measured for 1 hour the levels should not exceed 35 ppm. ([Source](#)) In Holden Heights, the measurement exceeded 10 ppm at 11.14 ppm on 10/1/2022. The relative humidity with the reading was 67.75% and the temperature in fahrenheit was 77.18 degrees. The readings in Parramore and Mercy Drive did not exceed 3 ppm for the duration of the measurement period.





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NO2

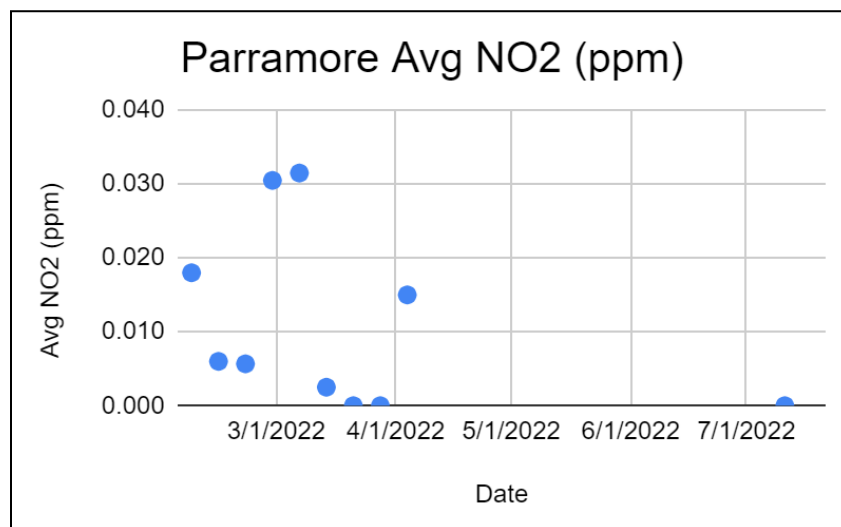
Nitrogen Dioxide (NO₂) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NO_x). Other nitrogen oxides include nitrous acid and nitric acid. NO₂ is used as the indicator for the larger group of nitrogen oxides.

NO₂ primarily gets in the air from the burning of fuel. NO₂ forms from emissions from cars, trucks and buses, power plants, and off-road equipment.

Breathing air with a high concentration of NO₂ can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO₂ may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO₂.

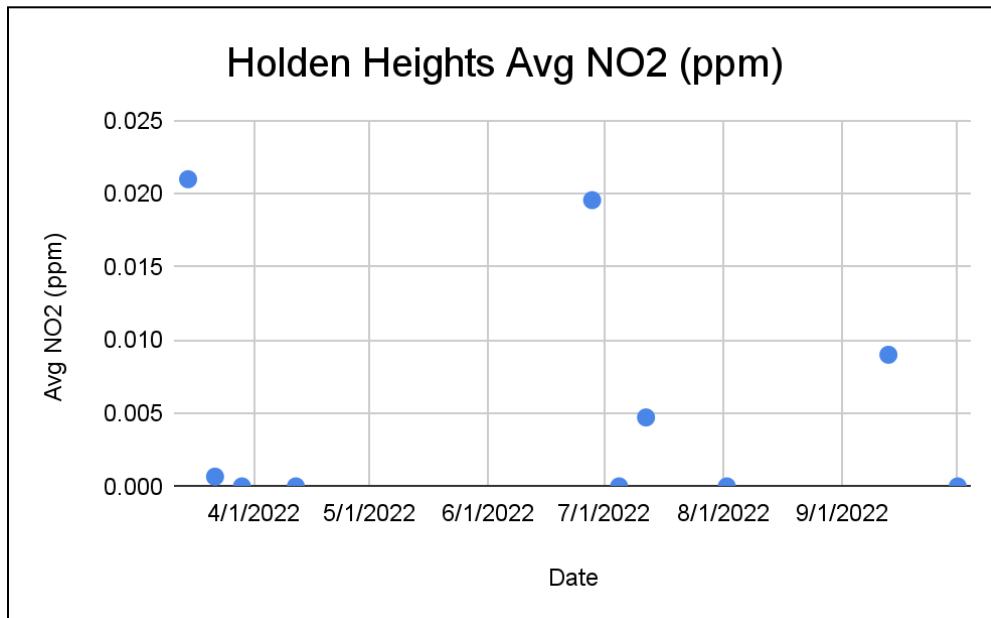
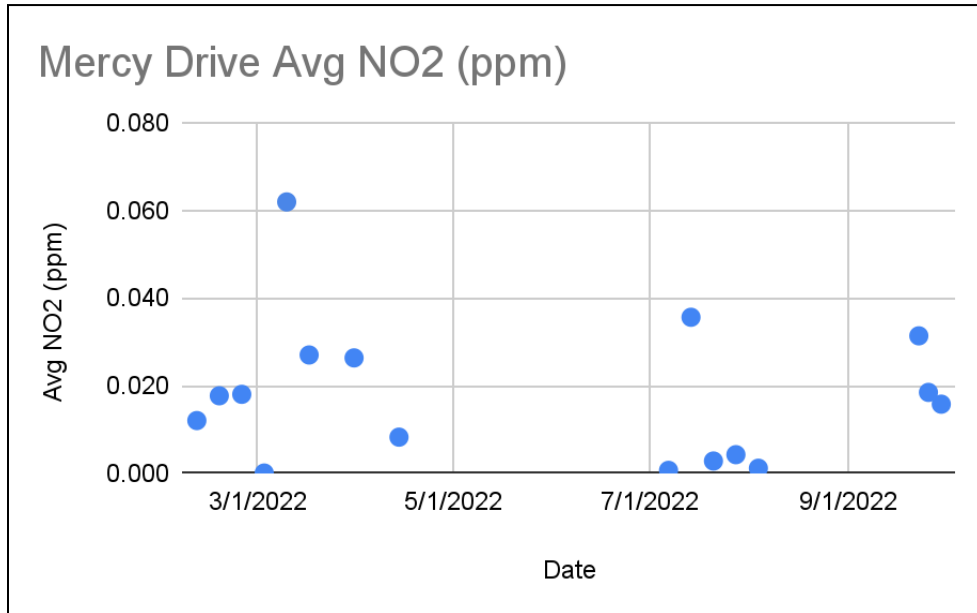
[\(Source\)](#)

The official level of the **annual NO₂ standard is 0.053 ppm**, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard. The form of the 1-hour standard is the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum NO₂ concentrations. NO₂ 0.1 ppm (98th percentile of 1-hour daily maximum concentrations, averaged over 3 years) It is important to note that NO₂ 100ppb = 0.1ppm. [\(Source\)](#)[\(Source\)](#) While none of our readings exceeded the NO₂ threshold of 0.1 ppm, the highest reading occurred at the Mercy Drive location on 3/10/2022 there was a reading of 0.062 ppm.





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O3

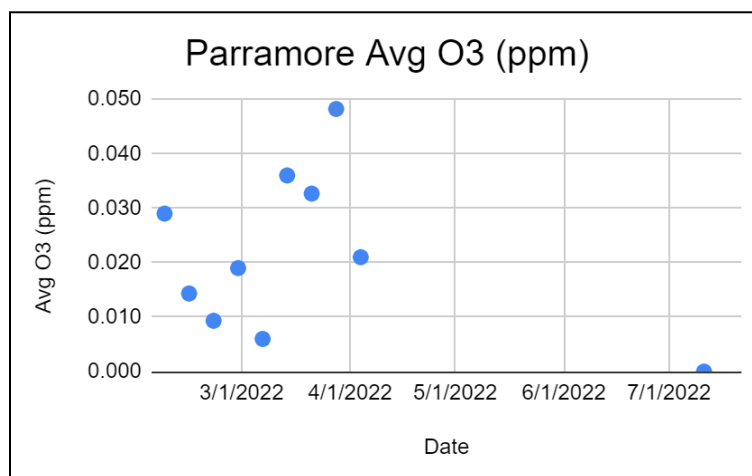
People most at risk from breathing air containing ozone include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers. In addition, people with certain genetic characteristics, and people with reduced intake of certain nutrients, such as vitamins C and E, are at greater risk from ozone exposure.

Depending on the level of exposure, ozone can:

- Cause coughing and sore or scratchy throat.
- Make it more difficult to breathe deeply and vigorously and cause pain when taking a deep breath.
- Inflammate and damage the airways.
- Make the lungs more susceptible to infection.
- Aggravate lung diseases such as asthma, emphysema, and chronic bronchitis.
- Increase the frequency of asthma attacks.

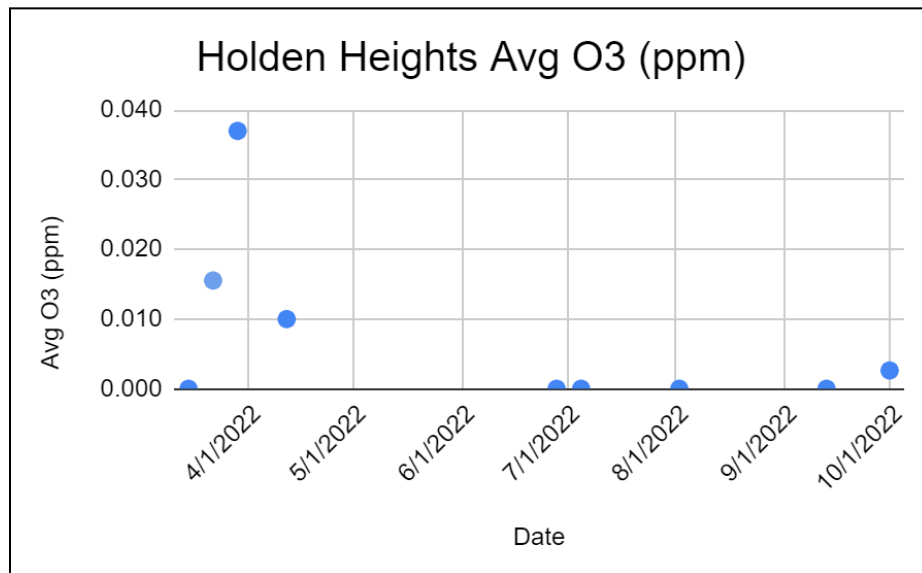
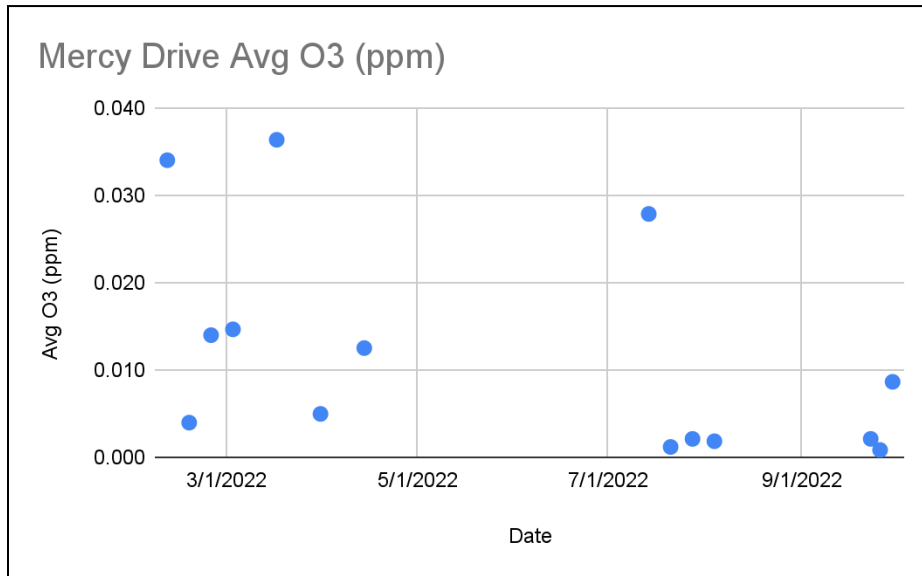
[\(Source\)](#)

The threshold for concern is currently derived from Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years at a level of 0.070 ppm. Our readings did not exceed this threshold, however did regularly exceed 0.03 ppm with a maximum reading of 0.048 at Parramore on 3/28/2022.





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PM2.5

Fine particles (PM2.5) are the main cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas. The size of particles is directly linked to their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. People with heart or lung diseases, children, and older adults are the most likely to be affected by particle pollution exposure.

Exposure to such particles can affect both your lungs and your heart. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- premature death in people with heart or lung disease
- nonfatal heart attacks
- irregular heartbeat
- aggravated [asthma](#)
- decreased lung function
- increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

[\(Source\)](#)

The upper limit of annual PM2.5 as per the 2005 standards, which is what countries now follow, is 10 microgram per cubic metre. That **has now been revised to five microgram per cubic metre.**

[\(Source\)](#) The EPA has primary and secondary standards for PM2.5 readings. Seen below from the [NAAQs Table](#).

primary	1 year	12.0 µg/m ³	annual mean, averaged over 3 years
secondary	1 year	15.0 µg/m ³	annual mean, averaged over 3 years
primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years

Regardless of the threshold you apply, only one reading that was taken exceeds these thresholds. The reading was taken in Holden Heights on 10/1/2022 and was at 33.556 ppm exceeding two of the three criteria below. Several of the readings in Parramore have reference data collected by UCF, this is seen in a chart below.



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[Images of Dr. Haofei Yu's Mobile Lab and field monitoring at W Amelia St & N Hughey in Parramore](#)





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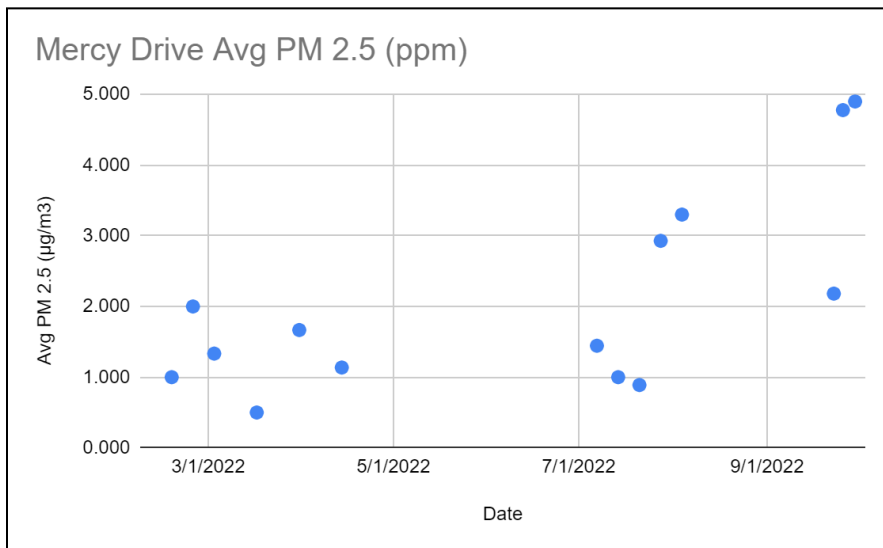
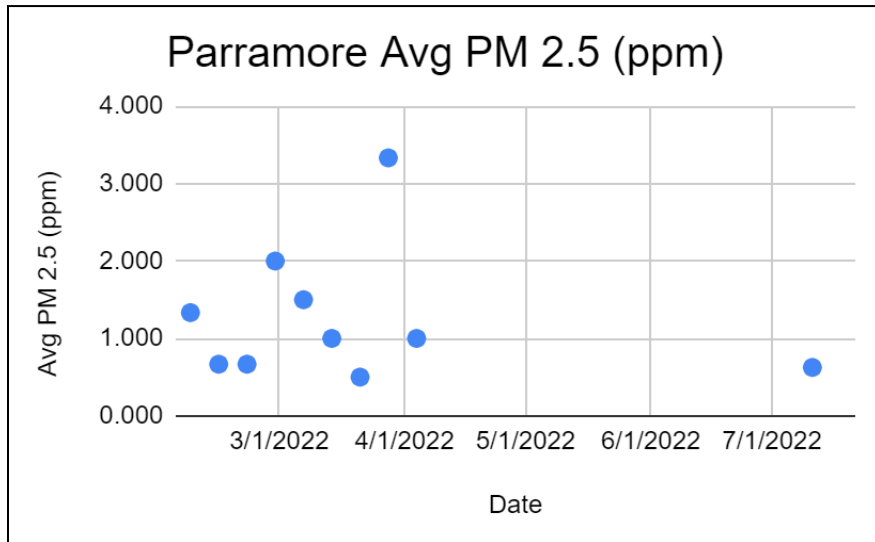
Dr. Haofei Yu, Department of Civil, Environmental and Construction Engineering, University of Central Florida, brought his field equipment to monitor to W Amelia St and N Hughey Ave.

Folder	File	Location	date	function	PM2.5 Conc (UCF)	PM2.5 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Average	8.210562879	1.5
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Median	7.499712	1.5
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	PM_data_2022 0321.xlsx	Parramore	3/21/2022	2 Average	20.09571224	0.5
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	PM_data_2022 0321.xlsx	Parramore	3/21/2022	2 Median	20.113632	0.5



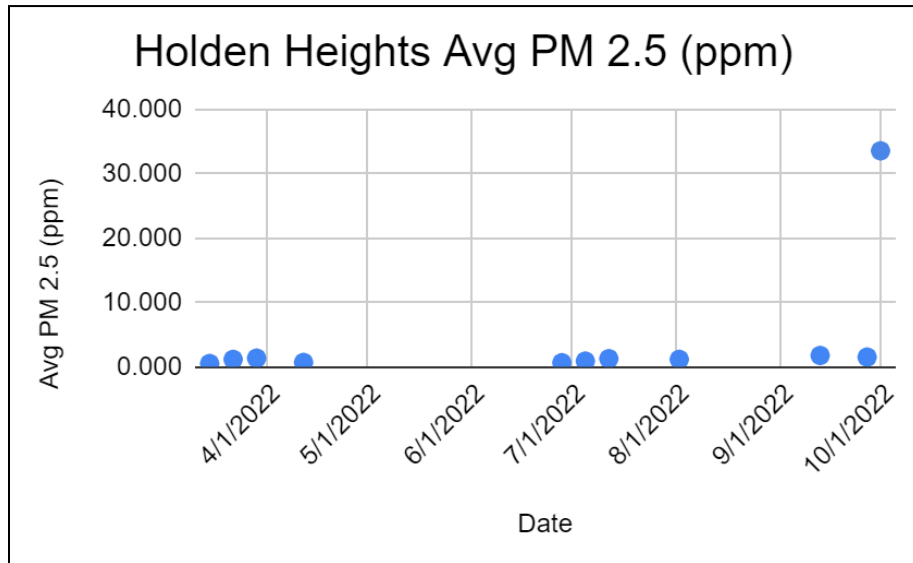


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PM10

Fine particles (PM10) are the main cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas. The size of particles is directly linked to their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. People with heart or lung diseases, children, and older adults are the most likely to be affected by particle pollution exposure.

Exposure to such particles can affect both your lungs and your heart. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- premature death in people with heart or lung disease
- nonfatal heart attacks
- irregular heartbeat
- aggravated [asthma](#)
- decreased lung function
- increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

[\(Source\)](#)

The upper limit of annual PM10 as per the 2005 standards, which is what countries now follow, is 10 microgram per cubic metre. That **has now been revised to five microgram per cubic metre.**

[\(Source\)](#) The EPA has a threshold of 150 µg/m3 in a period of 24 hours not to be exceeded more than once per year on average over 3 years. [NAAQs Table](#). The highest reading was taken in Holden Heights on 10/1/2022 and was at 31.8889 ppm exceeding two of the three criteria below. The second highest reading was taken in Mercy Drive on 9/26/2022 at 9.889 ppm. Several of the readings in Parramore have reference data collected by UCF, this is seen in a chart below.

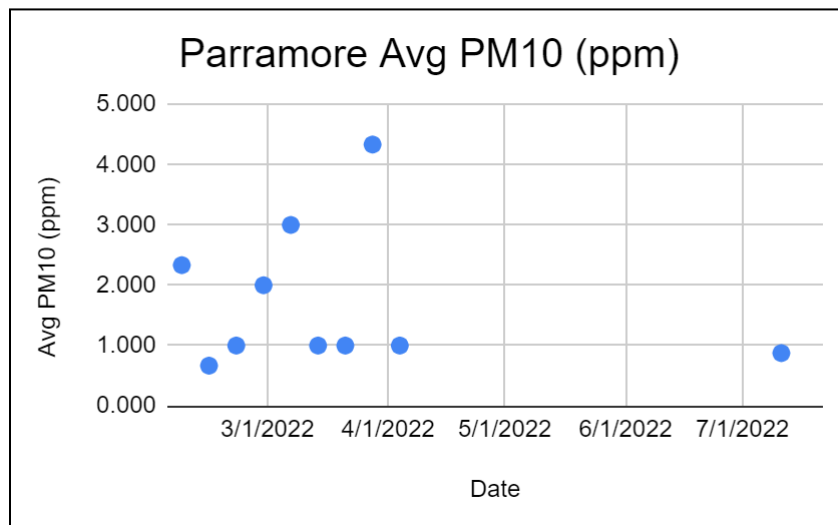
Folder	File	Location	date	function	PM10 Conc (UCF)	PM10 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Average	24.14328185	3
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Median	24.343968	3





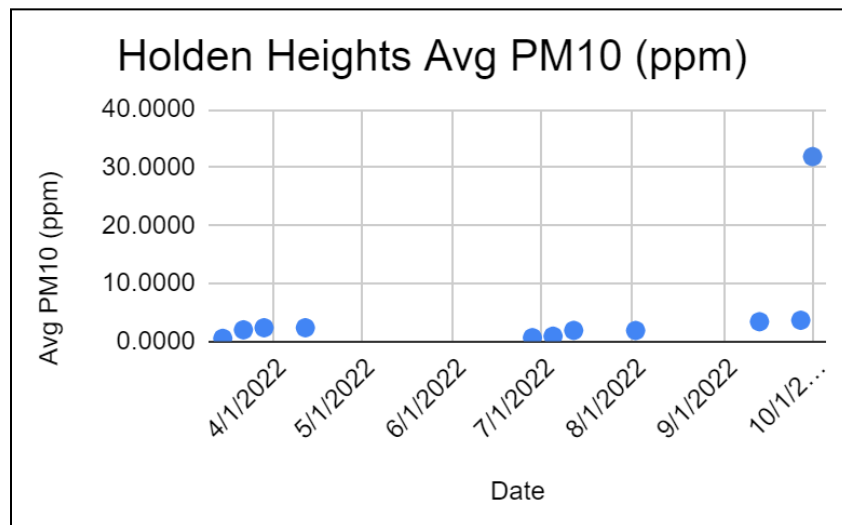
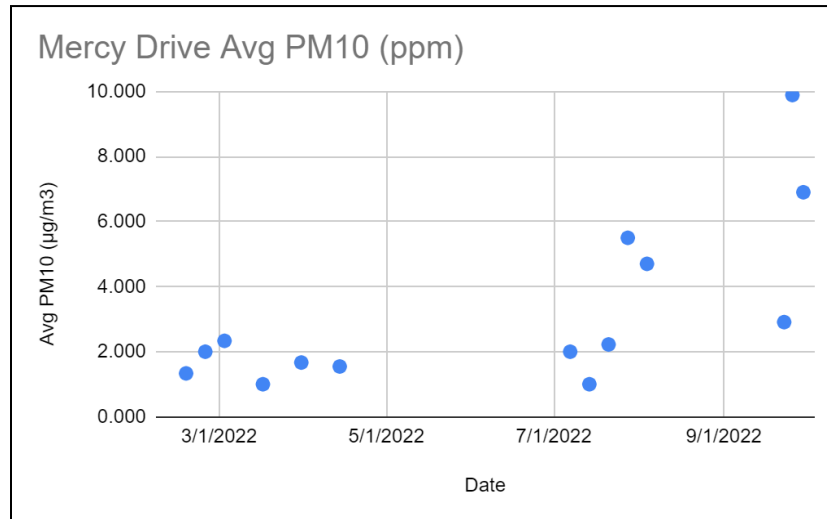
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Folder	File	Location	date	function	PM10 Conc (UCF)	PM10 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	PM_data_20220321.xlsx	Parramore	3/21/2022	Average	6.850594443	1
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	PM_data_20220321.xlsx	Parramore	3/21/2022	Median	6.58416	1





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<p>NAAQs</p>	<p>PM10. 150 µg/m³ (not to be exceeded more than once a year)</p>	<p><u>WHO</u>: The 24-hour ceiling used to be 25 microgram but has now dropped to 15. The PM10, or particulate matter of size exceeding 10 microgram, upper limit is 20 microgram and has now been revised to 15 whereas the 24-hour value has been revised from 50 to 45 microgram.</p>
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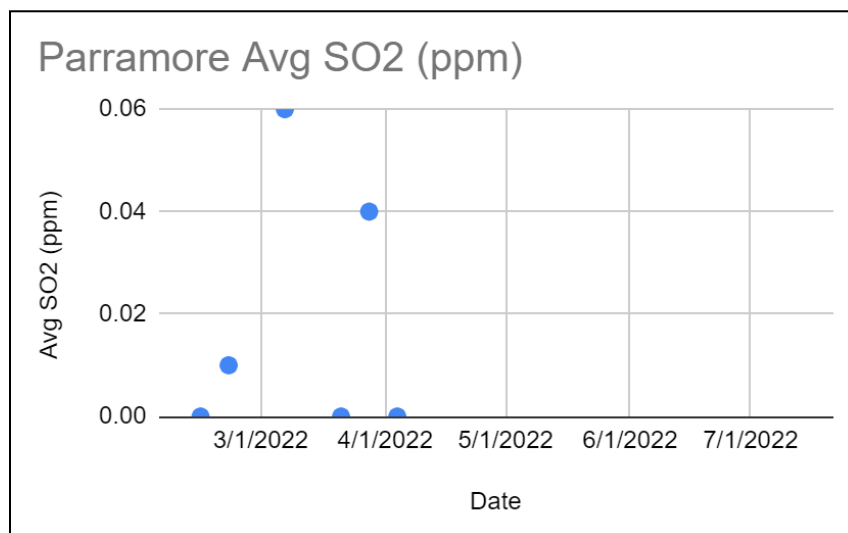




SO2

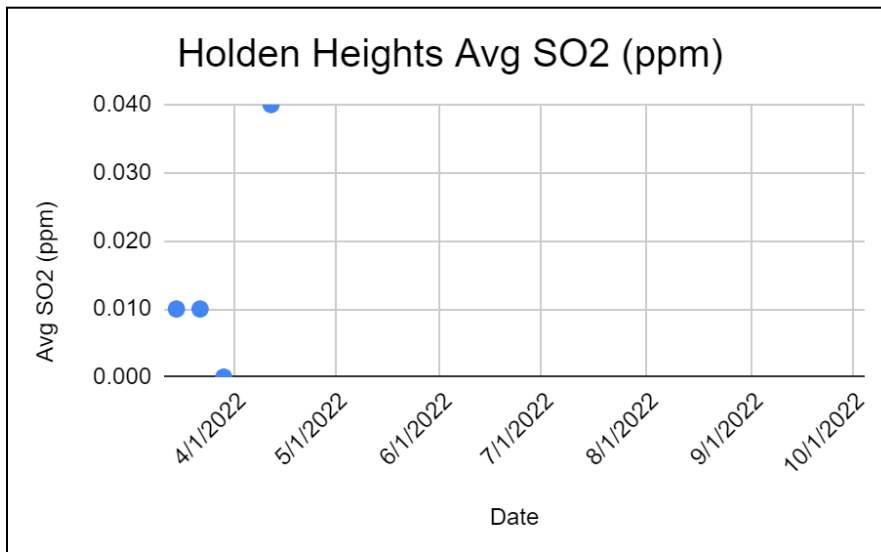
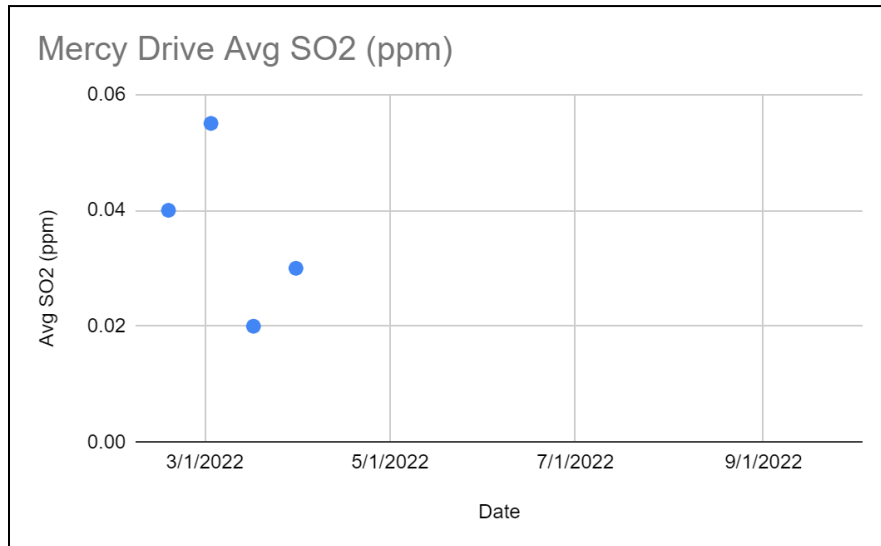
Sulfur dioxide is a colorless gas that has a strong, stinging odor. It has many industrial and agricultural uses. Most sulfur dioxide comes from burning fossil fuels containing sulfur and is a major part of air pollution. It is shipped and handled as a compressed gas in a special container. Some foods and wines are preserved with small amounts of sulfur dioxide that are safe for most people. Inhaling sulfur dioxide causes irritation to the nose, eyes, throat, and lungs. Typical symptoms include sore throat, runny nose, burning eyes, and cough. Inhaling high levels can cause swollen lungs and difficulty breathing. ([Source](#))

The existing standard, established in 2010, is 75 parts per billion based on the 3-year average of the 99th percentile of the yearly distribution of 1-hour daily maximum concentrations. ([Source](#)) The secondary threshold is over three hours not to be exceeded more than once per year at a level of 0.5 ppm ([NAAQs Table](#)). 75 ppb is the equivalent of 0.075 ppm. As our readings were taken in hour long intervals, we did not exceed the 0.075 ppm criteria. However, in Mercy Drive on 3/3/2022 the reading taken was 0.06 ppm. In Parramore on 3/7/2022, the reading taken was 0.06 ppm. These were the only readings that would exceed the secondary SO2 threshold of 0.05 ppm.





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Additional Pollutants CO2

Carbon dioxide (CO2) is a colorless, odorless, non-flammable gas that naturally occurs in the atmosphere. CO2 is produced by body metabolism and is a normal component of exhaled breath. It also results from the burning of fossil fuels and natural sources such as volcanic eruptions. CO2 levels in outdoor air typically range from 300 to 400 ppm (0.03% to 0.04%) but can be as high as 600-900 ppm in metropolitan areas. Although it is most commonly present as a gas, CO2 can also exist in a solid (dry ice) form. ([Source](#))

All 35 readings taken at all three locations exceeded the 400 ppm threshold. The highest reading at the Parramore location was 505.5 ppm. The readings that exceeded the threshold had a relative humidity ranges from 27.96666667% to 82%. The temperature in Fahrenheit ranges from 62.9 to 105.3725 degrees. An important note is that the highest recorded temperature is 93 degrees fahrenheit. ([Source](#)) Several of the readings in Parramore have reference data collected by UCF, this is seen in a chart below.

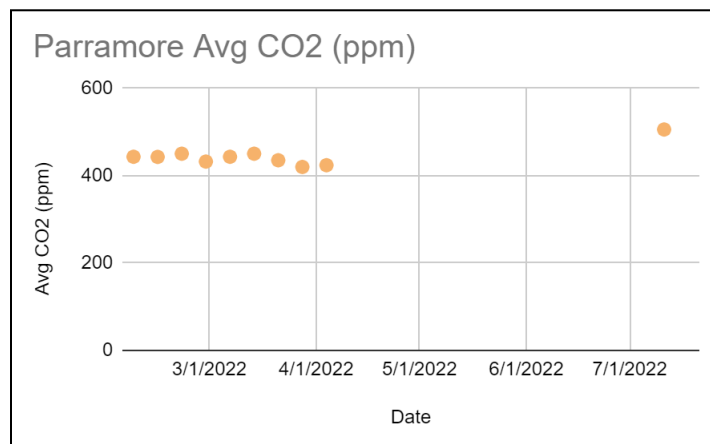
Folder	File	Location	date	function	CO2 (ppm) (UCF)	CO2 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	2/21/2022	Average	428.164071	450
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	2/21/2022	Median	424.88498	447
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Average	424.0827859	443
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Median	421.29736	443
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	CO2&CH	Parramore	3/21/2022	Average	429.3584233	435





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Folder	File	Location	date	function	CO2 (ppm) (UCF)	CO2 Average (ppm) (Monitor Findings)
u/1/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	4_data_20220321.xlsx					
https://drive.google.com/drive/folders/1NoU1AHx3q3T75MfsiXHgEgh5LtFowyPf	CO2&CH4_data_20220321.xlsx	Parramore	3/21/2022	Median	427.663225	432



The highest reading at the Mercy Drive location was 563.3 ppm. The readings that exceeded the threshold had a relative humidity ranges from 31.17777778% to 73.26666667%. The temperature in Fahrenheit ranges from 66.02 to 110.96 degrees. Several dates' temperatures exceeded the historical highs: 7/7/2022, 7/14/2022, 7/21/2022, and 7/28/2022. These values are below with the historical readings. Additionally, 8 of these reading exceed 500 ppm. The CO₂ levels measured with the Aeroqual monitors were similar to the CO₂ levels measured by the more sophisticated UCF monitor.

Date	Measured Value	Historical High Value	URL
7/7/2022	97.34	91	https://www.wunderground.com/history/daily/us/fl/miami/KMIA/date

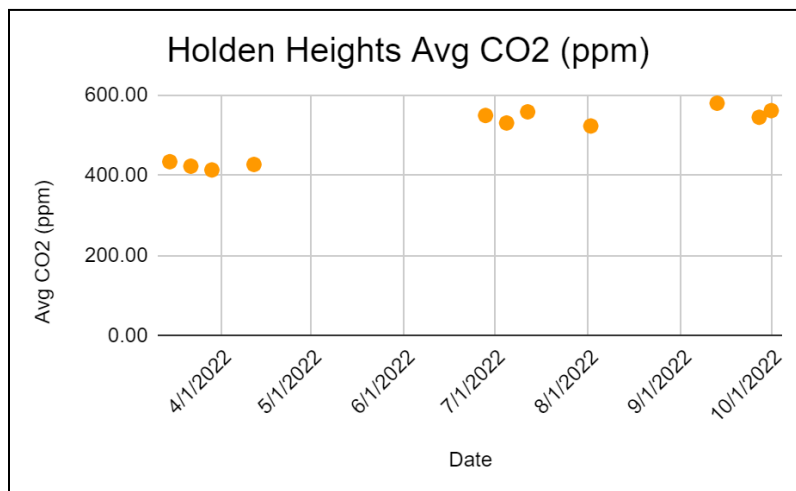




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			/2022-7-7
7/14/2022	106.72	90	https://www.wunderground.com/history/daily/us/fl/miami/KMIA/date/2022-7-14
7/21/2022	110.96	90	https://www.wunderground.com/history/daily/us/fl/miami/KMIA/date/2022-7-21
7/28/2022	102.92	90	https://www.wunderground.com/history/daily/us/fl/miami/KMIA/date/2022-7-28

The highest reading at the Mercy Drive location was 580.29 ppm. The readings that exceeded the threshold had a relative humidity range from 31.96666667% to 75.65%. The temperature in Fahrenheit ranges from 74.03 to 98.02 degrees. One date had temperatures that exceeded the historical highs: 7/12/2022. The historical temperature high is 92 degrees fahrenheit versus the 98.015 measured on the monitor when taking our reading. Additionally, 7 of these readings exceed 500 ppm.





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CH4

Methane is a colorless, highly flammable gas which is the primary component of natural gas. It may also be referred to as biogas, or marsh gas. It may be stored and/or transported under pressure as a liquid-gas. Natural gas is odorless therefore to help people detect any leaks a harmless chemical is added to it to make it easier to smell. It is described as a rotten egg or hydrogen sulfide smell. ([Source](#))

According to the World Meteorological Organization Global Atmosphere Watch Programme, methane’s current average global background level is 1824 ppb = 1.824 ppm. All three locations where readings were conducted exceeded 1.824 ppm. All three of our locations exceeded this threshold.

Parramore had 7 out of 8 readings exceed the 1.824 ppm threshold. 6 of the readings exceeding this threshold were greater than or equal to 5 ppm, with a maximum of 8 ppm. The readings that exceeded the threshold had a relative humidity range from 37.8% to 68.5%. The temperature in Fahrenheit ranges from 63.5 to 82.76 degrees. Several of the readings in Parramore have reference data collected by UCF, this is seen in a chart below.

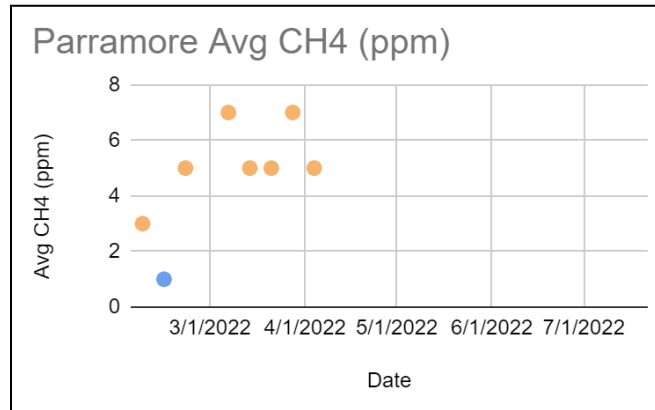
Folder	File	Location	date	function	Methane (ppb) (UCF)	CH4 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	Data.xlsx	Parramore	2/21/2022	Average	2022.249154	5
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	Data.xlsx	Parramore	2/21/2022	Median	2020.41775	5
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Average	2002.663821	7
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	Data.xlsx	Parramore	3/7/2022	Median	1996.4512	7
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	CO2&CH4_data_20220321.xlsx	Parramore	3/21/2022	Average	2006.557722	5





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Folder	File	Location	date	function	Methane (ppb) (UCF)	CH4 Average (ppm) (Monitor Findings)
https://drive.google.com/drive/u/1/folders/1NoU1AHx3q3T75MfsiXHgEg h5LtFowyPf	CO2&CH4_data_20220321.xlsx	Parramore	3/21/2022	Median	2004.64015	5

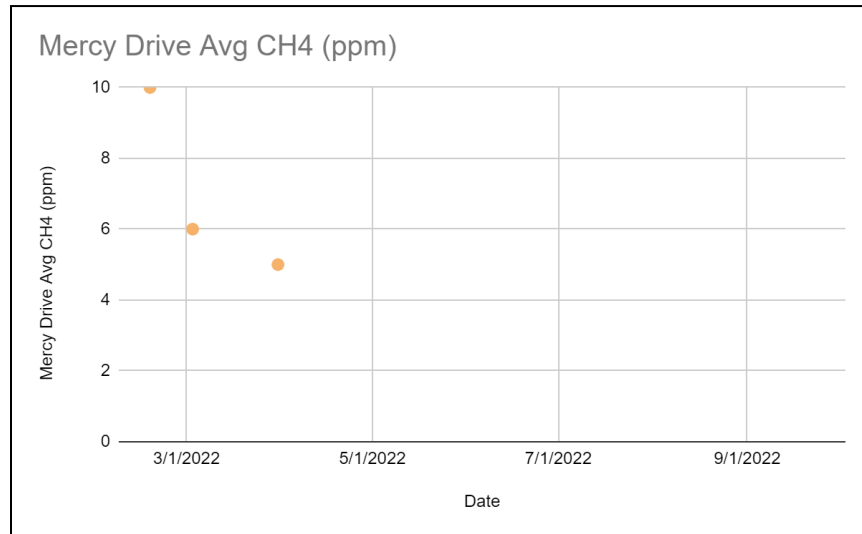


Mercy Drive had all three readings exceed the 1.824 ppm threshold. The readings were 5 ppm on 3/31/2022, 6 ppm on 3/3/2022, and 10 ppm on 2/17/2022. The readings that exceeded the threshold had a relative humidity range from 57.15% to 76.50%. The temperature in Fahrenheit ranges from 74.93 to 80.6 degrees. The Aeroqual monitor readings on 3/21/2022 were higher than the UCF monitor readings.

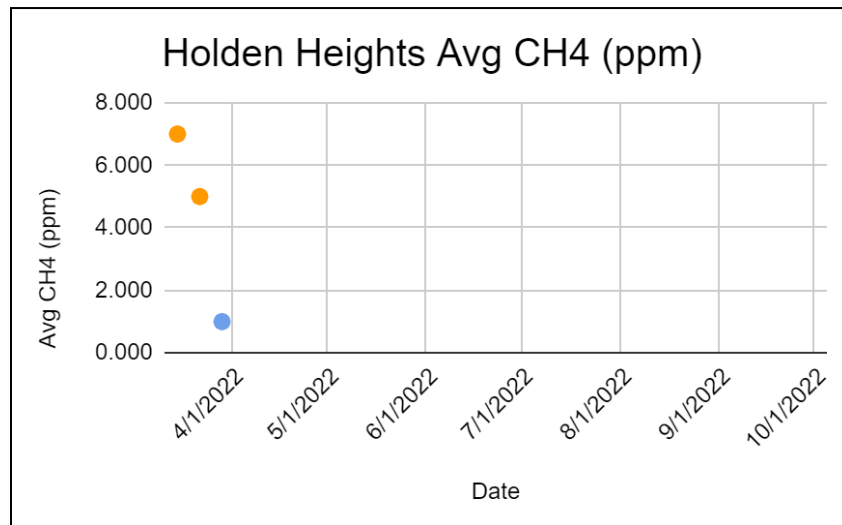




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Holden Heights had 2 out of 3 readings exceed the 1.824 ppm threshold. 2 of the readings exceeding this threshold were greater than or equal to 5 ppm, with a maximum of 7 ppm. The relative humidity exceeded readings ranges from 63.50% to 77.60%. The temperature in Fahrenheit ranges from 73.40 to 75.56 degrees.





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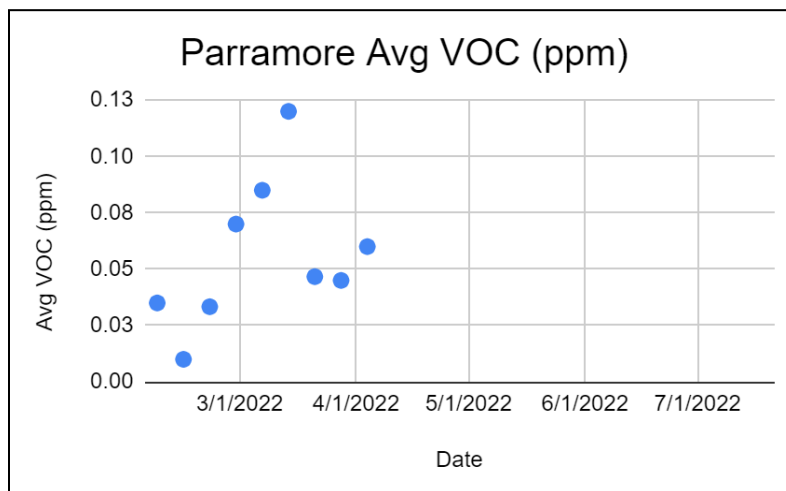
VOC

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. This is a very broad set of chemicals. VOCs include a variety of chemicals, some of which may have short and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by a wide array of products numbering in the thousands.

Volatile Organic Compounds (VOCs) come from paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions. Organic chemicals are widely used as ingredients in household products. Paints, varnishes, and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing, and hobby products. Fuels are made up of organic chemicals. All of these products can release organic compounds while you are using them or when they are stored.

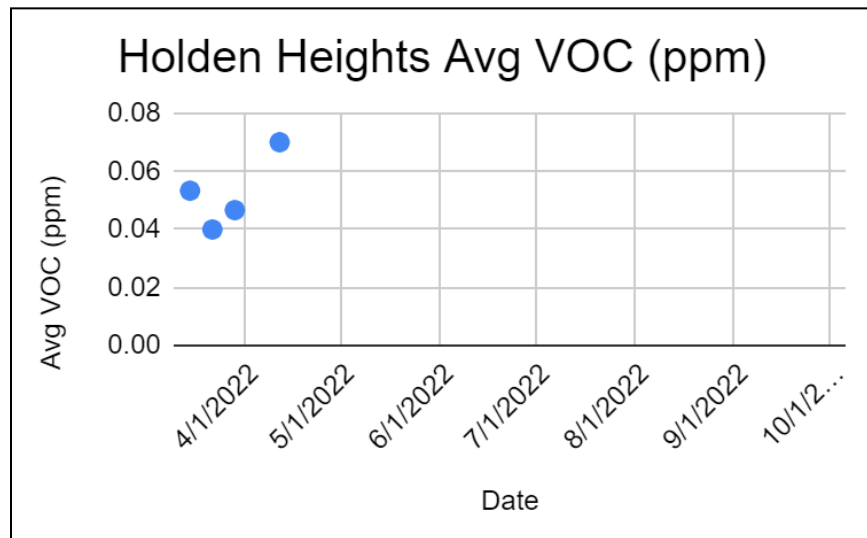
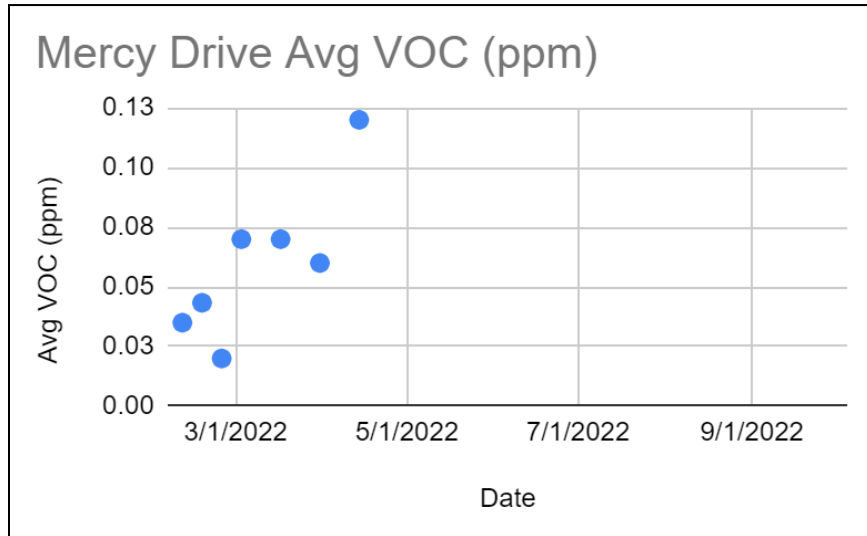
Volatile Organic Compounds (VOCs) are a health hazard resulting in eye, nose, and throat irritation, headaches, loss of coordination, nausea, damage to liver, kidney, and central nervous system. Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, and dizziness. ([Source](#))([Source](#))

OSHA (quoted by NAU) has adopted a Permissible VOC Exposure Level (PEL) of **.75 ppm**, and an action level of 0.5 ppm. None of the locations exceeded the action level of 0.5 ppm.





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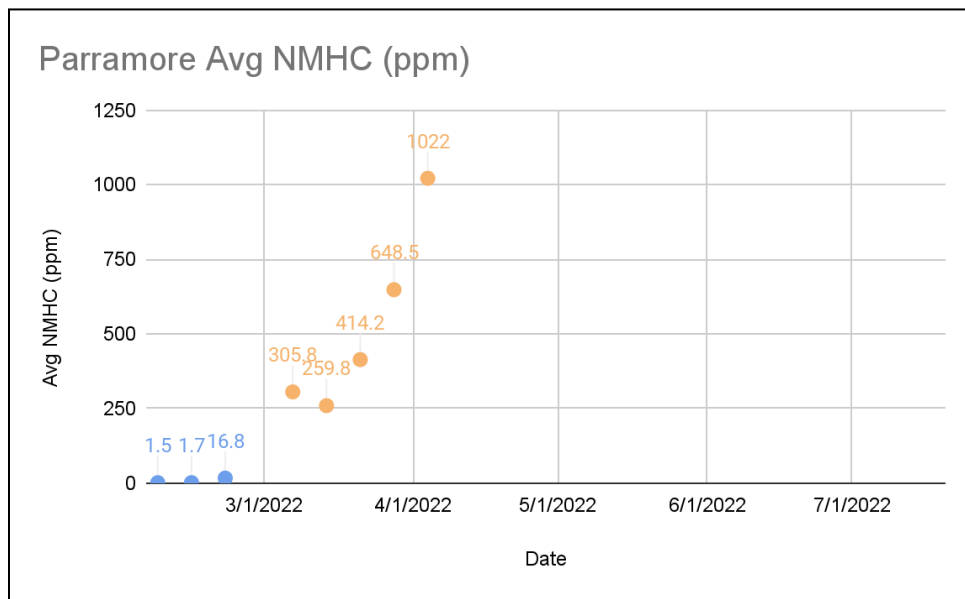


NMHC

The primary and secondary air quality standard for hydrocarbons promulgated by the U. S. Environmental Protection Agency is 100 µg/m³ (**0.24 ppm**) not to be exceeded more than once a year. ([Source](#))

All three locations exceeded the 100 µg/m³ (0.24 ppm) threshold.

In Parramore, 5 out of 8 readings exceeded this threshold. The highest reading was taken on 4/4/2022 at 1022 ppm. The lowest reading exceeding this threshold was on 3/14/2022 at 259.8 ppm. Parramore readings that exceeded the threshold had relative humidity ranges from 37.80% to 68.40%. The temperature in Fahrenheit ranges from 70.16 to 80.15 degrees.

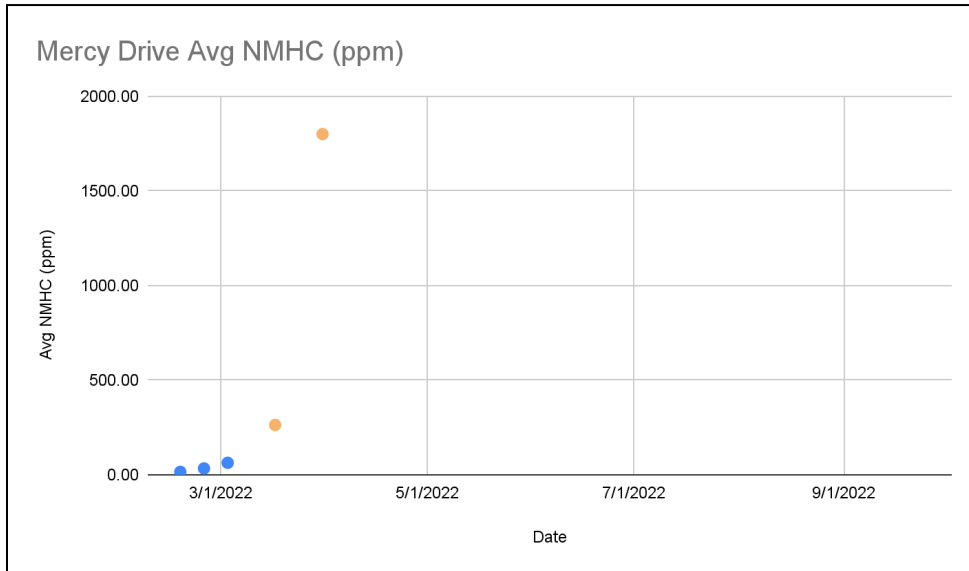


In Mercy Drive, 2 out of 5 readings exceeded this threshold. The highest reading was taken on 3/31/2022 at 1800 ppm. The lowest reading exceeding this threshold was 259.8 ppm. Parramore readings that exceeded the threshold had relative humidity ranges from 67.80% to 79.20%. The temperature in Fahrenheit ranges from 71.42 to 79.52 degrees.

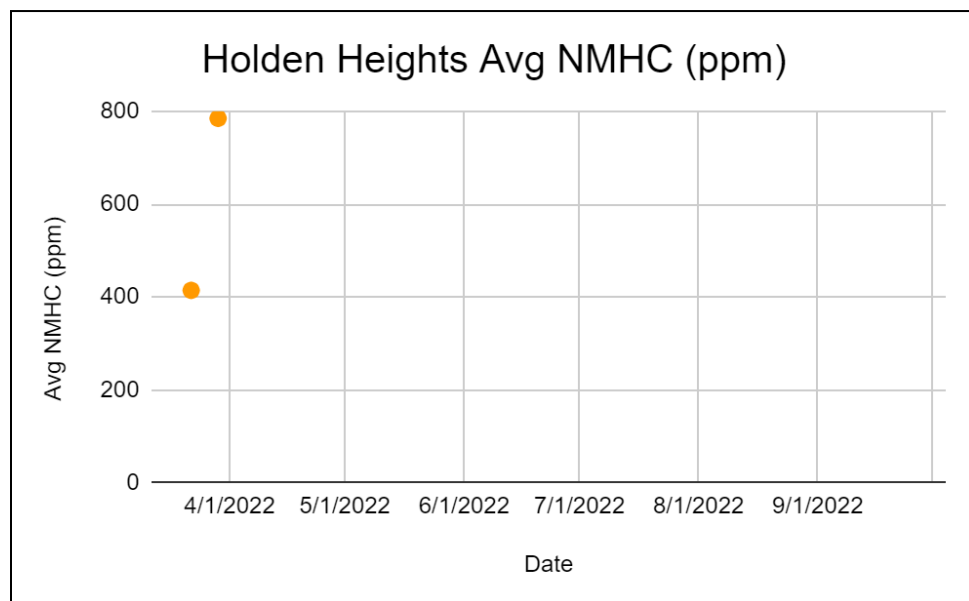




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In Holden Heights, both readings exceeded this threshold. On 3/22/2022 NMHCs were measured at 414.2 ppm. On 3/29/2022 NMHCs were measured at 748.8 ppm. Holden Heights readings that exceeded the threshold had relative humidity ranges from 39.30% to 63.00%. The temperature in Fahrenheit ranges from 75.56 to 85.82 degrees.





CH2O

Formaldehyde is a colorless, flammable gas at room temperature and has a strong odor. Exposure to formaldehyde may cause adverse health effects. ([Source](#)) Exposure to formaldehyde can irritate the skin, throat, lungs, and eyes. Repeated exposure to formaldehyde can possibly lead to cancer. Workers may be harmed by exposure to formaldehyde. The level of exposure depends upon the dose, duration, and work being done. ([Source](#))

Formaldehyde is found in:

- Resins used in the manufacture of composite wood products (i.e., hardwood plywood, particleboard and medium-density fiberboard);
- Building materials and insulation;
- Household products such as glues, permanent press fabrics, paints and coatings, lacquers and finishes, and paper products;
- Preservatives used in some medicines, cosmetics and other consumer products such as dishwashing liquids and fabric softeners; and
- Fertilizers and pesticides.

It is a byproduct of combustion and certain other natural processes, and so is also found in:

- Emissions from un-vented, fuel burning appliances, like gas stoves or kerosene space heaters; and
- Cigarette smoke.

([Source](#))

Indoor air contains higher levels of formaldehyde than outdoor air. Levels of formaldehyde measured in indoor air range from 0.02–4 parts per million (ppm). Formaldehyde levels in outdoor air range from 0.0002 to 0.006 ppm in **rural and suburban areas** and **0.001 to 0.02 ppm in urban areas**. As the readings were taken outside we will be using the 0.001 to 0.02 ppm threshold.

Nasal and eye irritation, neurological effects, and increased risk of asthma and/or allergy have been observed in humans breathing 0.1 to 0.5 ppm. Eczema and changes in lung function have been observed at 0.6 to 1.9 ppm. Decreased body weight, gastrointestinal ulcers, liver and kidney damage were observed in animals orally exposed to 50–100 milligrams/kilogram/day (mg/kg/day) formaldehyde. ([Source](#))

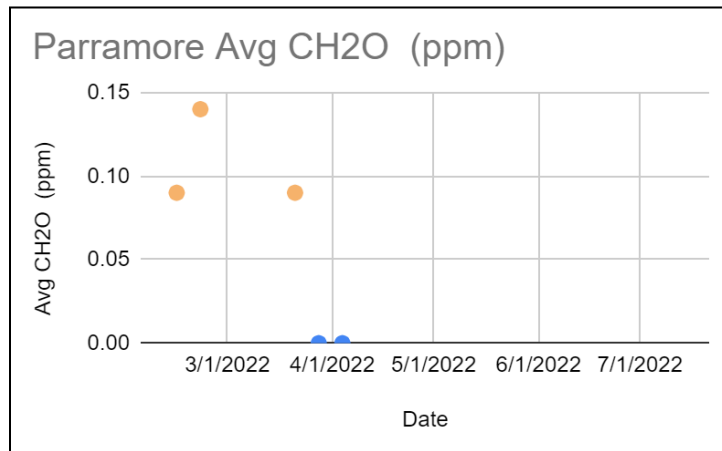
All three sources exceeded the 0.001 ppm threshold. In Parramore, 3 out of 5 readings exceeded this threshold. The highest reading was taken on 2/21/2022 at 0.14 ppm. The two remaining readings



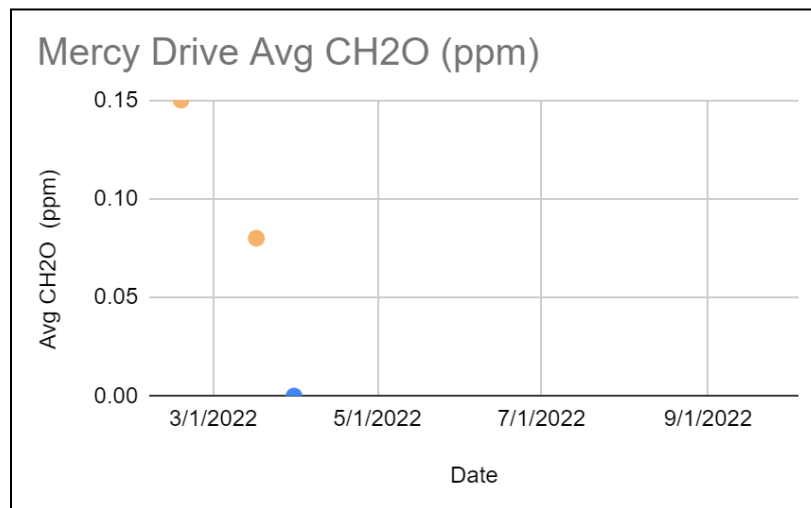


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were both 0.09 ppm on 2/14/2022 and 3/21/2022. Parramore readings that exceeded the threshold had relative humidity ranges from 46.90% to 54.10%. The temperature in Fahrenheit ranges from 57.02 to 76.10 degrees.



In Mercy Drive, 2 out of 3 readings exceeded this threshold. The highest reading was taken on 2/17/2022 at 0.15 ppm. The remaining reading was 0.08 ppm on 3/17/2022. Mercy Drive readings that exceeded the threshold relative humidity ranges from 65.20% to 72.00%. The temperature in Fahrenheit ranges from 74.3 to 78.98 degrees.





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In Holden Heights, 1 out of 3 readings exceeded this threshold. The highest reading was taken on 3/22/2022 at 0.120 ppm. Holden Heights readings that exceeded the threshold had a relative humidity of 63.60%. The temperature in Fahrenheit was 75.20 degrees.

