

# Air Monitoring Data

*for Galena Park & Jacinto City*

March – Oct 2022



# Air Pollutants

## Nitrogen Oxides (NOx)

Oxides of nitrogen - primarily emitted by vehicles and industrial facilities.

Contributes to breathing problems, smog, acid rain, ozone

## Volatile Organic Compounds (VOC)

Highly reactive carbon compounds – emitted by vehicles, industries, gasoline equipment, paints, chemicals, solvents etc.

Toxic at high concentrations, contributes to ozone

## Ozone (O<sub>3</sub>)

Ground level ozone – forms due to reactions between NOx and VOCs in sunlight and heat.

Contributes to breathing difficulties, respiratory issues

## Particulate Matter (PM<sub>2.5</sub>)

Inhalable particles - dust, dirt, soot, and even smaller – emitted by industries, vehicles, construction sites, fires, unpaved roads

Contributes to heart & lung complications, asthma

# Sources of Pollution

## Toxic Release Inventory (TRI)

Industrial and federal facilities that report toxic chemical releases.

Typically, larger facilities involved in manufacturing, metal mining/recycling, electric power generation, petrochemical, refining, and chemical manufacturing and hazardous waste treatment.

## Concrete Batch Plants (CBP)

Facilities that combine sand, cement, and other aggregates to make concrete

Typically, neighborhood-level facilities, that are significant sources of particulate matter (dust), diesel truck smoke, noise and light pollution among other nuisances.

## Roads / Freeways / Trains (yards)

Vehicular exhaust significantly emits a noxious brew of multiple types of pollution:

NO<sub>x</sub>, VOCs, PM<sub>2.5</sub>, GHGs and the precursors for ozone and smog

## Superfund sites

Polluted waste locations in the United States contaminated with extremely hazardous substances. Usually abandoned.

Uncleaned sites are continued sources of ground, air, and water pollution into the neighboring areas.

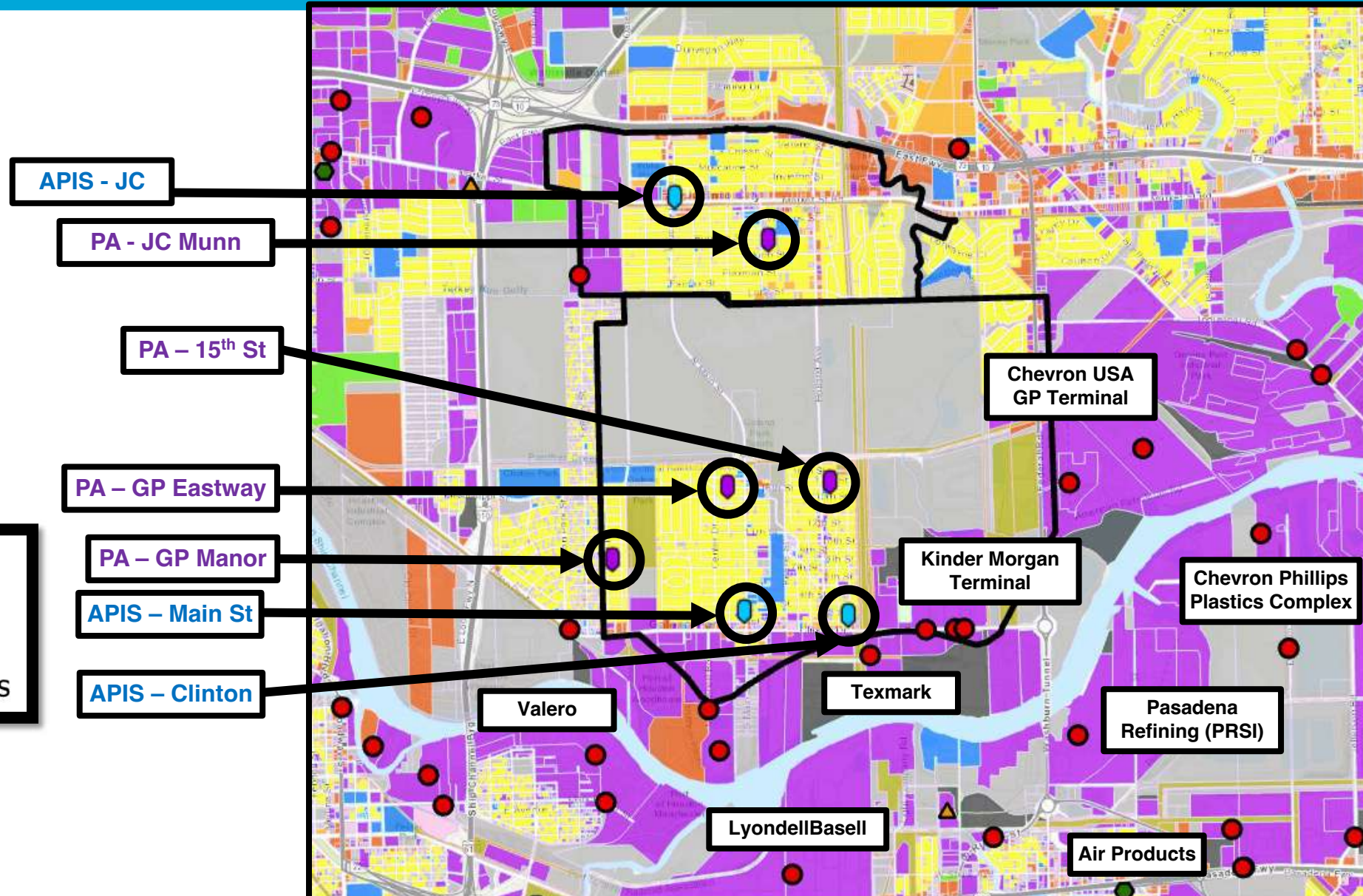


# Surrounding Land Use Map: GP + JC

- Single-Family Residential
- Multi-Family Residential
- Commercial
- Office
- Public & Institutional
- Industrial
- Park & Open Spaces
- Transportation & Utility
- Undeveloped
- Agriculture Production
- Unknown

- Superfund Sites 2022
- Texas TRI Facilities, 2020
- Concrete Batch Plants 2021
- Active Municipal Solid Waste sites

- APIS
- Purple Air

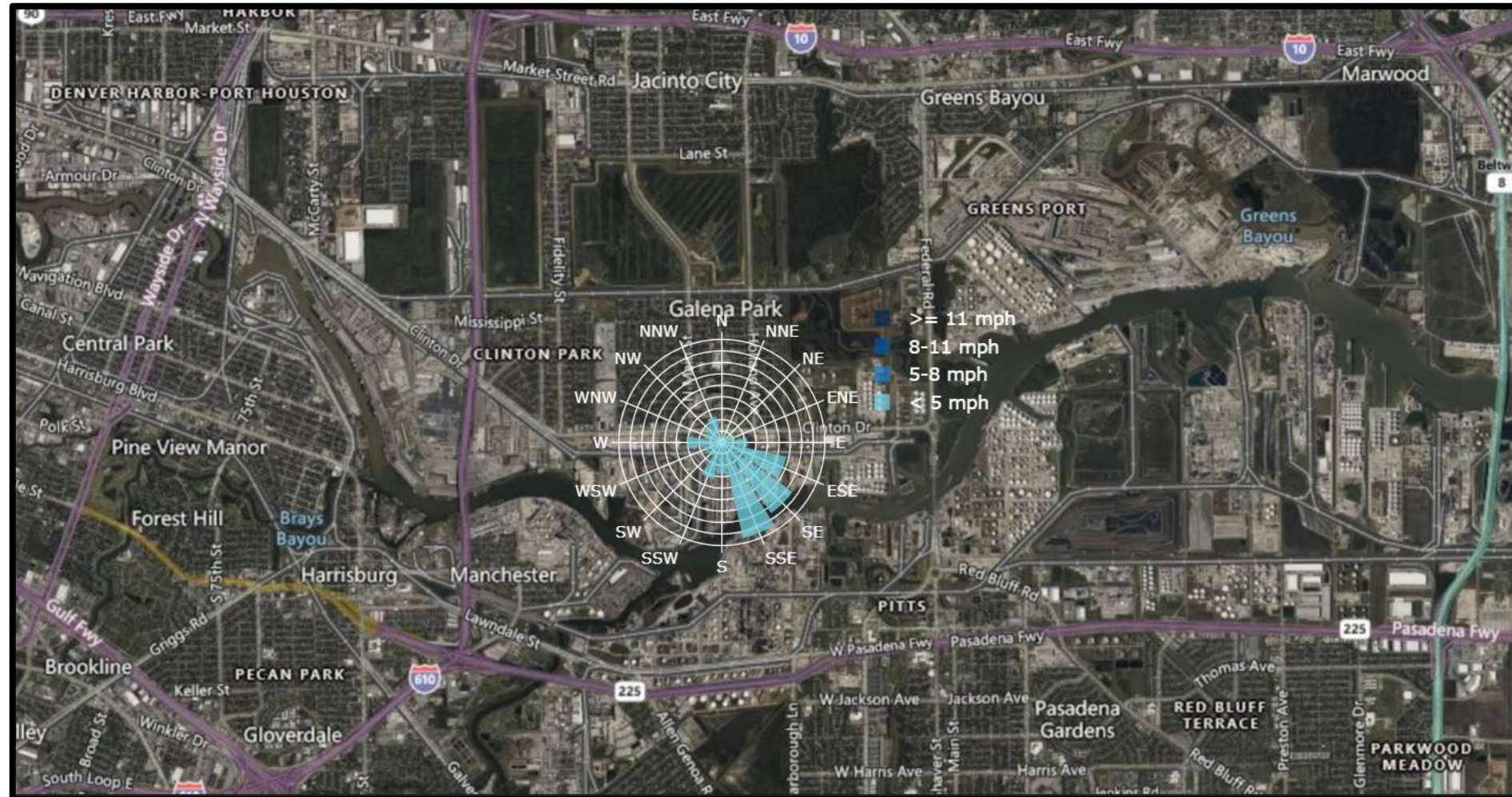




# Wind Direction and Speed

Averaged over:  
March – Oct 2022

*Sources of pollution upwind of the monitors make significant contributions to readings and measurements*



**Predominant winds: SOUTHEAST**

*In line with regional prevailing winds from the Gulf of Mexico*





# Air Monitor Measurements

March - Oct 2022

1. Nitrogen Oxides (NO<sub>x</sub>)
2. Ozone (O<sub>3</sub>)
3. Volatile Organic Compounds (VOCs)
4. Particulate Matter (PM)



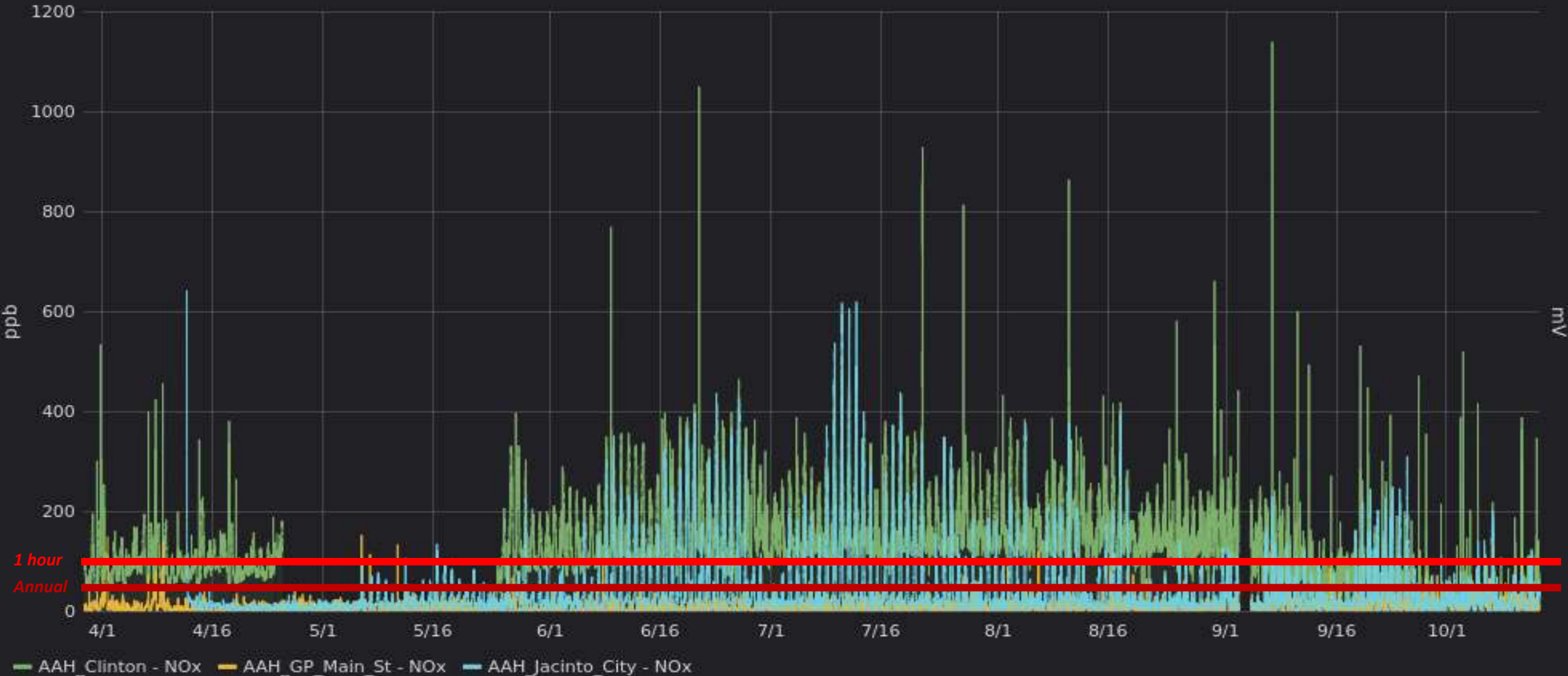
# Nitrogen Oxides (NO<sub>x</sub>)

*Includes Nitrogen Oxide (NO) and Nitrogen Dioxide (NO<sub>2</sub>)*

# NOx: Day-to-Day

EPA NOx standard	1 hour	Annual
	100 ppb	53 ppb

Gases



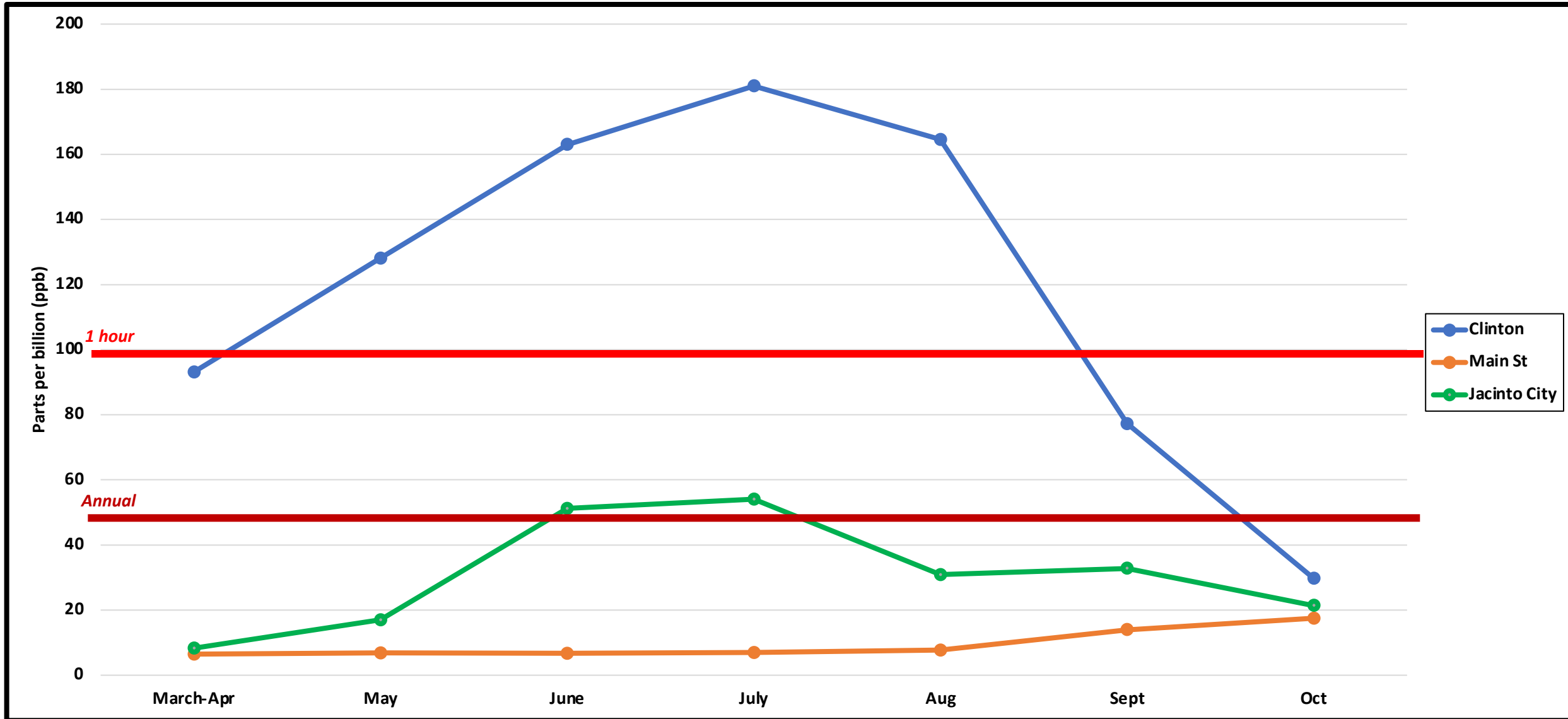


# NOx: Monthly Averages

EPA  
NOx standard

Annual

53 ppb



# NOx: Monthly Averages

EPA NOx standard	Annual
	53 ppb

	March-Apr	May	June	July	Aug	Sept	Oct	Overall
Clinton	93.1	128	163	181	164.5	77.2	29.7	136
Main St	6.5	6.8	6.7	7	7.7	14	17.5	8.9
Jacinto City	8.3	17	51.2	54.1	30.9	32.8	21.4	32.7

# Major takeaways

- Daily values peak differently across seasons:
  - Summer: Afternoon daily peak. Fall: Morning daily peak
- Trending upward in the spring/summer and back down since July
  - Monitors are generally in seasonal agreement
- Clinton monitor exposed to highest concentrations:
  - Likely industrial: Both routine and unplanned emission events
- Highest spikes recorded at Clinton: Far above EPA standards
  - Usually in the early mornings: 1 am - 6 am approx
  - Highest levels in the summer. Still occur but at lower levels in the fall/winter

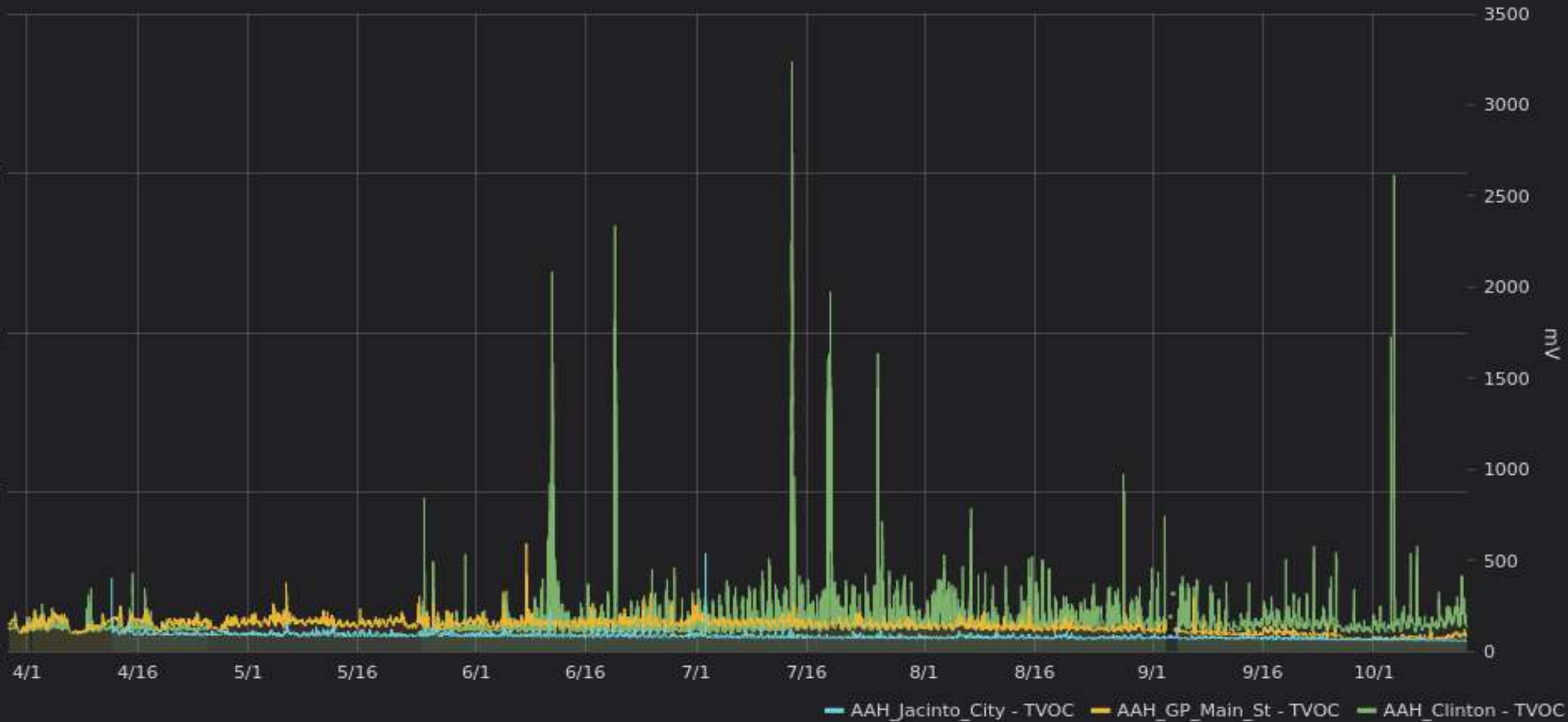


# Volatile Organic Compounds (VOCs)

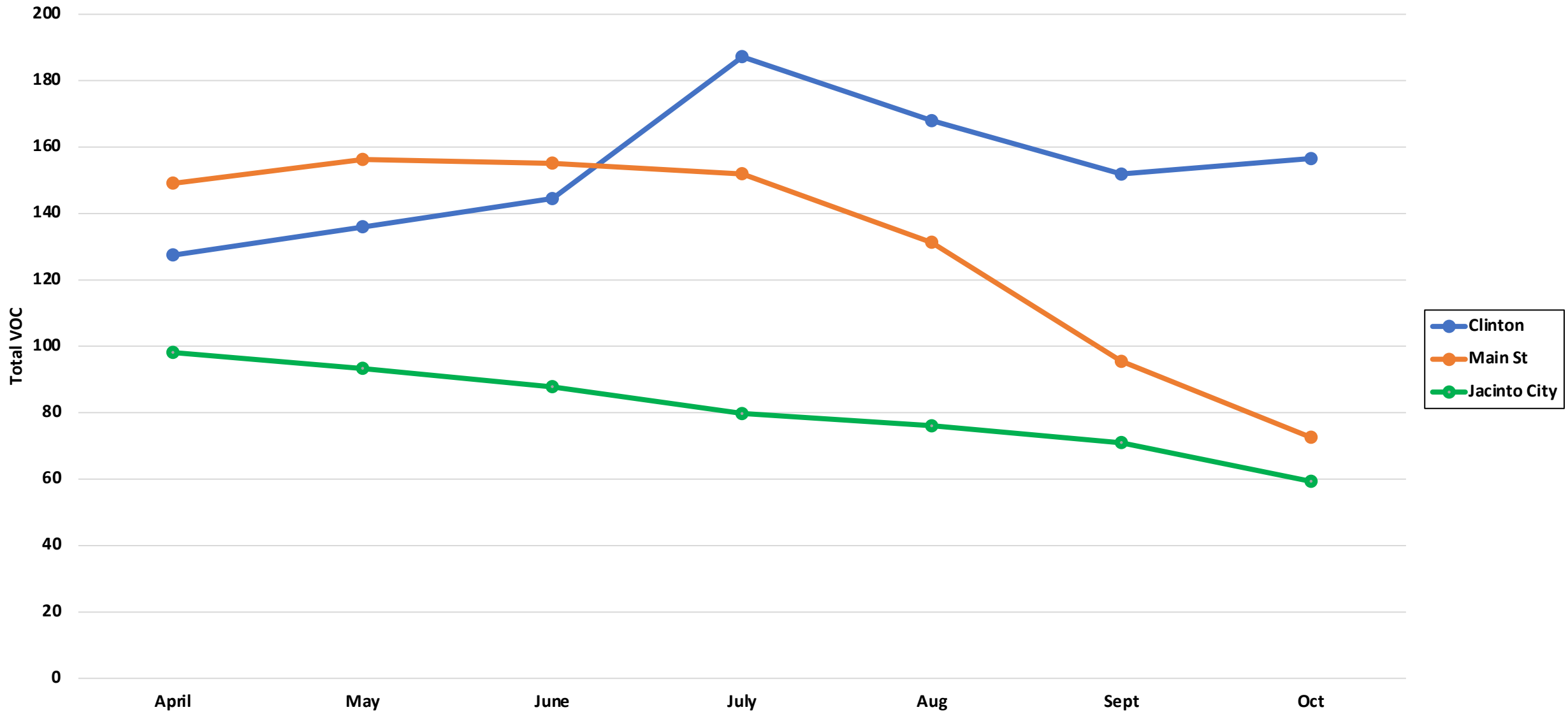
*Includes benzene, ethylene, formaldehyde, butadiene, propane, and ethane among many others*

# Total VOC: Day-to-Day

Gases



# Total VOC: Monthly Averages





# Total VOC: Monthly Averages

	March-Apr	May	June	July	Aug	Sept	Oct	Overall
Clinton	127.5	136	144.5	187.2	168	152	156.5	156.4
Main St	149	156	155.2	152	131.3	95.5	72.5	130.5
Jacinto City	98	93.3	87.8	79.8	76.1	71	59.3	79.7

# Major takeaways

- Daily values have no reliable peak. Especially at Clinton
  - Unpredictability points towards industrial source. Not daily traffic
- Differing trends at each monitor:
  - Clinton stable to increasing: Catching the influence of emissions
  - Main and JC both declining since March: No significant spikes
- Clinton and Main St. recording highest recordings. JC relatively silent
  - Potential sources likely at/across the Ship Channel
- High spikes recorded at Clinton: Very likely industrial emission events
  - Unpredictable and outside regular cycles

# Ozone (O<sub>3</sub>)

Ground level ozone (not stratospheric) that contributes to smog formation



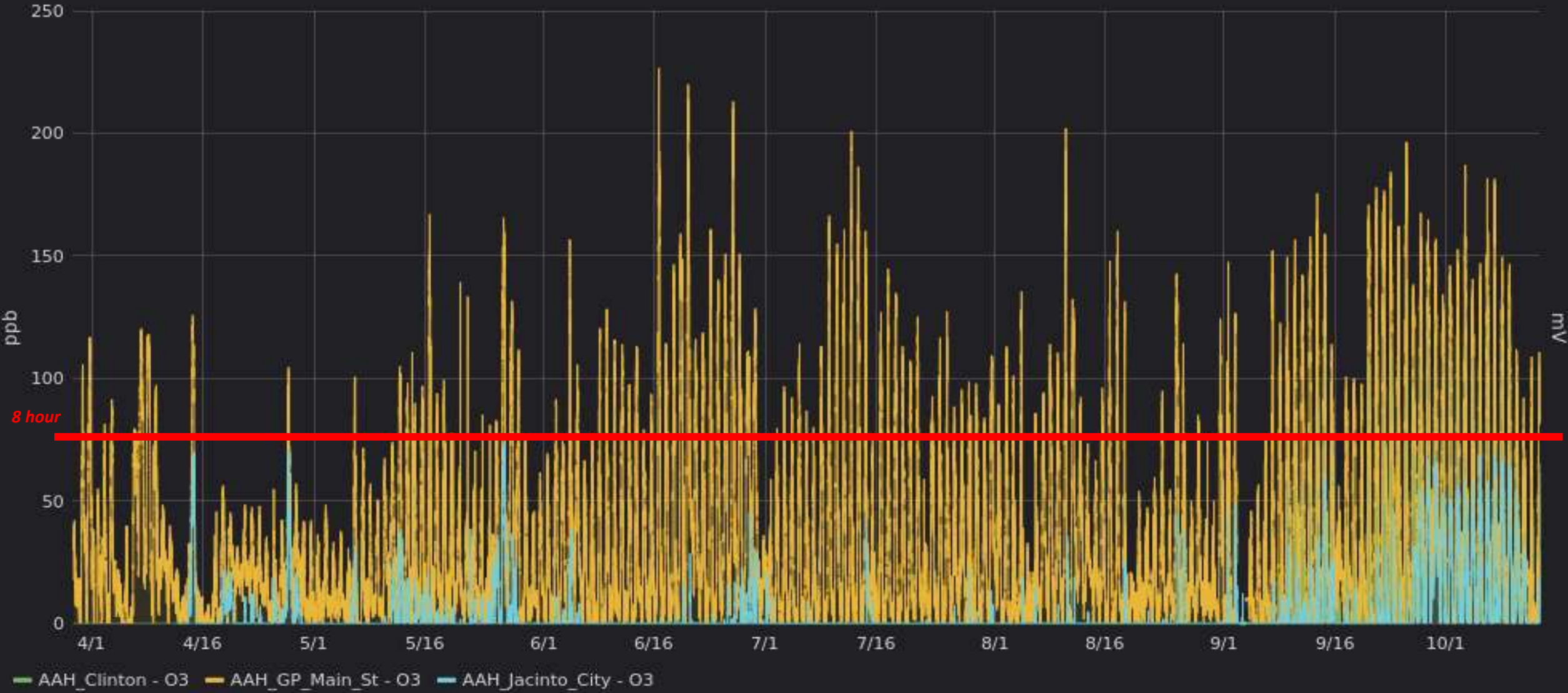
# Ozone (O3): Day-to-Day

EPA  
O3 standard

8 hour

70 ppb

Gases

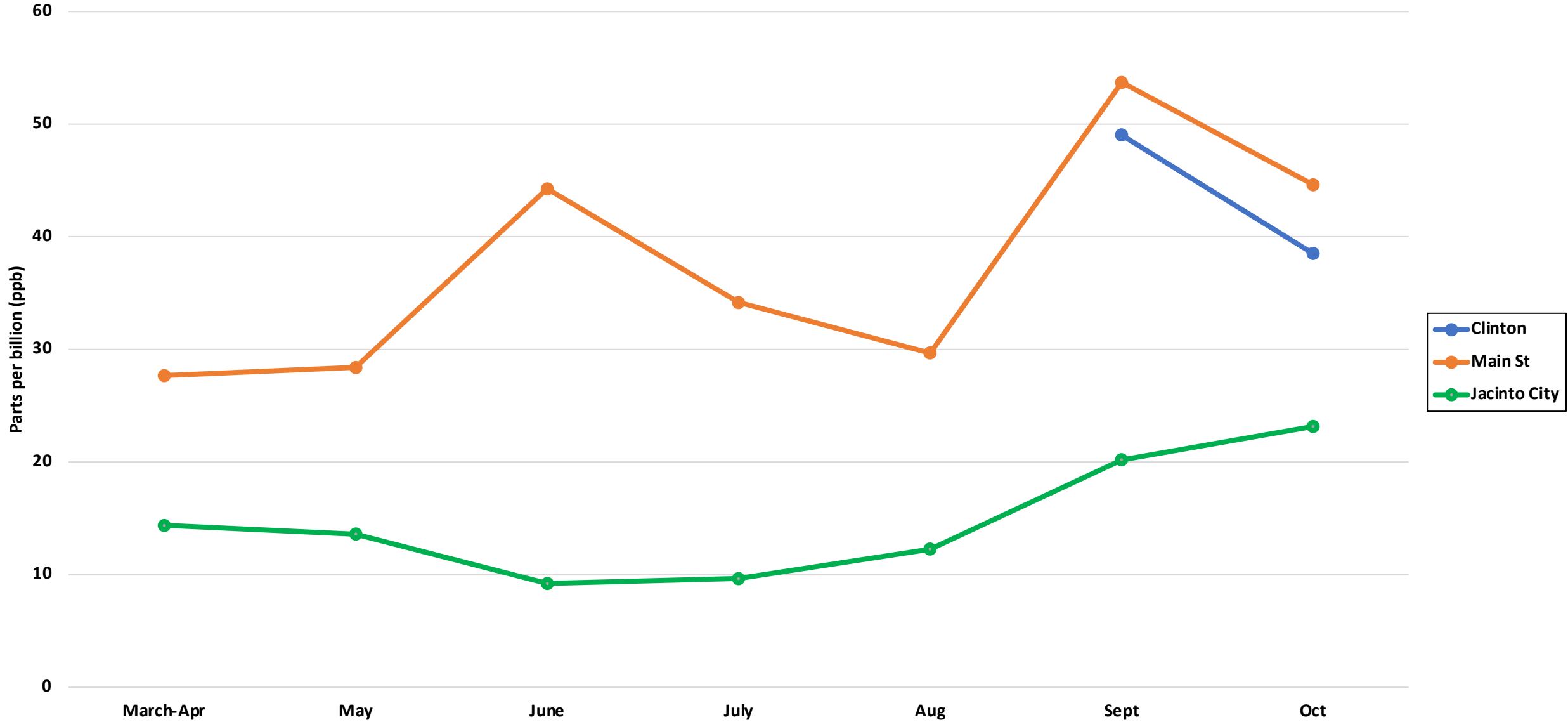


# Ozone: Monthly Averages

**EPA  
O3 standard**

**8 hour**

70 ppb



# Ozone: Monthly Averages

EPA  
O3 standard

8 hour

70 ppb

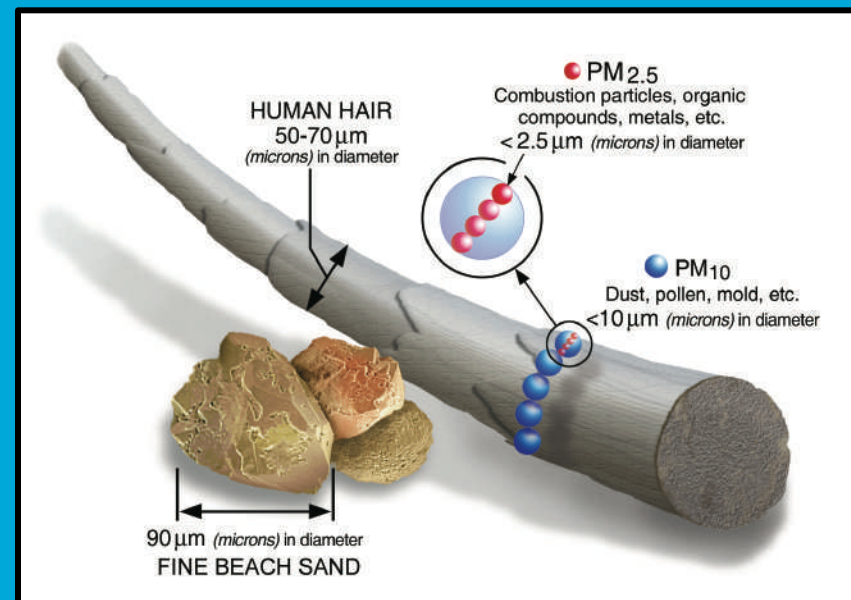
	March-Apr	May	June	July	Aug	Sept	Oct	Overall
Clinton						49	38.5	41.2
Main St	27.7	28.4	44.3	34.2	29.7	53.7	44.6	37.1
Jacinto City	14.4	13.6	9.22	9.7	12.3	20.2	23.2	16.6

# Major takeaways

- Daily values peak regularly around late afternoon: 2 - 4 pm
  - Likely daily traffic and industrial cycles . Zero concentration at night
- General upward trend until October
  - Likely influence of summer heat
- Main St. recording highest levels, followed by Clinton
  - Very high NO<sub>x</sub> and VOC levels in the immediate area: Closest to Ship Channel
  - JC significantly lower. Likely due to farther proximity
- Daily peaks are far above EPA ozone standard:
  - High NO<sub>x</sub> and VOC levels from industry and traffic (+ regional heat)
  - No unpredictable and/or abnormal spikes outside regular cycles

# Particulate Matter 2.5 (PM2.5)

*Fine inhalable particles that can penetrate deep into the lungs*





# PM Monitors

[map.purpleair.com](http://map.purpleair.com)

APIS - JC

PA - JC Munn

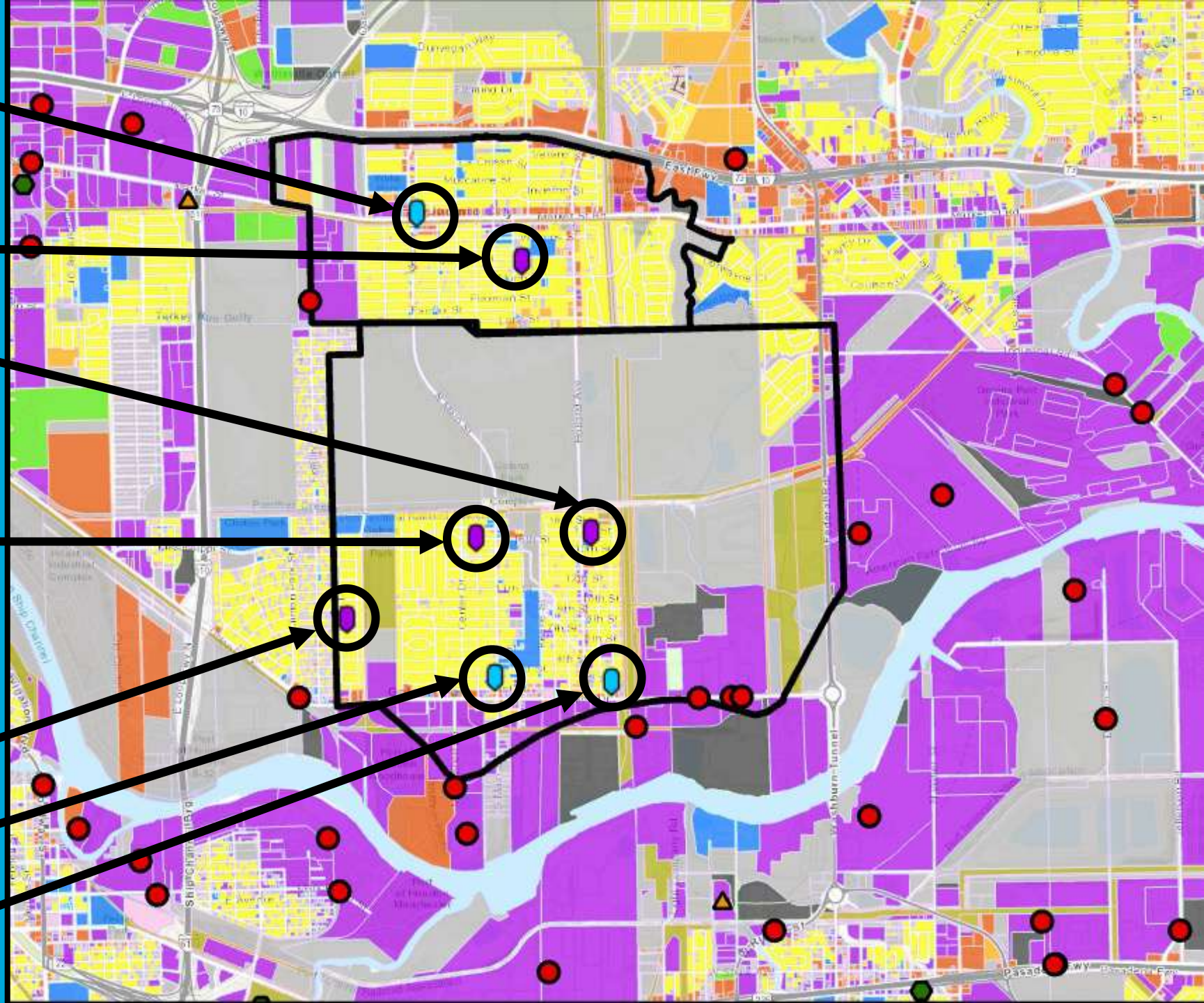
PA - 15<sup>th</sup> St

PA - GP Eastway

PA - GP Manor

APIS - Main St

APIS - Main St



# PM 2.5: Day-to-Day

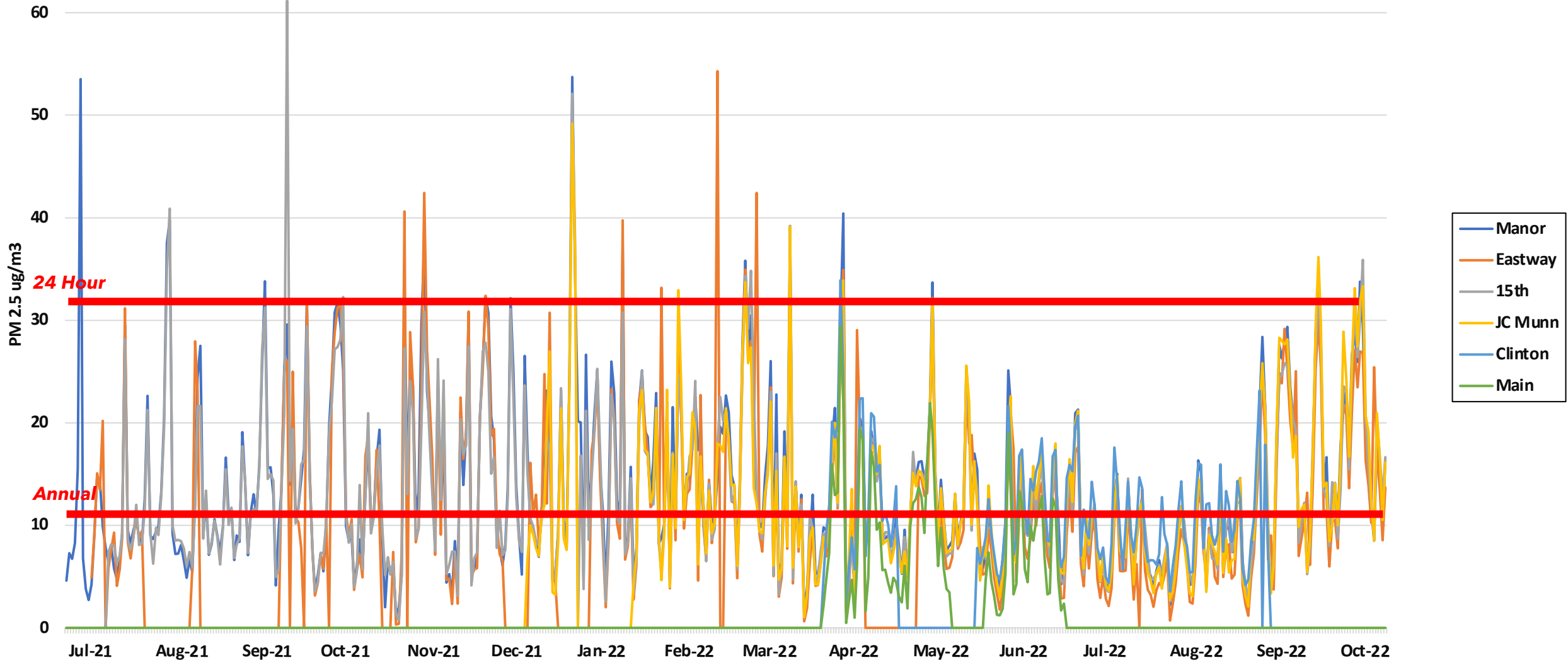
EPA  
PM 2.5 standard

24 hour

Annual

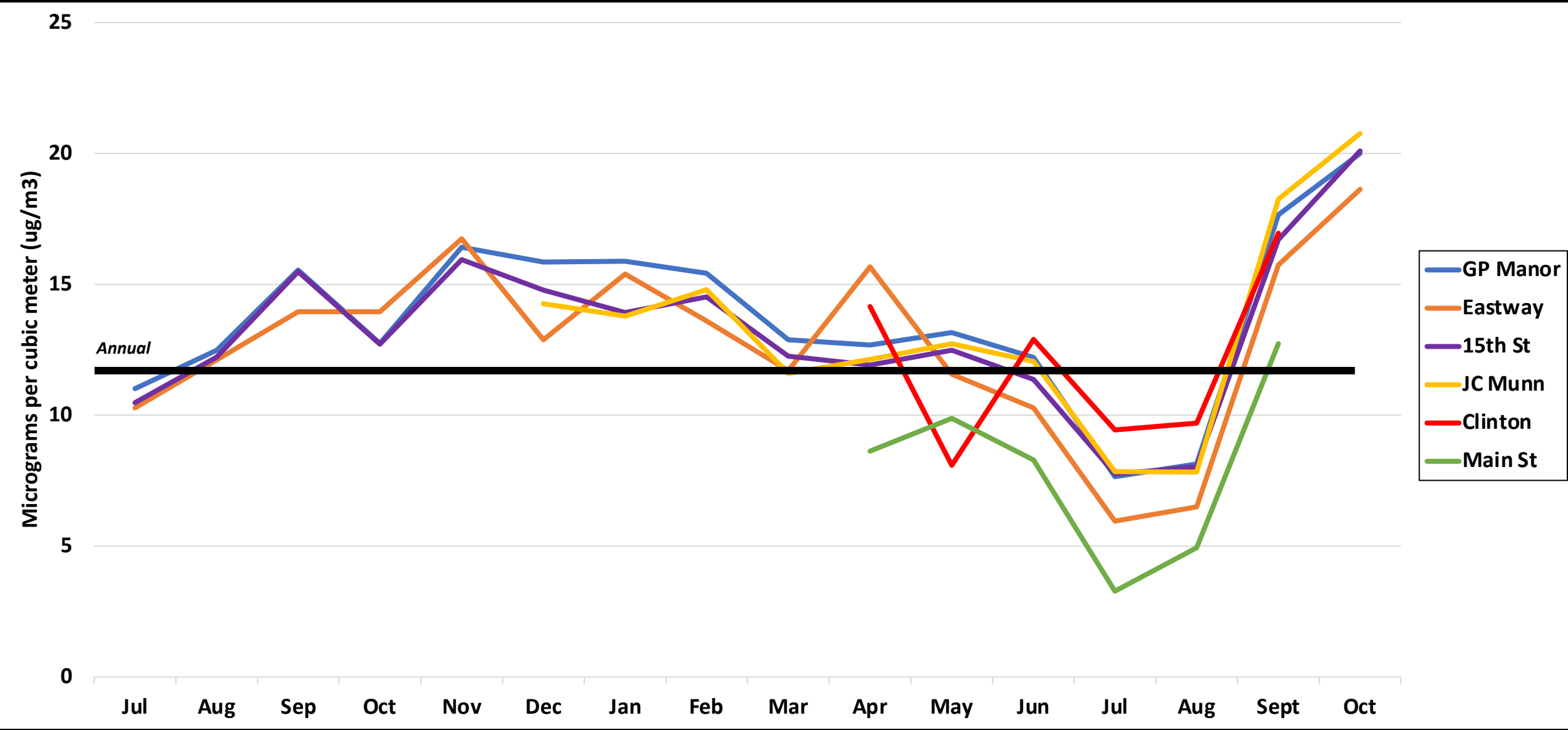
35 ug/m3

12 ug/m3



# PM: Monthly Averages

<b>EPA PM 2.5 standard</b>	<b>Annual</b>
	12 ug/m3



# PM: Monthly Averages

EPA  
PM 2.5 standard

Annual

12 ug/m3

Monitor	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sept 22	Oct 22
GP Manor	11	12.5	15.5	12.7	16.4	15.9	15.9	15.4	12.9	12.7	13.2	12.2	7.7	8.1	17.7	20
Eastway	10.3	12.1	14	13.5	16.7	12.9	15.4	13.6	11.7	15.7	11.6	10.3	6	6.5	15.7	18.6
15th St	10.5	12.2	15.5	12.7	15.9	14.8	13.9	14.5	12.3	12	12.5	11.4	7.8	8	16.7	20.1
JC Munn	-	-	-	-	-	14.3	13.8	14.8	11.6	12.1	12.7	12.1	7.9	7.8	18.3	20.8
Clinton	-	-	-	-	-	-	-	-	-	14.2	8.1	12.9	9.4	9.7	17	-
Main St	-	-	-	-	-	-	-	-	-	8.6	9.9	8.3	3.3	4.9	12.7	-

# PM: Yearly Averages

EPA  
PM 2.5 standard

Annual  
12 ug/m3

Monitor	2021 (July – Dec)	2022 (Jan – Oct)	Overall July 2021 – Oct 2022
GP Manor	14.4	13	13.7
Eastway	14.4	11.6	12.7
15th St	13.7	12.4	12.8
JC Munn	-	12.8	12.8



# Major takeaways

- Daily values do not peak as regularly
  - Reflecting some unpredictable influence: Likely industrial
- Peaked in the winter - declined in the spring/summer - going back up
  - Highest values this Sept - Oct (over last 16 months)
  - Possibly a larger regional pattern (also observed in Northside and Pasadena)
- All monitors in very close agreement: Not one particular recording highest levels
  - Above EPA standard: Aug '21 - May '22 and Sept - Oct '22
  - 2021 and 2022 annual averages exceeds EPA annual standard
- Peaks highest in the winter - spring
  - Recent peaks at around similar levels across monitors

**REVIEW**

# Methodology

- Calculated pure averages (mean) for each month and overall
  - Easy comparison with EPA standards
  - No further statistical manipulation
- Plotted progression of monthly averages on a line graph
  - To track seasonal pollution trends
- Screenshots of raw day-to-day measurements
  - To visualize short term spikes and exceedances of standards
- Observed times of highest daily pollution levels
- Tested hypotheses with real-world maps, data, information
  - Drawing informed conclusions about measurement/trend causes

# Caveats / Limitations

- **EPA Standards:**

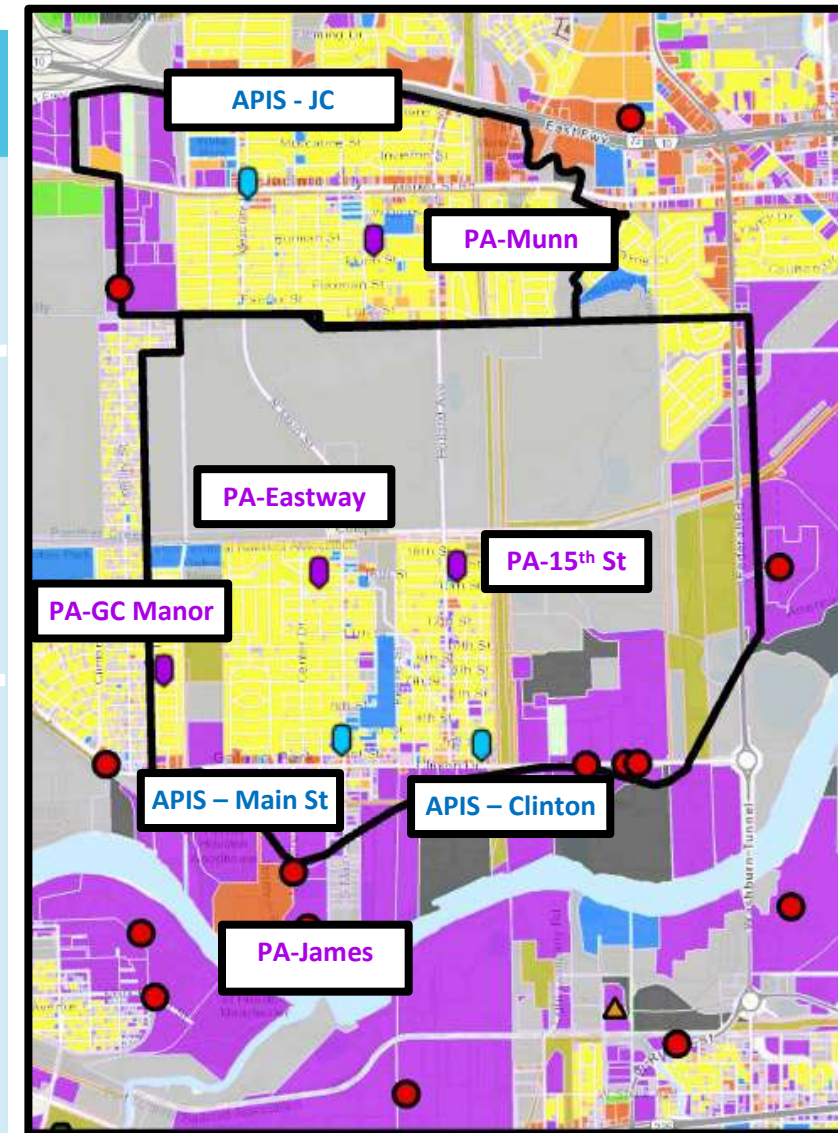
- Guidelines for public health protection. Regularly updated / revised
- Just because averages aren't at/near limit, doesn't mean there aren't effects
- Short-term spikes can still have significant effects

- **Monitors:**

- Limited by wind direction, technology (pollutants measured)
- Area of location: Results may be affected by seemingly smaller events
  - E.g.: Idling cars, household events, fireworks, outages, etc.
- Sensitivity: A high measurement point to multiple possible sources. Cannot pinpoint 100%
- There may be pollution levels and types that are not being caught
- Limited number of monitors across neighborhood: Not everywhere

# Conclusions: March – July 2022

NOX	VOC	O3	PM2.5
Much higher average at Clinton	Higher average at Clinton	Much higher average at Main St.	Similar averages across monitors
Higher spikes at Clinton (exceeding EPA standards)	Much higher spikes at Clinton and more activity being captured	Highest spikes at Main St. (exceeding EPA standards)	Significant spikes at all monitors (exceeding EPA standards)
Morning / afternoon daily peak (Depending on season)	No regular daily peak	Late afternoon daily peak	No regular daily peak
Peaked in June-July	Trending stable to downward with time (Spike driven)	Trending upward with time	Peaked in winter Down in summer Back up again





# Next Steps

- Will continue collecting and analyzing data
- Averages may change as monitors capture more emissions
  - Greater amounts of data coming in will improve accuracy
- Will develop action plans
- Identifying new locations for additional monitors:
  - To expand network