Comparison of 2020 and 2021 Nitrogen Oxides, Fine Particle and Benzene Concentrations in New Jersey with Data from 2017-2019

Analysis of the Covid-19 Impact on Air Quality in New Jersey

NJDEP Bureau of Air Monitoring

Updated 9/15/2021

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- Summary of impact to air quality due to stay-at-home directive
- Long term trends in air quality
- Is Covid-19 continuing to impact air quality in 2021?
- Monthly data in 2021 from NJ stations
- Summary

Covid-19 Timeline

- 3/21/20 Stay-at-home directive
- 6/9/20 Stay-at-home lifted
- 7/2/20 Casinos re-open
- 8/13/20 Schools re-open
- 9/4/20 Indoor dining resumes
- 12/11/20 1st Covid-19 vaccine approved for emergency use
- 12/18/20 2nd Covid-19 vaccine approved for emergency use
- 2/5/21 Bars re-open
- 2/27/21 3rd Covid-19 vaccine approved for emergency use
- 5/19/21 Outdoor gathering limit removed
- 6/4/21 Public Health Emergency lifted

Summary of Short-term Covid-19 Impacts

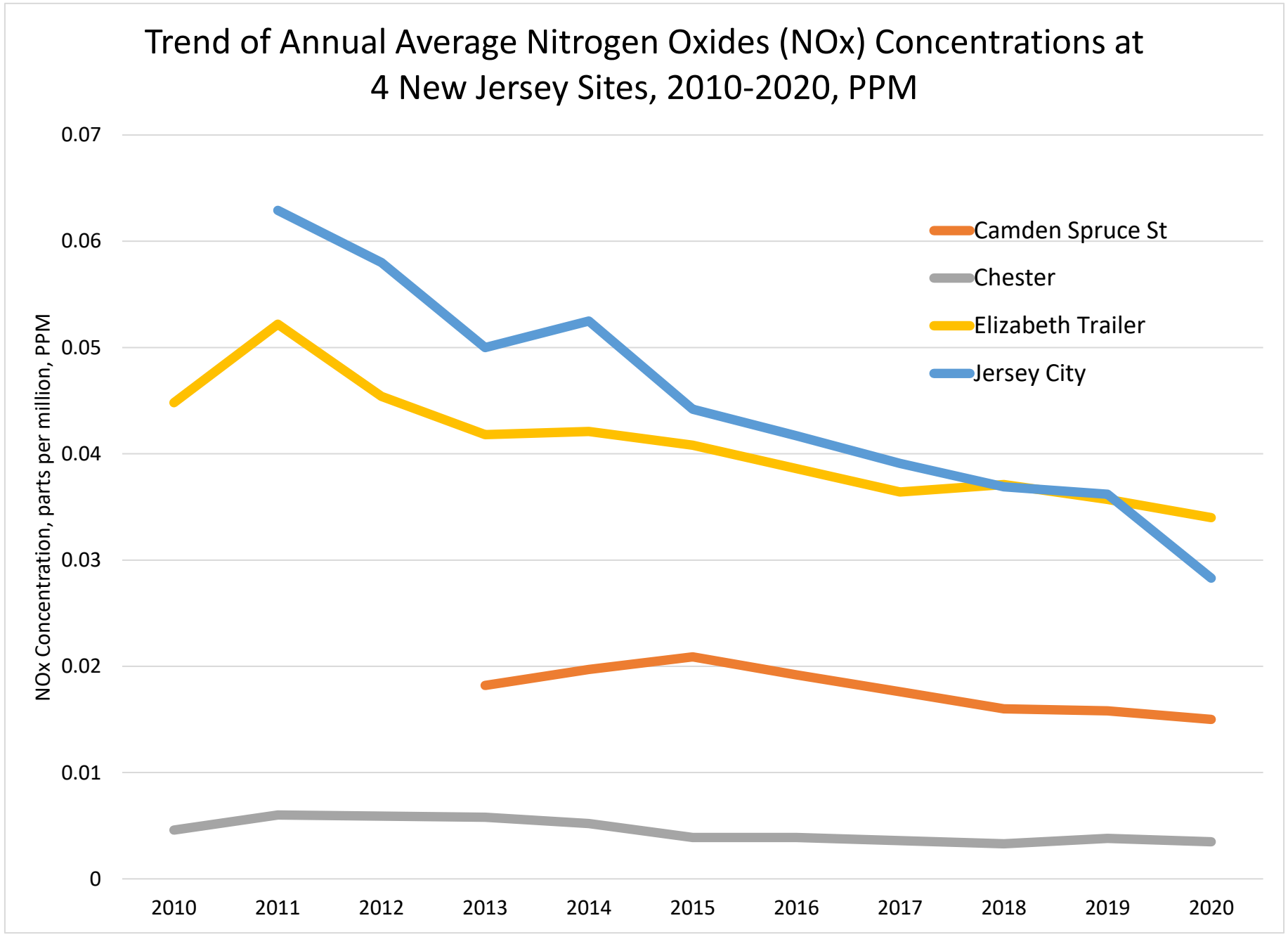
- 50% reduction in light duty traffic in April 2020
- 30% reduction in heavy duty traffic in April 2020
- >40% reduction in monthly NOx concentrations at urban air monitoring stations, April-May 2020
- >30% reduction in monthly PM2.5 concentrations at urban air monitoring stations, April-May 2020
- >20% reduction in monthly benzene concentrations at urban air monitoring stations, March-May 2020

Long-term Trends and Covid-19 Impact

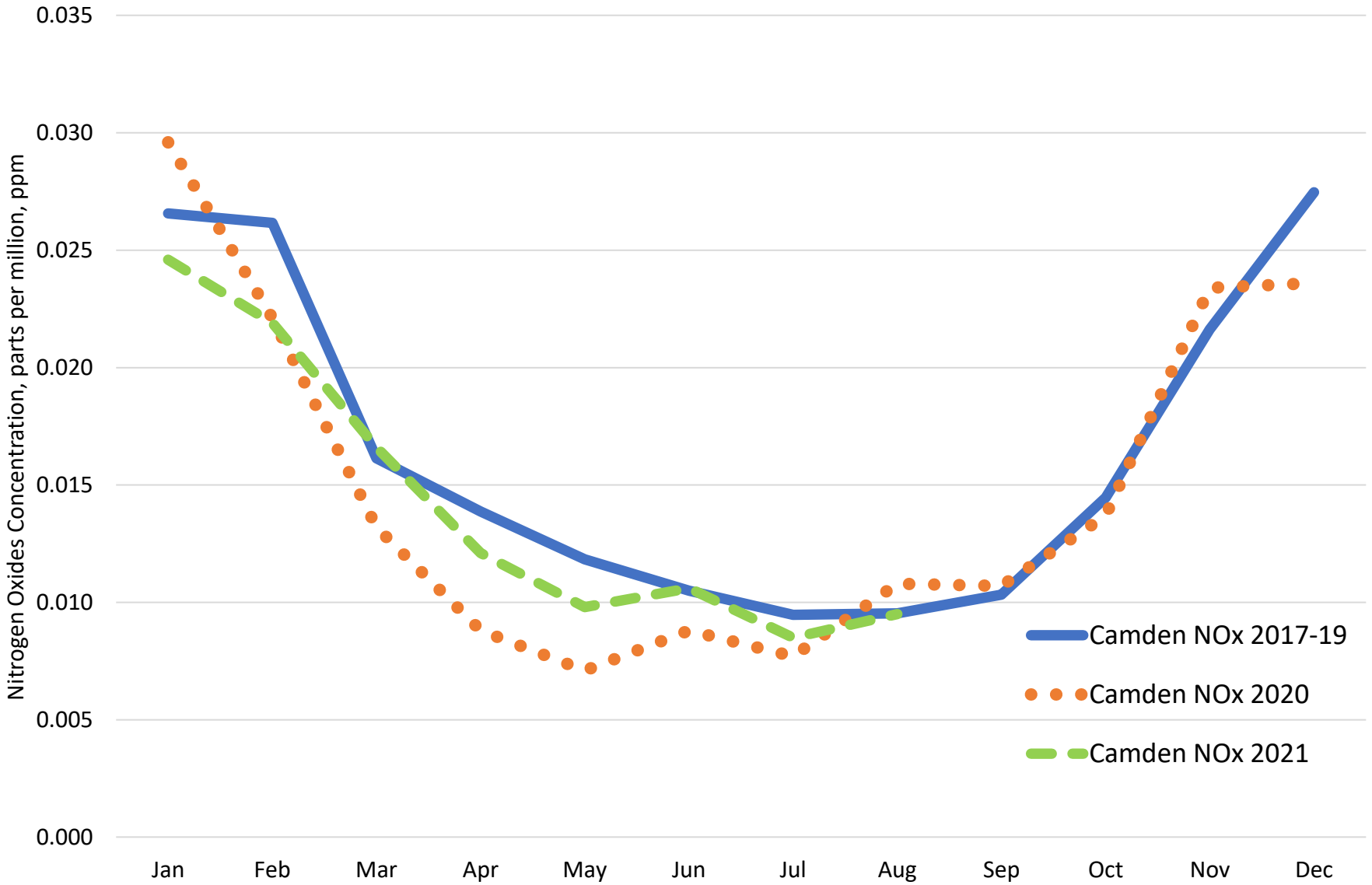
- Air Quality
  - Nitrogen oxides (NOx)
  - Fine Particles (PM2.5)
  - Benzene
  - Data for urban and background air monitoring stations from 2010-2019
- Energy Consumption
  - Retail electrical sales
  - Motor Gasoline consumption
- Are 2020 reductions continuing in 2021?

Nitrogen Oxides, NOx

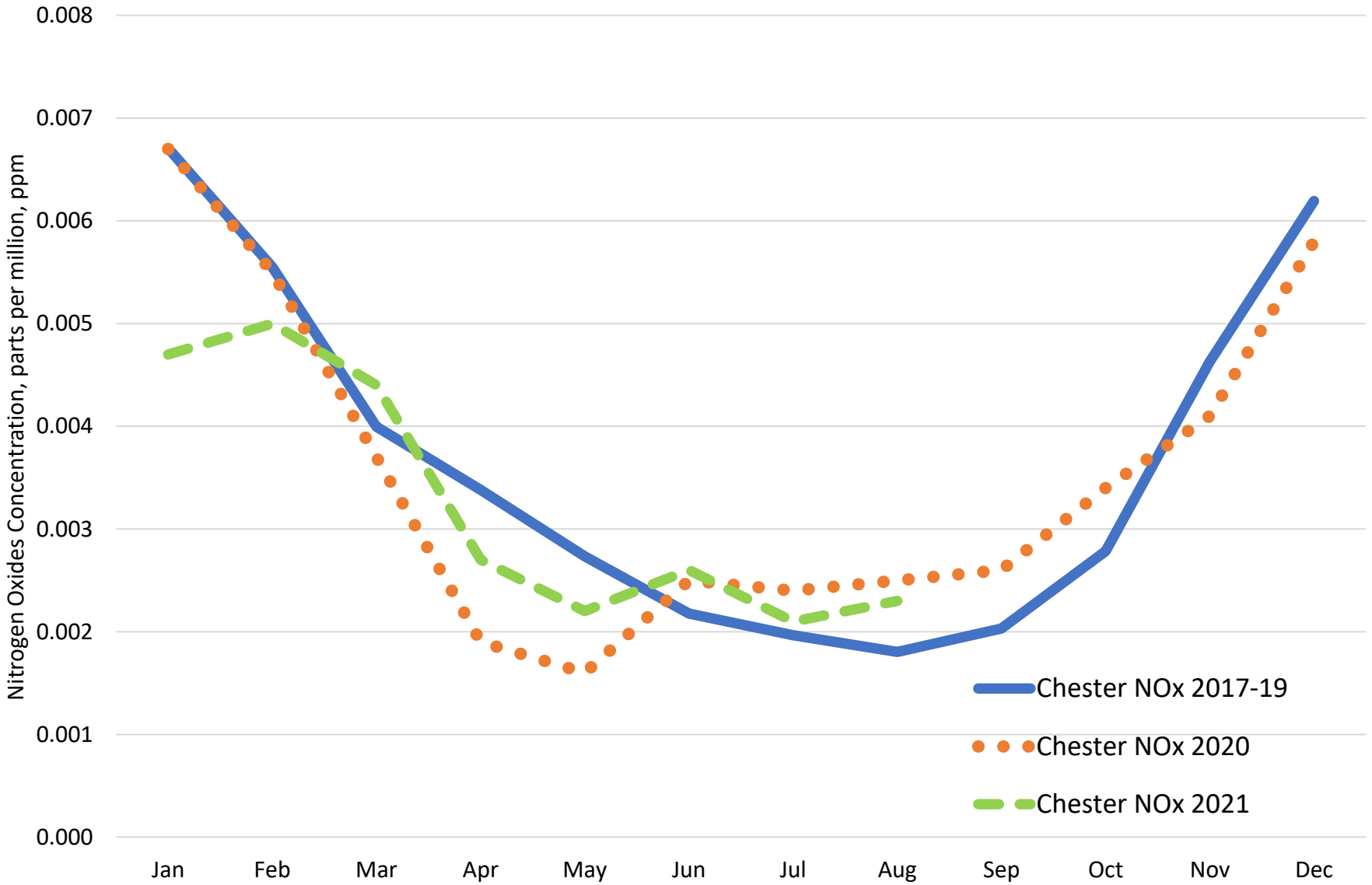
- Chester: background site
- Urban stations
  - Camden Spruce Street
  - Elizabeth Lab (NJ Turnpike Exit 13)
  - Jersey City


Trend of Annual Average Nitrogen Oxides (NOx) Concentrations at 4 New Jersey Sites, 2010-2020, PPM
NOx Concentration, parts per million, PPM
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Camden Spruce St
Chester
Elizabeth Trailer
Jersey City

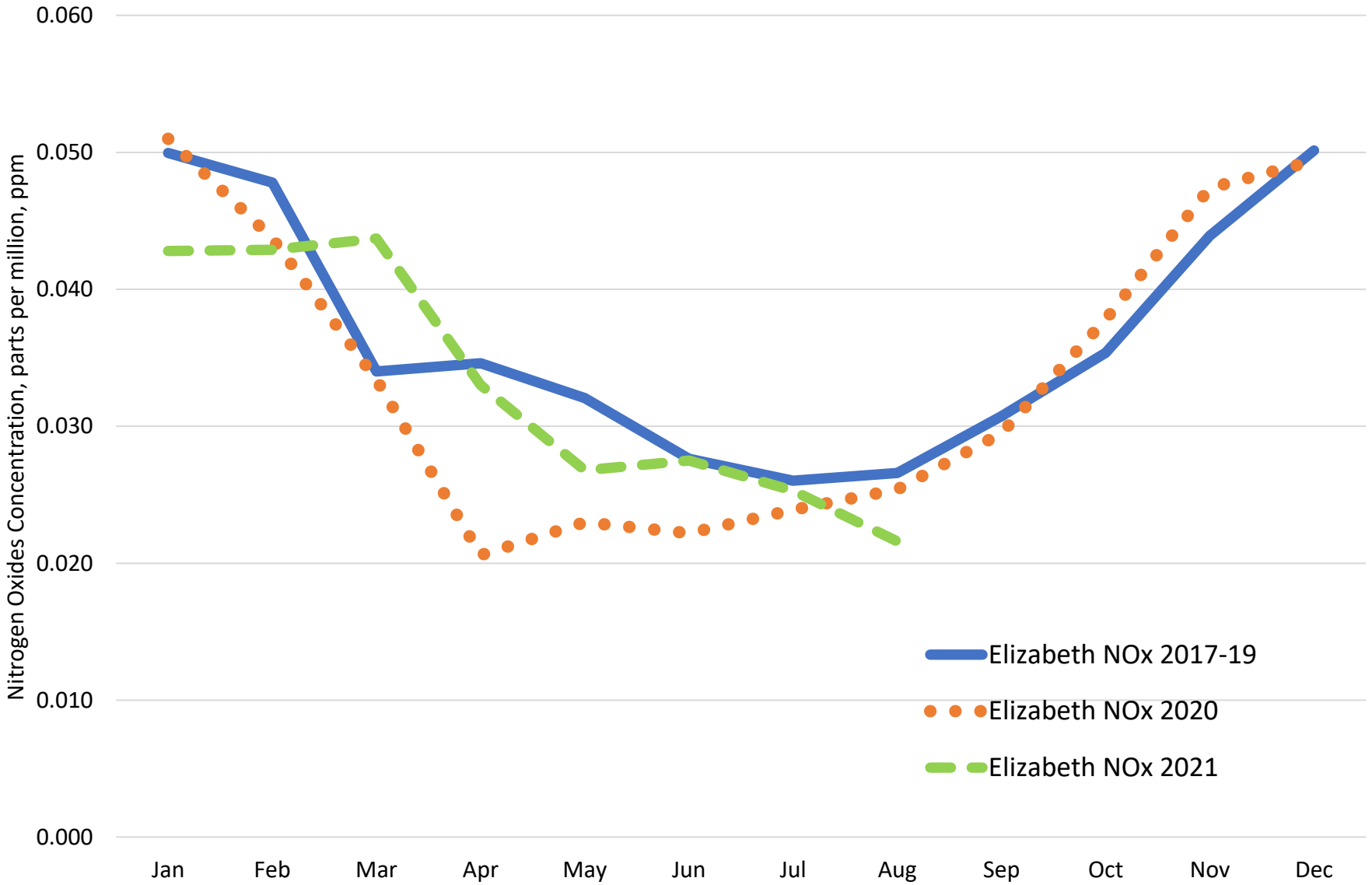
Monthly Average Nitrogen Oxides (NOx) Concentrations at Camden in 2017-19 Compared with 2020 and 2021, ppm



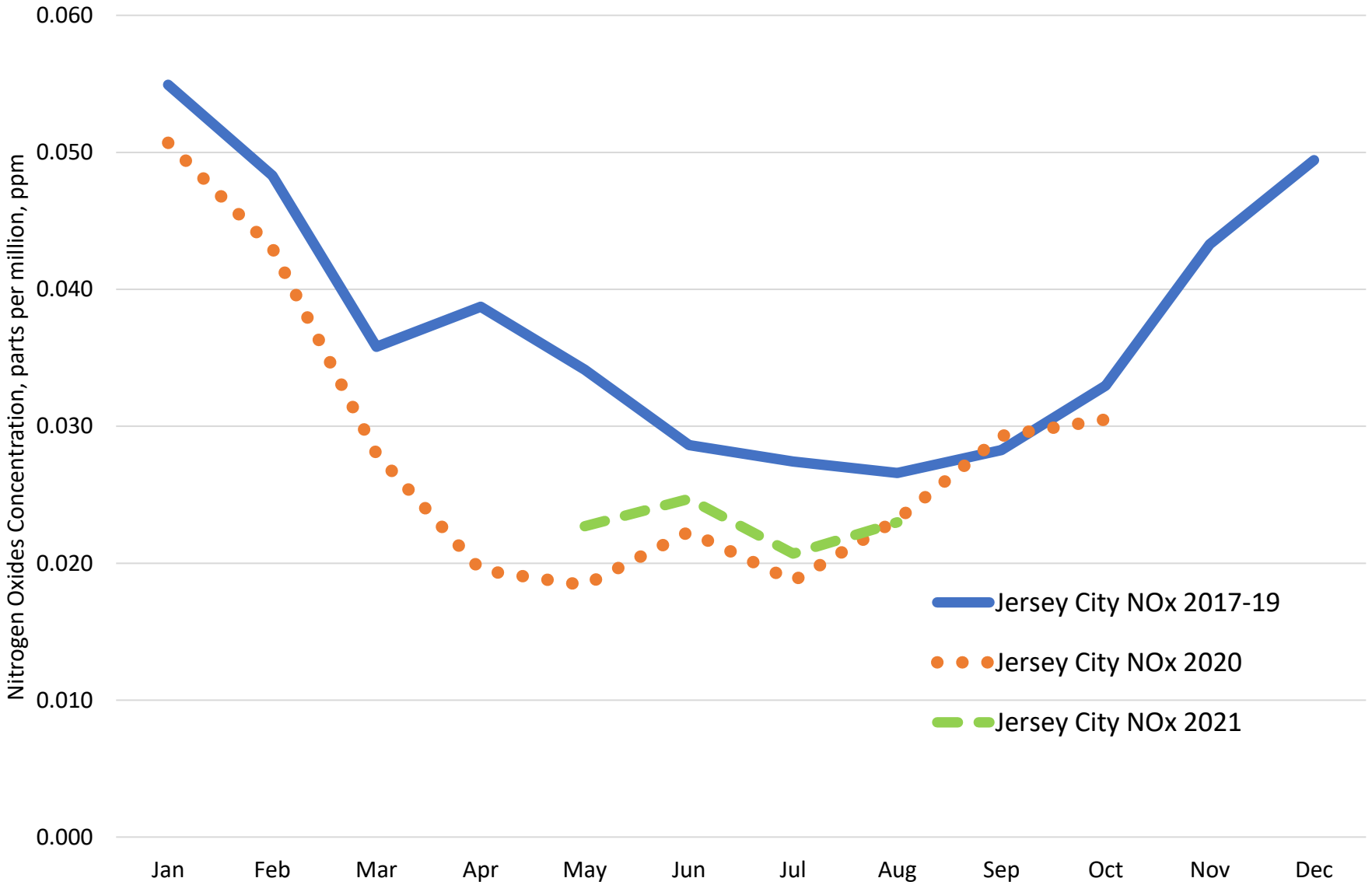
Monthly Average Nitrogen Oxides (NOx) Concentrations at Chester in 2017-19 Compared with 2020 and 2021, ppm



Monthly Average Nitrogen Oxides (NOx) Concentrations at Elizabeth in 2017-19 Compared with 2020 and 2021, ppm

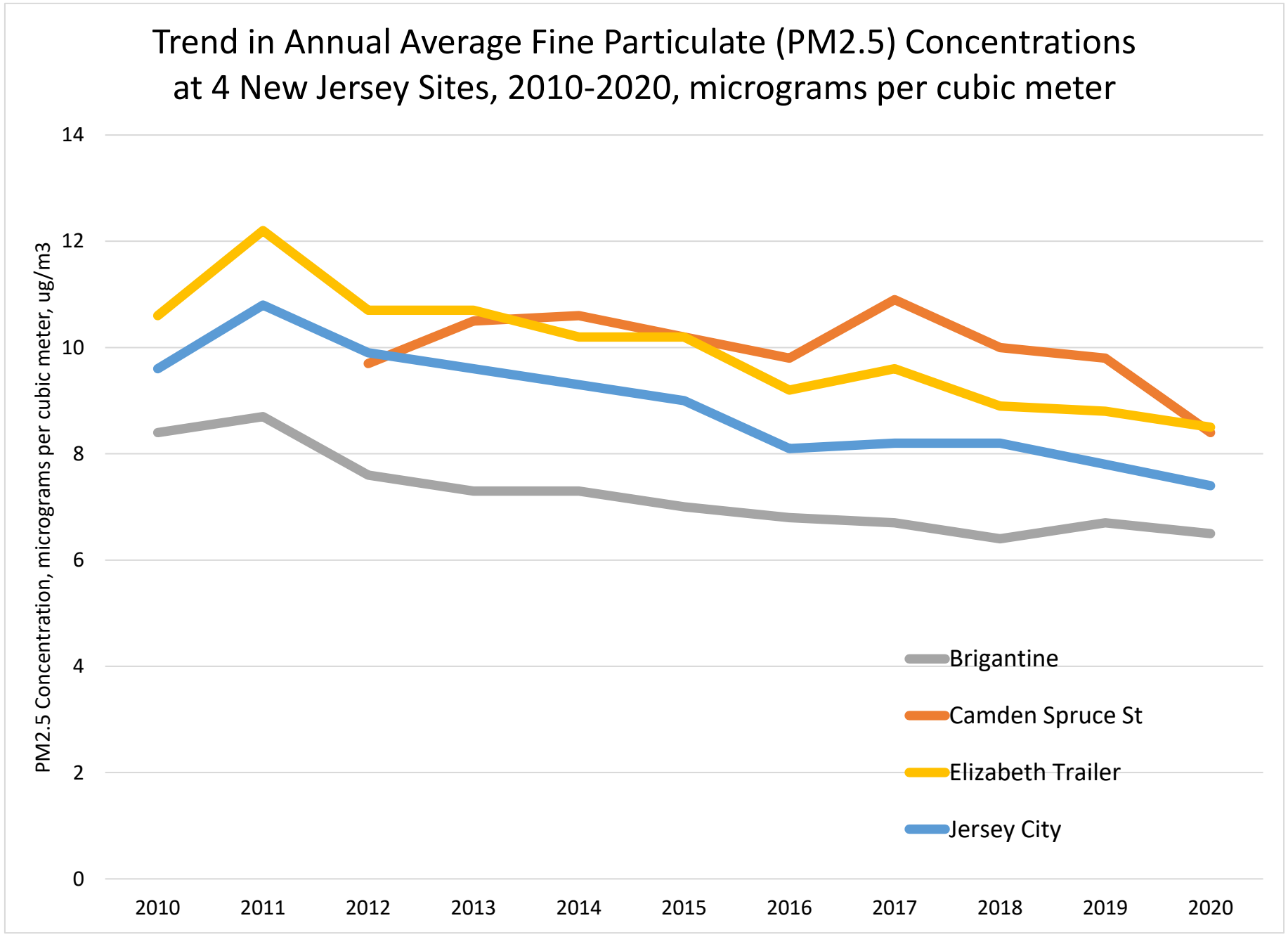


Monthly Average Nitrogen Oxides (NOx) Concentrations at Jersey City in 2017-19 Compared with 2020 and 2021, ppm

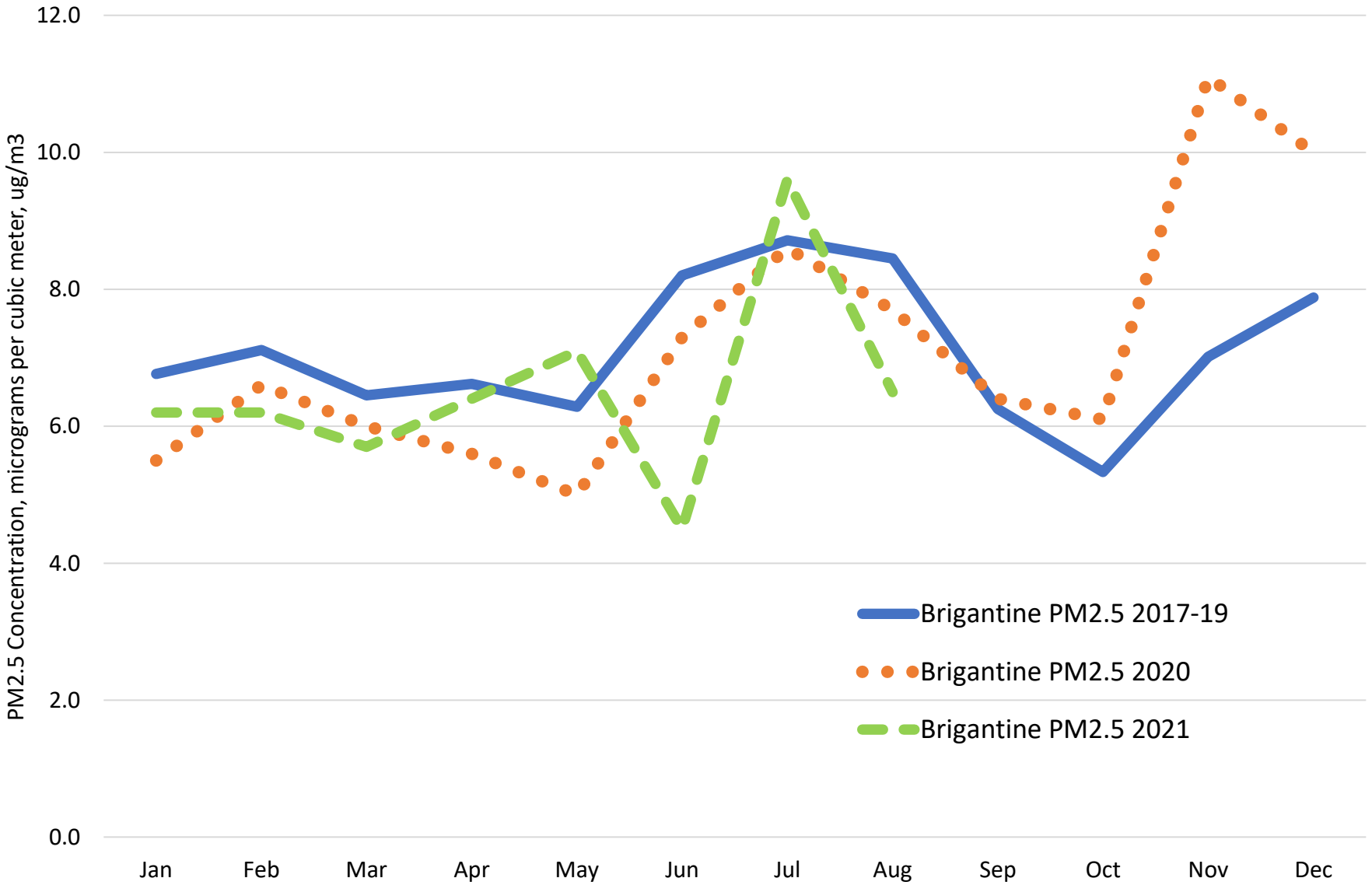


Fine Particulates, $PM_{2.5}$

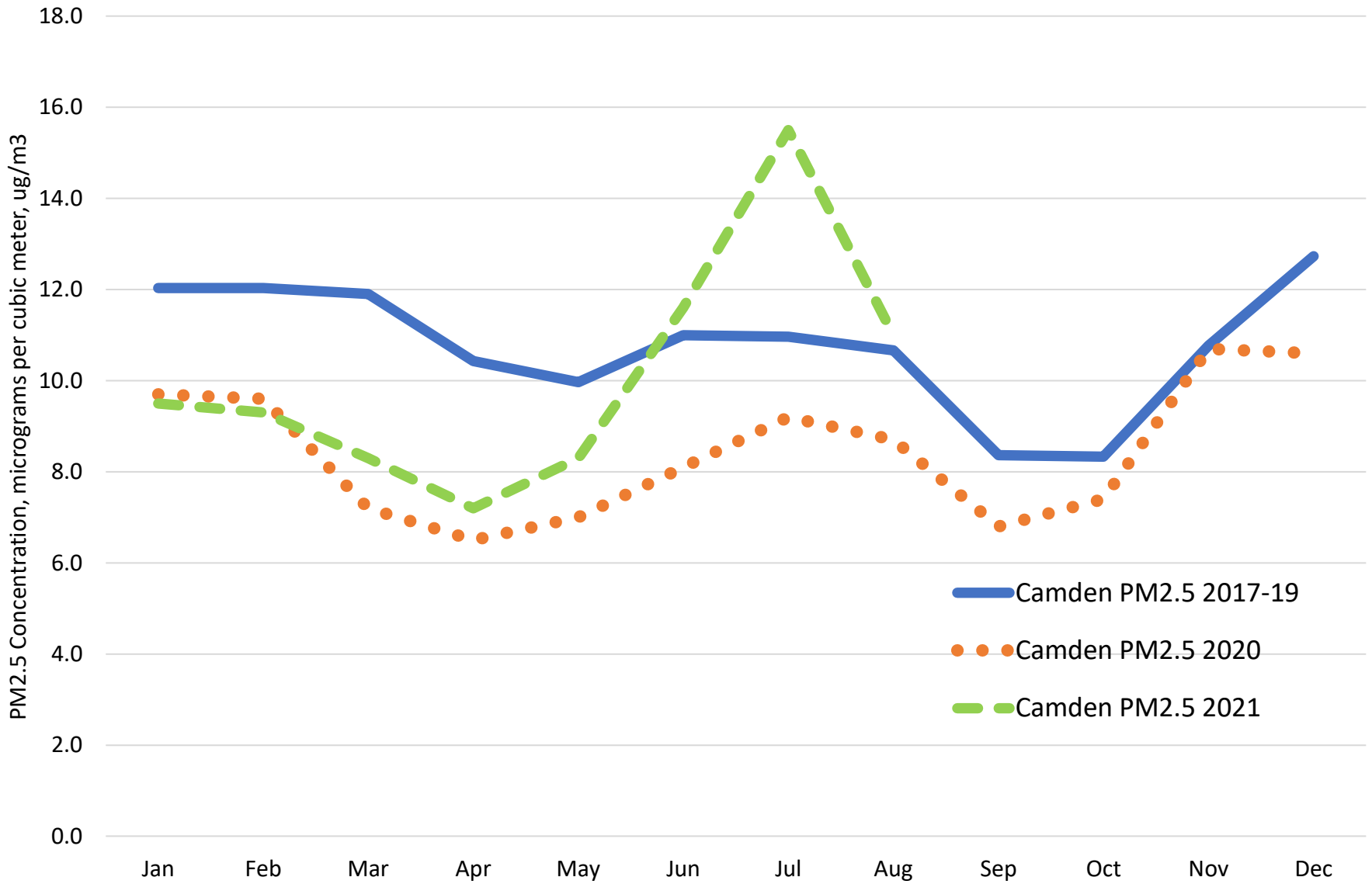
- Brigantine: background site
- Urban stations
  - Camden Spruce Street
  - Elizabeth Lab (NJ Turnpike Exit 13)
  - Jersey City


Trend in Annual Average Fine Particulate (PM2.5) Concentrations at 4 New Jersey Sites, 2010-2020, micrograms per cubic meter
PM2.5 Concentration, micrograms per cubic meter, ug/m3
14
12
10
8
6
4
2
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Brigantine
Camden Spruce St
Elizabeth Trailer
Jersey City

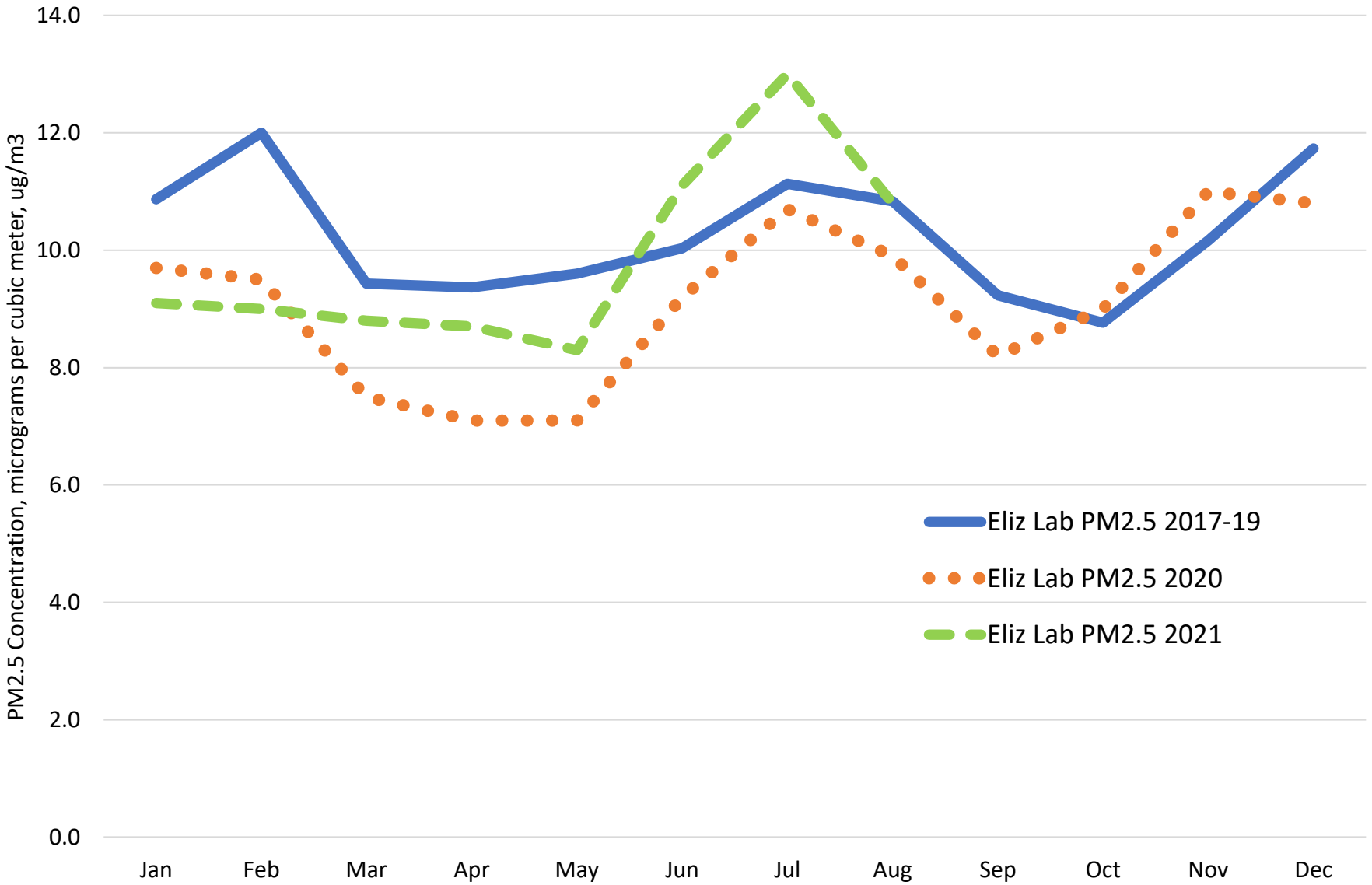
Monthly Average Fine Particle (PM2.5) Concentrations at Brigantine in 2017-19 Compared with 2020 and 2021, ug/m3



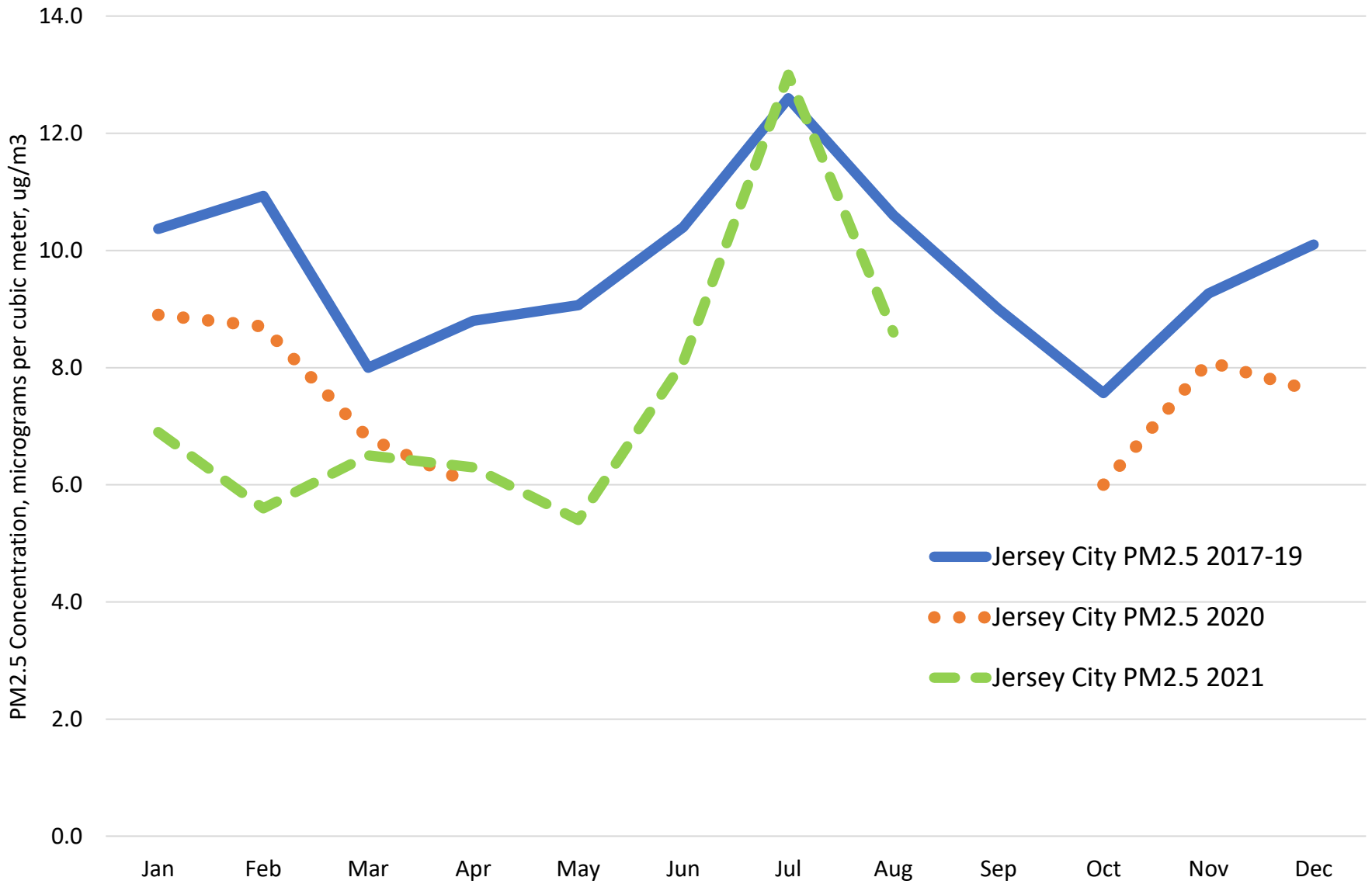
Monthly Average Fine Particle (PM2.5) Concentrations at Camden in 2017-19 Compared with 2020 and 2021, ug/m3



Monthly Average Fine Particle (PM2.5) Concentrations at Elizabeth in 2017-19 Compared with 2020 and 2021, ug/m3



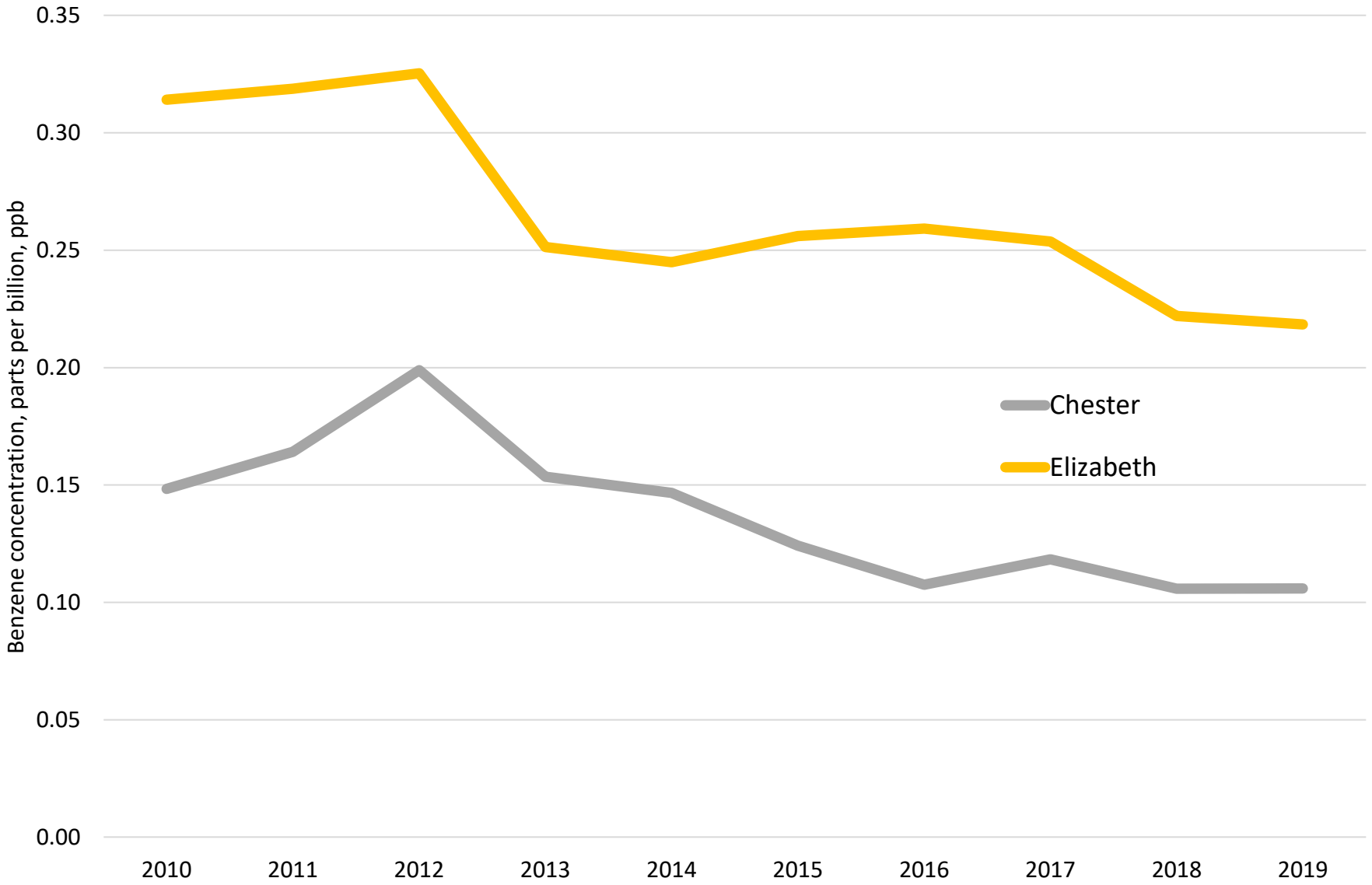
Monthly Average Fine Particle (PM2.5) Concentrations at Jersey City in 2017-19 Compared with 2020 and 2021, ug/m3



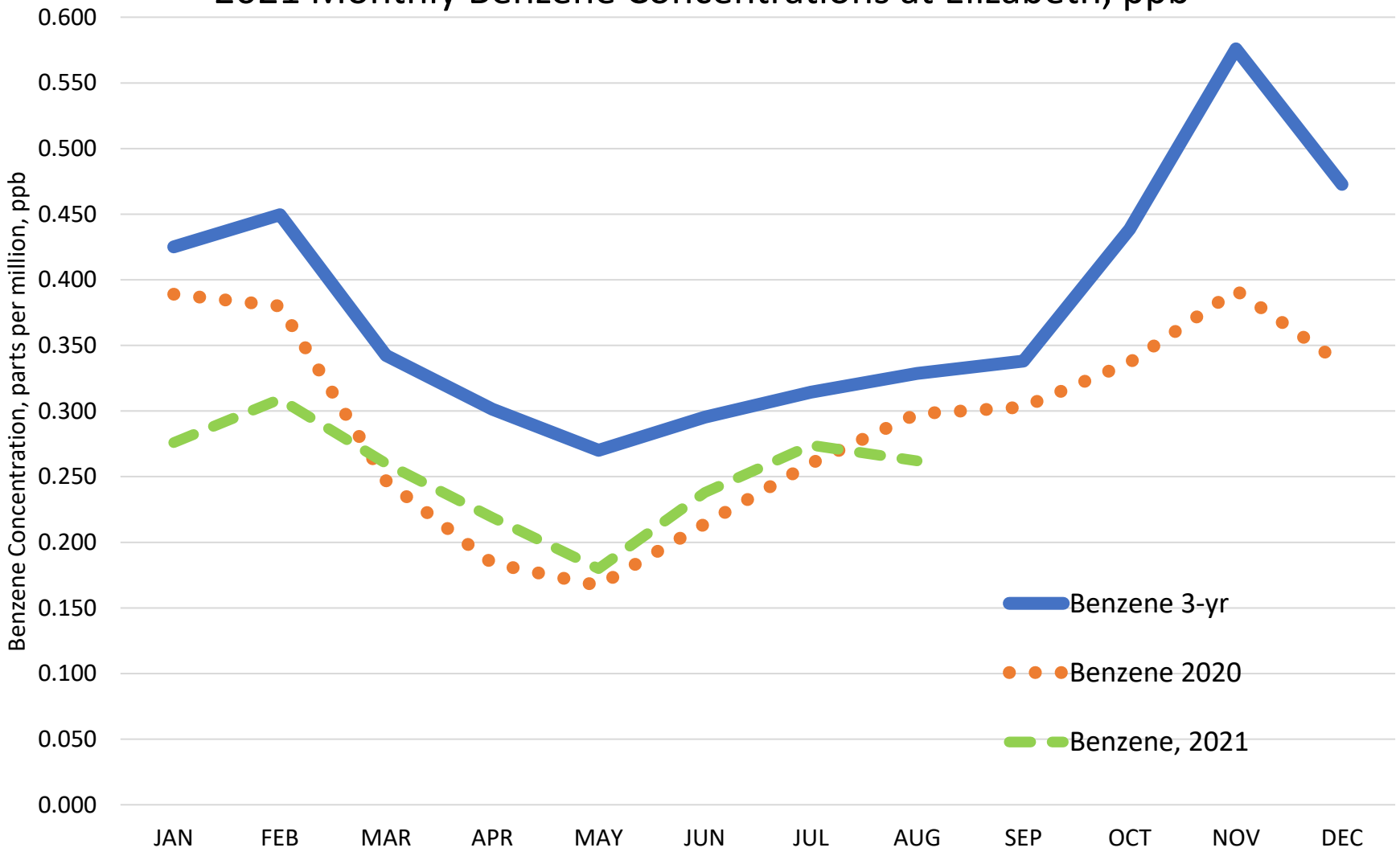
Benzene

- Chester: background site
- Urban station: Elizabeth Lab (NJ Turnpike Exit 13)

Trend in Annual Average Benzene Concentrations (24-Hr Samples Analyzed by TO-15) at Chester and Elizabeth, 2010-2019, ppb



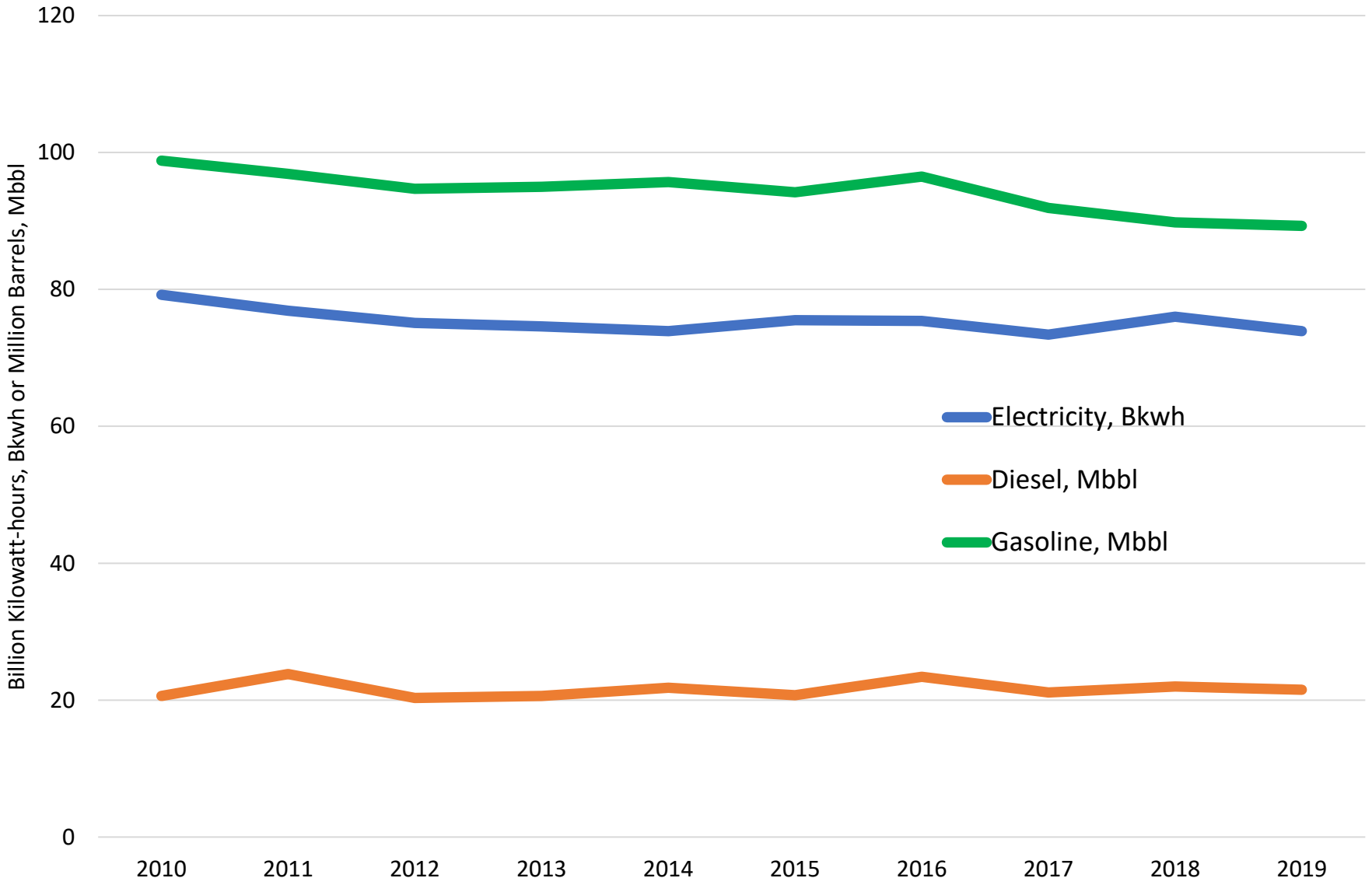
Comparison of 3-Year Average (2016, 2017, 2019) Monthly Benzene Concentrations (from hourly GC-PID monitor) with 2020, 2021 Monthly Benzene Concentrations at Elizabeth, ppb



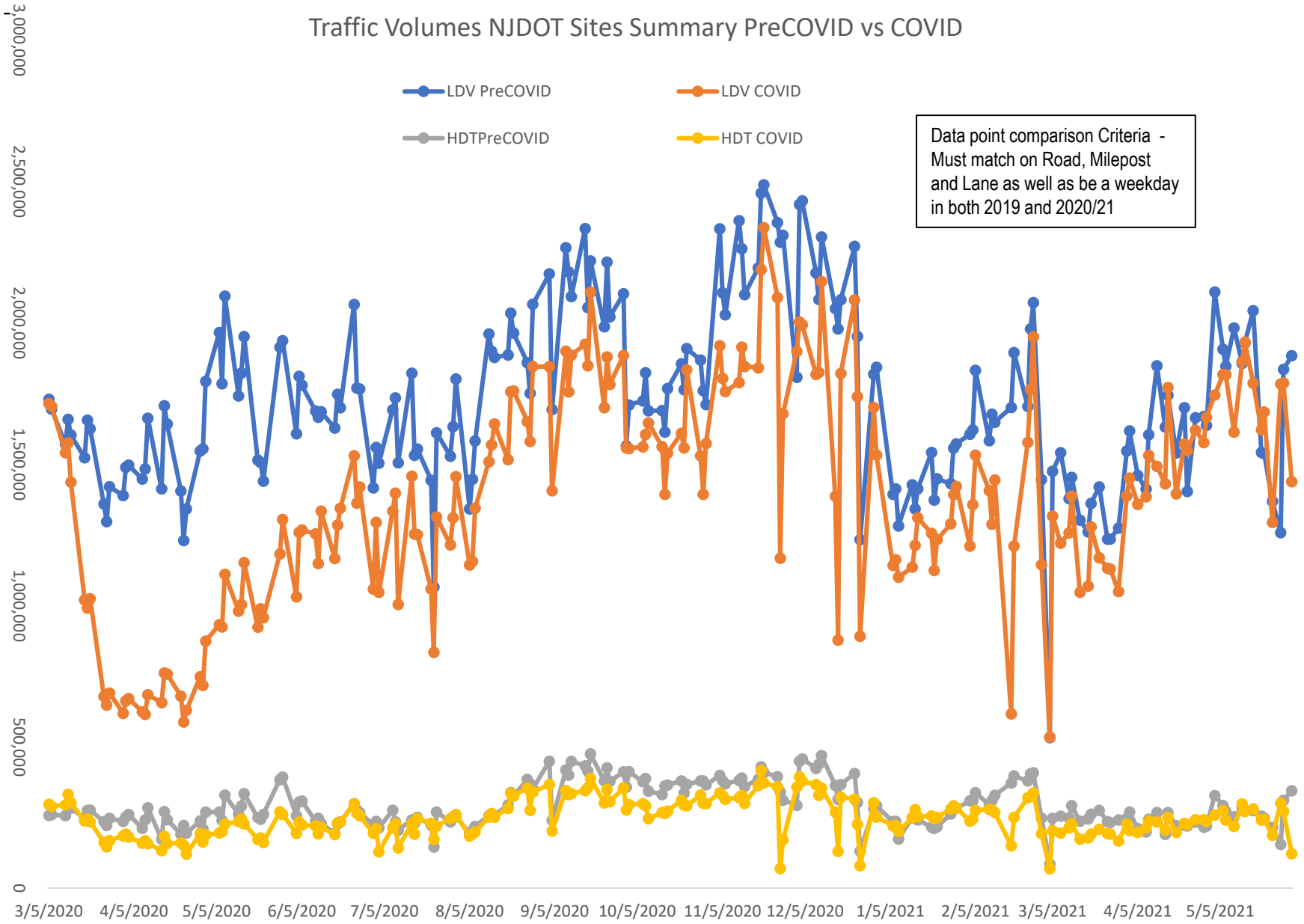
NJ Energy Consumption and Traffic Counts

- Electricity Retail Sales in New Jersey, 2010-2019
  - Source: US Energy Information Agency, www.eia.gov
- Transportation Petroleum Consumption Estimates in New Jersey, 2010-2019
  - Diesel
  - Motor Gasoline
  - Source: US Energy Information Agency, www.eia.gov
- Traffic counts for light-duty and heavy-duty vehicles
  - Source: NJDOT

Trend in Electricity and Transportation Fuel Consumption in New Jersey, 2010-2019



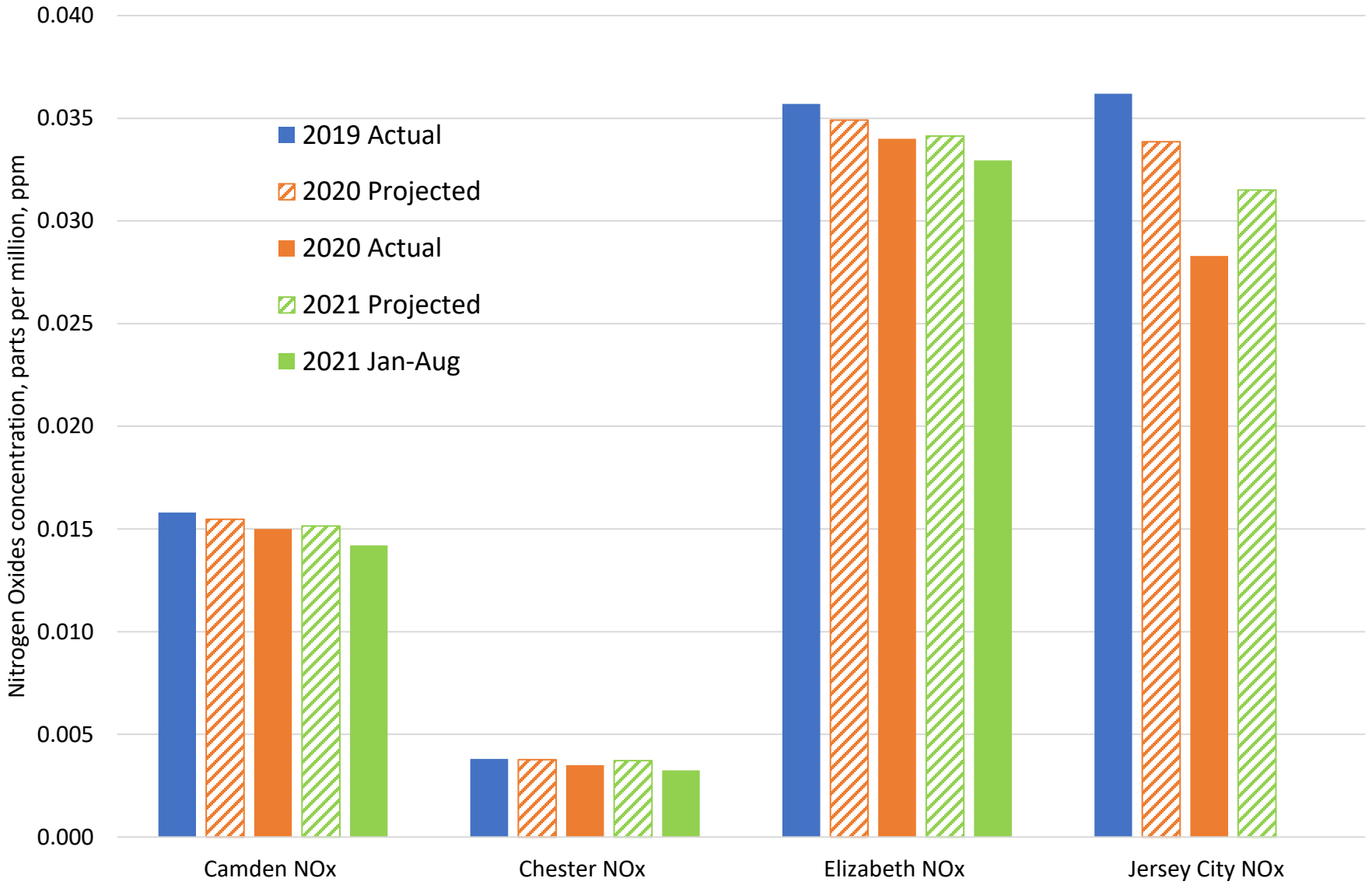
7:30 -


Traffic Volumes NJDOT Sites Summary PreCOVID vs COVID
LDV PreCOVID
LDV COVID
HDTPreCOVID
HDT COVID
Data point comparison Criteria - Must match on Road, Milepost and Lane as well as be a weekday in both 2019 and 2020/21
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
3/5/2020
4/5/2020
5/5/2020
6/5/2020
7/5/2020
8/5/2020
9/5/2020
10/5/2020
11/5/2020
12/5/2020
1/5/2021
2/5/2021
3/5/2021
4/5/2021
5/5/2021

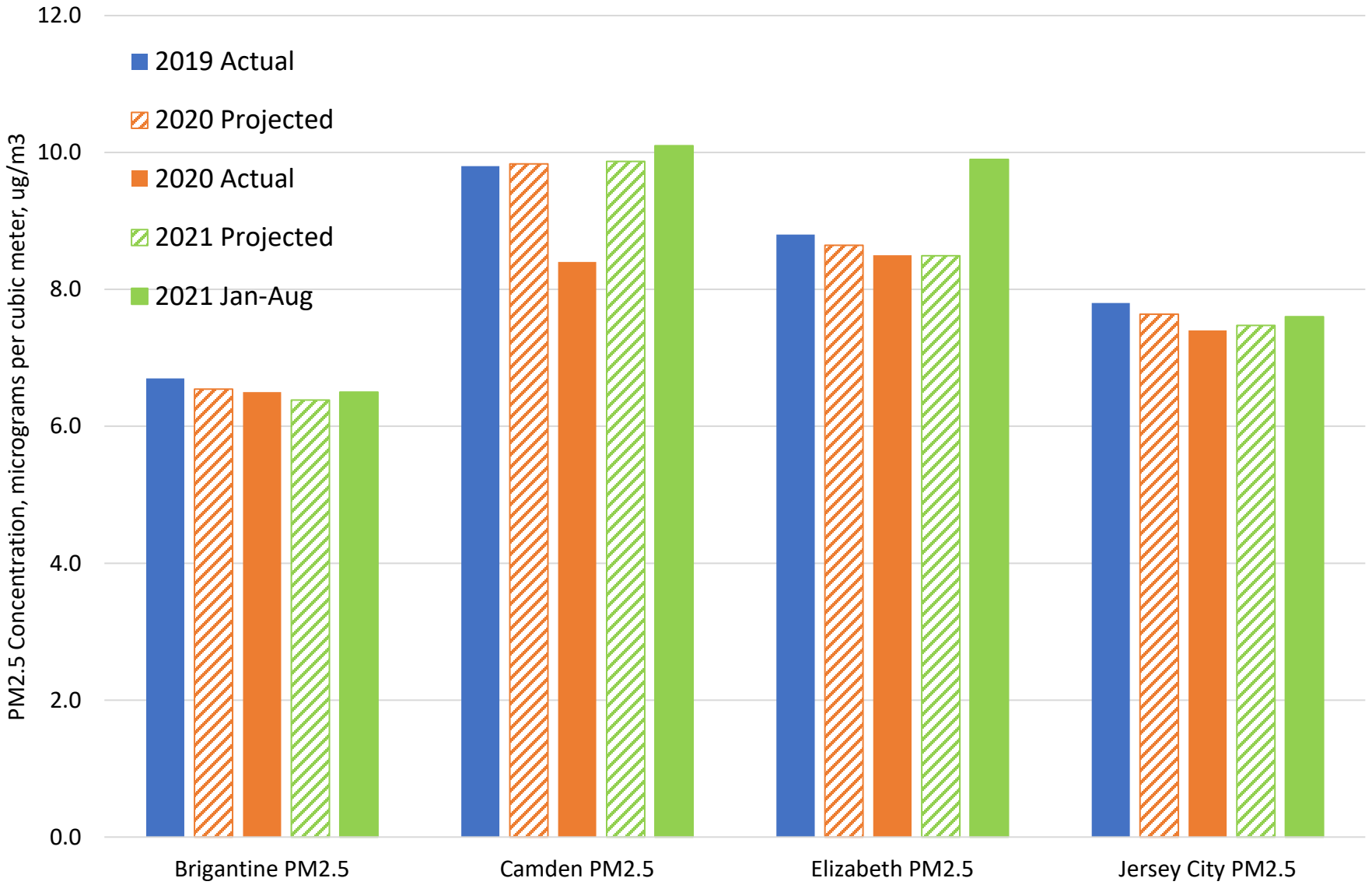
Summary

- Compared projected and actual concentrations in 2020 with projected and actual levels from January – August 2021
- Projections are based of average % change over 10 years
- Is Covid-19 still impacting air quality in 2021? (Are actual levels in 2021 lower than projected levels?)
  - NOx: Yes, actual levels in 2021 are 4-14% lower than projected NOx levels
  - PM2.5: No, because of outside forces (wildfires)
  - Benzene: Not conclusive because benzene levels in 2019 were also low
  - Traffic counts for light-duty and heavy-duty vehicles NJ are back to pre-Covid-19 levels
- 2021 has not ended

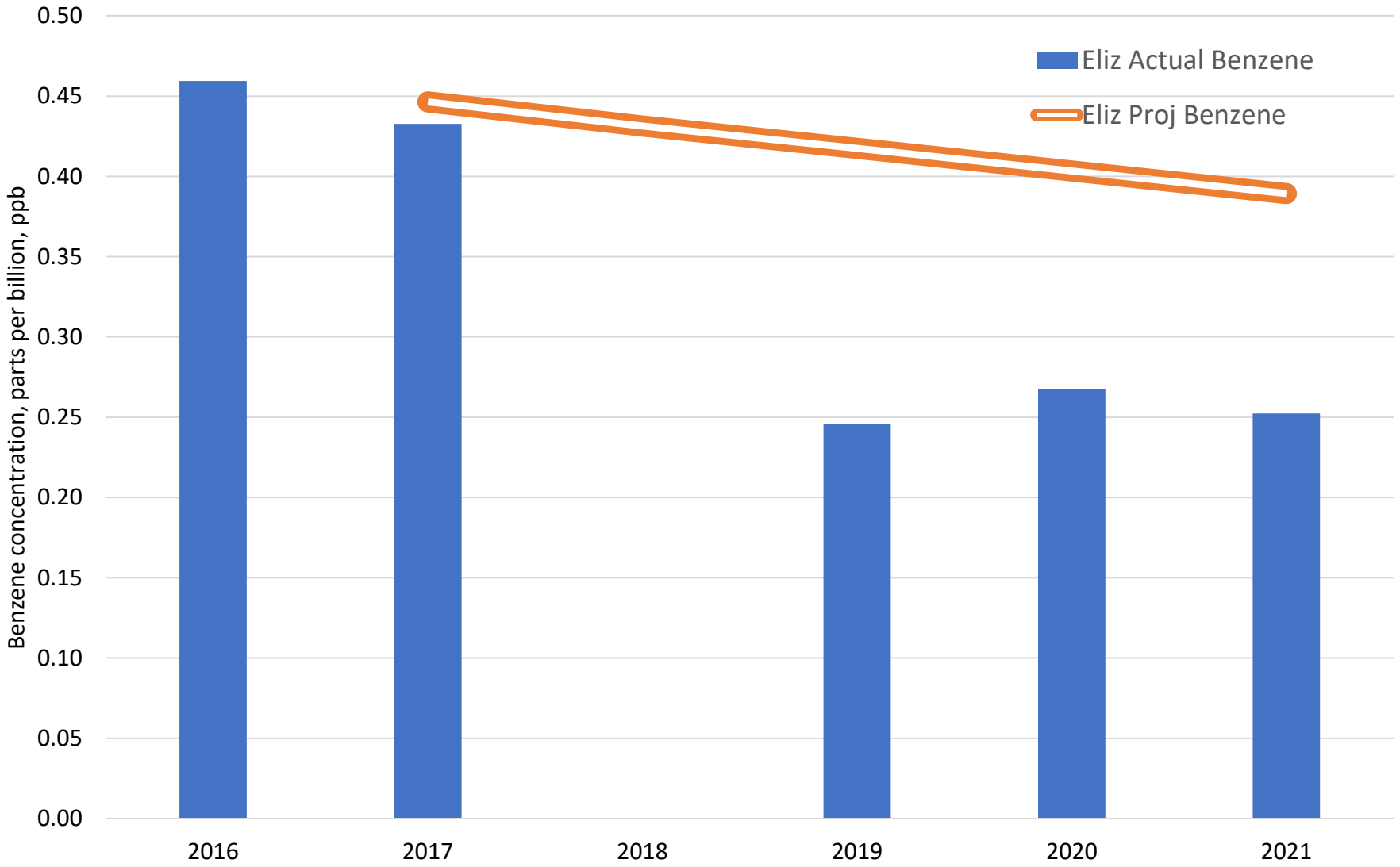
Comparison of Actual Nitrogen Oxides Concentrations in 2019 with Projected and Actual Concentrations in 2020 and 2021, ppm



Comparison of Actual PM2.5 Concentrations in 2019 with Projected and Actual Concentrations in 2020 and 2021, ug/m3



Comparison of Actual Benzene Concentrations (from hourly GC-PID monitor) at Elizabeth in 2016 with Actual and Projected Concentrations, 2017-2021, ppb



End

www.nj.gov/dep/airmon

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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION