



**Maryland**  
Department of  
the Environment

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# Air Quality 101

## A Review of Air Quality Facts & Figures in the Baltimore Region

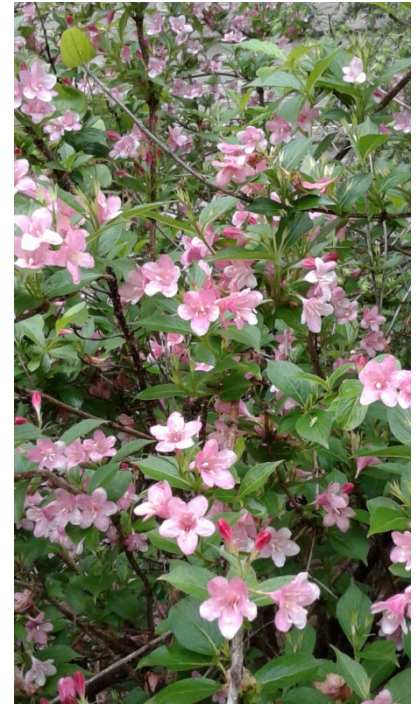
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# Air Pollution

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- Federal Clean Air Act requires the U.S. EPA to set National Ambient Air Quality Standards (NAAQS)
- Primary NAAQS are designed to protect health
  - Prevent effects such as respiratory and heart disease aggravation, respiratory symptoms, and even death
- Secondary NAAQS protect against welfare effects
  - Protect wildlife, vegetation, agriculture, buildings, and visibility





# Air Quality Standards

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- NAAQS are set for six common air pollutants (“criteria air pollutants”)
  - Ozone (smog,  $O_3$ )
  - Fine particulate matter ( $PM_{2.5}$ )
  - Lead (Pb)
  - Nitrogen dioxide, ( $NO_2$ )
  - Sulfur dioxide ( $SO_2$ )
  - Carbon monoxide (CO)
- Sources include motor vehicles, electricity production, industries, & even some trees



Pics: <https://www.epa.gov/criteria-air-pollutants>



# Maryland is in attainment of most air quality standards

- Nitrogen dioxide – one of the highly reactive gases, nitrogen oxides (NO<sub>x</sub>)
  - Sources: Primarily from burning fuel in motor vehicles, power plants, & off-road equipment
- Particulate matter – fine particles (PM<sub>2.5</sub>) and coarse particles (PM<sub>10</sub>)
  - Sources: motor vehicles, power plants, factories, wood burning, construction, forest fires, and more.
- Sulfur Oxides – harmful to the human respiratory system
  - Sources: Burning of fuel (primarily coal)
- Lead – released from industry & nature
  - Utilities, incinerators, & previously in gasoline
  - Now found predominantly in AvGas

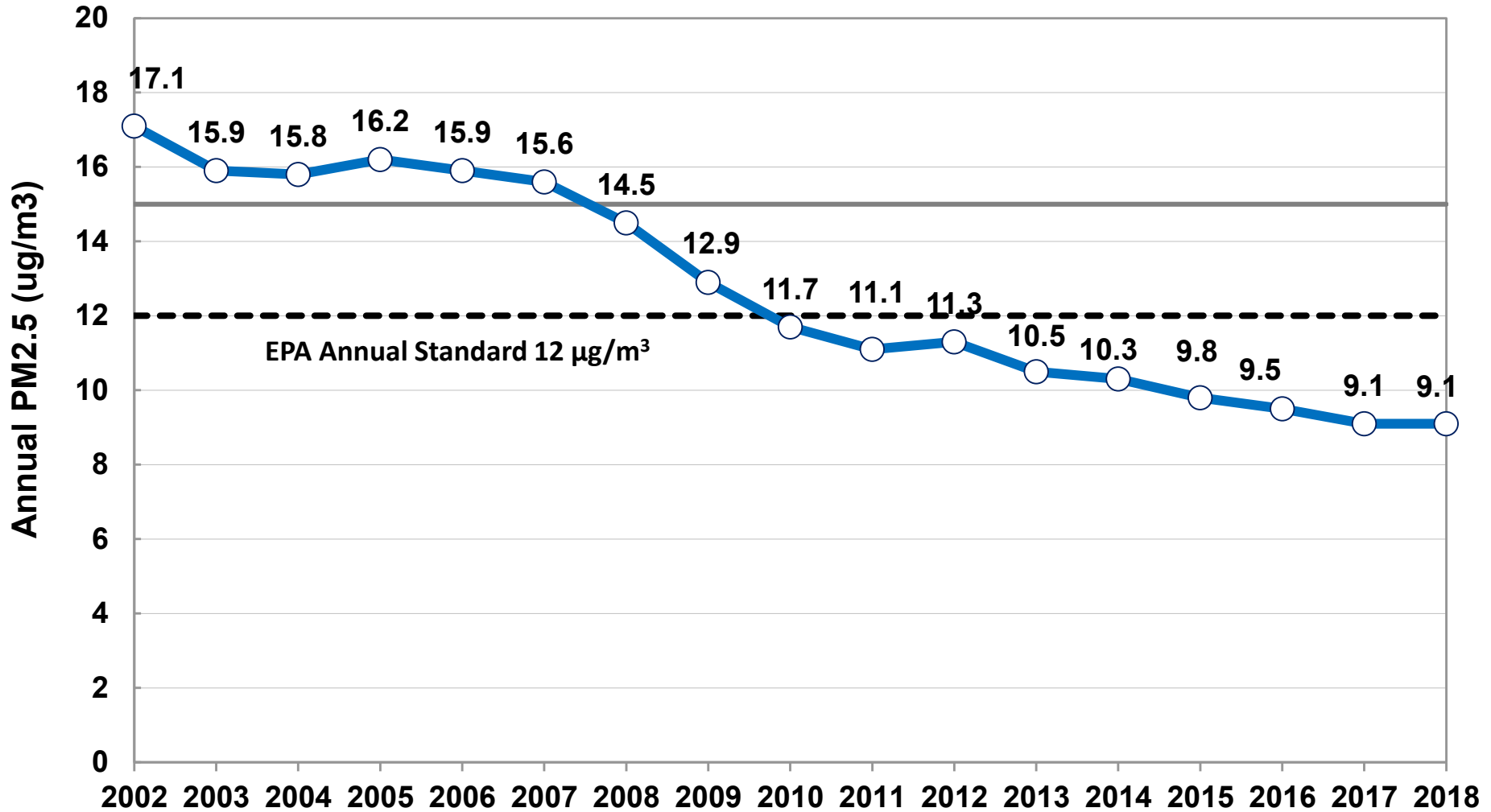


[https://www.osha.gov/images/dsg-motor\\_vehicles.jpg](https://www.osha.gov/images/dsg-motor_vehicles.jpg)



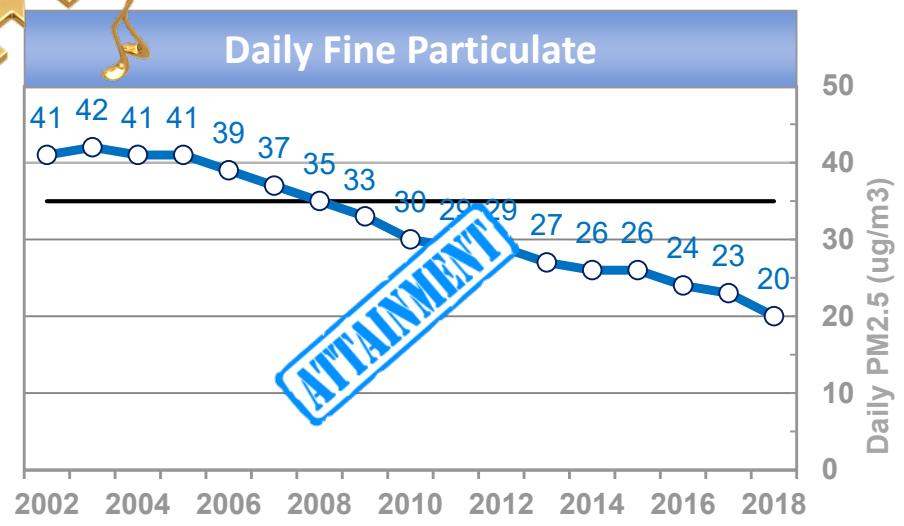
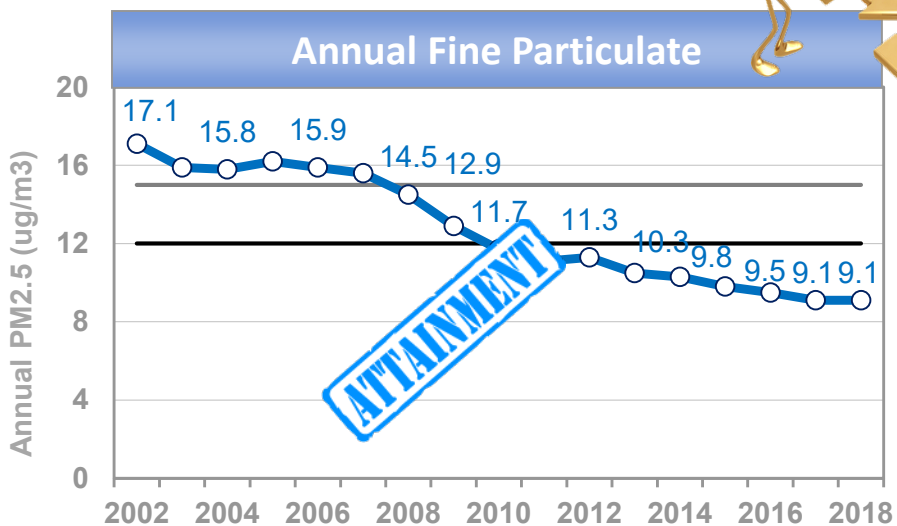
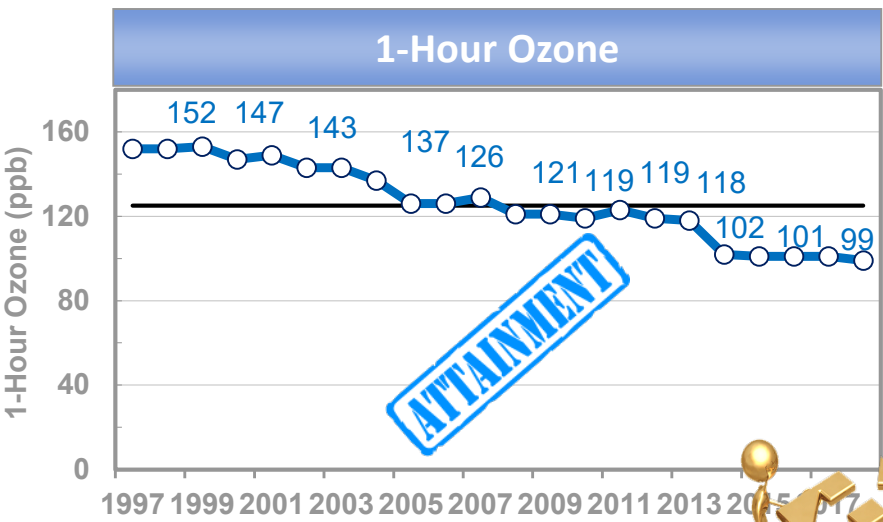
# Fine Particle Air Pollution

## *Lower Levels Across the State*





# Progress in Cleaning Maryland's Air



\* 2019 data is preliminary  
Though Aug 14th



# Baltimore area is “nonattainment” but getting close to attainment for these:

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- Ozone (smog) = nitrogen oxides (NO<sub>x</sub>) + volatile organic compounds (VOCs) + sunlight
  - Sources of NO<sub>x</sub>: burning fuel in motor vehicles, power plants/industries
  - Sources of VOCs: motor vehicles, recreational marine vehicles, consumer products
  - Sources of formed ozone: upwind states
- Sulfur dioxide
  - Sources: burning of fossil fuels, especially coal & diesel in power plants, paper & steel industries, ships



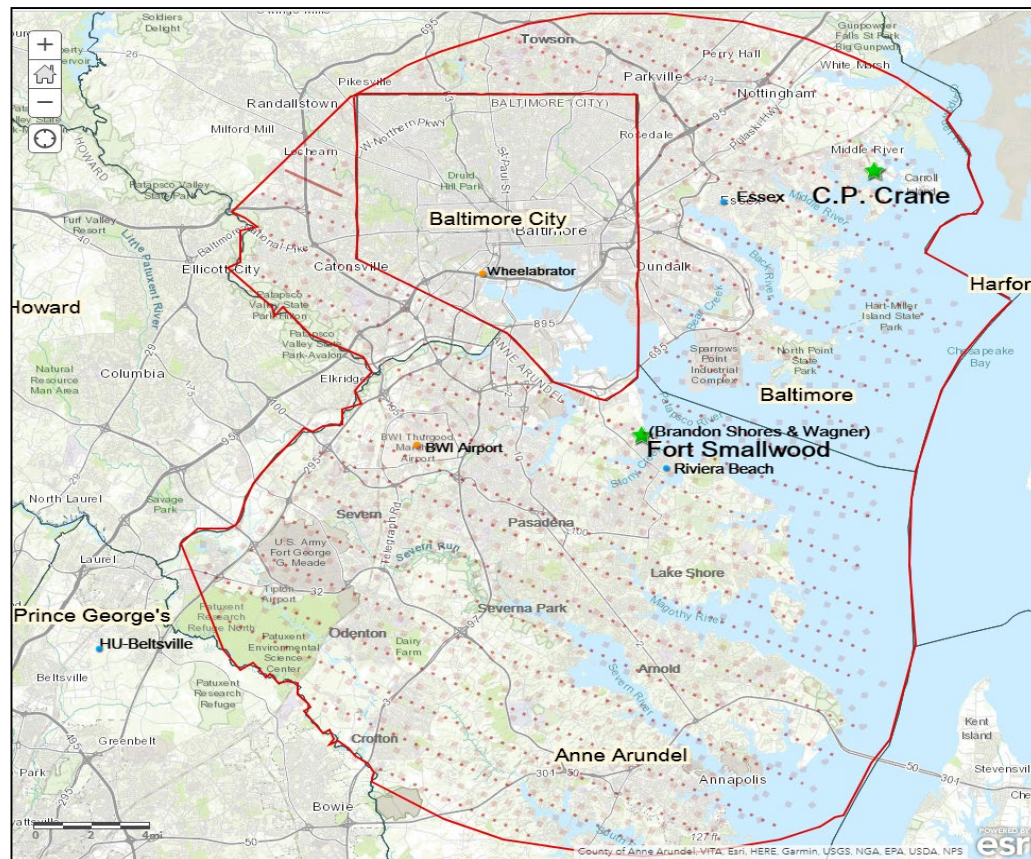
[https://en.wikipedia.org/wiki/Sulphur\\_Emission\\_Control\\_Area](https://en.wikipedia.org/wiki/Sulphur_Emission_Control_Area)



# Sulfur Dioxide – SO<sub>2</sub>

## Anne Arundel County and Baltimore County SO<sub>2</sub> Nonattainment Area

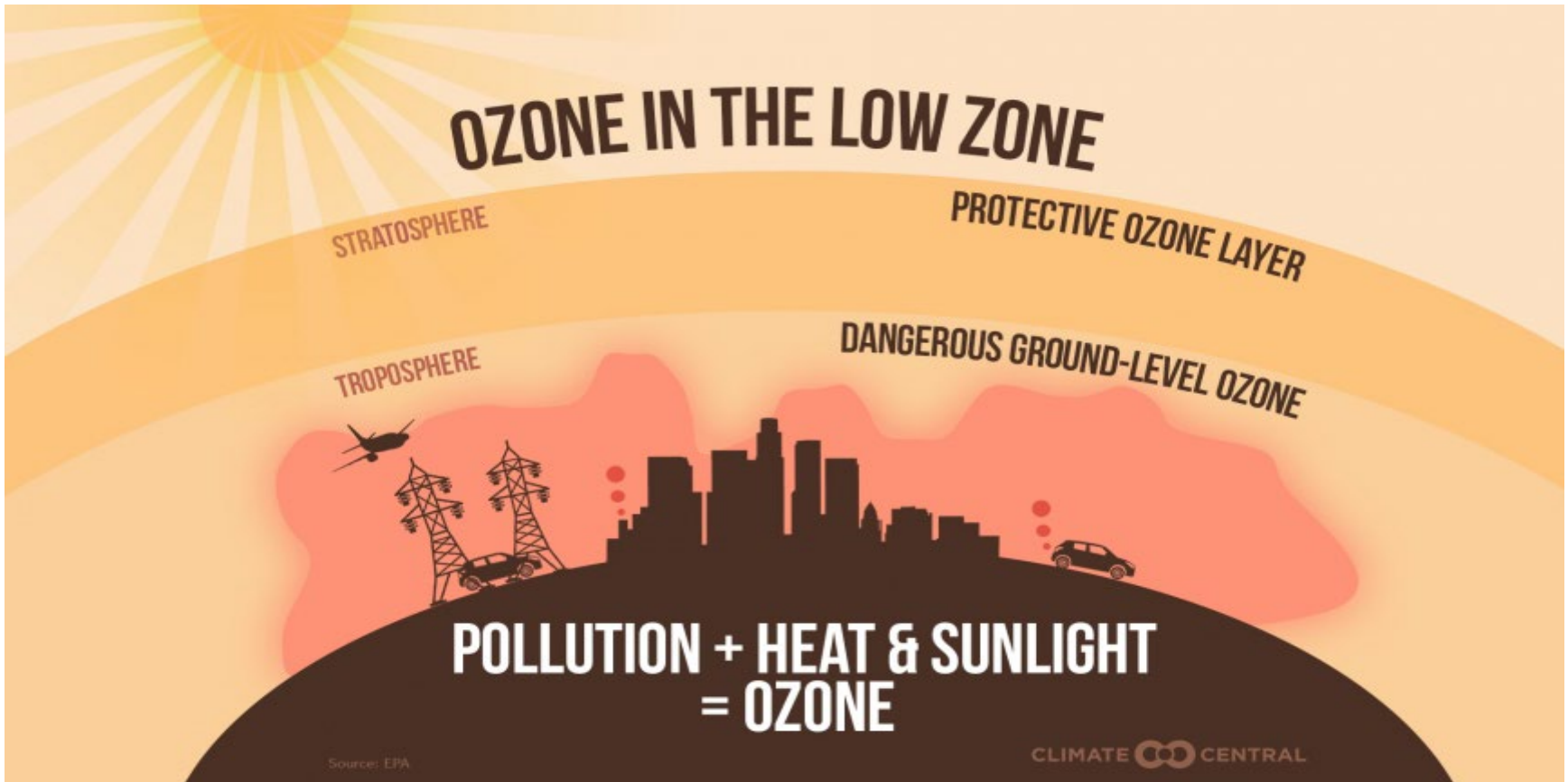
- 26.8 km (16.7 miles) of the Wagner Unit 3 stack







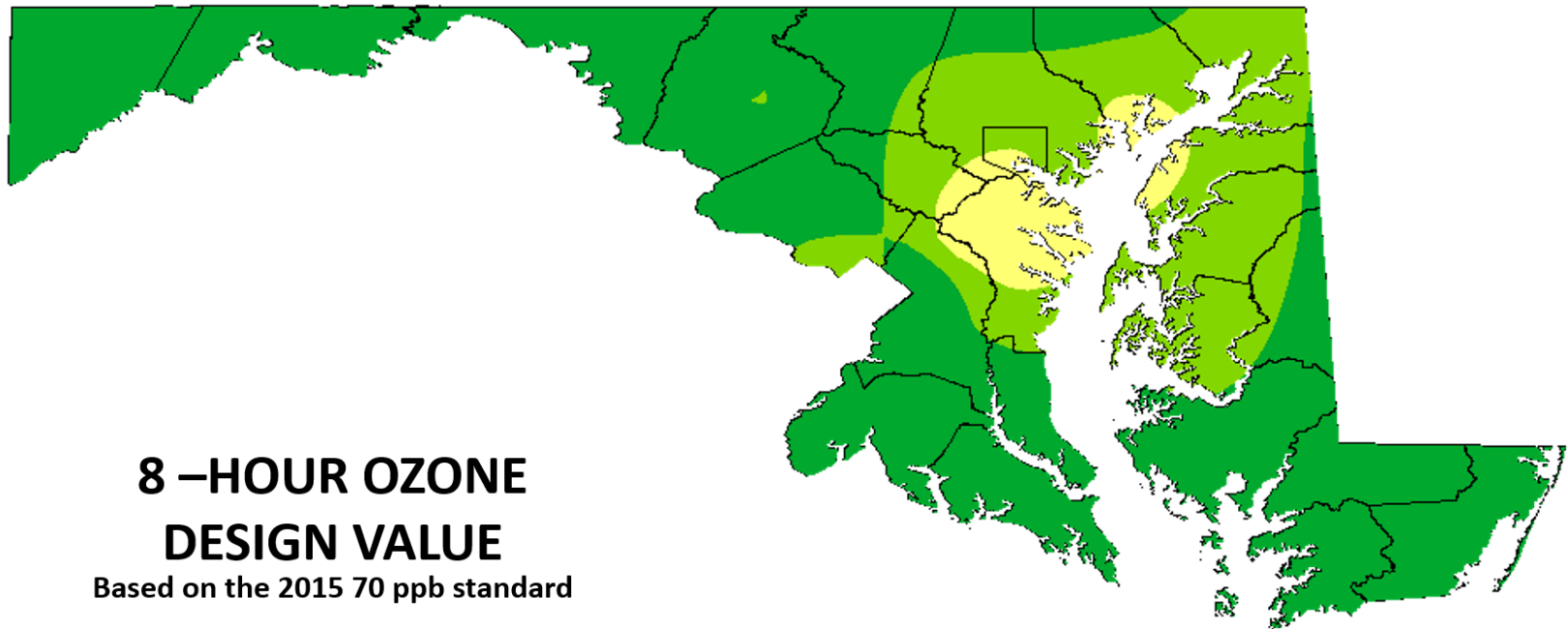
# Ozone - Smog





# Maryland 2020 Ozone Design Values

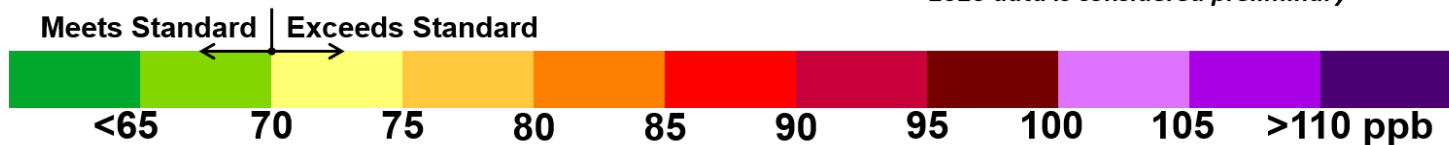
## 2020 Ozone Design Values



### 8 –HOUR OZONE DESIGN VALUE

Based on the 2015 70 ppb standard

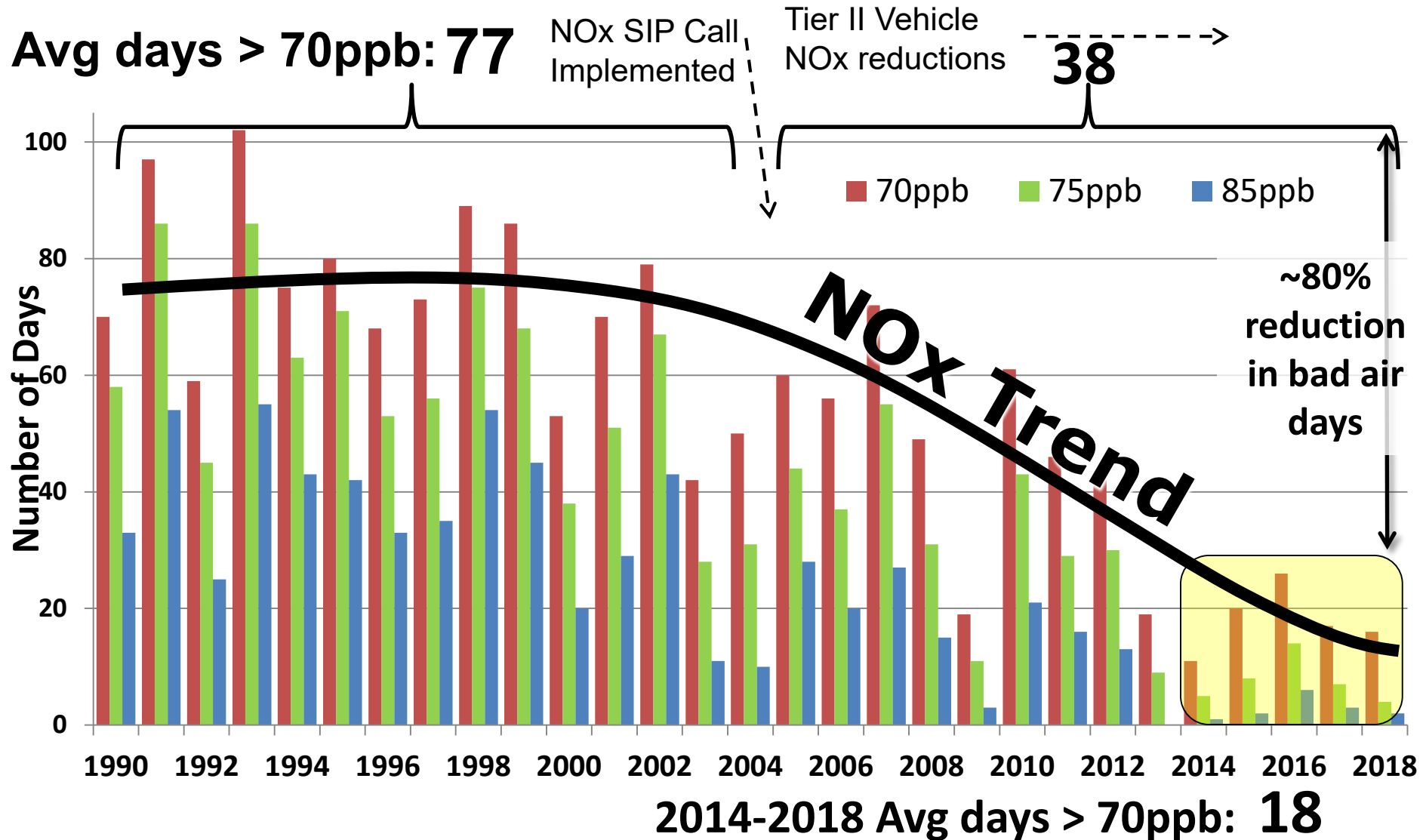
*\*2020 data is considered preliminary*





# Maryland Exceedance Days are Decreasing

Number of days annually when any MD monitor exceeds NAAQS





# Understanding Ozone Designations and SIP Process

## Key Dates for 2015 Ozone Nonattainment Areas

Final Area Designations	April 2018
Emission statement rule, emission inventory, and Moderate area/OTR RACT SIPs	August 2020
Marginal area attainment date	August 2021*
Attainment plans and demonstrations for initial Moderate areas	August 2021
Attainment plans and demonstrations for initial Serious and above areas	August 2022
Moderate area attainment date	August 2024
Serious area attainment date	August 2027
Severe area attainment date	August 2033



# Demonstrating Attainment of the NAAQS

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- Short Answer – By Monitoring Actual Pollutant Concentrations in the Nonattainment Area
- Long Answer
  1. Each Monitor in the Nonattainment Area must demonstrate attainment
  2. The monitors are independent of each others
    - If one monitor exceeds the NAAQS then the entire area is in Nonattainment
    - Therefore, calculations for demonstrating attainment must also be conducted by individual monitor.



# Demonstrating Attainment of the NAAQS EPA Design Value Concept

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- What is a Design Value?

A design value is a statistic that describes the air quality status of a given location relative to the level of the National Ambient Air Quality Standards (NAAQS).

Developed to deliver a 98% Confidence Level

Very high threshold/hurdle to meet

- The Baltimore NAA monitors did not meet the criteria for Attainment by the end of the 2020 or 2021 Ozone Seasons



# Demonstrating Attainment of the NAAQS EPA Design Value Concept

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- Design Value Calculation (per Monitor)
  1. 3-year average of the 98th percentile 1-hour daily maximum concentrations
  2. Hourly Concentrations are Recorded and Daily Maximum 8-hour Average Concentrations are Calculated
    - 24 possible running 8-hour average ozone concentrations for each calendar day during the ozone season.
    - The daily maximum is the highest of the 24 possible 8-hour averages.
  3. The 4<sup>th</sup> Highest Annual 8-Hour Average Ozone Concentration is used to Calculate the 3-year Design Value



# Demonstrating Attainment of the NAAQS EPA Design Value Concept

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## Summary DV Statistic

- The standard-related summary statistic is the annual fourth-highest daily maximum 8-hour ozone concentration averaged over three years, also known as the design value.
- The three year average is expressed to three decimal places, and any remaining digits to the right are truncated.
- Example 2020 Design Value for Monitor I

$$2020DV (i) = (4^{\text{th}} \text{ High Value for } 2018+2019+2020)/3$$

Truncated at 3 decimal places

$$0.0709 = 0.070$$





# Implications Not Meeting the NAAQS by the Attainment Date

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- If Attainment is NOT demonstrated by assigned Attainment Date
  - The Nonattainment Area is “Bumped Up” to the next highest Ozone Classification
    - i.e: Marginal NAA are “Bumped Up” to Moderate
    - The “Bump Up” can be a voluntary action by the state(s) or mandated by EPA.
    - Higher Classifications are given more time to meet the NAAQS
  - The Baltimore Marginal Ozone Nonattainment Area will be “Bumped Up” to the Moderate Ozone Classification



# Moderate SIP Requirements

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- All Marginal SIP Requirements
- Attainment demonstration
  - Photochemical Modeling that Demonstrates Attainment
  - Due Date by Statute: August 2024
  - August is NOT the end of an Ozone Season so Attainment must be demonstrated by the end of the 2023 Ozone Season
- 15% reasonable further progress (RFP) over 6 years
  - All source categories
- On-Road Mobile Emissions Conformity Budget
- Contingency measures for failure to attain



# Closing Thoughts

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- Enormous amount of work to be done in a relatively short period of time.
  - Typically an entire ozone SIP takes 2 -3 years
  - This one needs to be done in less than 1 year.
- Photochemical modeling and Reasonable Further Progress Demonstrations are the most time consuming
- MDE is counting on MDOT/Baker/BMC to provide on-road emissions for the SIP in a timely fashion.