



Maryland
Department of
the Environment

Lower Eastern Shore Ambient Air Monitoring Project



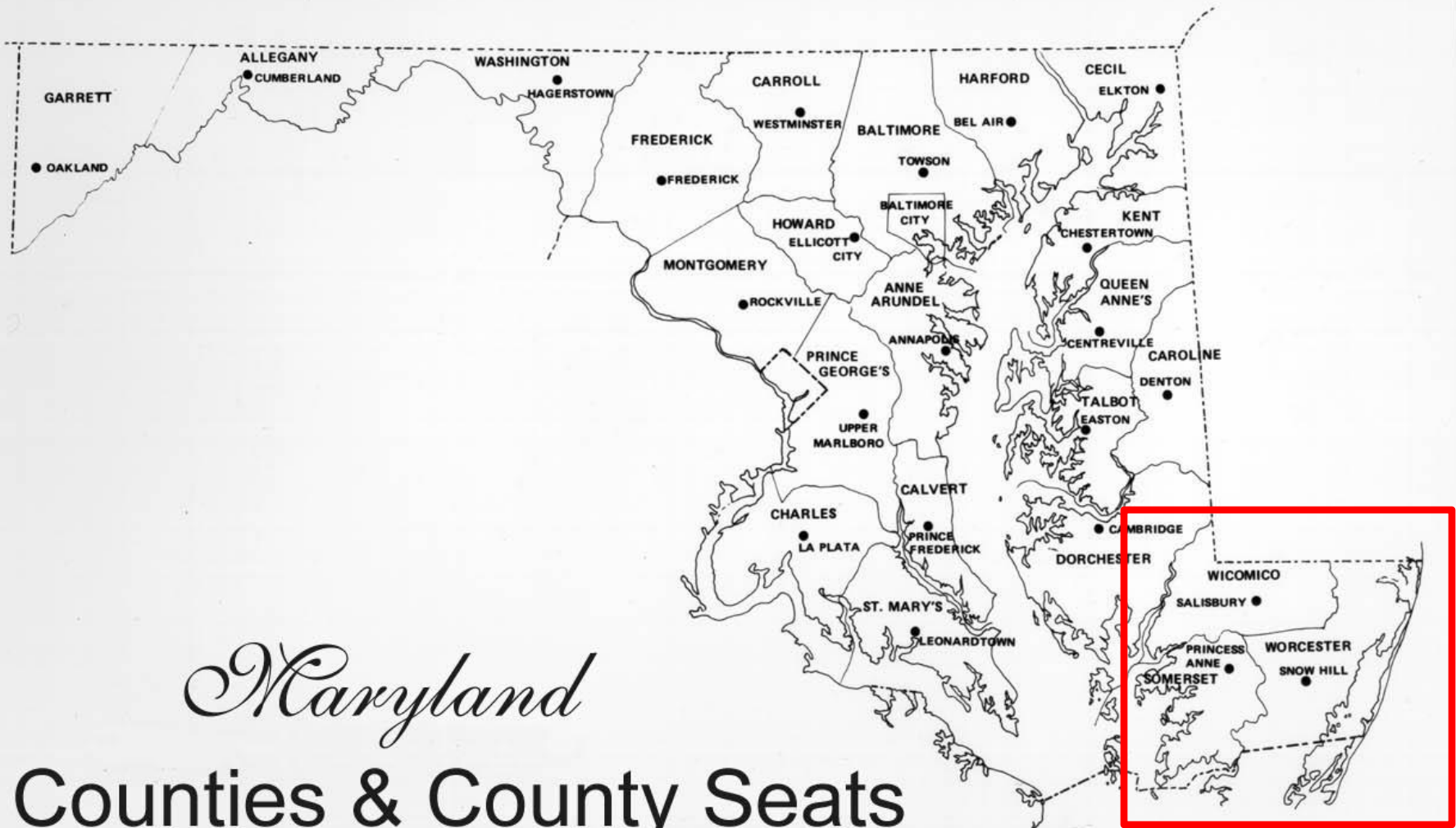
David Krask

November 29, 2021

EPA/NACCA Monitoring Steering Committee Virtual Meeting



Lower Eastern Shore



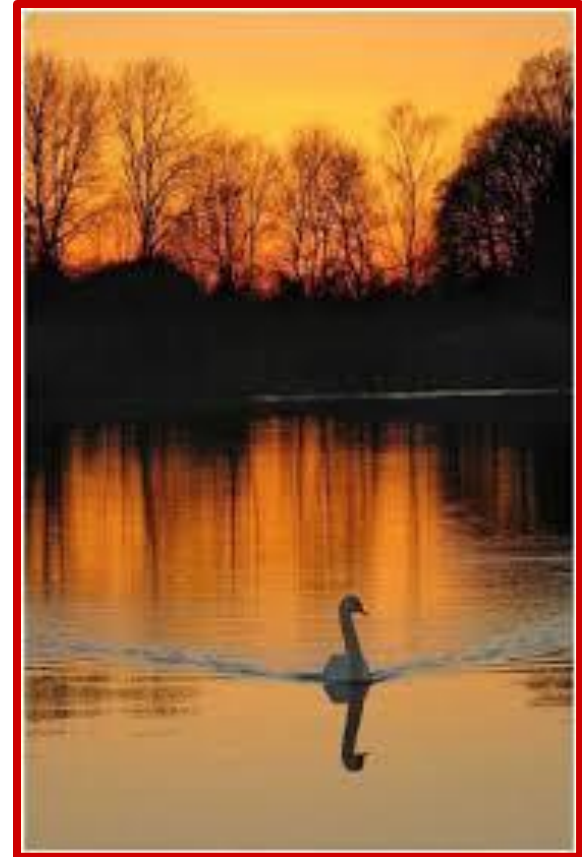
Maryland

Counties & County Seats



Outline

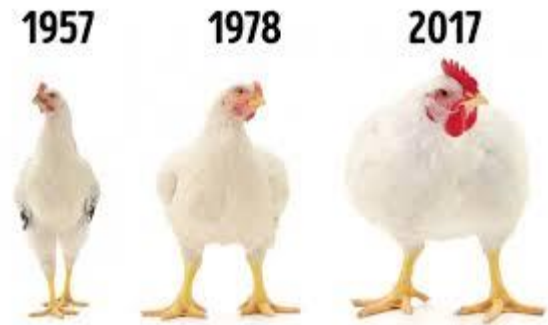
- Background
- Project Objectives and Design
- Monitoring Sites and First Year Results
- Current Status





Background

- Evolution of the commercial broiler industry from small scale “Mom and Pop” farms to massive industrial farming operations.
- Growing public concern:
 - MDE had no monitoring presence on the lower Eastern Shore (LES).
 - CAFOs remain exempt from reporting air emissions from animal waste.
 - EPA inaction 16 years after the 2005 Voluntary AFO Compliance Agreement.
 - Multiple failed State legislative efforts to mandate CAFO emission studies.





“Mega” Poultry Houses





“Mega” Poultry Houses





Background

- Growing media attention:
 - “Eastern Shore Residents Concerned Over Air Pollution From Mega-Chicken Houses” 13WJZ CBS Baltimore Jan. 24, 2018
 - “Fowl air? Lawmakers propose study to begin tracking air pollution from Maryland chicken farms” Baltimore Sun, Feb. 9, 2018
 - “Giant Chicken Houses Overrun Delmarva, and Neighbors Fear It's Making Them Sick” Inside Climate News, Apr. 23, 2018
 - “Chicken Farms Are Making it Harder to Breathe on Maryland’s Eastern Shore” Sentient Media, Oct. 16, 2018





LES Project Genesis

- MDE enters into a partnership with the Delmarva Chicken Association (DCA) and the Keith Campbell Foundation for the Environment (KCF) in the Summer of 2018.
- Partners agree to a one year multi-station air quality monitoring study on the LES.
- DCA and KCF agree to finance equipment purchases for the study (\$500,000).
- MDE will independently conduct the study.





LES Project Objectives

- Collect data where none currently exists.
- Conduct a one year air quality monitoring study in an area where there is a large concentration of chicken house.
- Measure ambient air representative of what a majority of LES community residents breathe.
 - Not focused on emissions right at ventilation fans.
 - Not looking for worst case scenario.
 - Not targeting any individual poultry operation.
- All data will be made available to the public
 - Near real-time display on MDEs website
- Compare to data from other areas in Maryland.
- Determine what future steps might be needed.





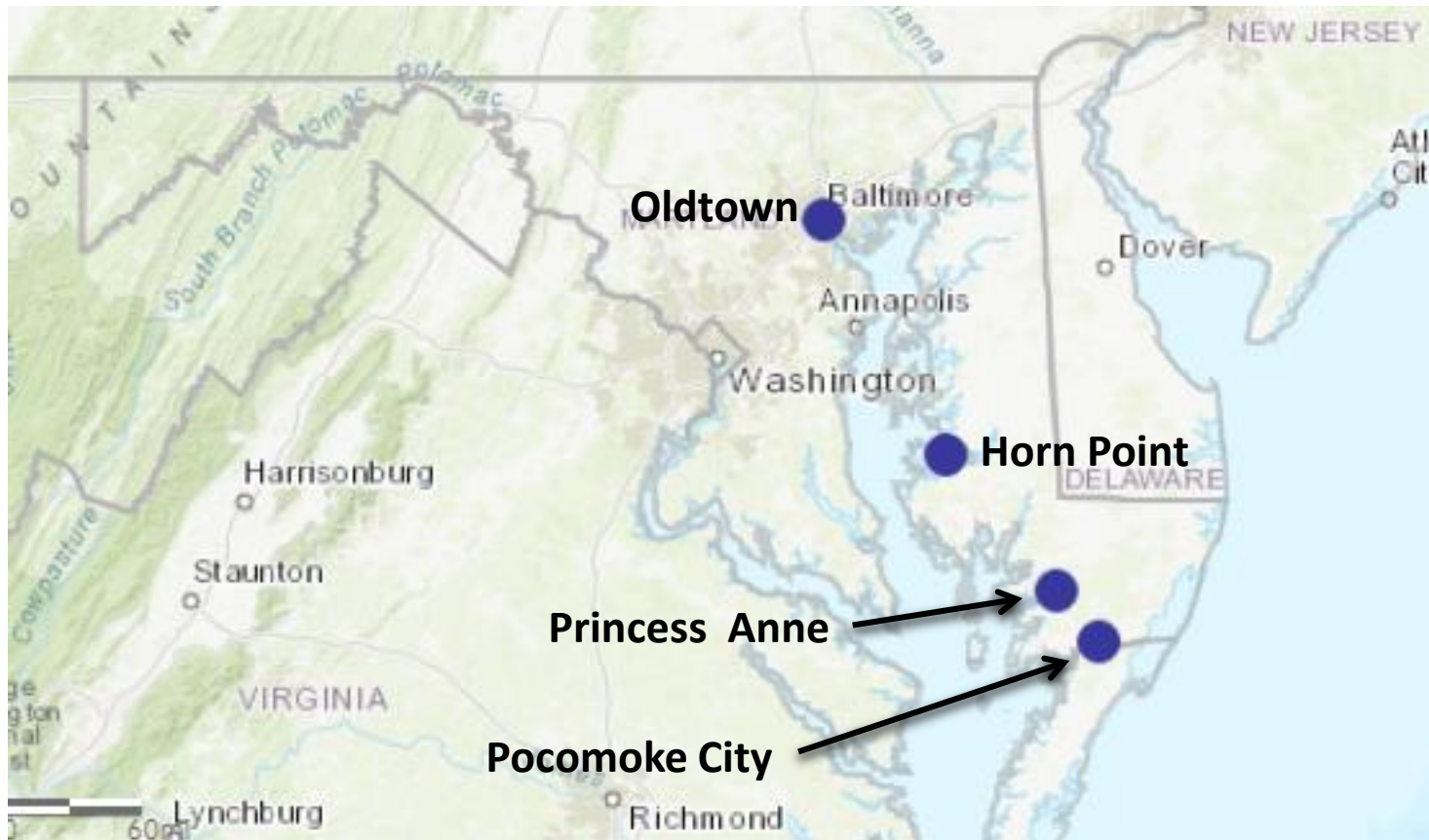
LES Monitoring Project Design

- Locate one monitoring station in an area with high density of poultry operations and one in an area with a low density of poultry operations on the lower Eastern Shore.
 - Monitor for ammonia (NH_3), fine particulate matter (PM), coarse PM and meteorological parameters.
 - TAPI 201 chemiluminescence NH_3 analyzer.
 - TAPI T640x PM-2.5/PM-10 mass monitor.
 - Vaisala WXT530 weather transmitter.
- Also install new NH_3 monitors at two existing air monitoring sites (PM data already being collected).
 - Horn Point station in Dorchester County.
 - Oldtown station in Baltimore City.
- UMES operates LES stations under contract to MDE.





Monitoring Project Sites



Oldtown: Urban, no poultry operations

Horn Point*: Rural, no poultry operations

Princess Anne: Rural, low poultry operation density

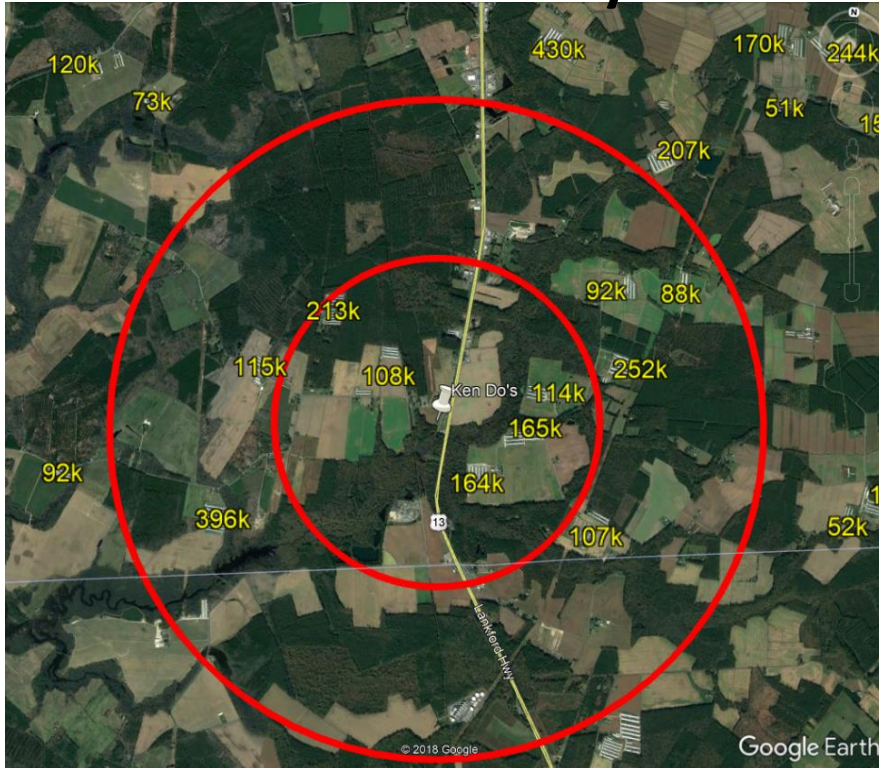
Pocomoke City: Rural, high poultry operation density

**As of May 14th, 2021 NH₃ & PM₁₀ measurements at Horn Point have been discontinued*



Sites: High Density vs Low Density

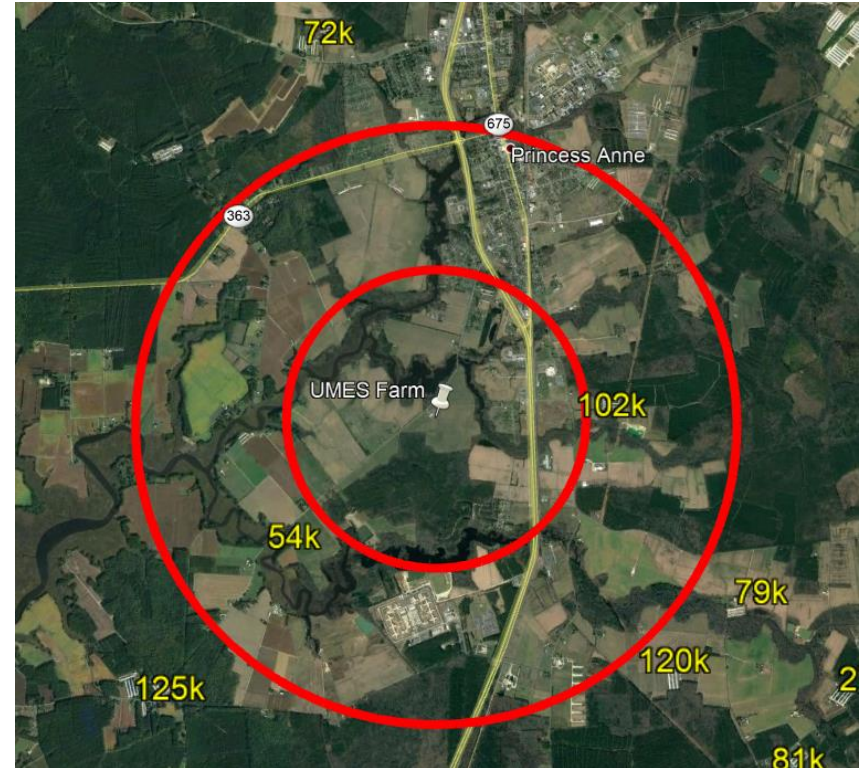
Pocomoke City



Higher

- 29 broiler houses within a 1-mile radius
- 70 houses within a 2-mile radius
- ~1.6 million chickens within a 2-mile radius
- More poultry houses outside of 2-mile radius

Princess Anne



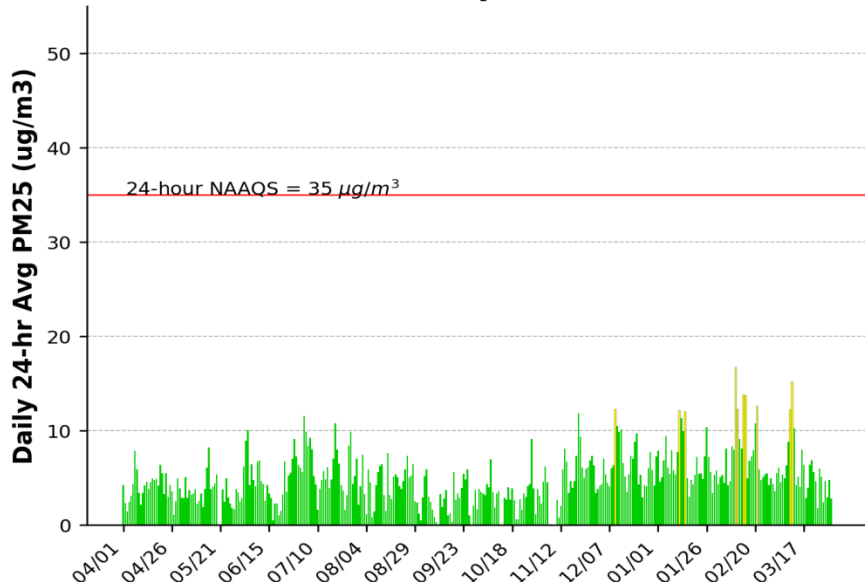
Lower

- No broiler houses within a 1-mile radius
- 7 houses within a 2-mile radius
- ~150K chickens within a 2-mile radius
- More poultry houses outside 2-mile radius

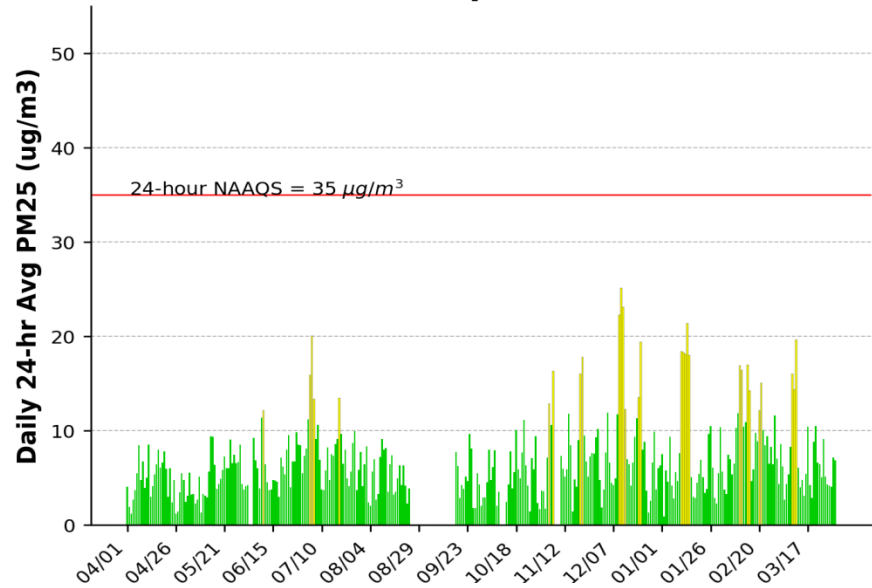


Time Series Charts PM_{2.5}

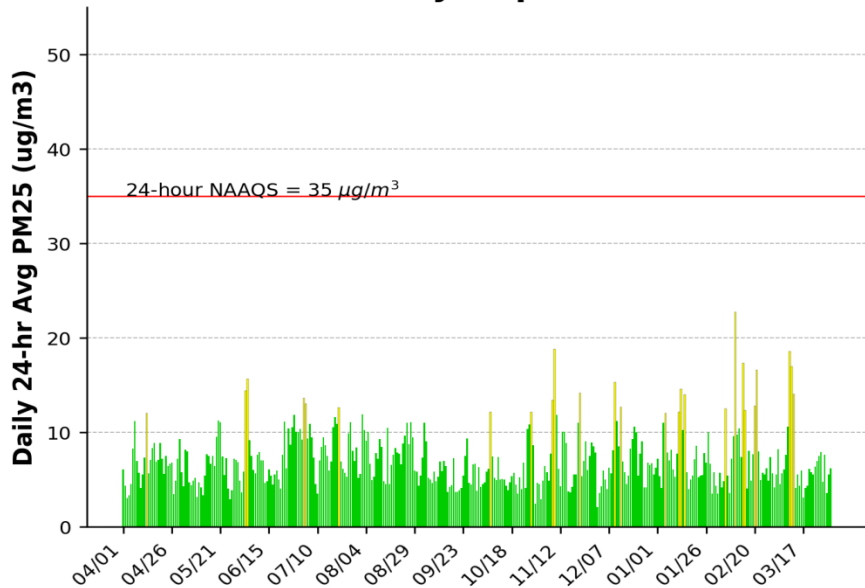
PM25 Horn Point - April2020-March2021



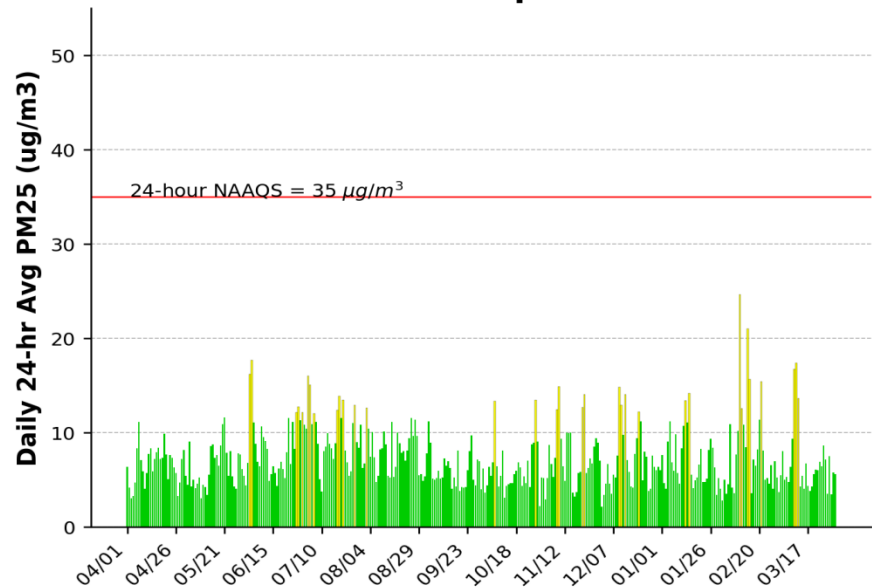
PM25 Old Town - April2020-March2021



PM25 Pocomoke City - April2020-March2021



PM25 Princess Anne - April2020-March2021





PM2.5 Summary To Date

(April 2020 –March 2021) Data Summary for PM2.5

NAAQS PM2.5 24-hr standard = 35 $\mu\text{g}/\text{m}^3$

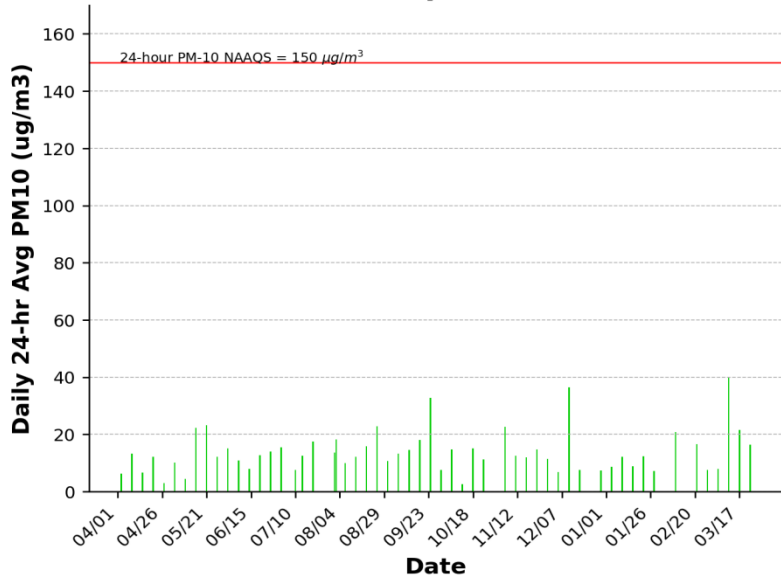
Pollutant	Site	Average 24-hr Value ($\mu\text{g}/\text{m}^3$)	Median 24-hr value ($\mu\text{g}/\text{m}^3$)	Maximum 24-hr value ($\mu\text{g}/\text{m}^3$)	Minimum 24-hr value ($\mu\text{g}/\text{m}^3$)	Percent Complete (%)
PM2.5	Oldtown (Urban, no poultry operations)	6.7	6	25.1	0.8	89
	Horn Point (Rural, no poultry operations)	4.9	4.6	16.7	-1	96
	Princess Anne (Low poultry operation density)	7.2	6.6	24.6	2	100
	Pocomoke City (High poultry operation density)	7	6.4	22.6	2	99.6

* Data is considered preliminary

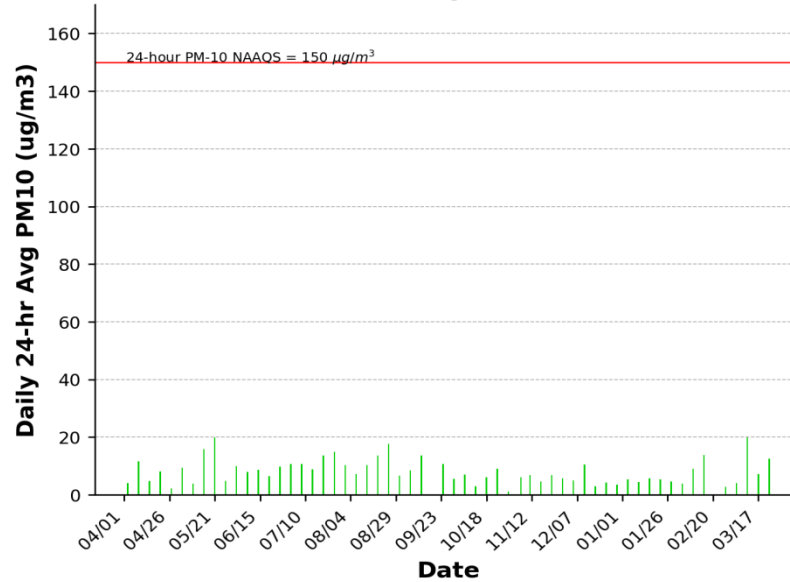


Time Series Charts PM₁₀

PM10 Old Town - April2020-March2021

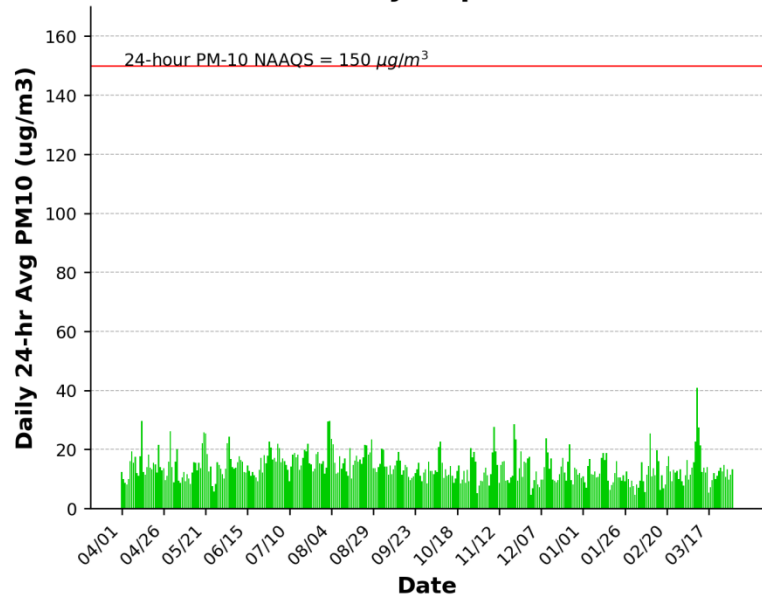


PM10 Horn Point - April2020-March2021

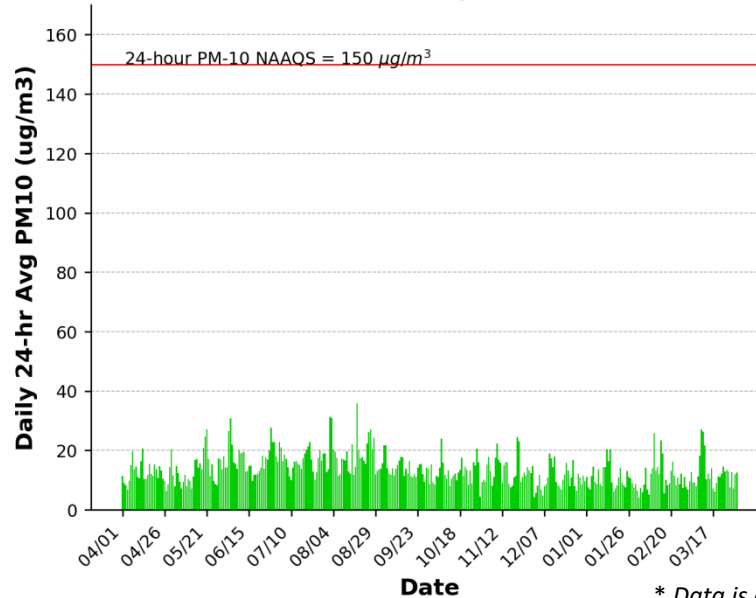


**Oldtown and Horn Point stations measure PM₁₀ with manual filter method*

PM10 Pocomoke City - April2020-March2021



PM10 Princess Anne - April2020-March2021



** Data is considered preliminary*



PM10 Summary To Date

(April 2020 –March 2021) Data Summary for PM10

NAAQS PM10 24-hr standard = 150 $\mu\text{g}/\text{m}^3$

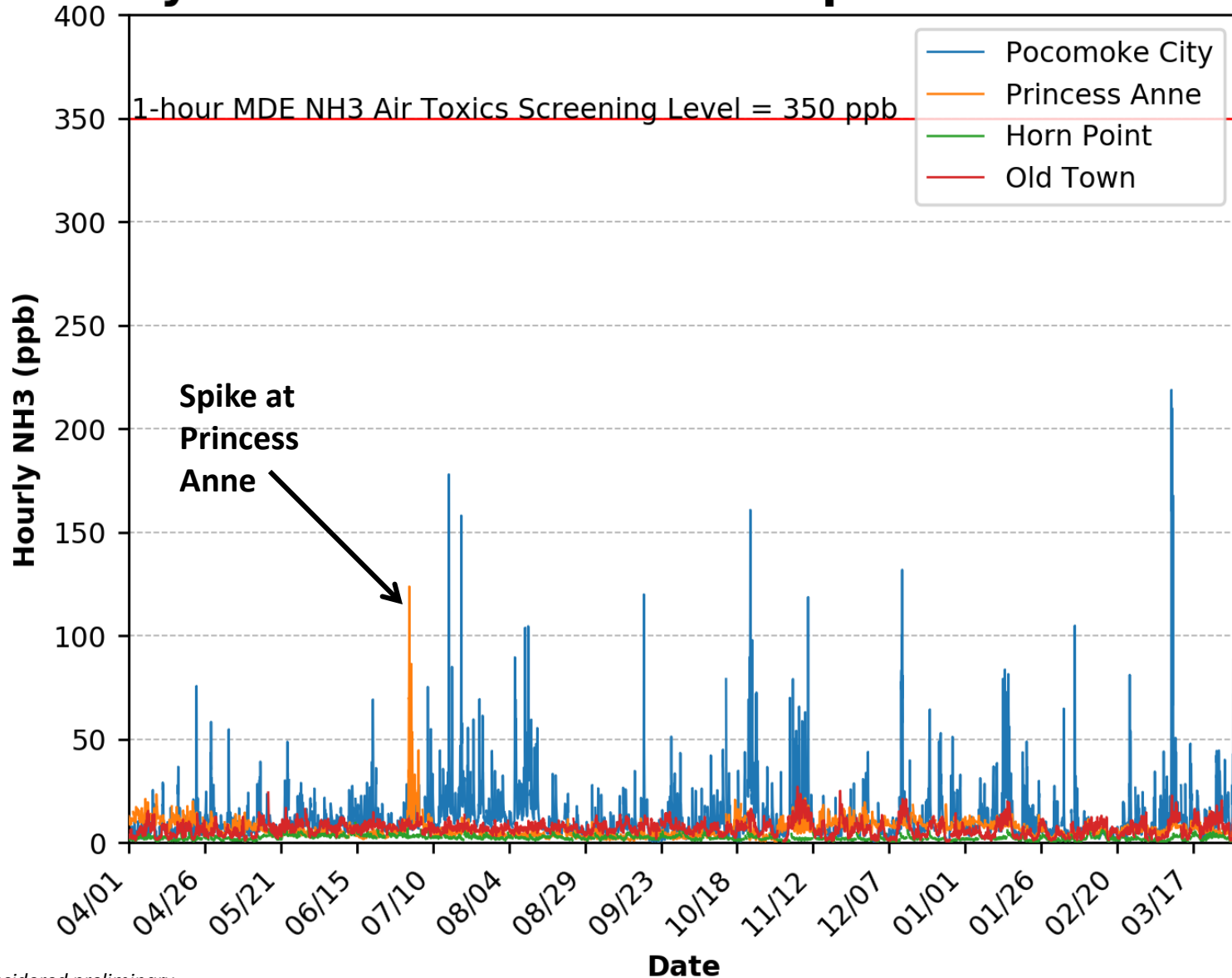
Pollutant	Site	Average 24-hr Value ($\mu\text{g}/\text{m}^3$)	Median 24-hr value ($\mu\text{g}/\text{m}^3$)	Maximum 24-hr value ($\mu\text{g}/\text{m}^3$)	Minimum 24-hr value ($\mu\text{g}/\text{m}^3$)	Percent Complete (%)
PM10	Oldtown* (Urban, no poultry operations)	13.5	12.1	40	2.6	100
	Horn Point* (Rural, no poultry operations)	8	7	20	1.2	100
	Princess Anne (Low poultry operation density)	13.5	12.9	35.8	4	100
	Pocomoke City (High poultry operation density)	13.7	13.1	40.8	4.5	99.6

*As of May 14th, 2021 PM10 measurements at Horn Point have been discontinued



Time Series Chart: NH₃

Hourly NH₃ Concentrations - April 2020-March 2021



* Data is considered preliminary



NH₃ Summary To Date

(April 2020 –March 2021) Data Summary for NH₃

MDE 1-hr air toxic screening level = 350 ppb

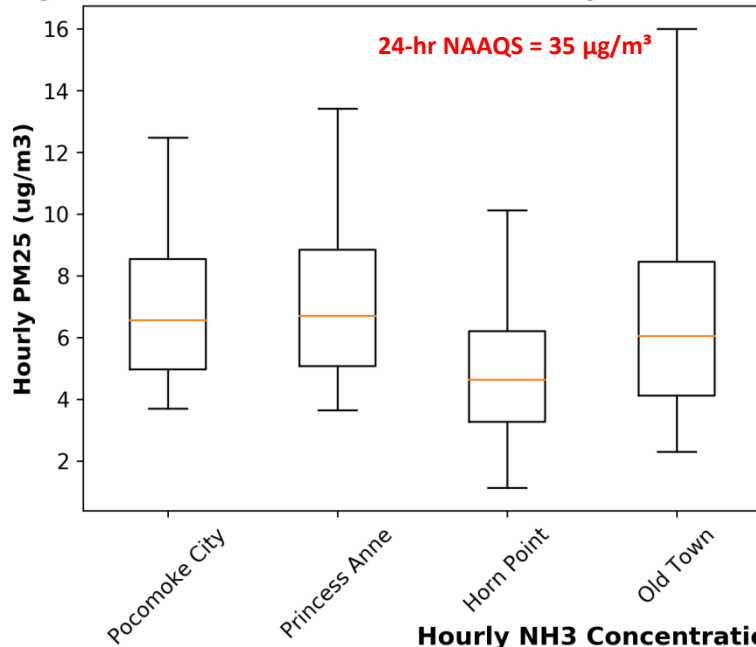
Pollutant	Site	Average Hourly Value (ppb)	Median hourly value (ppb)	Maximum hourly value (ppb)	Minimum hourly value (ppb)	Percent Complete (%)
NH ₃	Oldtown (Urban, no poultry operations)	6.5	6.4	26.9	-0.1	91
	Horn Point* (Rural, no poultry operations)	2.2	2.1	9.4	0.3	91
	Princess Anne (Low poultry operation density)	6.3	5.5	123.6	0	92
	Pocomoke City (High poultry operation density)	11.3	8.3	218.7	0.2	92

**As of May 14th, 2021 NH₃ measurements at Horn Point have been discontinued*

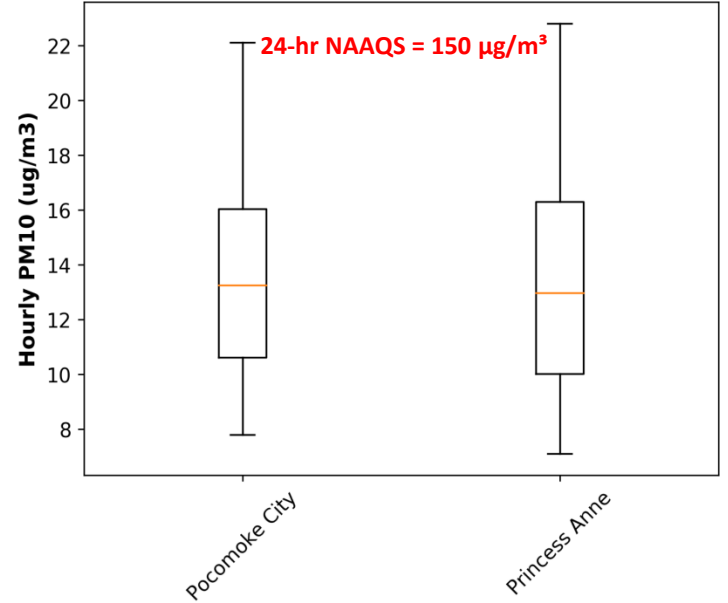


Whisker Plots: PM_{2.5}, PM₁₀ & NH₃

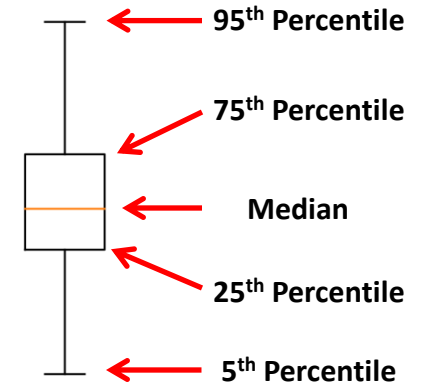
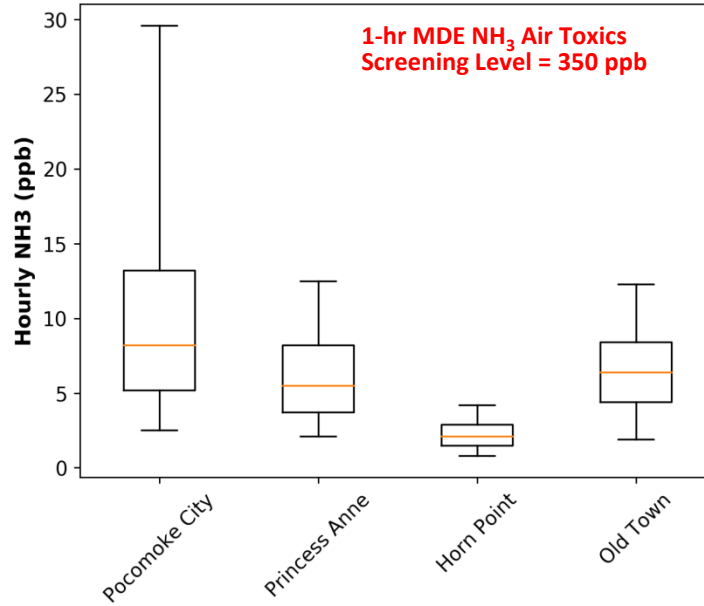
Hourly PM_{2.5} Concentrations Box Plots - April2020-March2021



Hourly PM₁₀ Concentrations Box Plots - April2020-March2021



Hourly NH₃ Concentrations Box Plots - April2020-March2021



* Data is considered preliminary



LES Project Website

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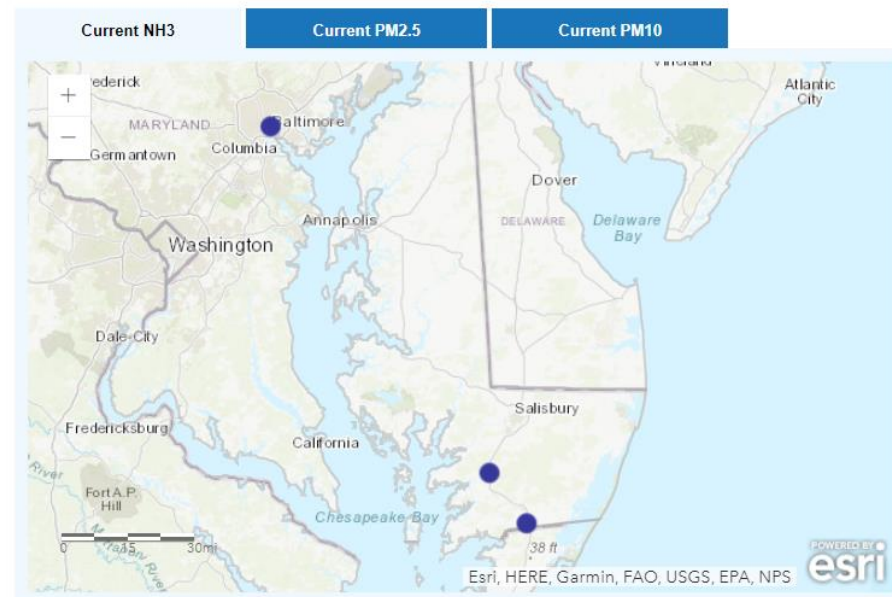
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Lower Eastern Shore: Project Beginings

Lower Eastern Shore Ambient Air Quality Monitoring Project



****Please Note:** As of May 14, 2021, Horn Point NH3 and PM-10 measurements have been discontinued.**

This map illustrates near real-time concentration of ammonia (NH3), fine particulate matter (PM-2.5) and

<https://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/Lower-Eastern-Shore-Monitoring-Project.aspx>



LES Project Website

Downloadable Hourly Data and Summaries

	Monthly Summary	Hourly Data	Project Summary (to date)
			✓
August - 2021	✓	✓	
July - 2021	✓	✓	
June - 2021	✓	✓	
May - 2021	✓	✓	
April - 2021	✓	✓	
March - 2021	✓	✓	
February - 2021	✓	✓	

Lower Eastern Shore Air Monitoring Project - September 2020 Summary

September 2020 Data Summary for NH₃

MDE 1-hour screening level = 350 ppb

Parameter	Site	Average hourly value (ppb)	Median hourly value (ppb)	Maximum hourly value (ppb)	Minimum hourly value (ppb)
NH ₃	Oldtown (Urban, no poultry operations)	7.7	7.6	14.7	1.8
	Horn Point (Rural, no poultry operations)	2.5	2.5	5.9	0.9
	Princess Anne (Low poultry operation density)	2.8	2.6	11.6	0.8
	Pocomoke City (High poultry operation density)	8.5	6.4	119.8	0.2

September 2020 Data Summary for PM_{2.5}

NAAQS PM_{2.5} 24-hour standard = 35 µg/m³

Parameter	Site	Average 24-hr value (µg/m ³)	Median 24-hr value (µg/m ³)	Maximum 24-hr value (µg/m ³)	Minimum 24-hr value (µg/m ³)
PM _{2.5}	Oldtown (Urban, no poultry operations)	4.5	4.2	9.6	1.7
	Horn Point (Rural, no poultry operations)	2.6	2.7	5.9	-0.6
	Princess Anne (Low poultry operation density)	5.9	5.5	11.1	3.7
	Pocomoke City (High poultry operation density)	5.6	5.3	10.9	3.6

- Monthly and hourly data files are available on the project website along with a summary to date PDF data file

- All data for the project is available on our website: <https://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/Lower-Eastern-Shore-Monitoring-Project.aspx>

Group: LES data summary Monthly: 09/2020 Type: AVG 1 Hr.

Date & Time	OLD TOWN	HORN POINT	Princess Anne
	NH ₃ ppb	NH ₃ ppb	NH ₃ ppb
9/1/2020 12:00 AM	7.6	2.1	3.3
9/1/2020 1:00 AM	7.6	2	3.1
9/1/2020 2:00 AM	Calibration	Calibration	Calibration
9/1/2020 3:00 AM	Calibration	Calibration	Calibration
9/1/2020 4:00 AM	3Span	5Span	3Span
9/1/2020 5:00 AM	3Span	5Span	3Span
9/1/2020 6:00 AM	Calibration	Calibration	Calibration
9/1/2020 7:00 AM	Purge	Purge	Purge
9/1/2020 8:00 AM	Purge	Purge	Purge
9/1/2020 9:00 AM	9.5	4.3	6.3
9/1/2020 10:00 AM	11	3.6	6
9/1/2020 11:00 AM	9.4	3.3	6.5
9/1/2020 12:00 PM	9.7	3.1	5.6
9/1/2020 1:00 PM	10.8	2.9	4.8
9/1/2020 2:00 PM	11.2	2.9	4
9/1/2020 3:00 PM	11.6	2.8	3.9
9/1/2020 4:00 PM	10.8	3.1	3.5
9/1/2020 5:00 PM	11	2.9	3.2
9/1/2020 6:00 PM	11	3.2	2.9
9/1/2020 7:00 PM	13.1	3.2	2.7
9/1/2020 8:00 PM	12.4	3.1	2.6
9/1/2020 9:00 PM	11.1	2.9	2.5
9/1/2020 10:00 PM	10.7	2.8	2.2
9/1/2020 11:00 PM	10	3.4	2
9/2/2020 12:00 AM	9.5	3.4	1.8



Current Status and Next Steps

- The project has successfully met the stated objectives of the one year study.
- Monitoring remains ongoing at the 2 LES and Oldtown sites.
- Horn Point was discontinued on May 15, 2021 due to consistently low concentrations.
- Options for new monitoring locations are currently being explored.



Pocomoke City site



Acknowledgements

- Ryan Auvil ryan.auvil@maryland.com
- Chris Smith chris.smith@maryland.gov
- Colleen Williams colleen.williams@maryland.gov
- James Boyle james.boyle@maryland.gov



Princess Anne site