DOEE

2024 Hyperlocal Air Quality Monitoring: Project Results and Next Steps

MWAQC-TAC: March 5, 2025

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Photo: Buzzard Point

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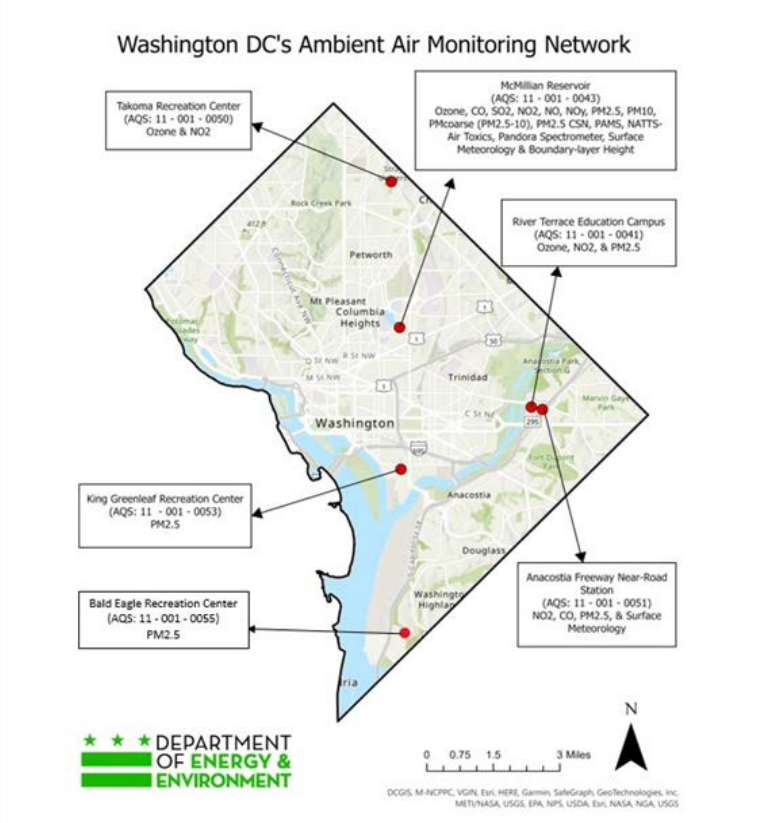
Agenda

1. Project Refresher
2. Monitoring Areas and Results
3. Next Steps

Existing Monitoring System



DOEE has 6 stationary monitors in all 4 quadrants of the city

Monitor	Ward	Location Setting*
River Terrace Education Center	7	AQ Community of Concern
I-295 Near-Road Station	7	AQ Community of Concern
Bald Eagle Recreational Center	8	AQ Community of Concern
King Greenleaf Rec Center	6	AQ Community of Concern
McMillan Reservoir	1	
Takoma Rec Center	4	

Newest monitoring station

* All monitors considered to be urban monitors

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Additional District-wide Monitors and Sensors

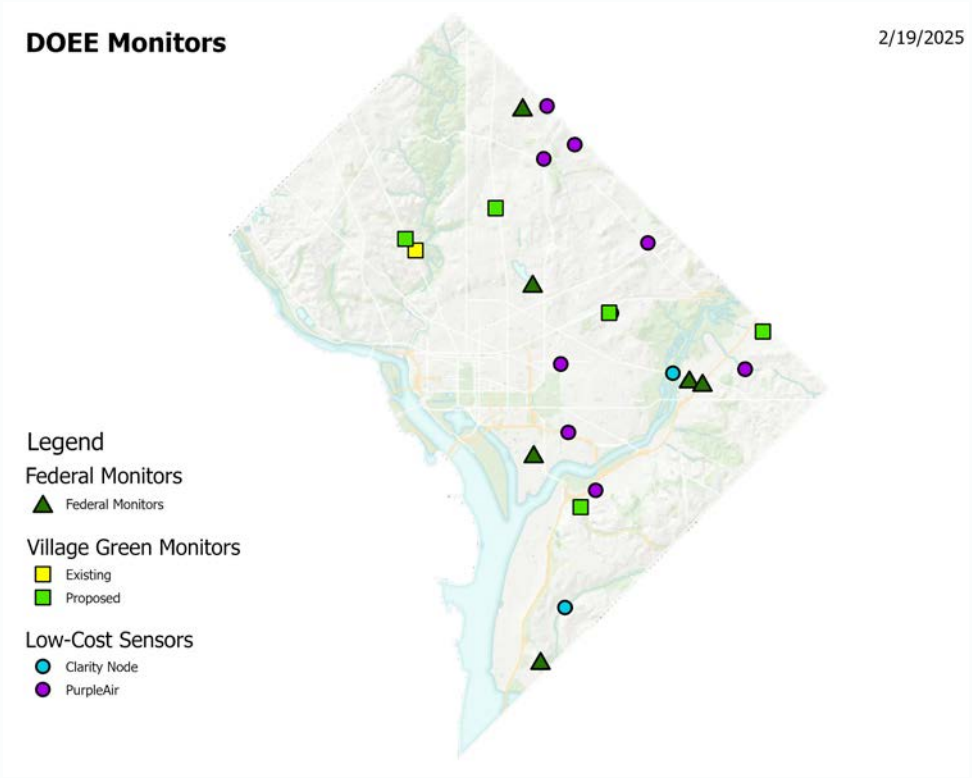
DOEE has begun implementing its low-cost air quality sensor program.

To date we have installed:

- **1 Village Green park bench monitor**
- **8 Purple Airs**
- **2 Clarity Nodes**

We also have potential locations chosen for 4 Village Green park bench monitors

You can sign up to host a Purple Air yourself here: https://doee.dc.gov/service/purpleair-monitoring-project



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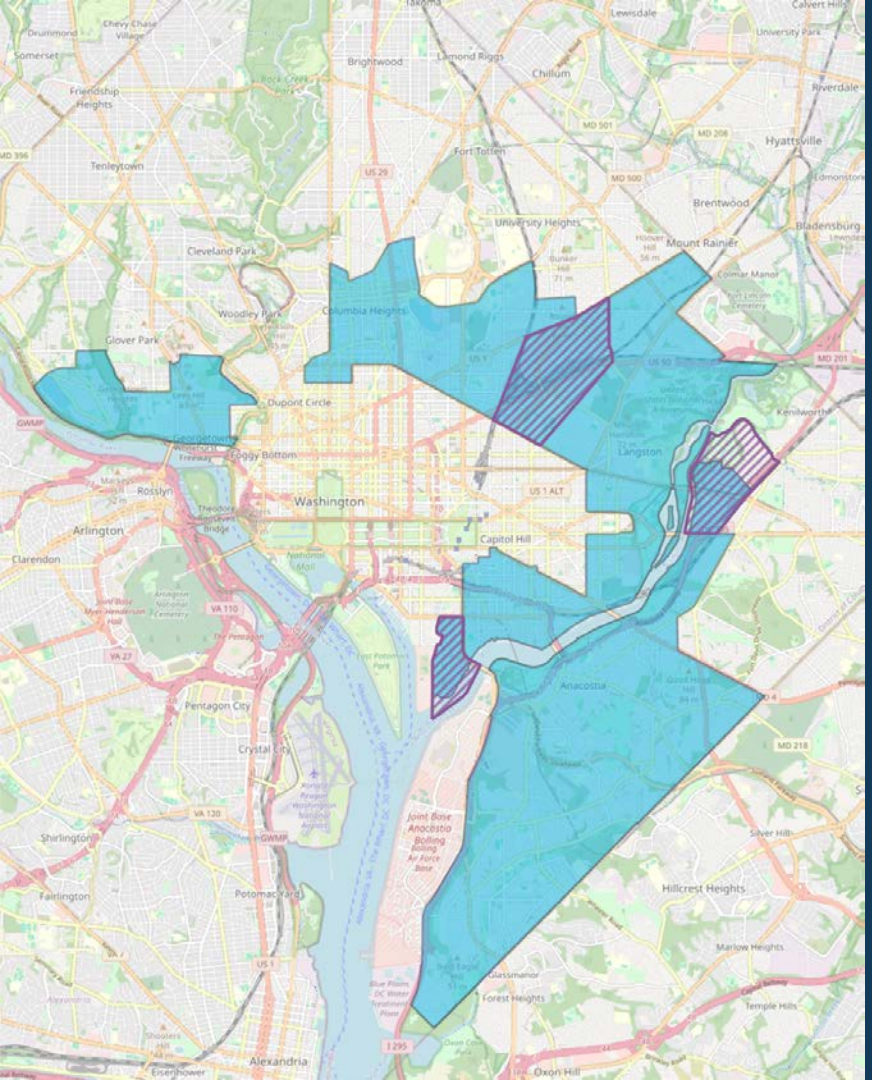

2024 Mobile Monitoring Initiative

Starting in **August 2024**, Aclima conducted **six weeks** of hyperlocal mobile air quality measurement approximately 24 hours a day across neighborhoods in the District:

- Columbia Heights/Park View
- Howard/LeDroit Park
- Eckington/Edgewood/Bloomingdale
- Ivy City/Brentwood*
- Trinidad/Carver
- South Capitol Hill/Barney Circle
- Buzzard Point*
- River Terrace*
- Greater Anacostia/Naylor Gardens/Good Hope
- Bellevue/Congress Heights
- Georgetown/Palisades

*Included in 2023 pilot

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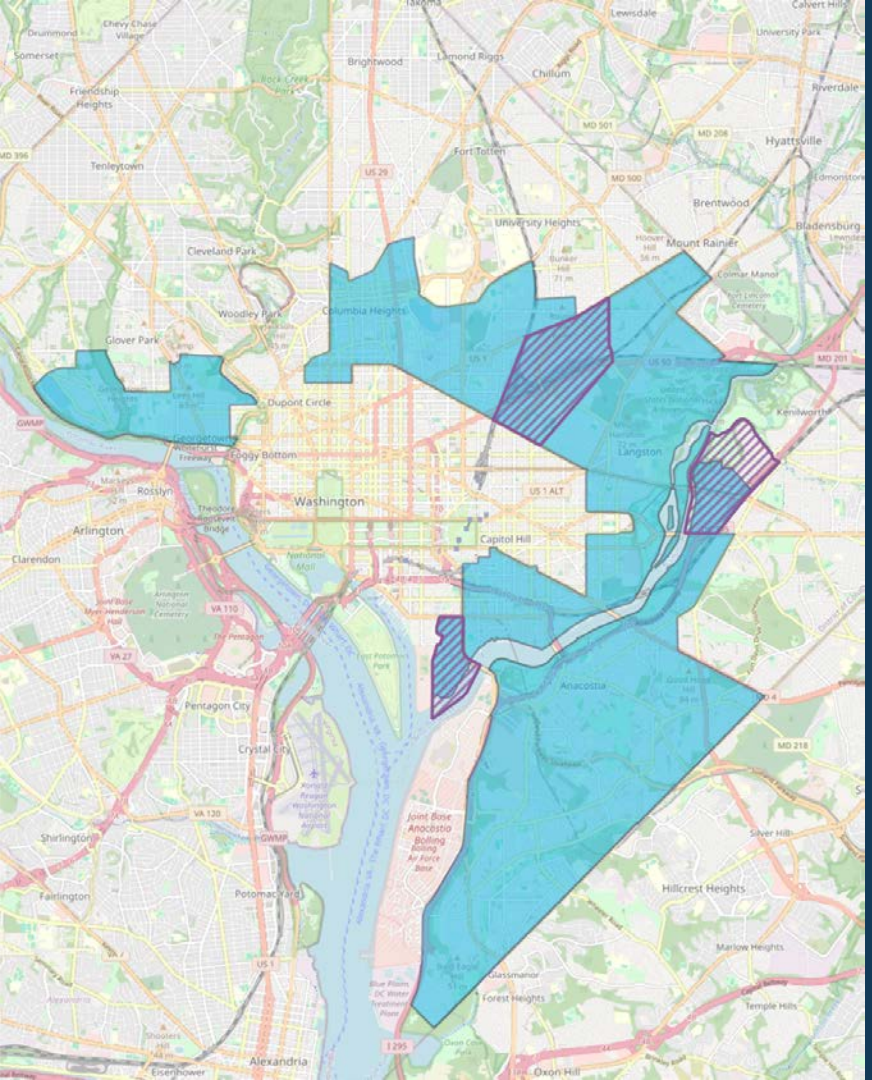

How were these neighborhoods chosen?

- The majority of the neighborhoods included in the monitoring project were chosen due to their history of disproportionate exposure to environmental hazards.
- Georgetown was chosen to provide comparison data to areas of the city that have been historically disadvantaged.
- DOEE held listening sessions in preparation for data collection and included community input in final maps.

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What is Mobile Monitoring?

- Mobile monitoring uses moving sensors to collect air quality measurements at multiple points in space over time
- Aclima uses mobile monitoring to measure, map, and analyze air pollution and greenhouse gases block by block.
- Data is collected continuously at 1-second intervals as the vehicle moves and aggregated geographically.
- We provide science and data-backed information about air pollution at the hyperlocal level — illuminating each neighborhood block's unique air.

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2024 Mobile Monitoring Initiative

Measurements included:

- Fine particulate matter
- Black carbon
- Nitrogen dioxide
- Ozone
- Carbon monoxide
- Methane
- TVOCs
- Carbon dioxide

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Data aggregation

The data has been combined into a hexagonal spatial grid to show the average concentration levels over the 6-week sampling period.

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EPA's National Ambient Air Quality Standards (NAAQS)

Criteria Air Pollutants (**highlighted** pollutants are measured by Aclima)

Nitrogen dioxide (NO_2)	**100 ppb (1 hour); 53 ppb (annual average)**
Ozone (O_3)	**70 ppb (8 hour)**
Fine particulate matter ($PM_{2.5}$)	**35 $\mu g/m^3$ (24 hour); 9 $\mu g/m^3$ (annual average)***
Coarse particulate matter (PM_{10})	150 $\mu g/m^3$ (24 hour)
Carbon monoxide (CO)	**35 ppm (1 hour), 9 ppm (8 hour)**
Sulfur dioxide (SO_2)	75 ppb (1 hour)
Lead (Pb)	0.15 $\mu g/m3$ (3 month average)

*Lowered from 12 $\mu g/m3$ in early 2024

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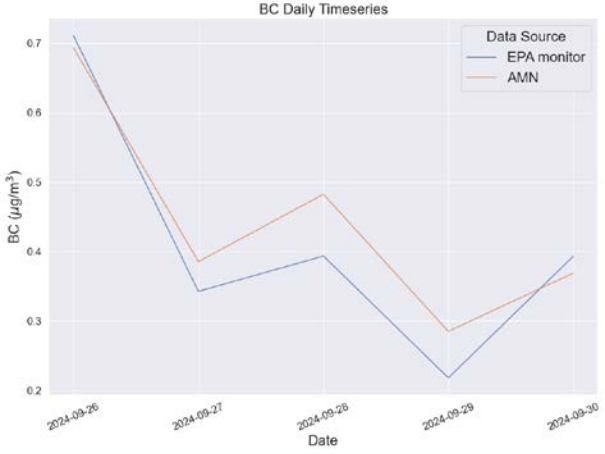
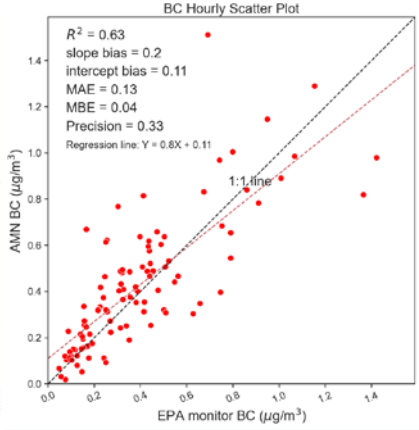
Comparison with DOEE regulatory monitors





Aclima conducted a 5-day stationary co-location with DOEE's regulatory monitors at the McMillan air monitoring site.

We also compare all Aclima mobile data collected within 250 m of any of DOEE's monitoring sites during the 6-week monitoring period as a mobile-to-stationary comparison.

Complete results of the co-locations and mobile-to-stationary comparisons will be included in the final report.

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Results

Key pollutant: Fine particulate matter ($PM_{2.5}$)

Sources:

- Combustion (especially diesel)
- Dust
- Photochemistry (sunlight)

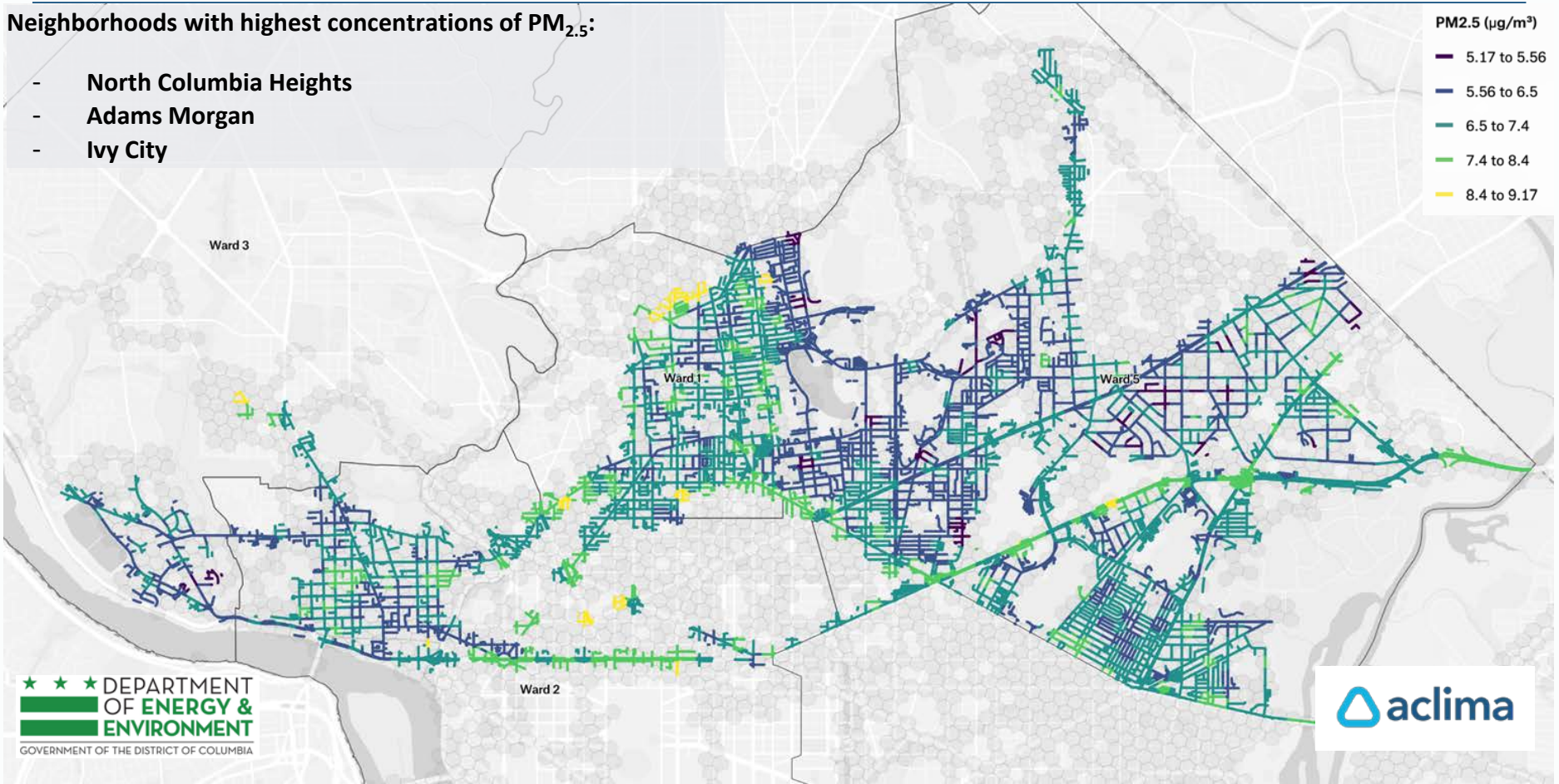
Health Effects:

- Increased mortality
- Respiratory damage
- Asthma

Wards 1-5: Fine Particulate Matter

Neighborhoods with highest concentrations of $PM_{2.5}$:

- **North Columbia Heights**
- **Adams Morgan**
- **Ivy City**



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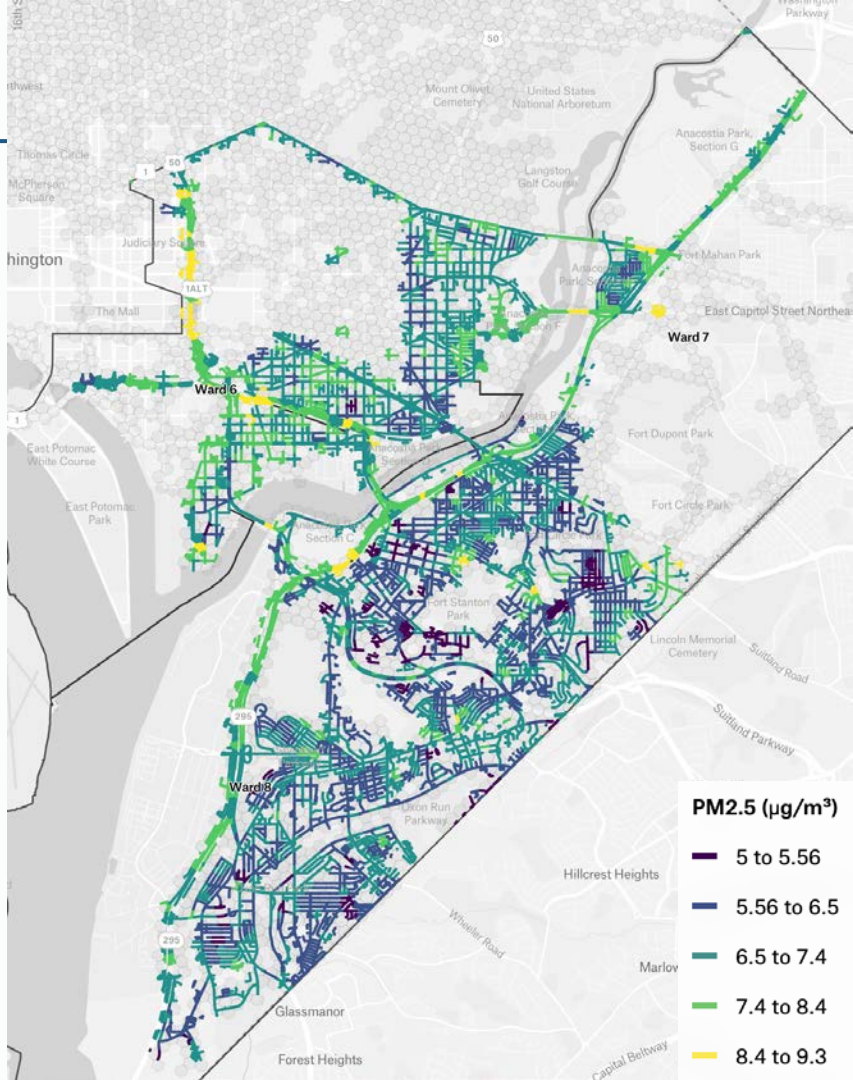
Wards 6-8: Fine Particulate Matter

Neighborhoods with highest concentrations of $PM_{2.5}$:

- **South Capitol Hill**
- **River Terrace**
- **Hillcrest/Good Hope**



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Key pollutant: Black Carbon (BC)

Part of $PM_{2.5}$ that is "soot"

Sources:

- **Diesel engines**
- **Wood fires**
- **Combustion**

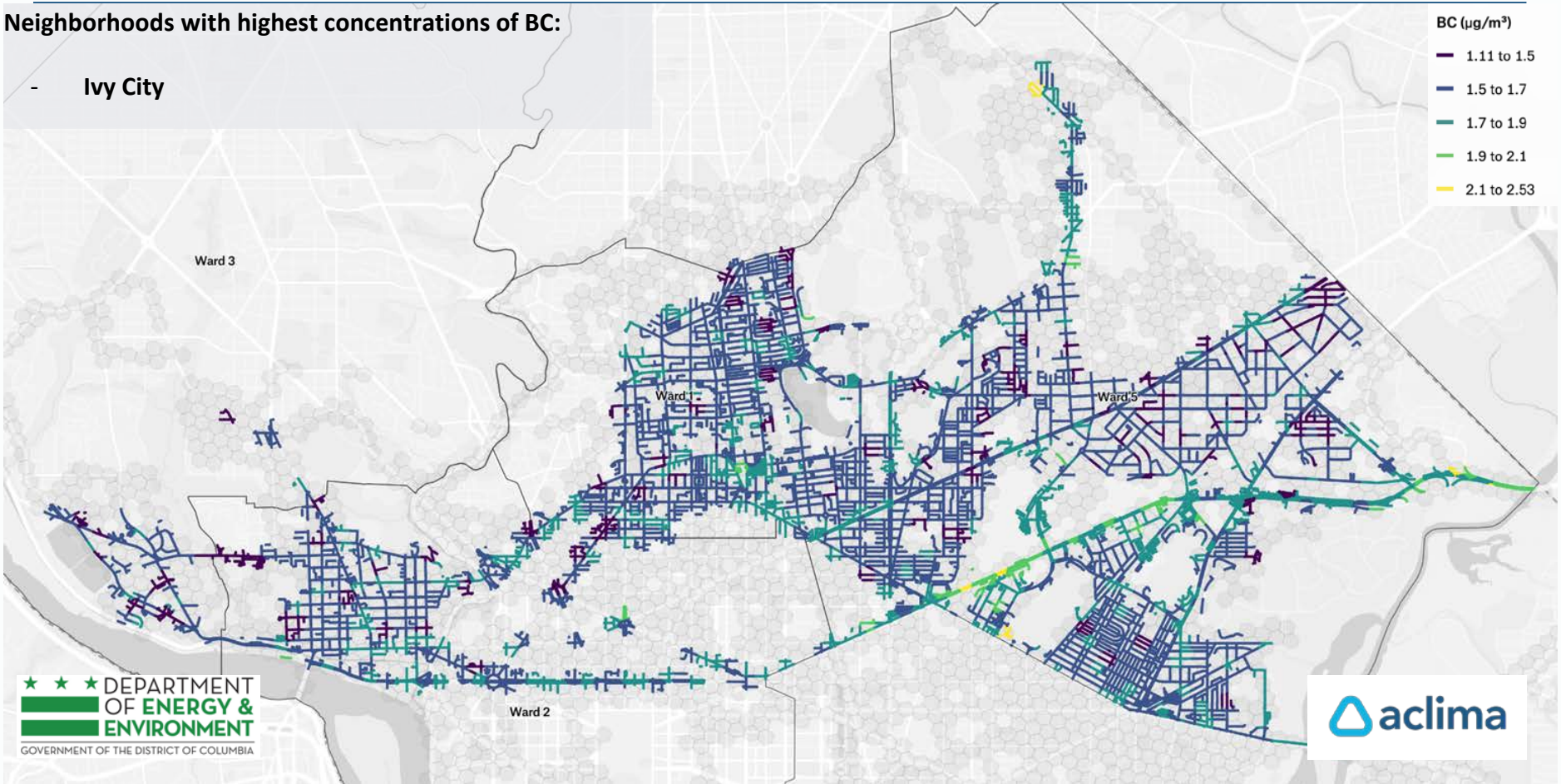
Health Effects:

- **As "diesel particulate matter," classified as a carcinogen (cancer-causing)**

Wards 1-5: Black Carbon (BC)

Neighborhoods with highest concentrations of BC:

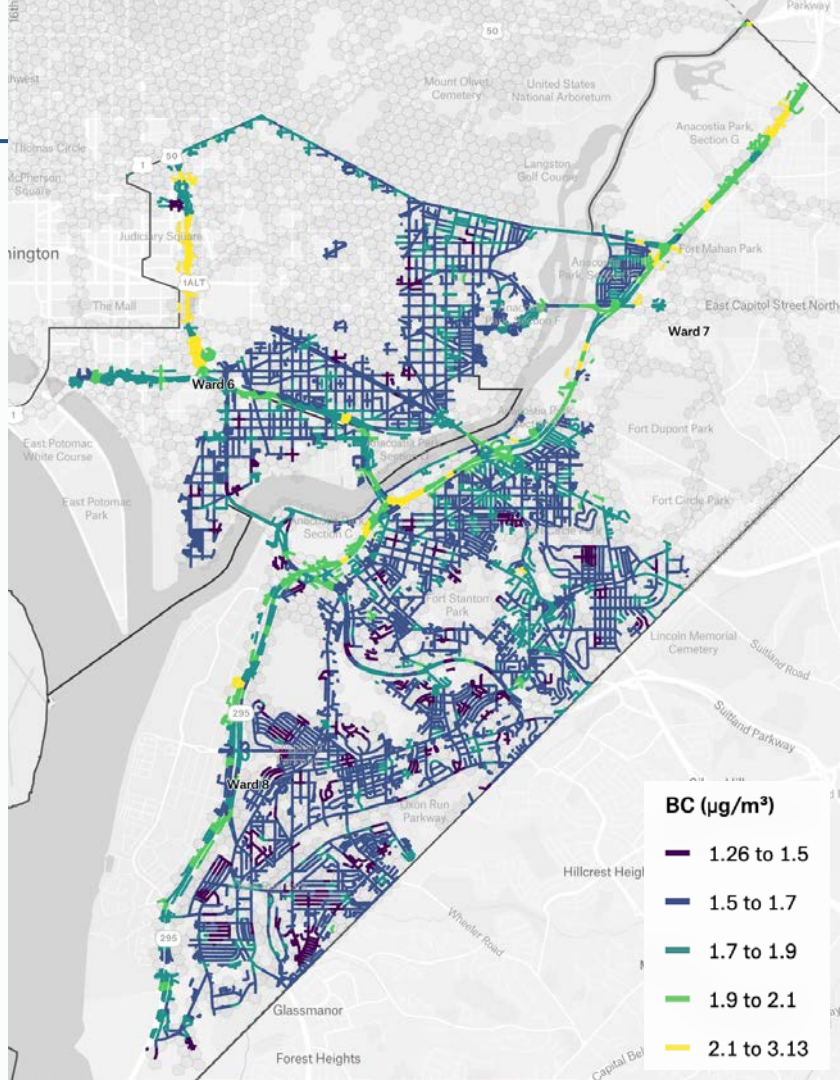
- **Ivy City**



Wards 6-8: Black Carbon (BC)

Neighborhoods with highest concentrations of BC:

- **River Terrace**
- **South Capitol Hill**
- **Areas in Ward 8 near 295**



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Key pollutant: Nitrogen Dioxide (NO_2)

Sources:

- **Emissions + Photochemistry (sunlight)**

Health Effects:

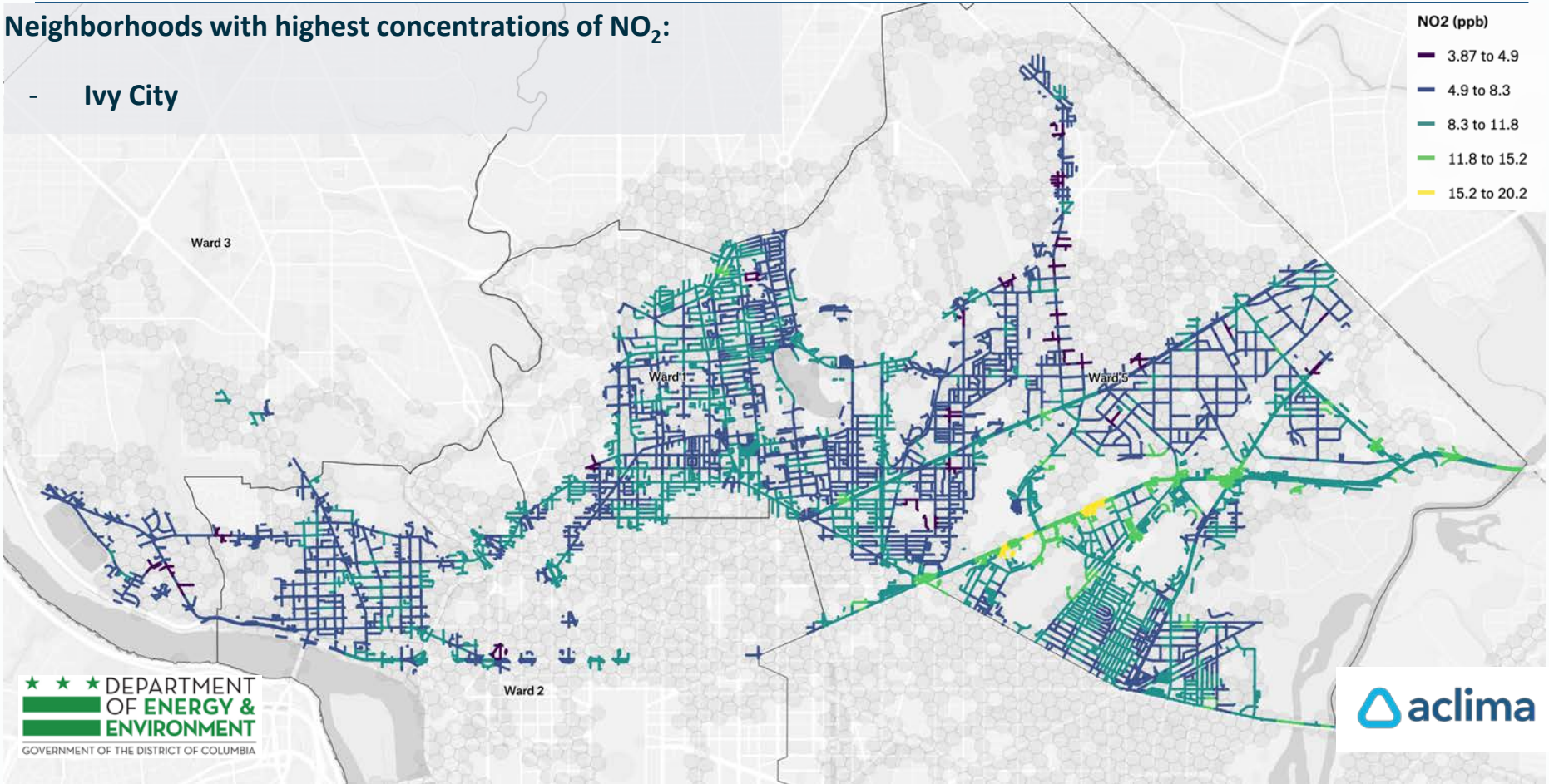
- **Reduced lung function**
- **Increased asthma attacks**
- **Increased risk of respiratory infections**

Denver, Colorado's "Brown Cloud" (source)

Wards 1-5: Nitrogen Dioxide (NO_2)

Neighborhoods with highest concentrations of NO_2:

- **Ivy City**



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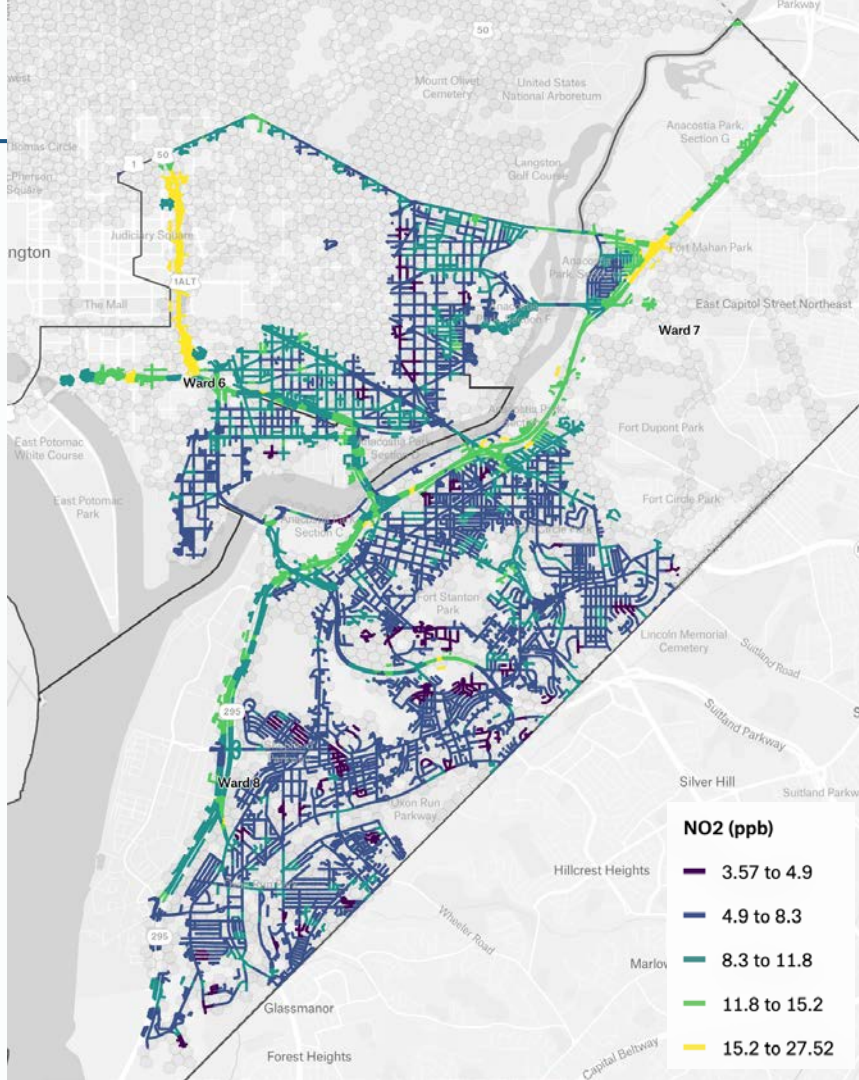
Wards 6-8: Nitrogen Dioxide (NO_2)

Neighborhoods with highest concentrations of NO_2:

- River Terrace
- South Capitol Hill
- Areas in Ward 8 near 295



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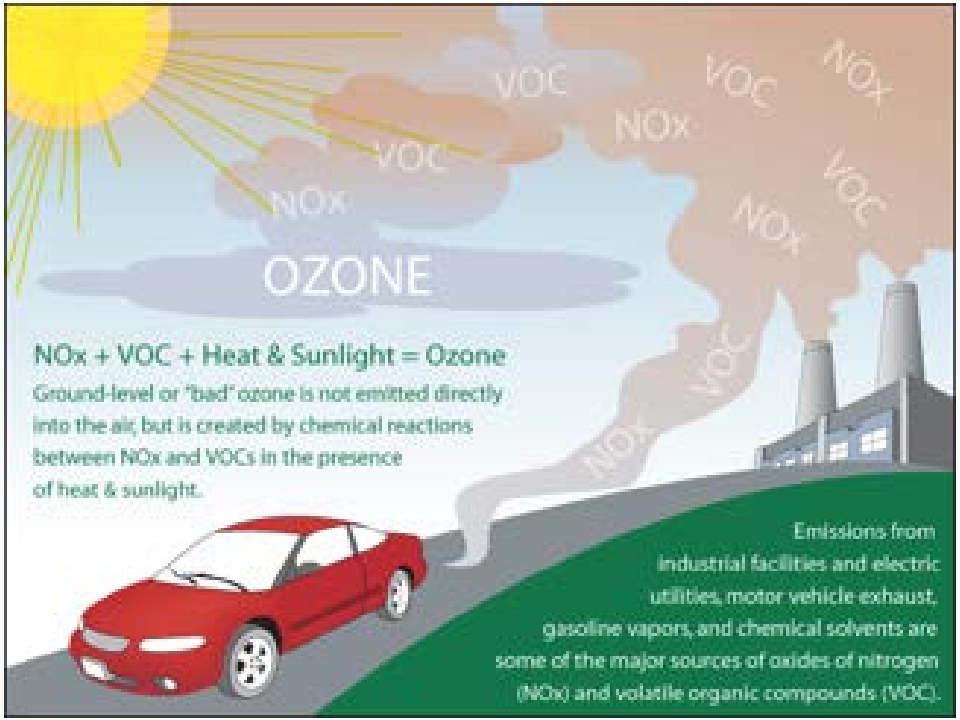
Key pollutant: Ozone (O_3)

Sources:

- **Emissions (eg. NOx from traffic, VOCs from paints) + photochemistry (sunlight)**

Health Effects:

- **Reduced respiratory system function**
- **Chest pain, asthma, bronchitis**
- **Damage to vegetation**

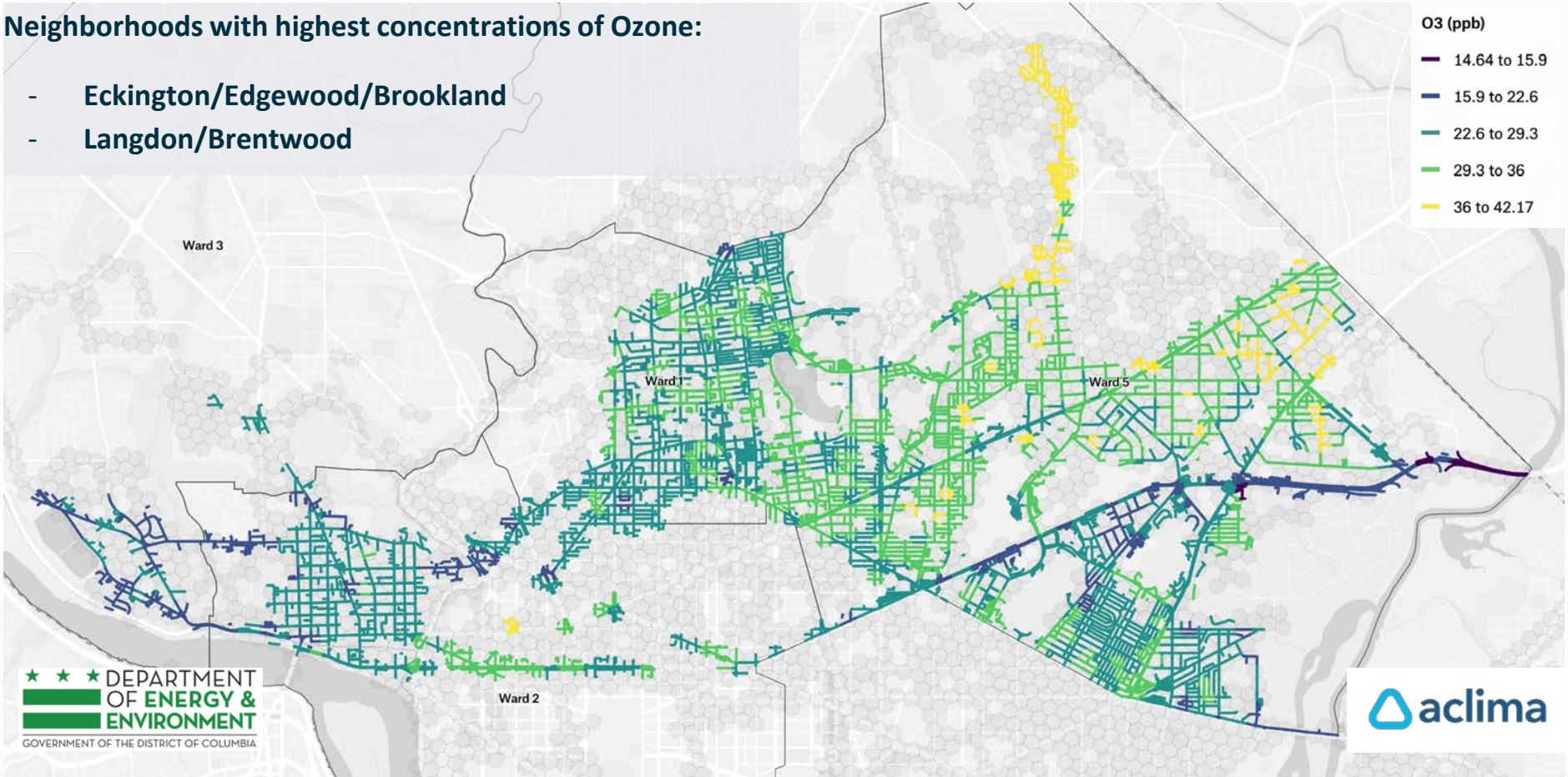


Source: AirNow

Wards 1-5: Ozone (O_3)

Neighborhoods with highest concentrations of Ozone:

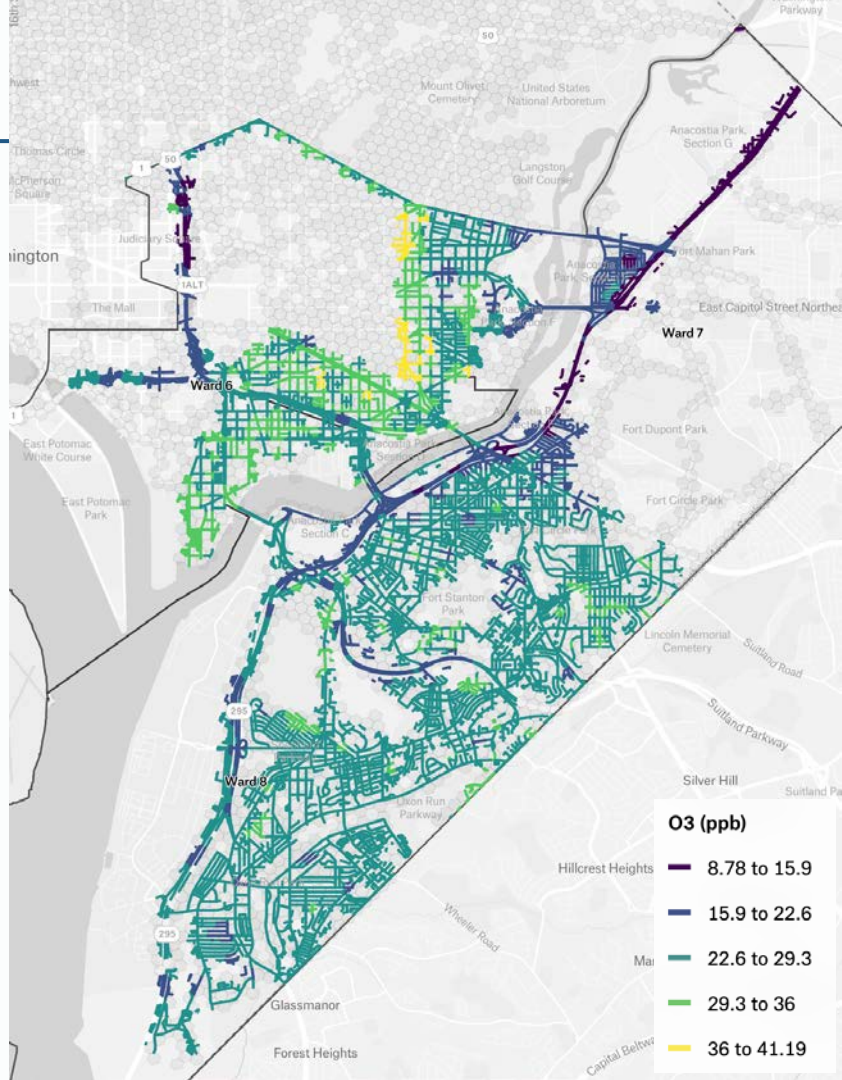
- **Eckington/Edgewood/Brookland**
- **Langdon/Brentwood**



Wards 6-8: Ozone (O_3)

Neighborhoods with highest concentrations of Ozone:

- **Kingman Park**
- **Barney Circle**
- **South Capitol Hill**



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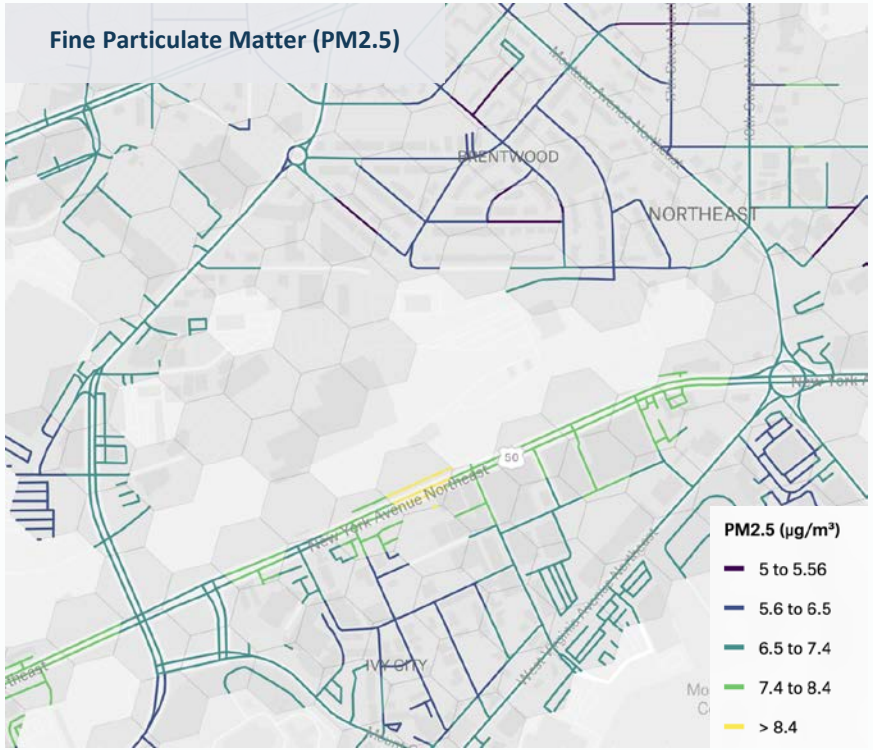
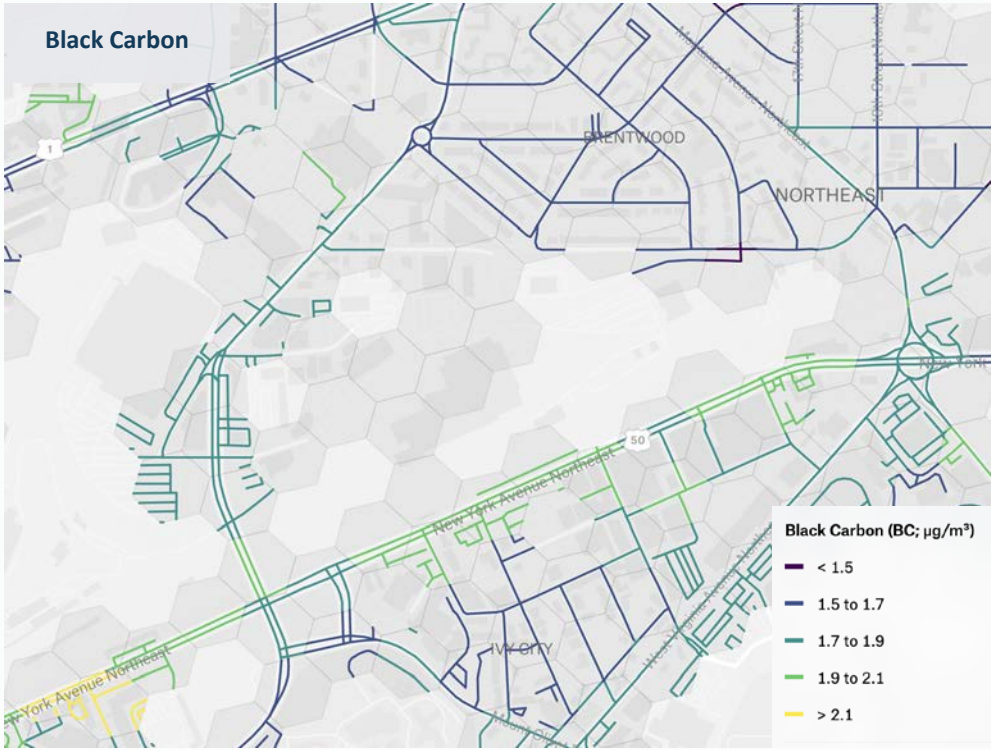
Select Neighborhood Hotspots

Ivy City/Brentwood - Diesel impact





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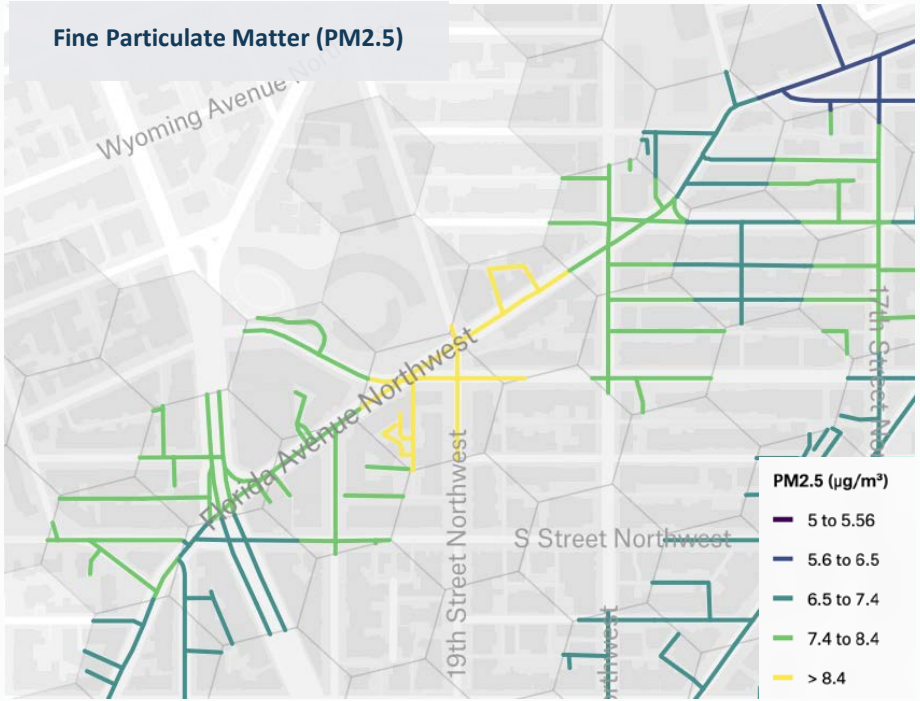
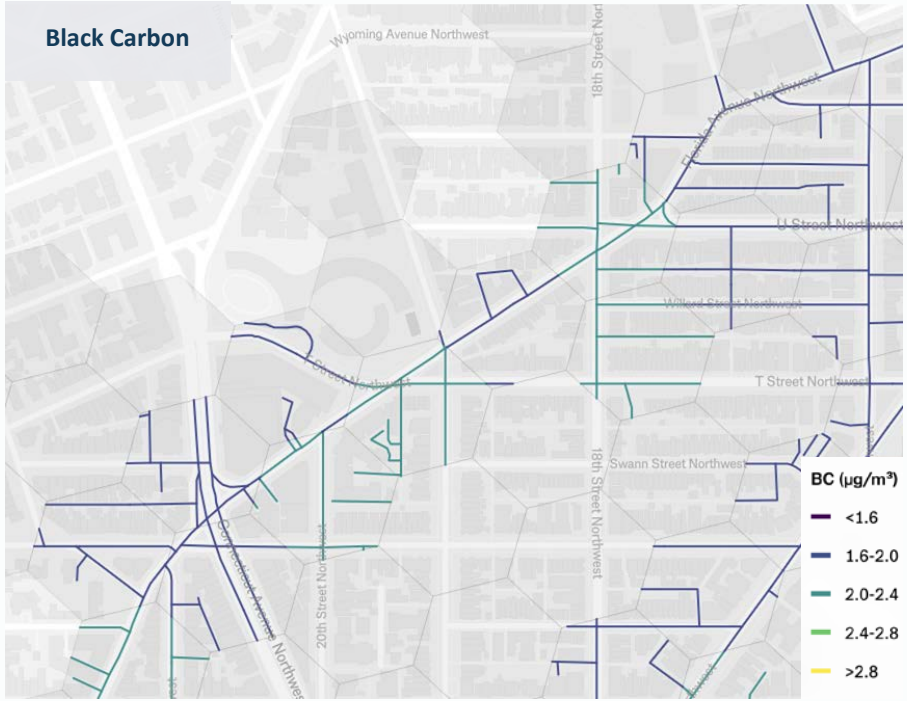
Adams Morgan - $PM_{2.5}$

Fine Particulate Matter (PM2.5)



Black Carbon



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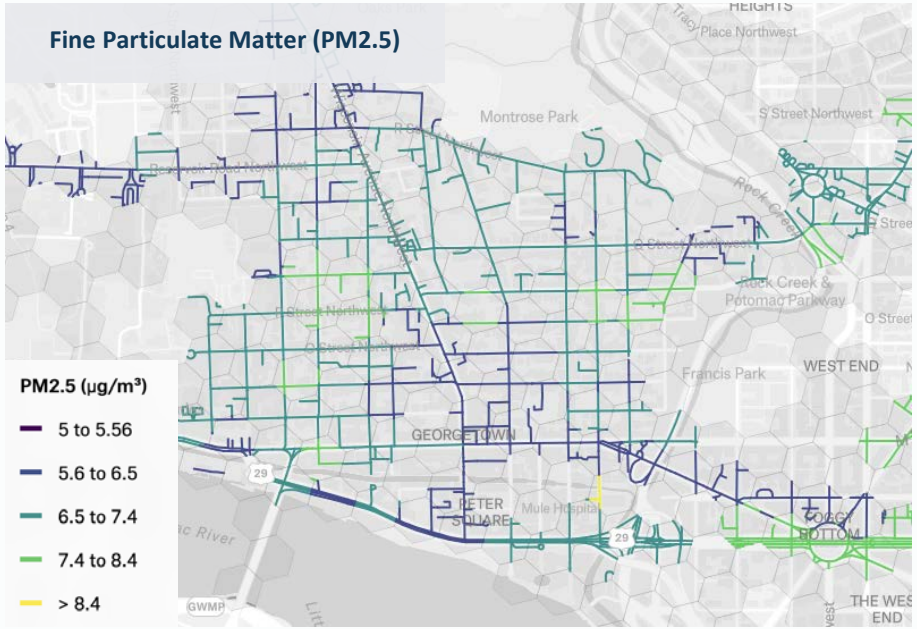
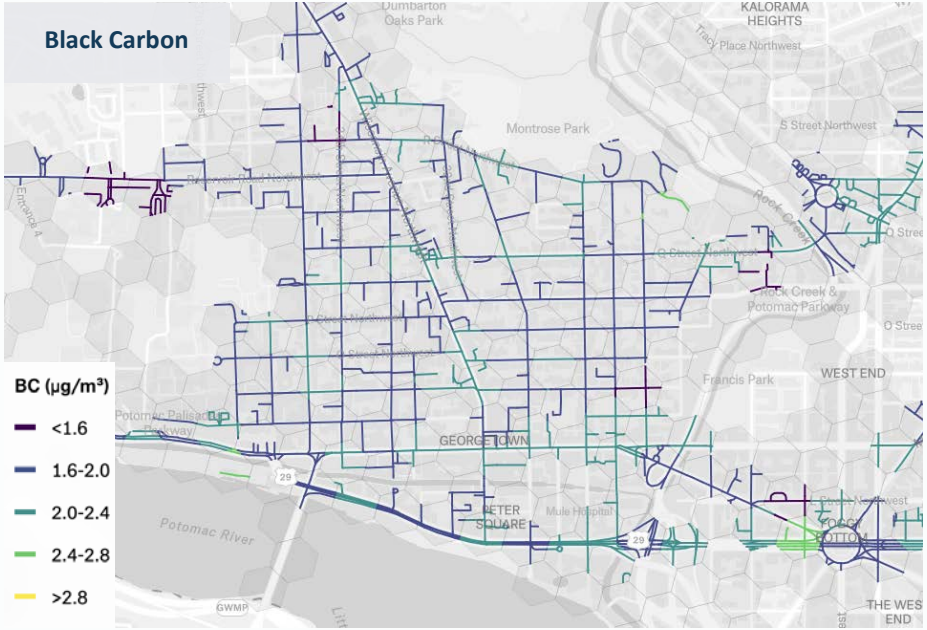
Georgetown - $PM_{2.5}$





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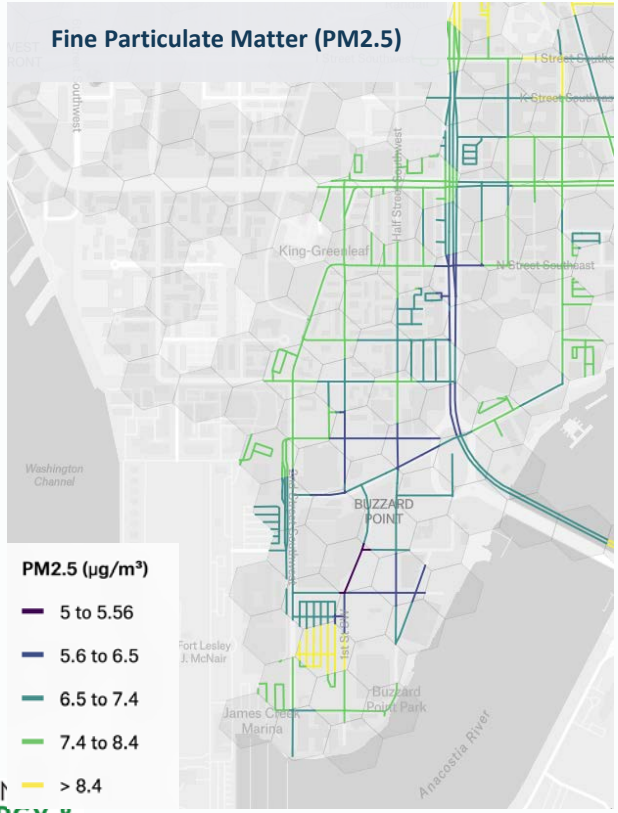
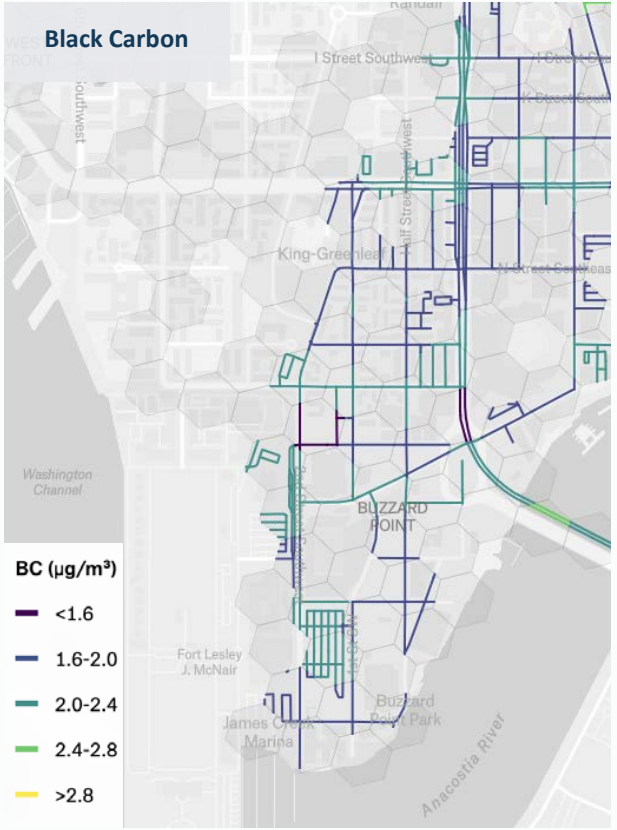
Buzzard Point - $PM_{2.5}$





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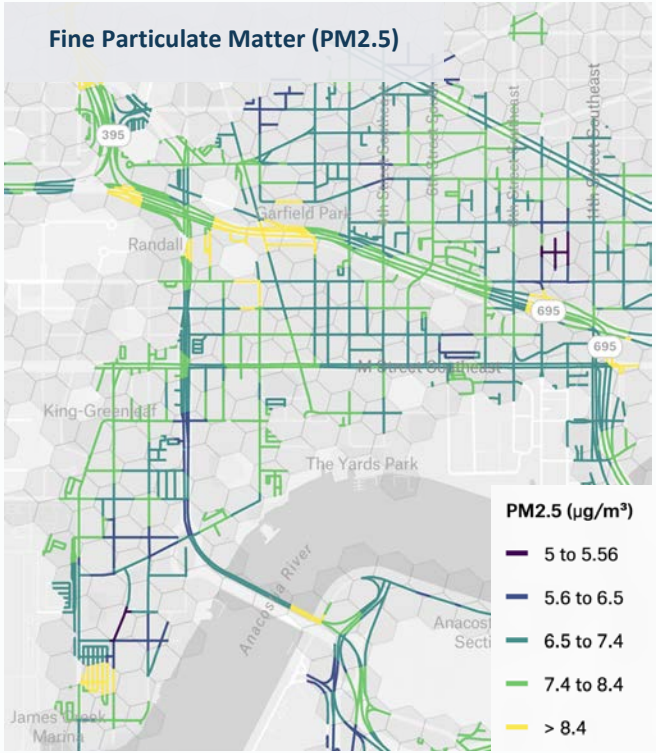
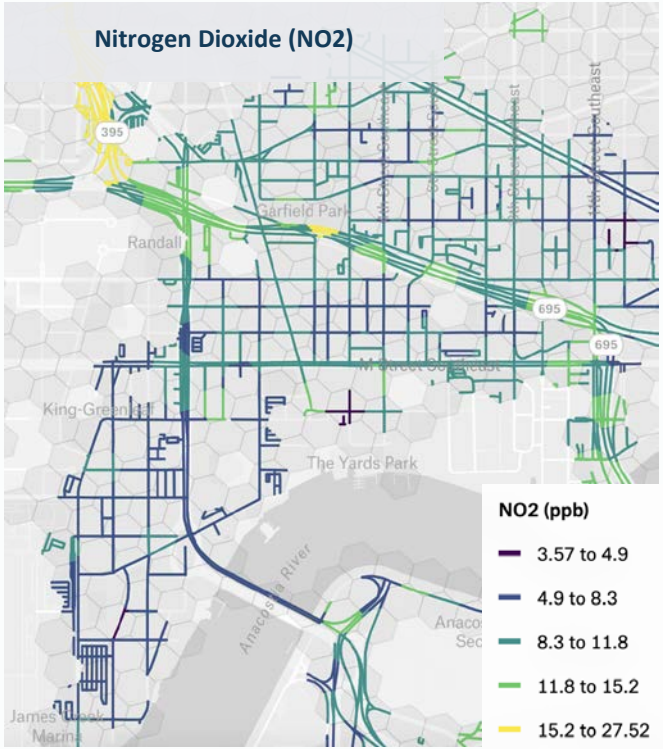
South Capitol Hill/Barney Circle - $PM_{2.5}$ and NO_2





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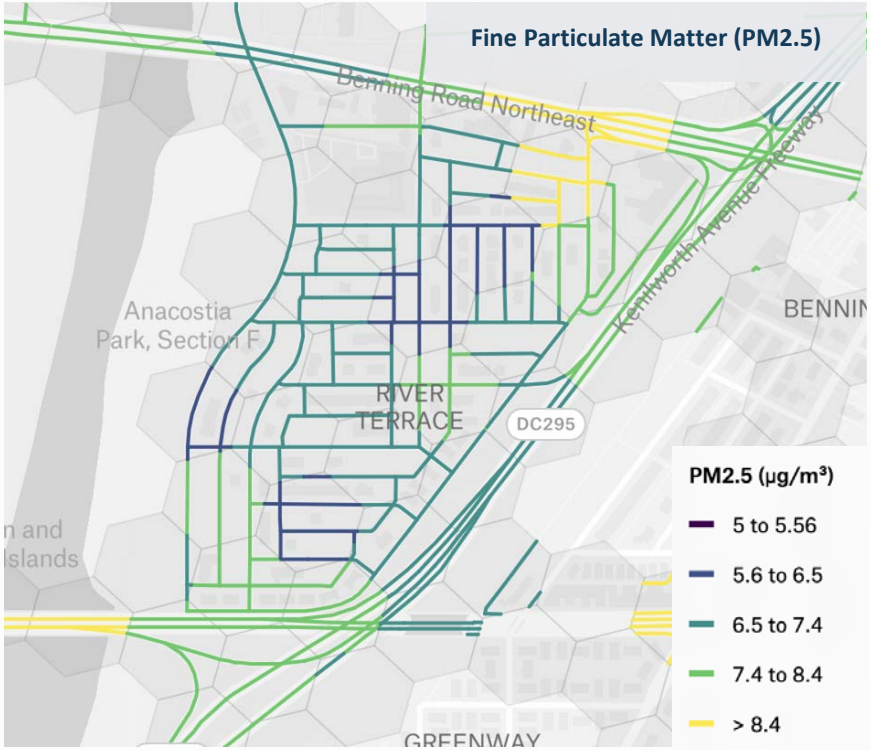
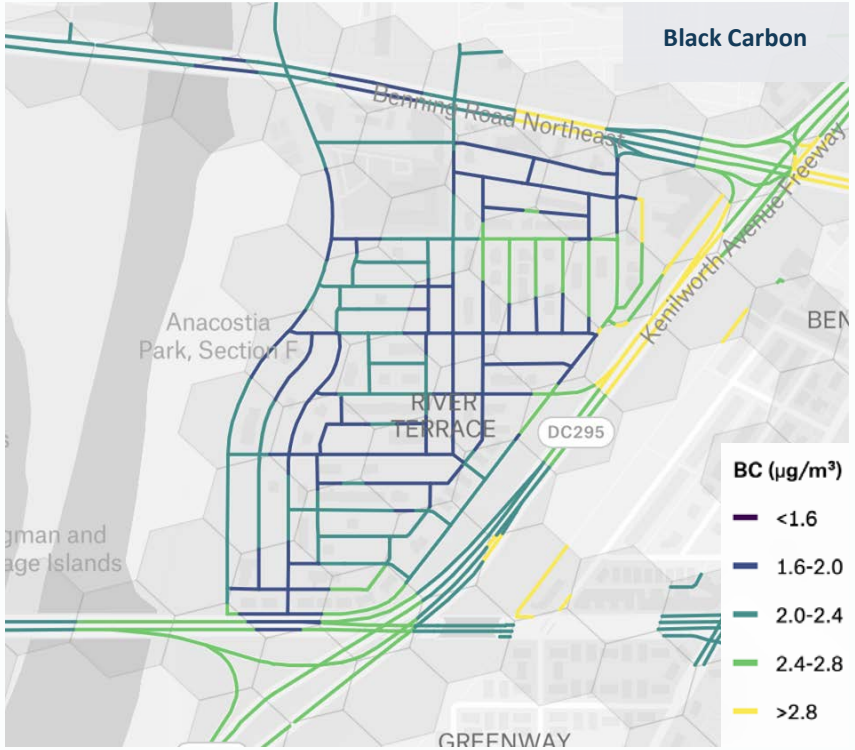
River Terrace - Diesel impact





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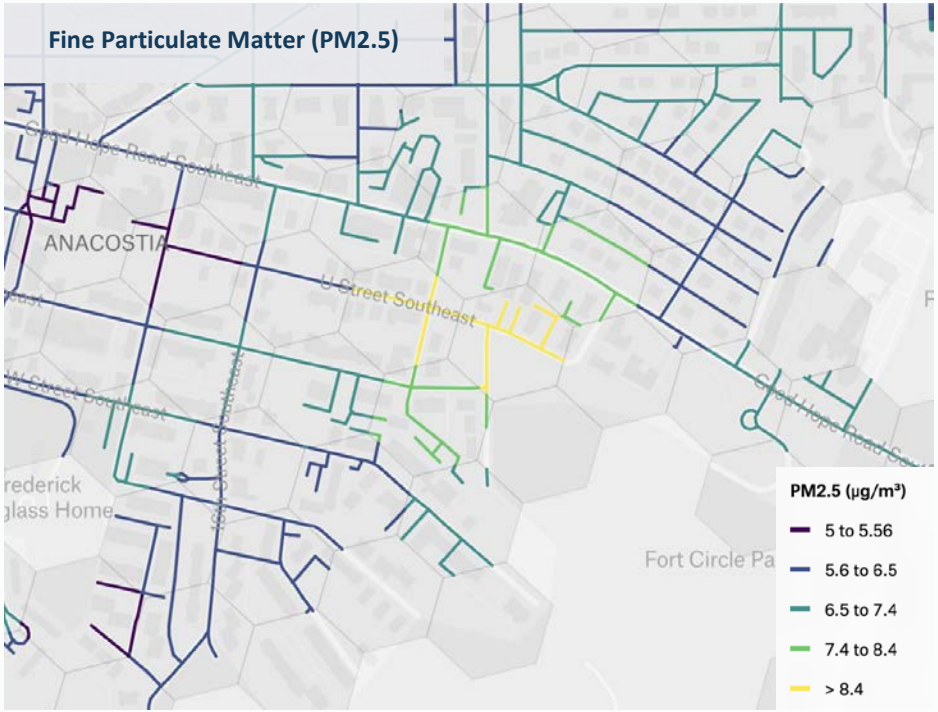
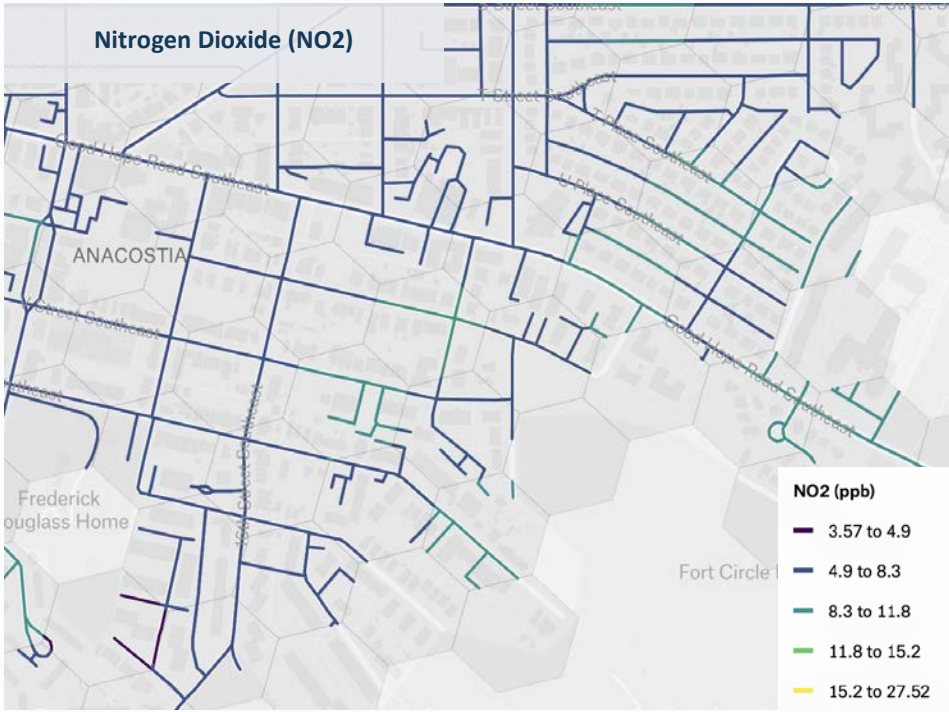
Anacostia - $PM_{2.5}$





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Next Steps

- Data availability
  - DOEE will put summary files on opendata.dc.gov
  - Aclima will finalize a report to be posted on DOEE website
  - Map is available at https://www.aclima.earth/dc2024
- Future data uses
  - Conducting further research, including factor in low-cost sensor placement
  - Sharing with other District agencies to aid decision making
  - Scouting out potential hot spots for targeted enforcement

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Email: AirQuality.Planning@dc.gov

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