

Engaging youths to think about air quality and pollution by engaging them to measure Air Quality PM 2.5 with an Air Beam



Using your school as a laboratory: student led investigation of air quality and energy

In preparation for our time together, please choose one of the following documents/documentary to watch or read.

1) America's Super Polluters. Many states have at least one. In southwest Indiana, there are four. Jamie Smith Hopkins from Center for Public Integrity produced in collaboration with The Weather Channel and USA TODAY. A 12 minute documentary on "Super Polluters"
<https://www.publicintegrity.org/2016/09/29/20248/america-s-super-polluters>

2) How moss revealed an undetected air pollution threat in Portland

8:20 min PBS/News Hour piece

<http://www.pbs.org/newshour/bb/moss-revealed-undetected-air-pollution-threat-portland/>

Portland, Oregon, prides itself on being very focused on the environment. So many people were shocked to discover that certain neighborhoods contain high levels of toxic metals

3) Air Pollution Is Yet Another Issue that Disproportionately Impacts Minorities and Low-Income Communities- Georges C Benjamin 10/09/2016

http://www.huffingtonpost.com/entry/air-pollution-minority-communities_us_57fa6cd6e4b0b6a4303324c84

4) Cleaner air may be driving water quality in the Chesapeake Bay

July 26, 2016 <https://www.sciencedaily.com/releases/2016/07/160726142257.htm> A new study suggests that improvements in air quality over the Potomac watershed, including the Washington, D.C., metro area, may be responsible for recent progress on water quality in the Chesapeake Bay.

5) Ozone injury on cutleaf coneflower (*Rudbeckia laciniata*) and crown-beard (*Verbesina occidentalis*) in Great Smoky Mountains National Park

<http://www.appstate.edu/~neufeldhs/publications/chap2003.pdf>

<http://www.handsontheland.org/environmental-monitoring/ozone-bio-monitoring.html?showall=&start=1>

Academic paper on ground level ozone causes deleterious effects to cutleaf coneflowers and crown-beard. NEEF's [handsontheland.org](http://www.handsontheland.org) project Cutleaf coneflower as ozone bio-monitors.

6) The Big Green Payoff From Bigger Urban Forests

Trees clean and cool the air, but just how much depends on where you are, a new report finds. <http://www.citylab.com/design/2016/10/the-big-green-payoff-from-bigger-urban-forests/505913/>

7) Particulate Matter Exposure and Preterm Birth: Estimates of U.S. Attributable Burden and Economic Costs. Leonardo Trasande, Patrick Malachuk and Teresa Attina

<http://ehp.niehs.nih.gov/15-10810/>

8) Protecting people and Planet from "invisible killer" is focus of UN campaign to tackle air pollution

<http://www.un.org/apps/news/story.asp?NewsID=55356-.WBx4C-ErI1i>

9) 300 million children live in areas with extreme air pollution, data reveals

<https://www.theguardian.com/environment/2016/oct/31/300-million-children-live-in-areas-with-extreme-air-pollution-data-reveals>

Indoor Vs Outdoor Air Quality

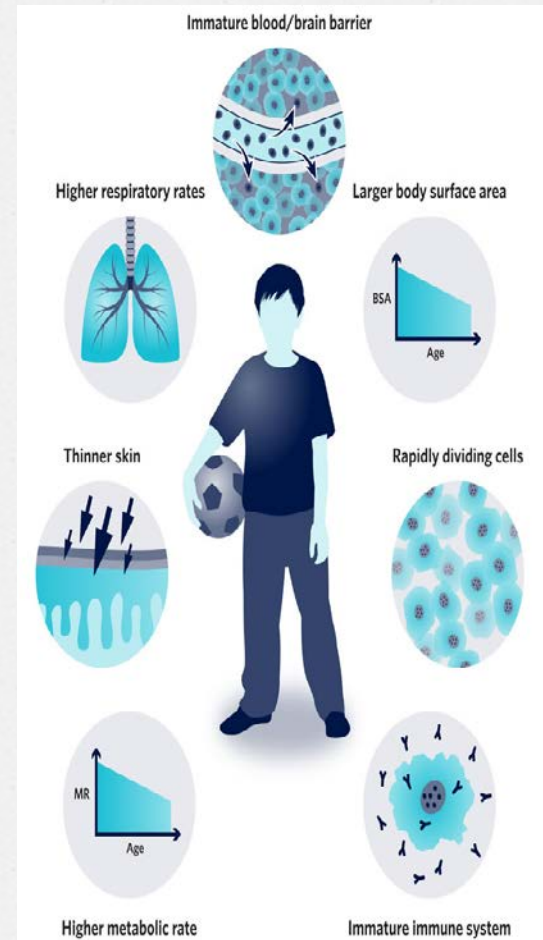


Indoor Air:

Dust, pests, pesticides, dampness, mold, toxic cleaning and building materials, and poor ventilation interferes with student & staff performance and increases asthma and absenteeism.

Outdoor Air:

Pollution, exhaust, local traffic patterns, industry exhaust, pesticides, and smoking are some factors that can contribute to poor air quality in schools



The AirBeam uses a light scattering method to measure fine particulate matter or PM2.5. Air is drawn through a sensing chamber wherein light from an LED bulb scatters off particles in the airstream. This light scatter is registered by a detector and converted into a measurement that estimates the number of particles in the air.

Via Bluetooth, the AirBeam measurements are communicated once a second to the AirCasting mobile app, which maps and graphs the data in real time on your android smartphone. At the end of each AirCasting session, the collected data is sent to the AirCasting website, where the data is crowdsourced with data from other AirCasters to generate heat maps indicating where PM2.5 concentrations are highest and lowest.

By identifying the sources of air pollution around their school or community and collecting data to support their claim students (NGSS-SEP-CCC) are empowered to present possible solution and may affect change through civic action.

How Do AirCasting Sensors Work?

There are many different types of sensors and instruments that measure particles in the air. We'll use the AirCasting system, which contains a particle-counting sensor. Let's take a closer look at the sensor and learn how it works.

In a light-scattering sensor

- Light is absorbed and scattered by particles.
- Light scattering is related to the amount of fine particles in the air.
- The intensity of light received by the detector depends on
 - Amount of particles
 - Size of particles
 - Wavelength of light
 - Angle of light scattering
 - Number of particles
 - Color of particles

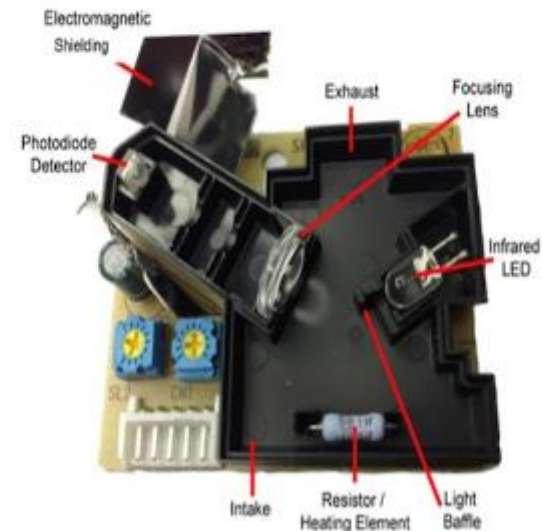
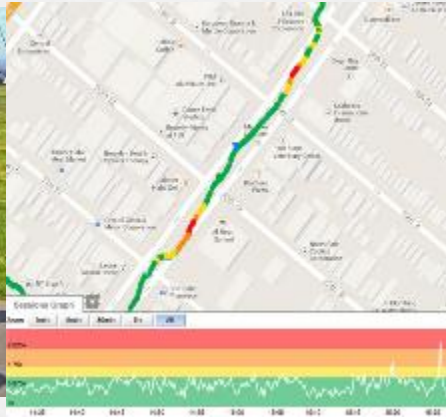
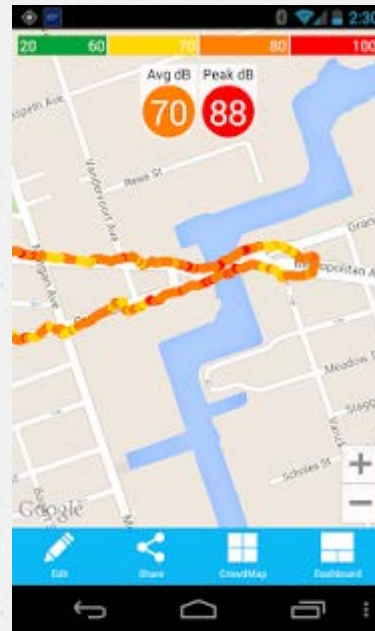
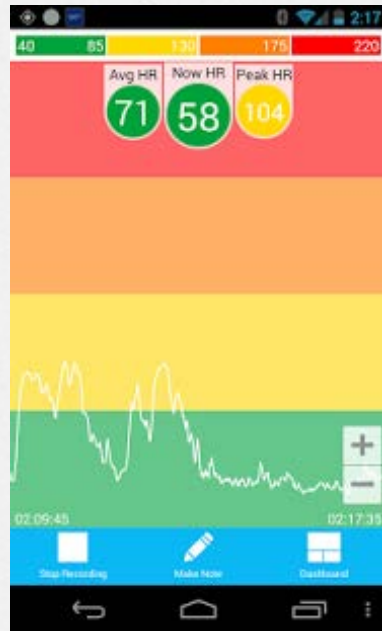
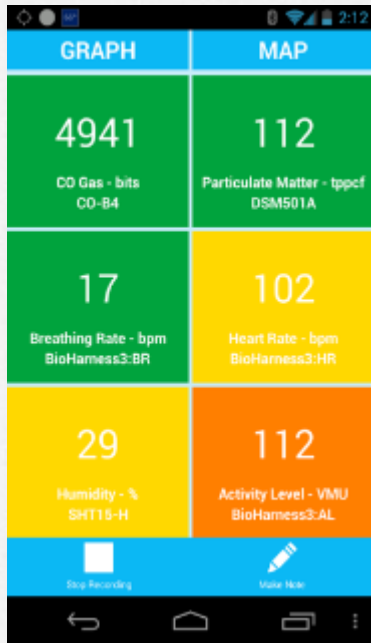
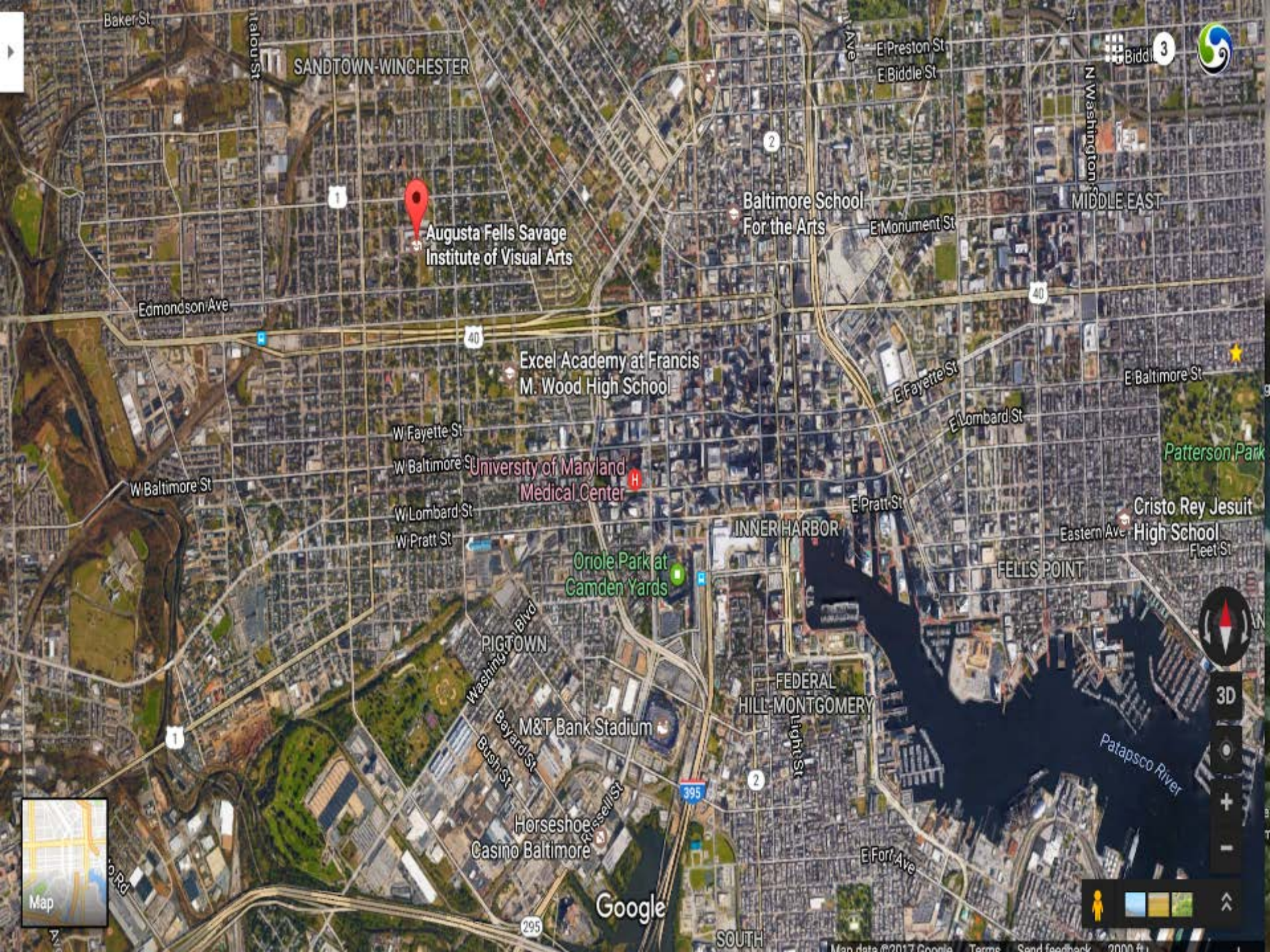


Image by Chris Nafis, modified by HabitatMap.

WALKing ABOUT WITH THE AIRBEAM





Augusta Fells Savage
Institute of Visual Arts

Baltimore School
For the Arts

Excel Academy at Francis
M. Wood High School

University of Maryland
Medical Center

Oriole Park at
Camden Yards

PIGTOWN

INNER HARBOR

FEDERAL
HILL-MONTGOMERY

FELLS POINT

Cristo Rey Jesuit
High School

M&T Bank Stadium

Horseshoe
Casino Baltimore

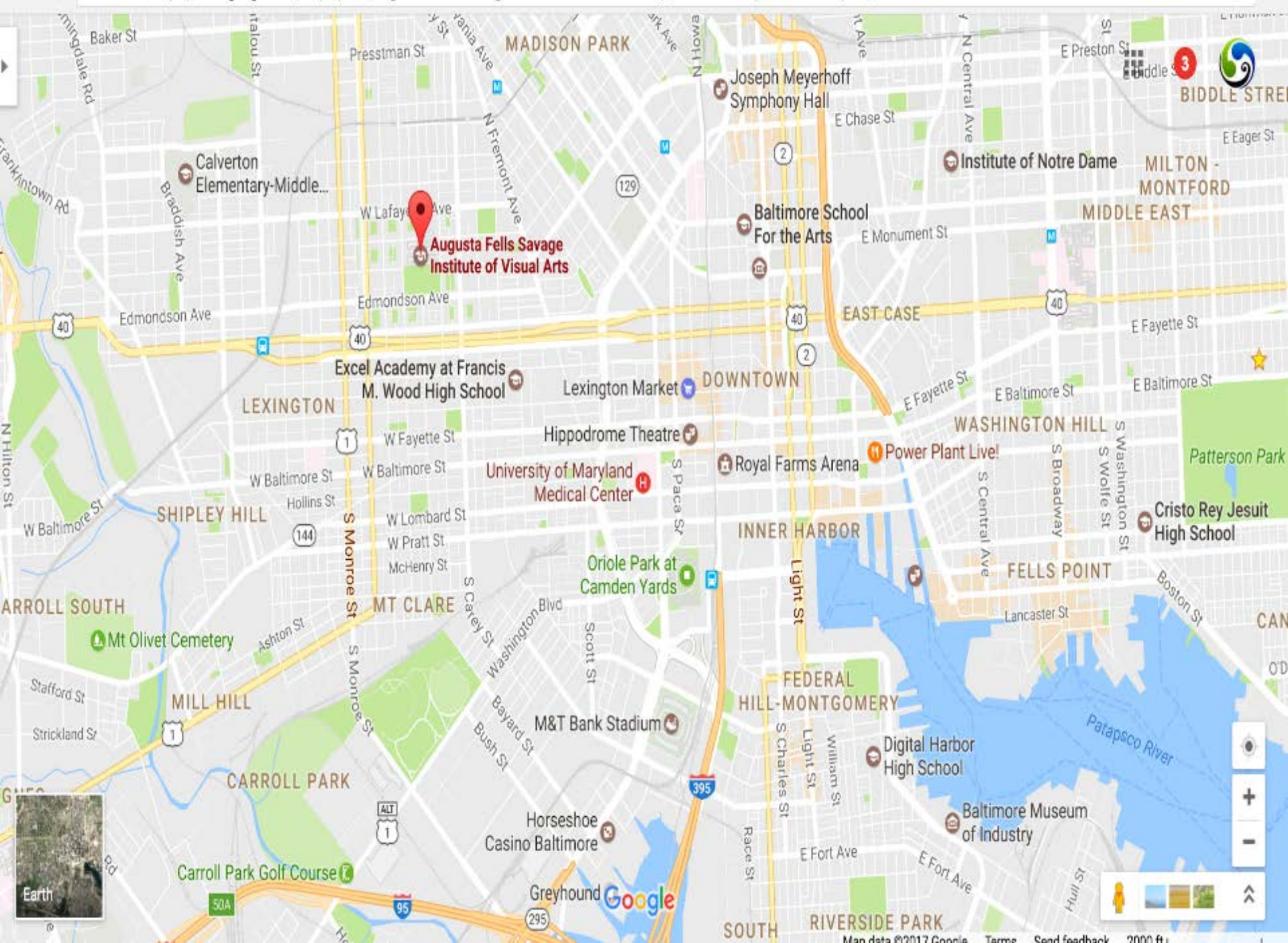
Patapsco River



3D



Google



**Augusta Fells Savage
Institute of Visual Arts**

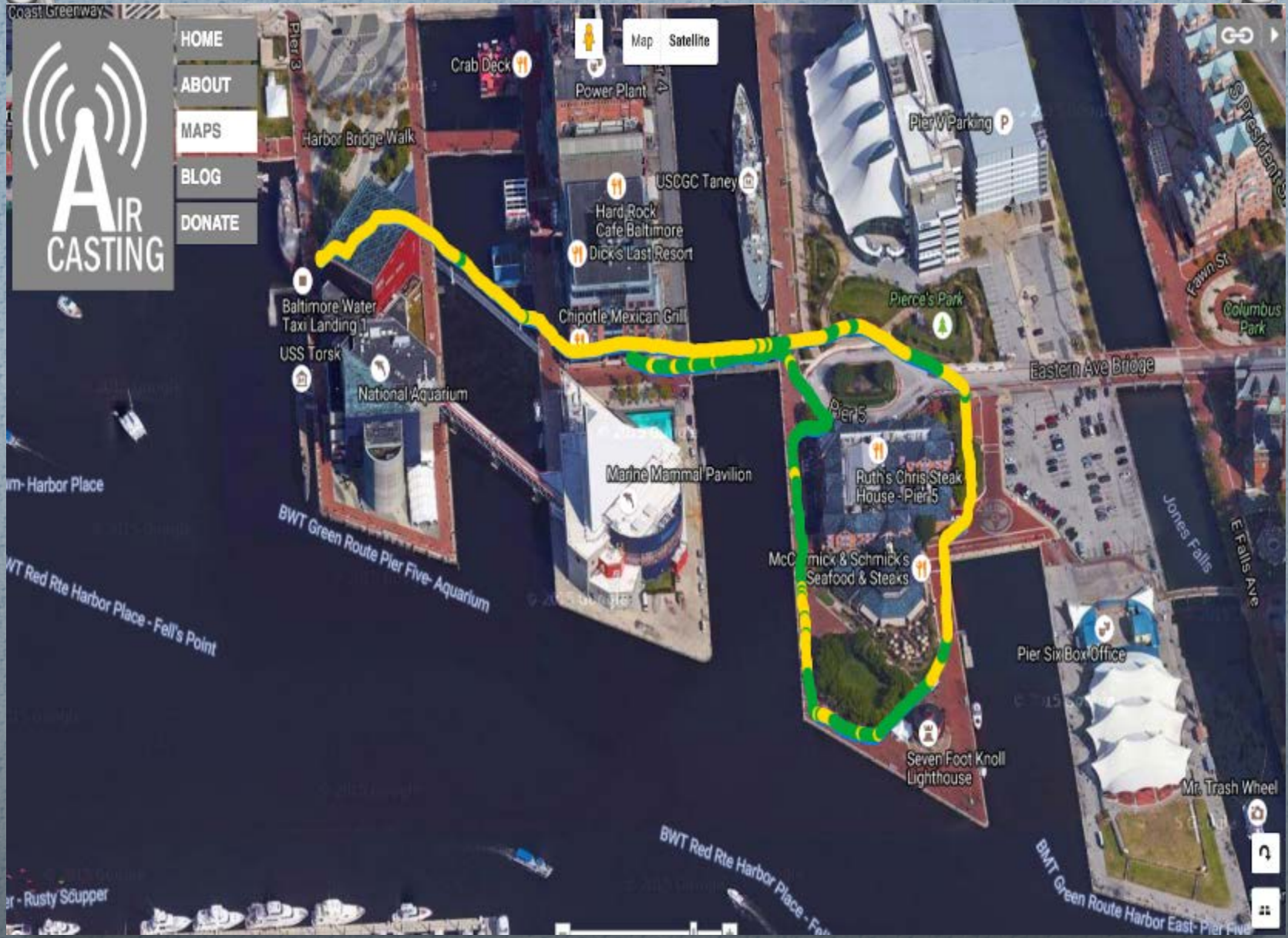


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Map Satellite



Crab Deck
Power Plant
USCGC Taney
Hard Rock Cafe Baltimore
Dick's Last Resort
Chipotle Mexican Grill
Pier 5
Ruth's Chris Steak House - Pier 5
McCormick & Schmick's Seafood & Steaks
Seven Foot Knoll Lighthouse
Pier Six Box Office
Mr. Trash Wheel
Pier 3
Harbor Bridge Walk
USS Torsk
National Aquarium
Marine Mammal Pavilion
Pier 5 Parking
Pierce's Park
Eastern Ave Bridge
Jones Falls
E Falls Ave
Columbus Park
Fawn St
President St
BMT Green Route Harbor East - Pier Five
BMT Red Rte Harbor Place - Fell's Point
BMT Red Rte Harbor Place - Fell's Point
BMT Green Route Pier Five - Aquarium
BMT Green Route Harbor East - Pier Five



DOEE- Green Zone Environmental Program- GZEP
Woodson HS, La Salle, West Education, Kramer MS, Phelps HS, Ballou HS

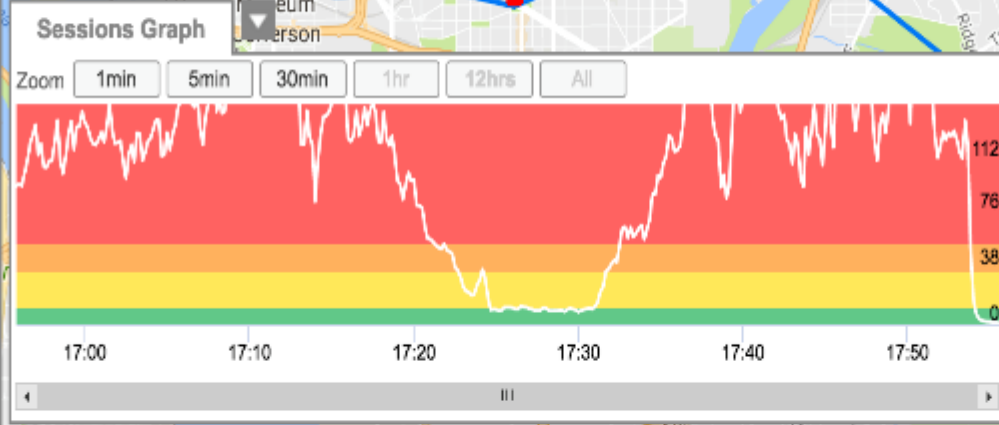






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- Sessions export none
- lancer1
cleanairpartners, 03/11/2016,
09:54-10:07 dB/F/PM/RH
 - maranda2
cleanairpartners, 03/11/2016,
15:39-16:55 dB/F/PM/RH
 - lancer3
cleanairpartners, 03/11/2016,
09:54-10:07 dB/F/PM/RH
 - unnamed
cleanairpartners, 03/11/2016,
15:23-15:27 dB/F/PM/RH
 - maranda1
cleanairpartners, 03/11/2016,
15:55-16:55 dB/F/PM/RH



CrowdMap Mobile Fixed

Parameter - Sensor
All

Location
Address, Intersection, or Zip

Within
10 Miles radius

Limit my search to the current map view

reset submit

Profile names
cleanairpartners,

reset submit

Tags

Time Range

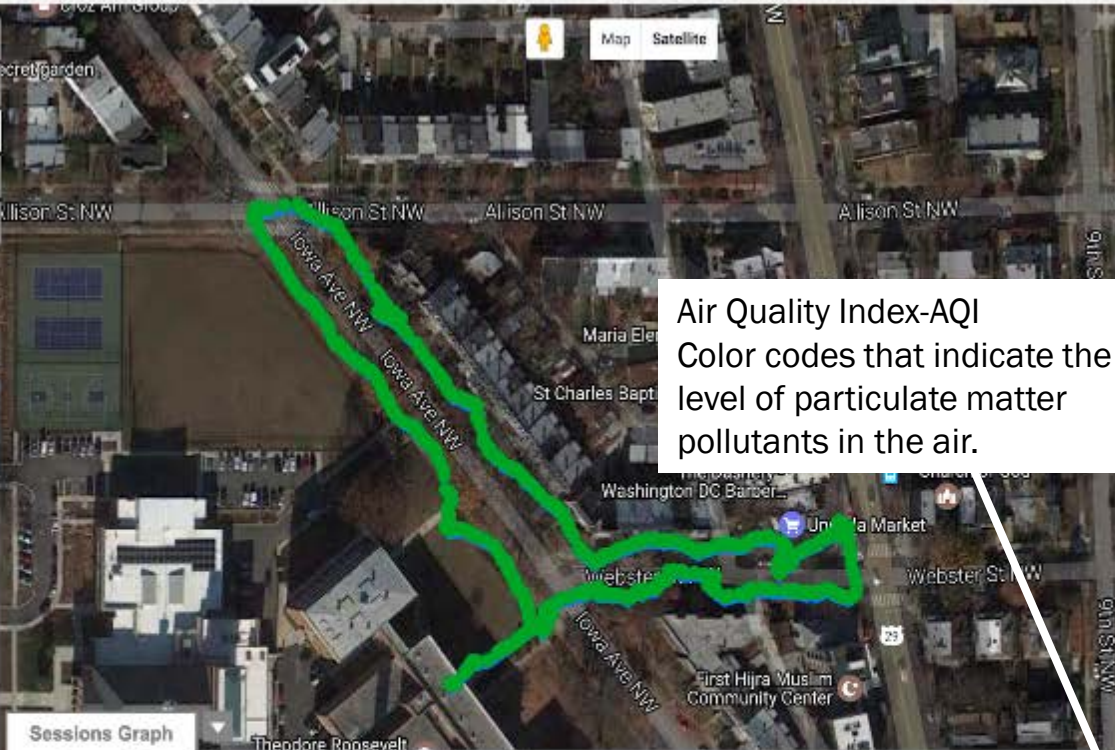
Heat Legend Units
12µg/m³ 55µg/m³



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Sessions export none

- cleanairpartners
cleanairpartners, 03/16/2017,
10:07-10:24 dB/F/PM/RH
- 1
cleanairpartners, 03/08/2017,
13:28-13:28 dB
- Marie Reed Thursday
cleanairpartners, 03/16/2017,
10:27-10:27 dB/F/PM/RH
- Cleanairpartners,
MarieReed
Thurspink/white
cleanairpartners, 03/16/2017,
10:29-10:46 dB/F/PM/RH
- air test
cleanairpartners, 03/08/2017,
13:25-13:26 dB
- cleanairpartners
MarieReed ThursGreen
cleanairpartners, 03/16/2017,
10:07-10:26 dB/F/PM/RH
- cleanairpartners



Air Quality Index-AQI
Color codes that indicate the
level of particulate matter
pollutants in the air.



Fixed Mobile CrowdMap

Parameter - Sensor
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Limit my search to the current map view

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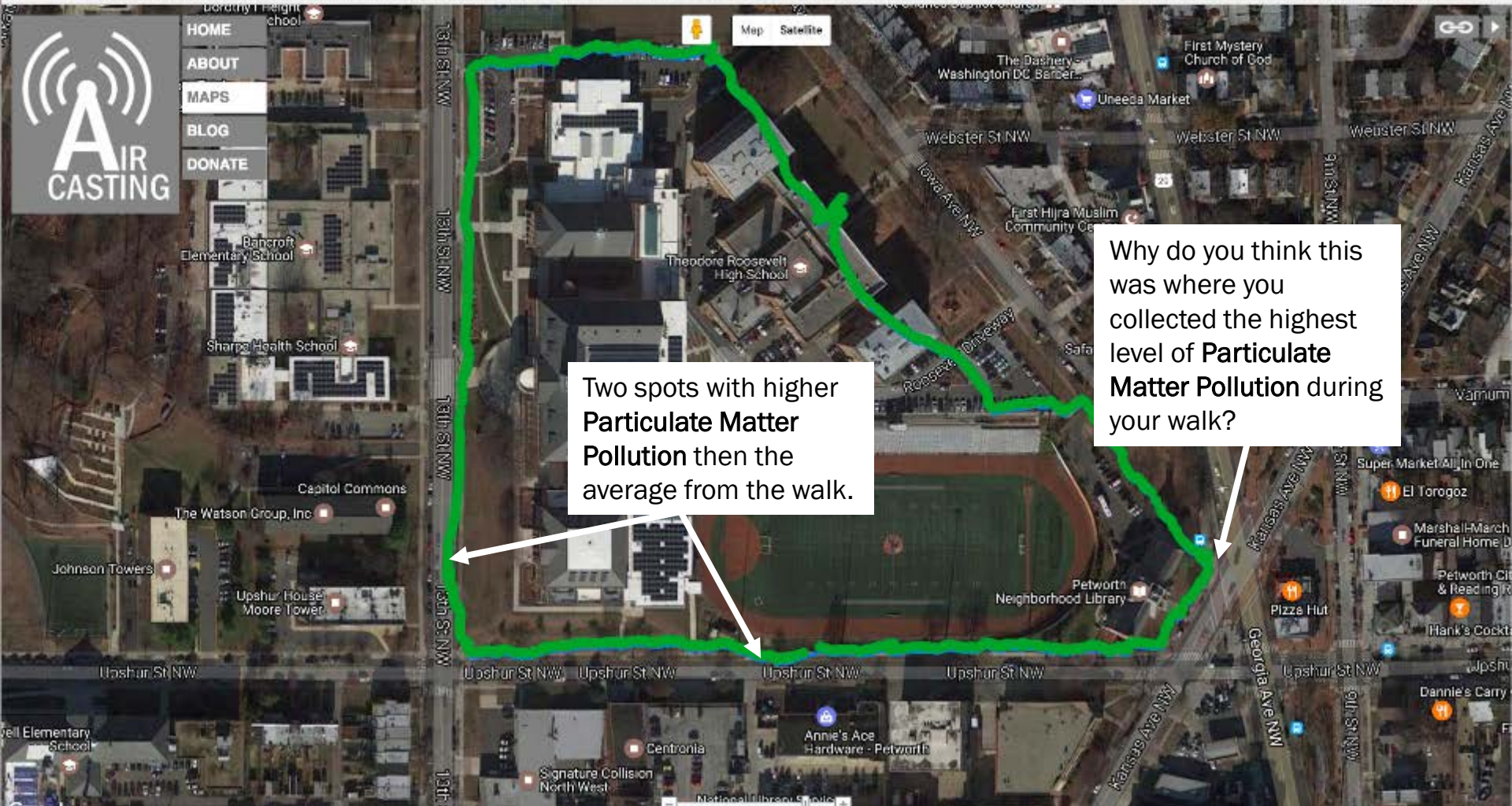
Time Range

Heat Legend Units

12µg/m³ 55µg/m³
0µg/m³ 35µg/m³ 150µg/m³

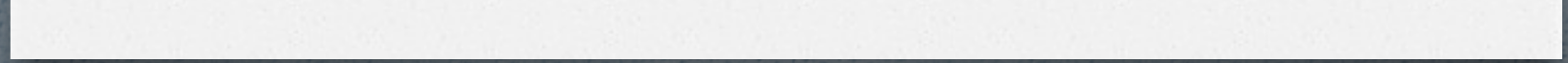


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Two spots with higher Particulate Matter Pollution than the average from the walk.

Why do you think this was where you collected the highest level of Particulate Matter Pollution during your walk?





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