

# Risk and Environmental Justice (EJ) Screening for Teaching, Research & Beyond

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MAKE WAVES.

# My topics today

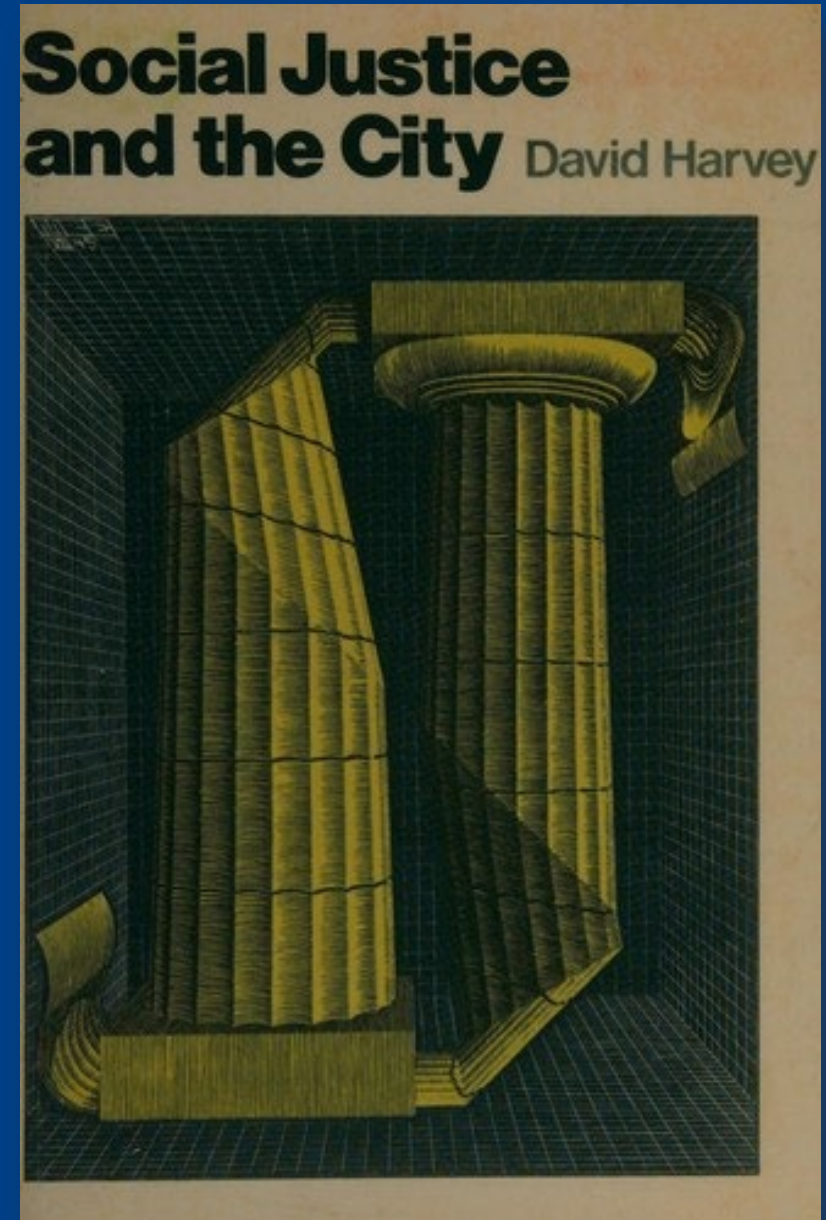
1. City profiles with EJ Screening and Mapping Tool (EJScreen) and Risk-Screening Environmental Indicators (RSEI)
2. Seattle's riskscape
3. Ground truthing Seattle's toxic pollution

**Good research leads to  
more questions than  
answers.**

So does a good screening tool.

# Teaching Risk and EJ Screening

1. Did you find pollution disparities in your city?
2. Describe one socioeconomic and environmental indicator between facilities with the highest and lowest risk scores in your city.
3. Does your evidence support or refute any of our course readings?



# Groups used EJScreen to profile a city's demographic & environmental conditions.

Variable/Indicator	Value (%)	State percntle	Region percntle	National percntle
Demographic index	29	58	59	47
People of color	36	65	72	54
Low income	21	46	39	36
Unemployment rate	4	50	48	48
Linguistically isolated	5	71	76	70
Less than high school education	5	43	40	31
Under age 5	5	37	38	39
Over age 64	12	15	16	16

Variable/Indicator	Value (%)	State percntle	Region percntle	National percntle
Particulate matter-2.5 ( $\mu\text{g}/\text{m}^3$ )	7.7	51	38	25
Ozone (ppb)	31.7	23	14	5
Diesel particulate matter ( $\mu\text{g}/\text{m}^3$ )	0.707	95	90-95	95-100
Air toxics cancer risk	39	88	90-95	95-100
Air Toxics Respiratory hazard index	0.54	77	80-90	95-100
Hazardous waste proximity	8.7	94	96	97

Seattle WA profile

# Then, they profiled city facilities with RSEI

Facility Name	RSEI Score	2020 Industry median	TRI Pounds
Alaskan Copper Works	6,378,399	63	22,100
Ardagh Glass	6,212,946	95	9,841
Young Corp	3,780,749	2,076	26,014
Asko Processing	6	27	67,883
Delta Marine	2	210	6,079
Glacier NW	2	0	17,532
<b>Total for City</b>	<b>18,425,222</b>	<b>n/a</b>	<b>58,756,062</b>

Finally, they performed buffer analysis for the six facilities. Here, we display Ardagh Glass

Variable/Indicator	1-mile (%)	State percntle	Region percntle	USA percntle
Demographic index	33	68	69	54
People of color	45	75	81	61
Low income	21	48	40	38
Unemployment rate	5	56	55	54
Linguistically isolated	2	55	61	57
Less than high school education	7	53	51	41
Under age 5	5	42	42	44
Over age 64	13	47	45	43
Particulate matter-2.5 ( $\mu\text{g}/\text{m}^3$ )	7.79	60	44	28
Ozone (ppb)	31.9	28	18	5
Diesel particulate matter ( $\mu\text{g}/\text{m}^3$ )	0.718	95	90-95 <sup>th</sup>	95-100 <sup>th</sup>
Air toxics cancer risk	40	92	90-95 <sup>th</sup>	95-100 <sup>th</sup>
Respiratory hazard index	0.5	72	70-80 <sup>th</sup>	95-100 <sup>th</sup>
Hazardous waste proximity	14	97	98 <sup>th</sup>	97 <sup>th</sup>

# Research for Seattle's segregated riskscape

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<https://toxicnews.org/2019/02/21/seattles-segregated-riskscape/>

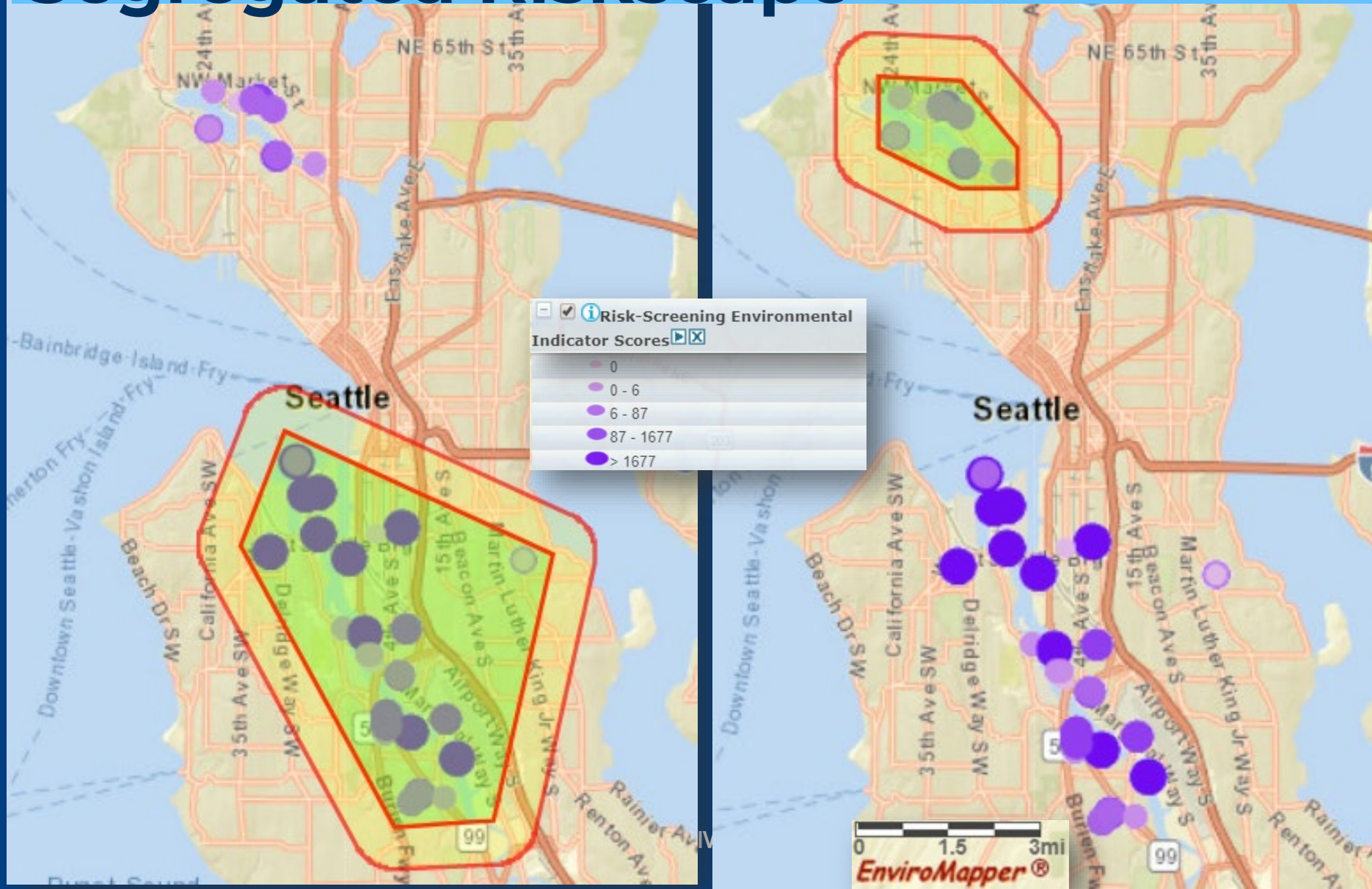


If you've seen  
Seattle, you  
probably  
recognize  
this view





# This is an EJScreen view of Seattle's Segregated Riskscape



**But remember, RSEI and EJScreen are screening tools.**

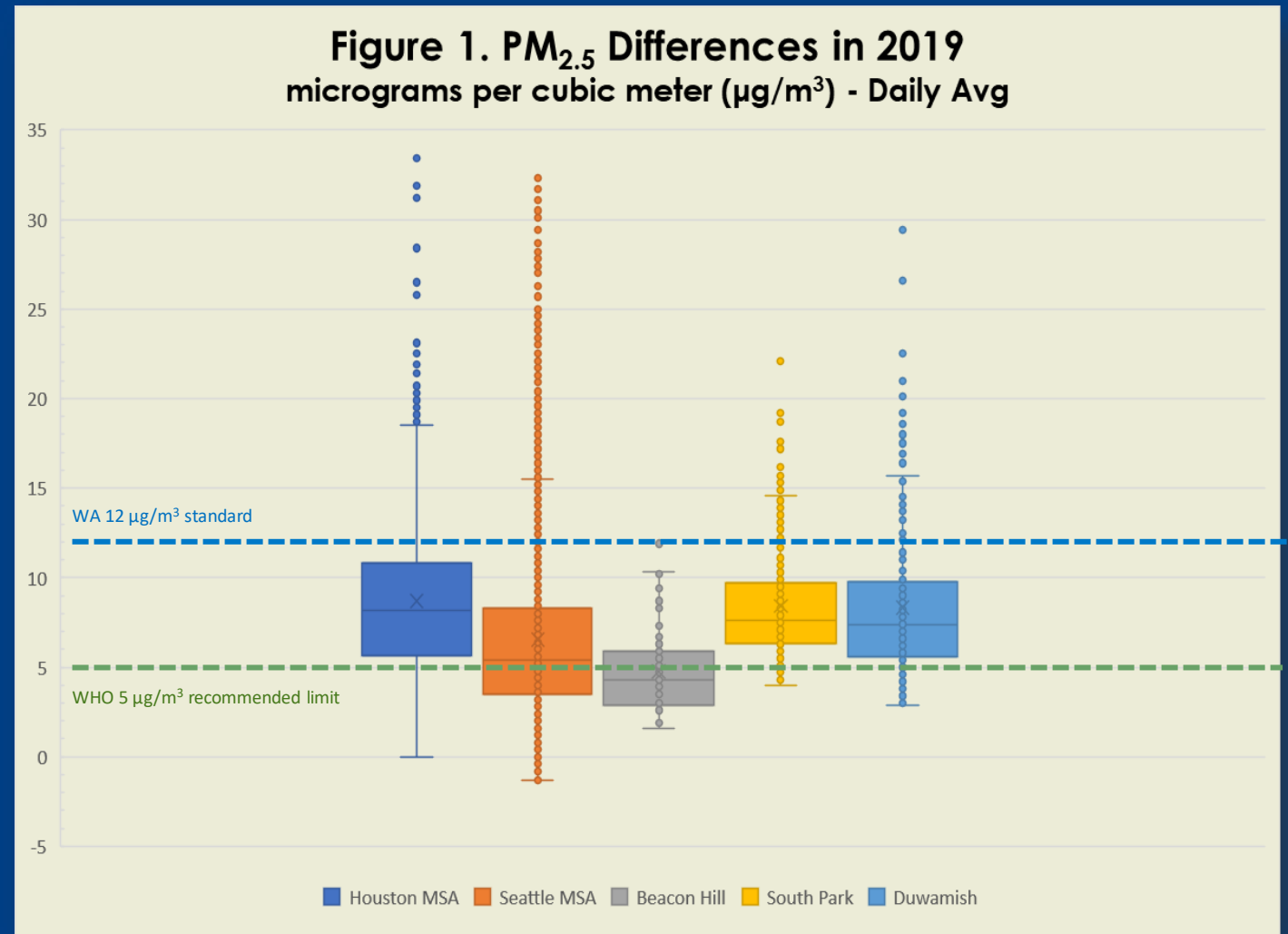


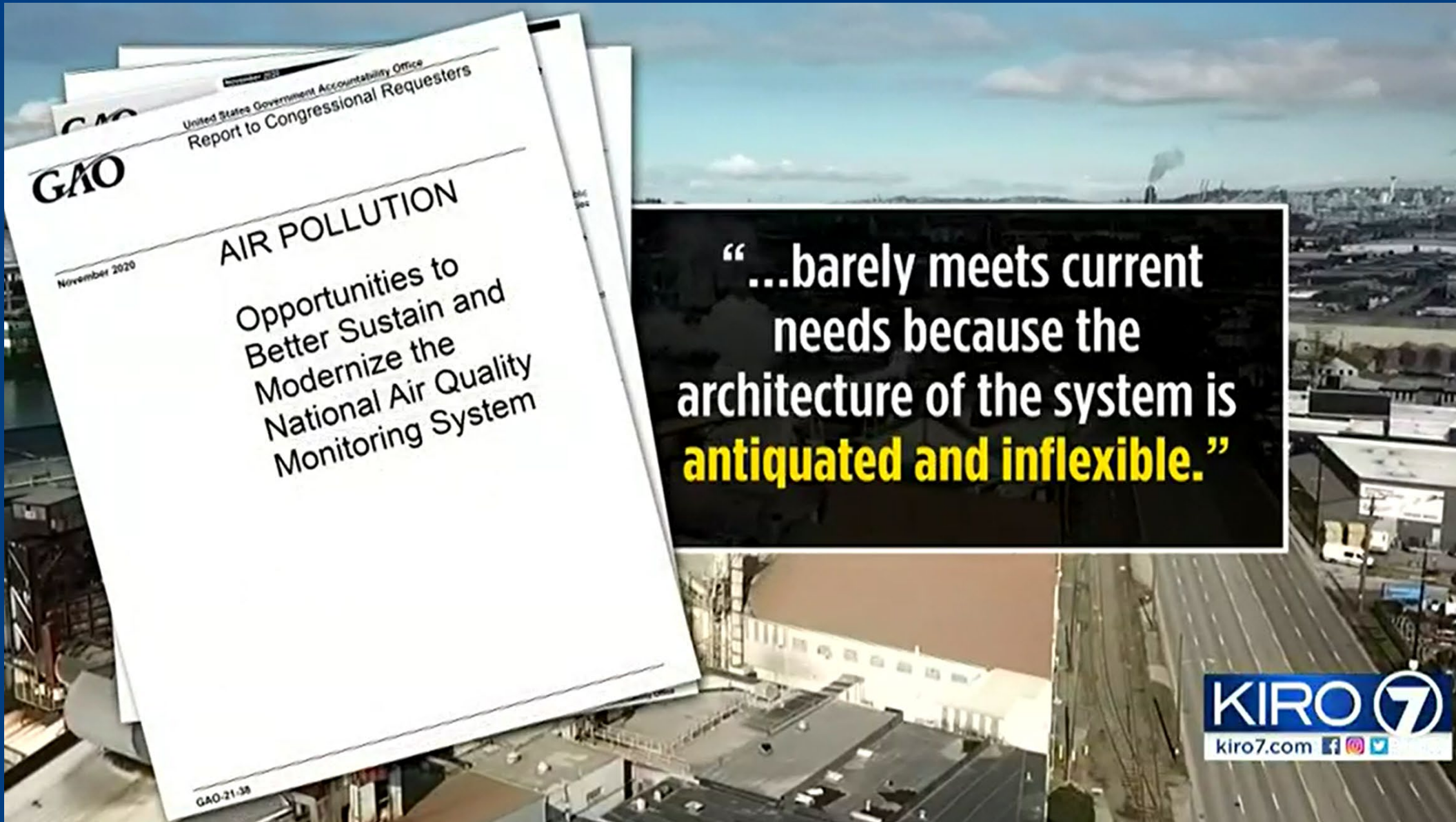
Particulate Matter (PM) pollution in Seattle's Duwamish River valley. January 14, 2021



# Air quality in the DRV is not like the rest of Seattle.

1. Houston and surrounding Harris County is one of the most industrialized metropolitan areas hosting 541 industrial polluters reporting to the Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) between 2011 and 2020. Air pollution releases exceeded 112.8 million pounds. Conversely, 71 industrial polluters between 2011 and 2020 called King County Washington home.
2. Using existing monitoring data, our research showed that Duwamish River Valley particle pollution ( $PM_{2.5}$ ) was more like the heavily industrialized port city of Houston Texas than the rest of Seattle.





GAO  
United States Government Accountability Office  
Report to Congressional Requesters

GAO

November 2020

## AIR POLLUTION

Opportunities to  
Better Sustain and  
Modernize the  
National Air Quality  
Monitoring System

GAO-21-38

“...barely meets current  
needs because the  
architecture of the system is  
**antiquated and inflexible.**”



# Our Oregon friends know this well.

## The Oregonian

Map shows arsenic pollution in five more  
Portland neighborhoods

By [Rob Davis](#)  
Feb. 11, 2016

## The New York Times

*Toxic Moss in Portland, Ore., Shakes  
City's Green Ideals*

By [Kirk Johnson](#)

March 2, 2016

# Moss doesn't lie

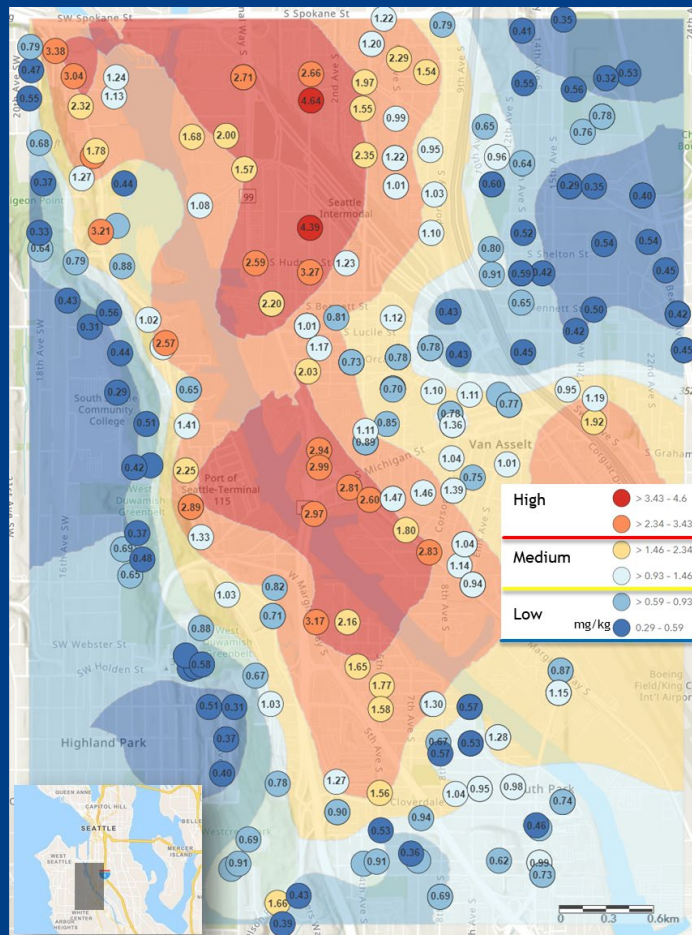
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Ground truthing in Seattle

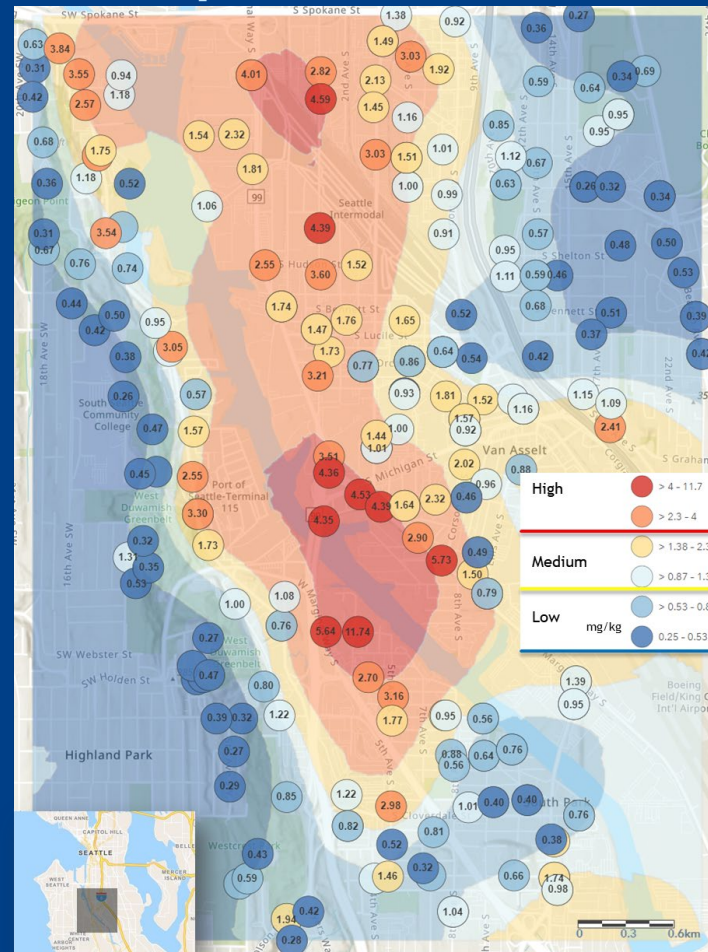


# Arsenic (As), Cobalt (Co), Nickel (Ni) Maps in the Duwamish River Valley

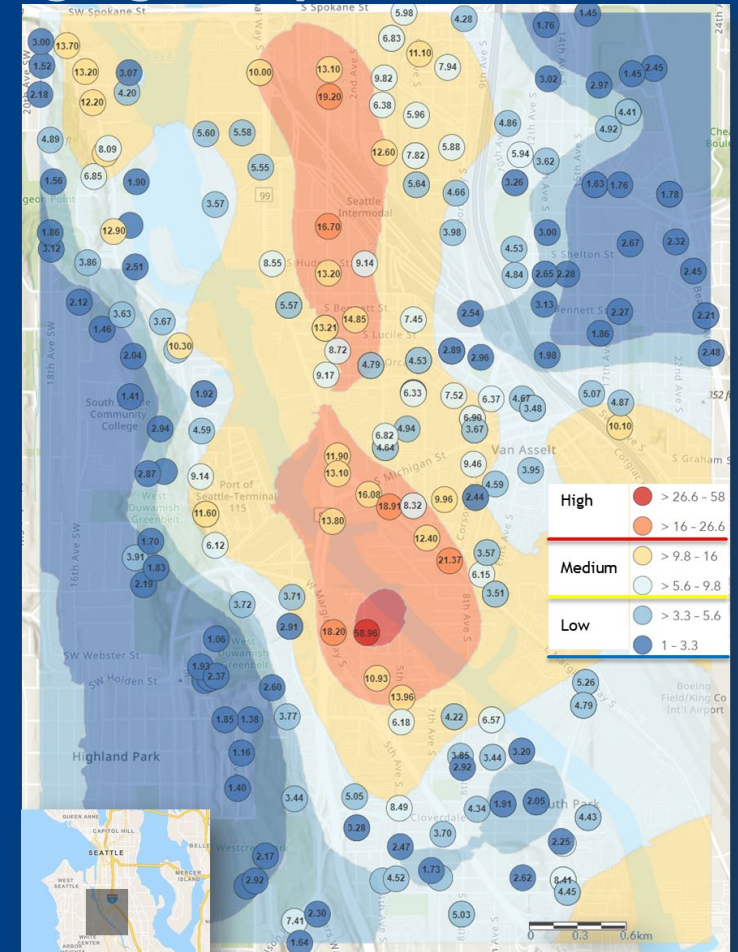
Combined 2019 & 2021 Moss sample concentrations and Kriging interpolation



Arsenic



Cobalt

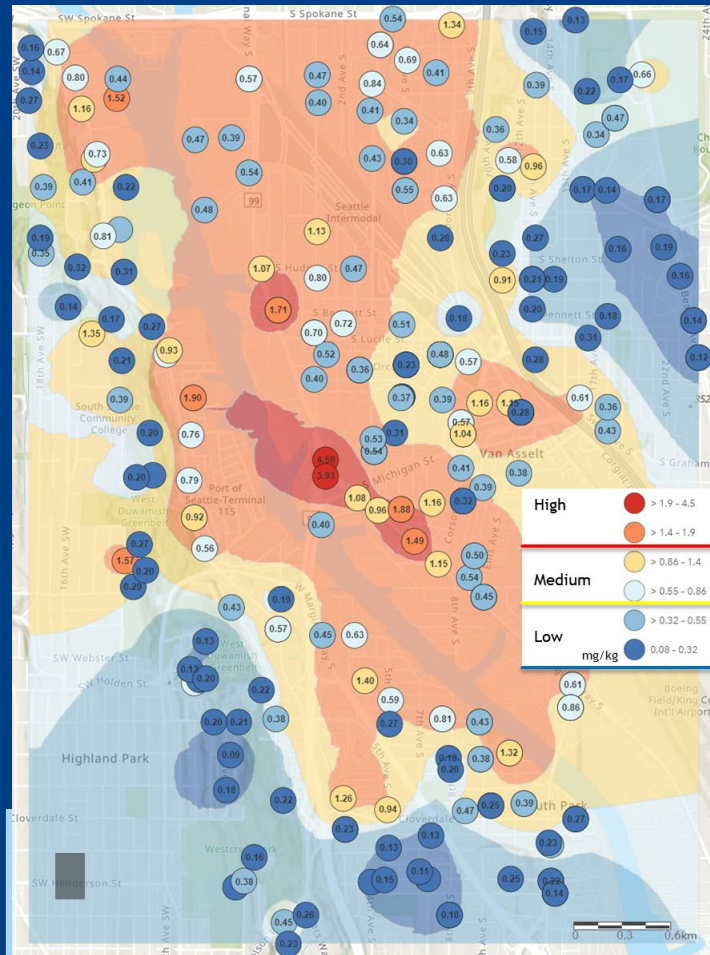


Nickel

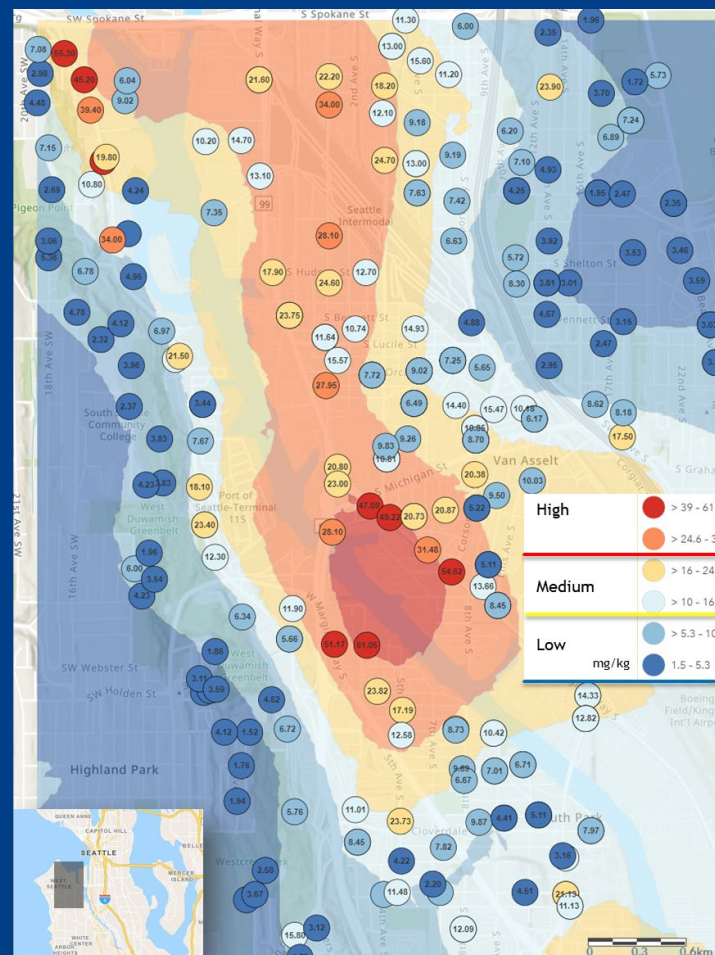


# Cadmium (Cd), Chromium (Cr), Lead (Pb) Maps

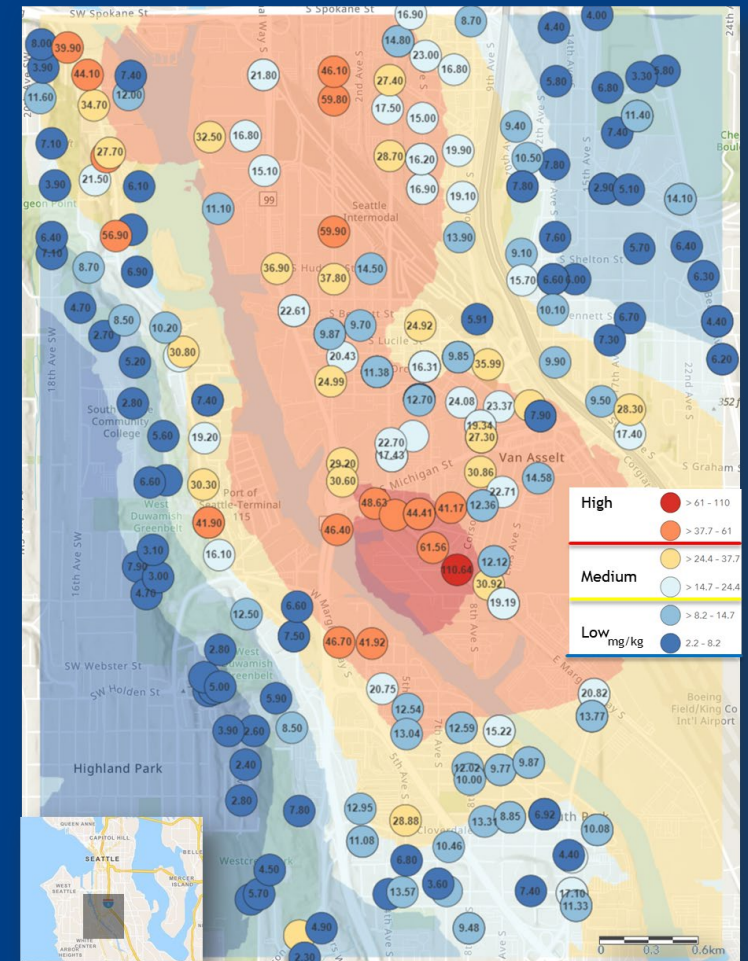
## Combined 2019 & 2021 Moss samples



Cadmium



Chromium



Lead

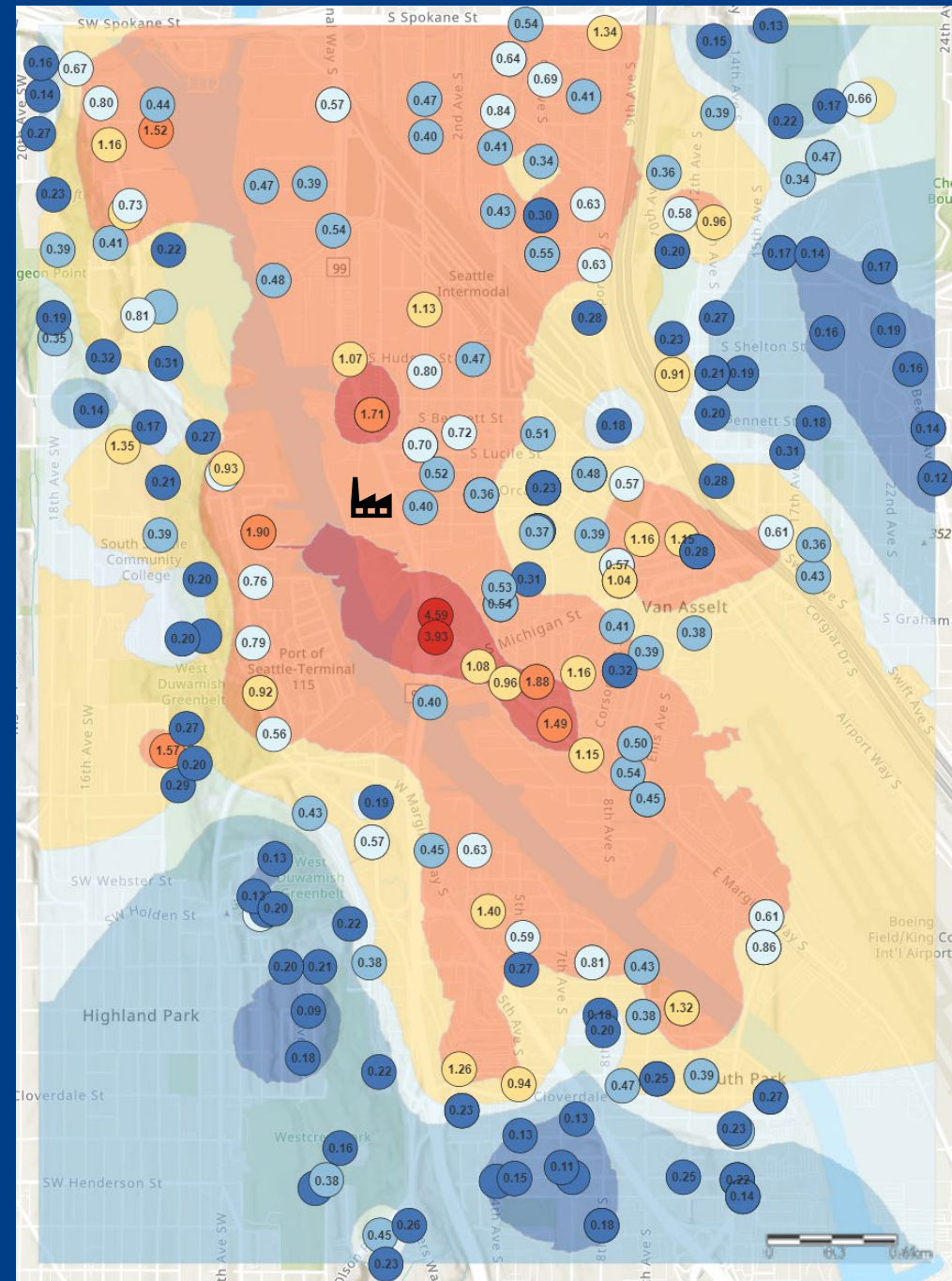




# Closer look at cadmium

Again, using a similar kriging method as Jovan et al. (2022), this is the interpolated cadmium contours with individual concentrations.

But then look at the highest concentrations along the river. Connect the dots. A cadmium hotspot was linked to a stained-glass manufacturer in a Portland study that inspired our moss study.



# Acknowledgements

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- Our research has not been formally reviewed by the EPA or USDA nor peer-reviewed for publication. The views expressed in this document are solely those of Dr. Troy D. Abel and doctoral candidate Jonah White. EPA does not endorse any products or commercial services mentioned in this publication.

