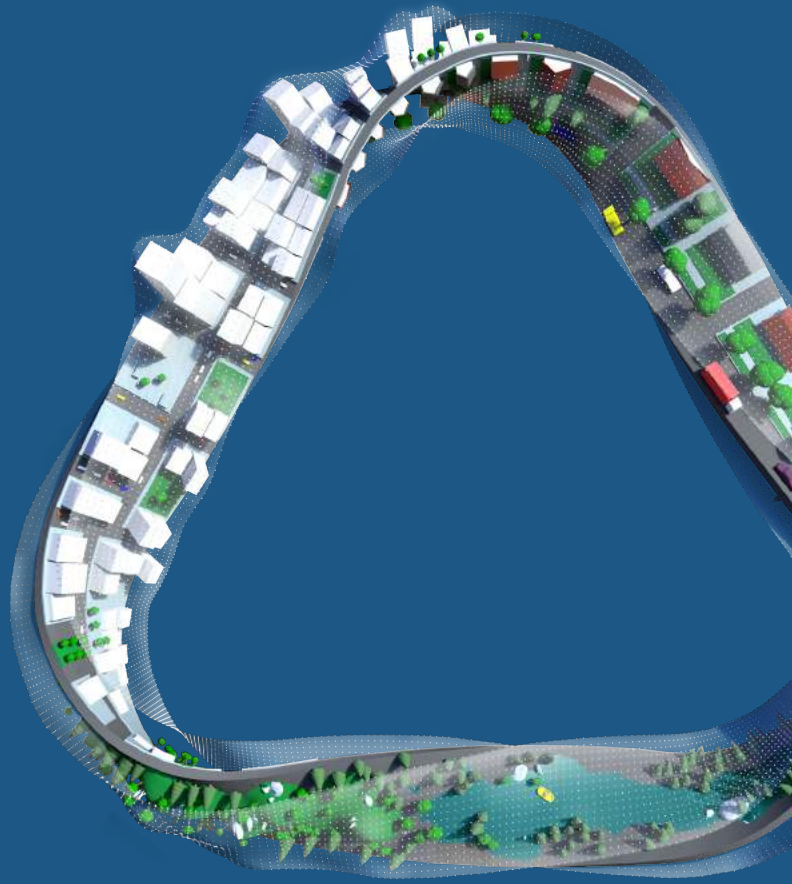
Environmental intelligence for people and the planet

Richmond-San Pablo Steering Committee
December 11, 2019



Agenda

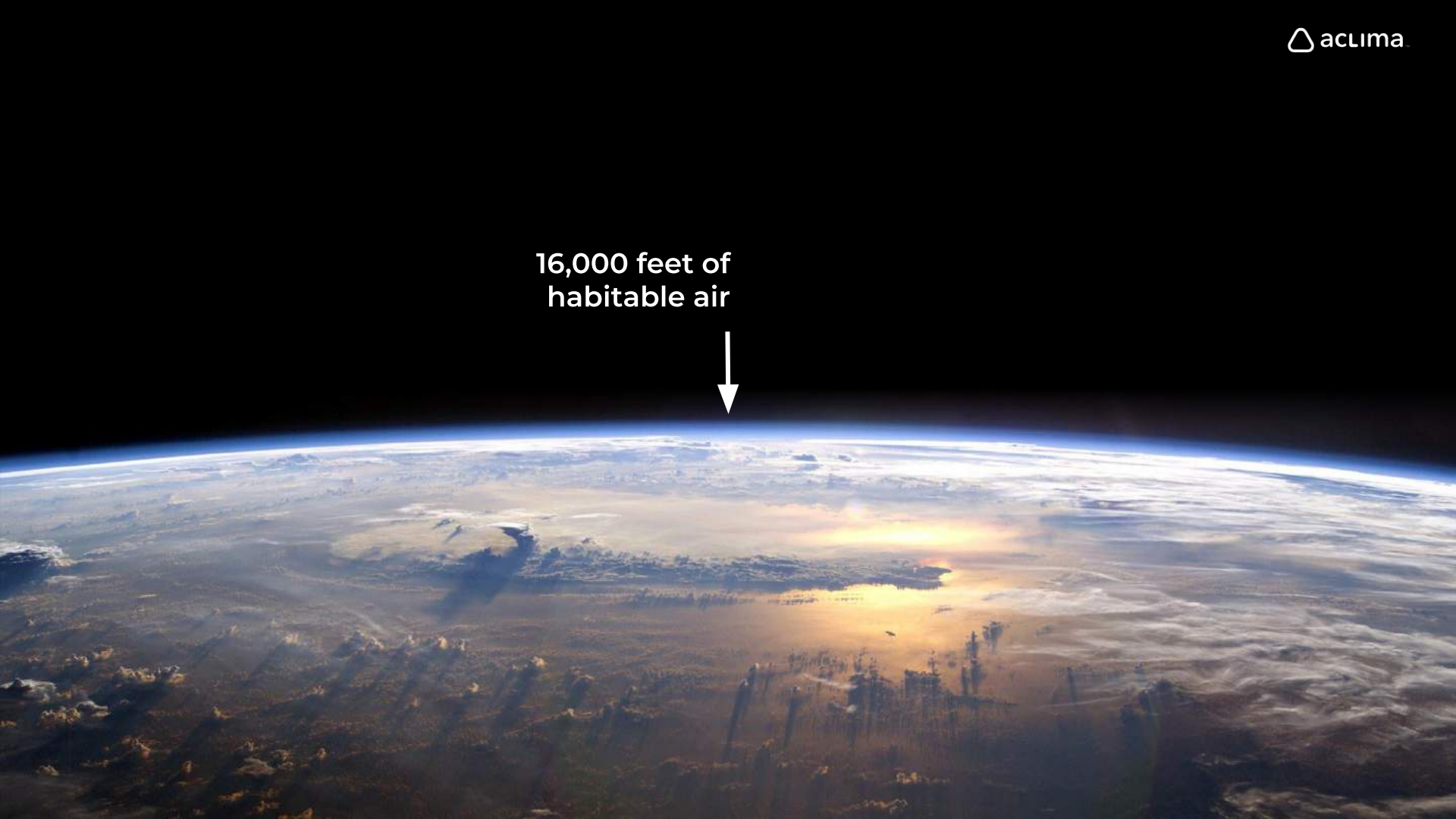
Partnership approach

Overview of mapping campaign

Aclima data quality review

Live in-person / virtual training

Partnership approach


16,000 feet of
habitable air

Aclima principles of engagement

Building the future together

INNOVATION THROUGH COOPERATION: We embrace the power of partnership to unlock innovation that solves the biggest challenges facing society.

SERVICE THROUGH SCIENTIFIC RIGOR: We serve our customers through our commitment to the highest levels of scientific rigor in all we do. This doesn't mean perfection — it means integrity.

TRUST THROUGH OPENNESS: We earn trust from our customers and partners through openness and transparency. We share our successes, areas for improvement, opportunities and challenges, even when it's hard. When we can't solve a problem on our own, we ask for help and we work to solve it together.

Overview of mapping campaign

What we measured

We measured critical air pollutants, greenhouse gases, and more:

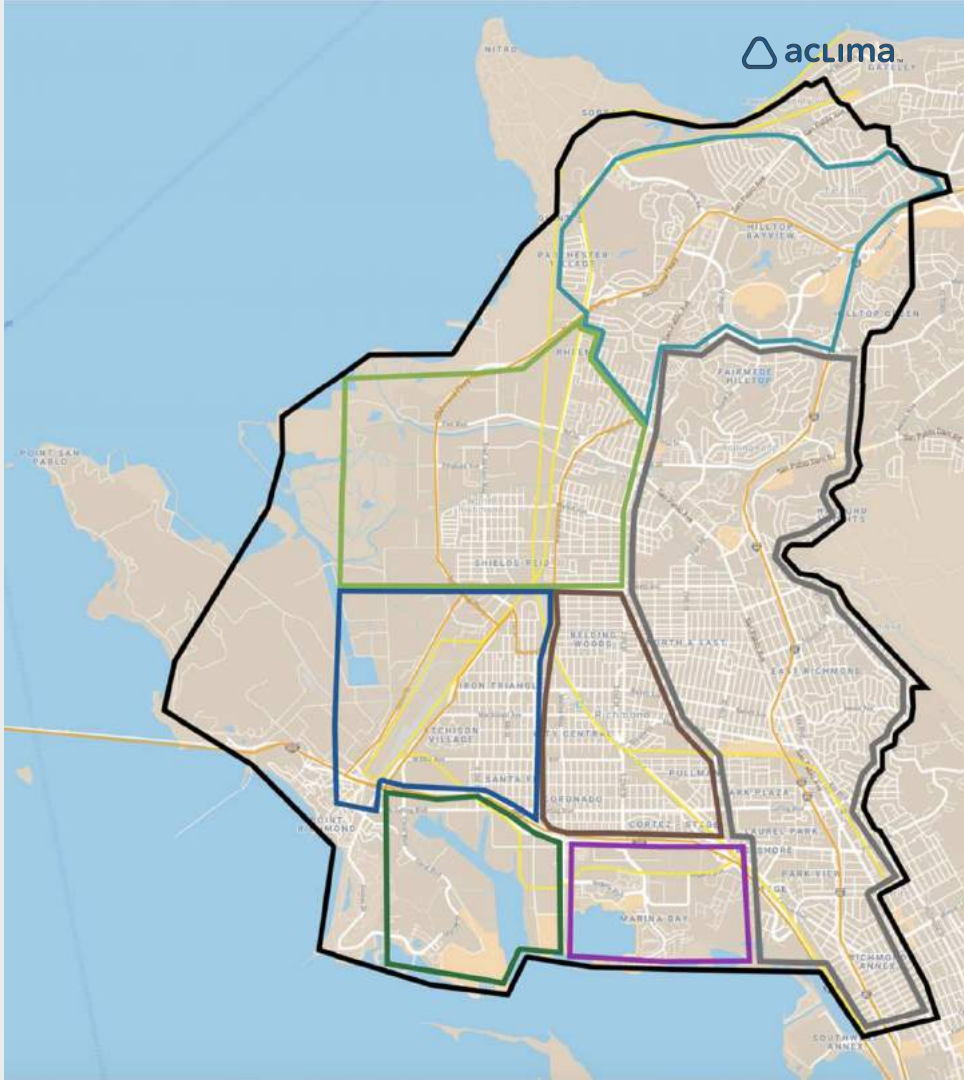
Carbon Dioxide (CO2)
Carbon Monoxide (CO)
Nitric Oxide (NO)
Nitrogen Dioxide (NO2)
Ozone (O3)
Particulate Matter (PM2.5)

How we mapped

3 MONTHS
August 1- October 31, 2019

7 FOCUS AREAS
comprehensive coverage

5 VEHICLE OPERATORS
2 hired locally, from the community



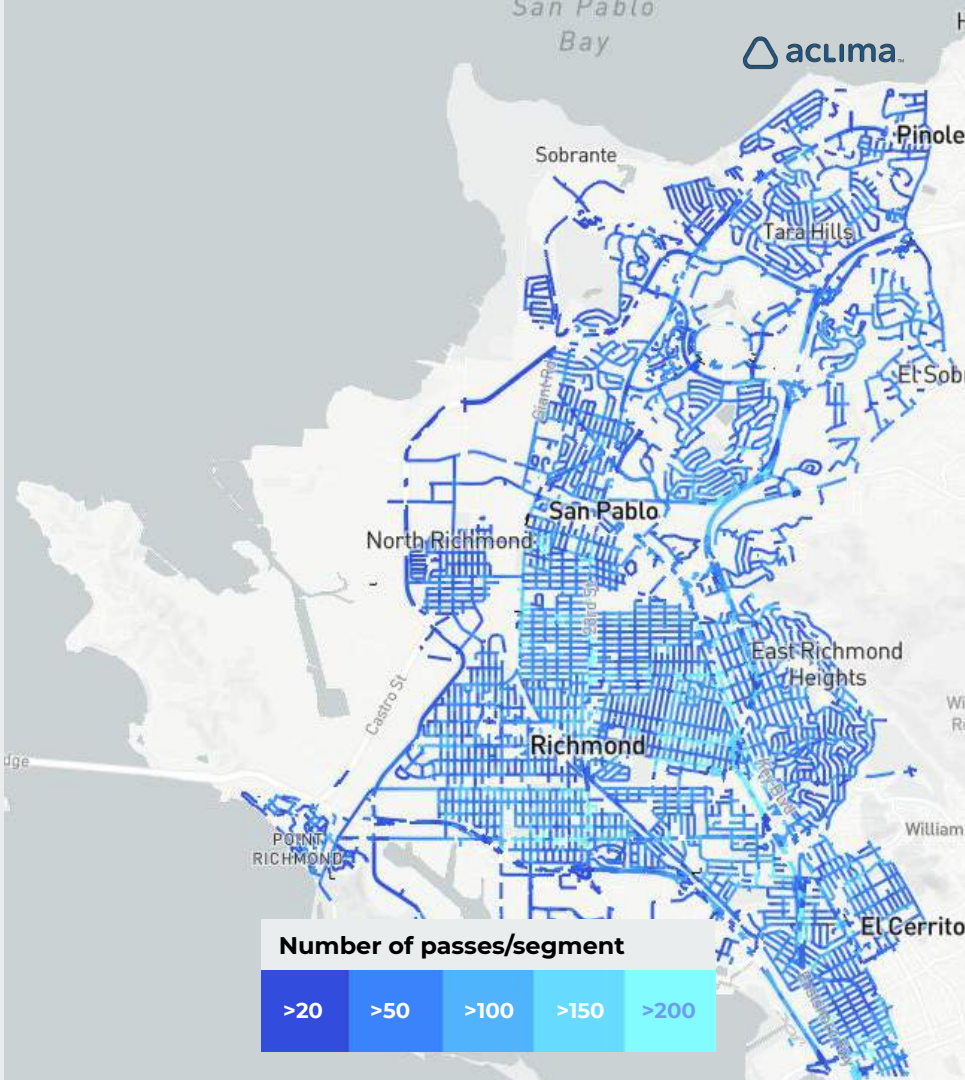
Where we mapped

92 days

25,870 miles driven

42 square miles covered

110 million data points collected



Community feedback

Engagements

Co-lead interviews
Steering Committee and Community Summit
Hiring vehicle operators from the community

Major findings so far

“Parameter” scale appears to be interactive, but isn’t
Are levels “good” or “bad” for your health?
Customizing calls to action in Richmond-San Pablo
Various requests in Aclima’s log for consideration

Aclima data quality review

Aclima's data stages prior to Insights release

Preliminary 1

In progress data collection

Preliminary 2 ✓

Baseline complete, but revisions are possible:

→ Statistical assessment of sampling

→ Review of the data by Aclima's staff scientists

Verified ✓✓

Data is ready for release

In-person & virtual training

Commitment to Richmond-San Pablo

In-person training (with options for virtual participation)

Sign up at the sign-in table to be notified of the release of the tool (available by March 2020) and the option to participate in training specifically for Richmond-San Pablo residents

Public release is the first step

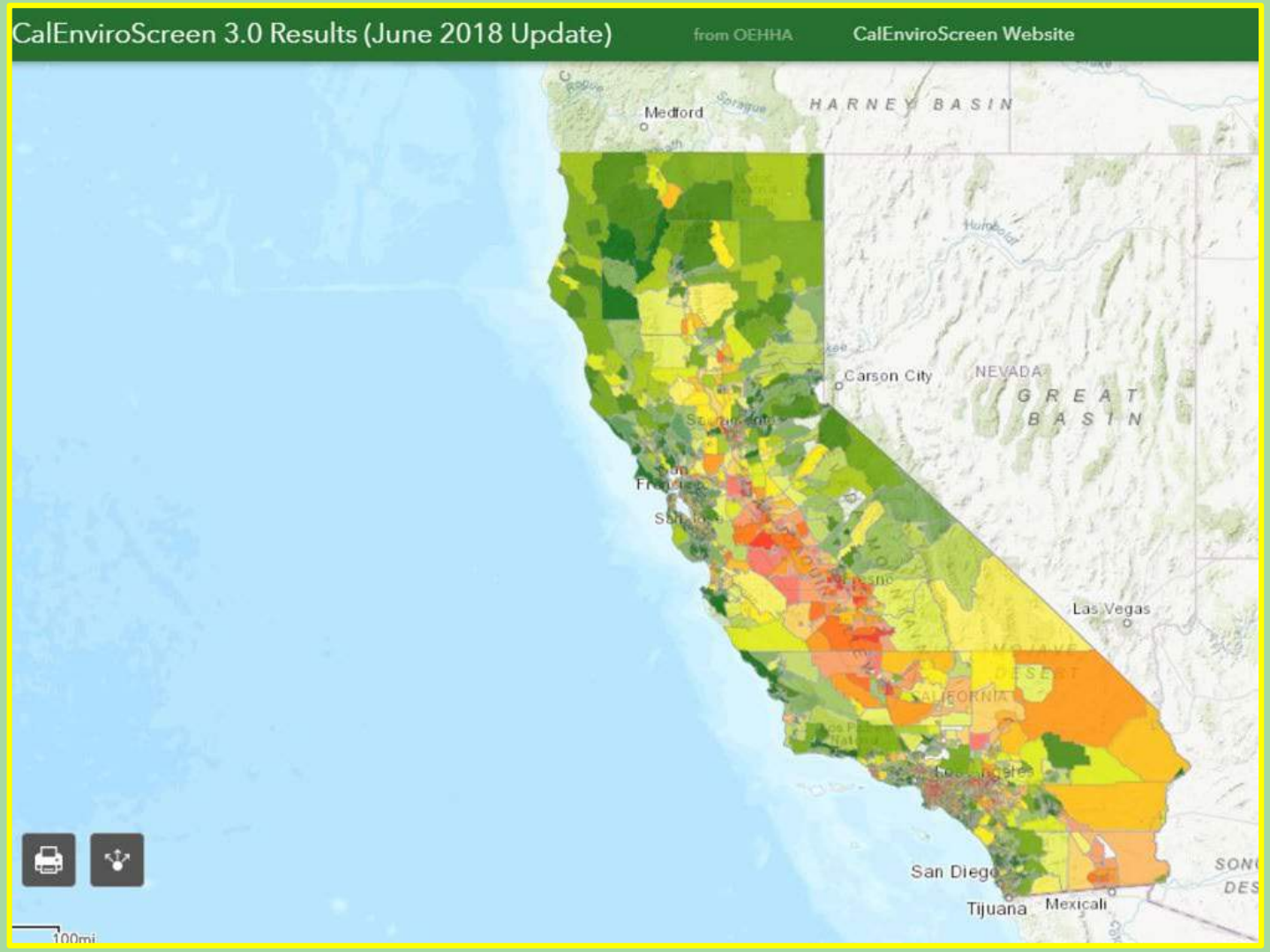
Aclima applies ongoing, constantly-improving software development approaches. Our success is tied to the usefulness of the tool and its ability to support work that you all have been doing for years

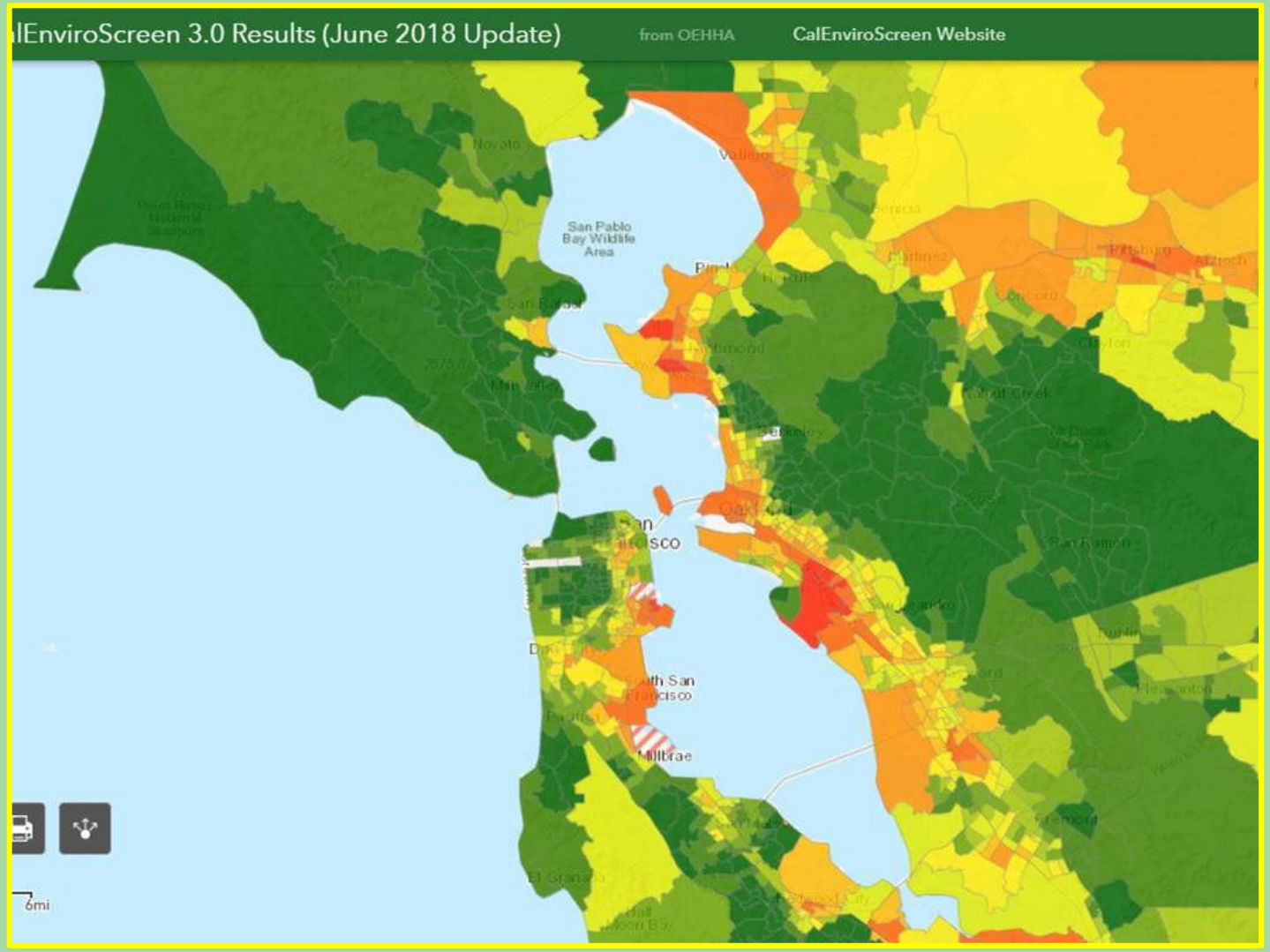
Mapping in Contra Costa County continues

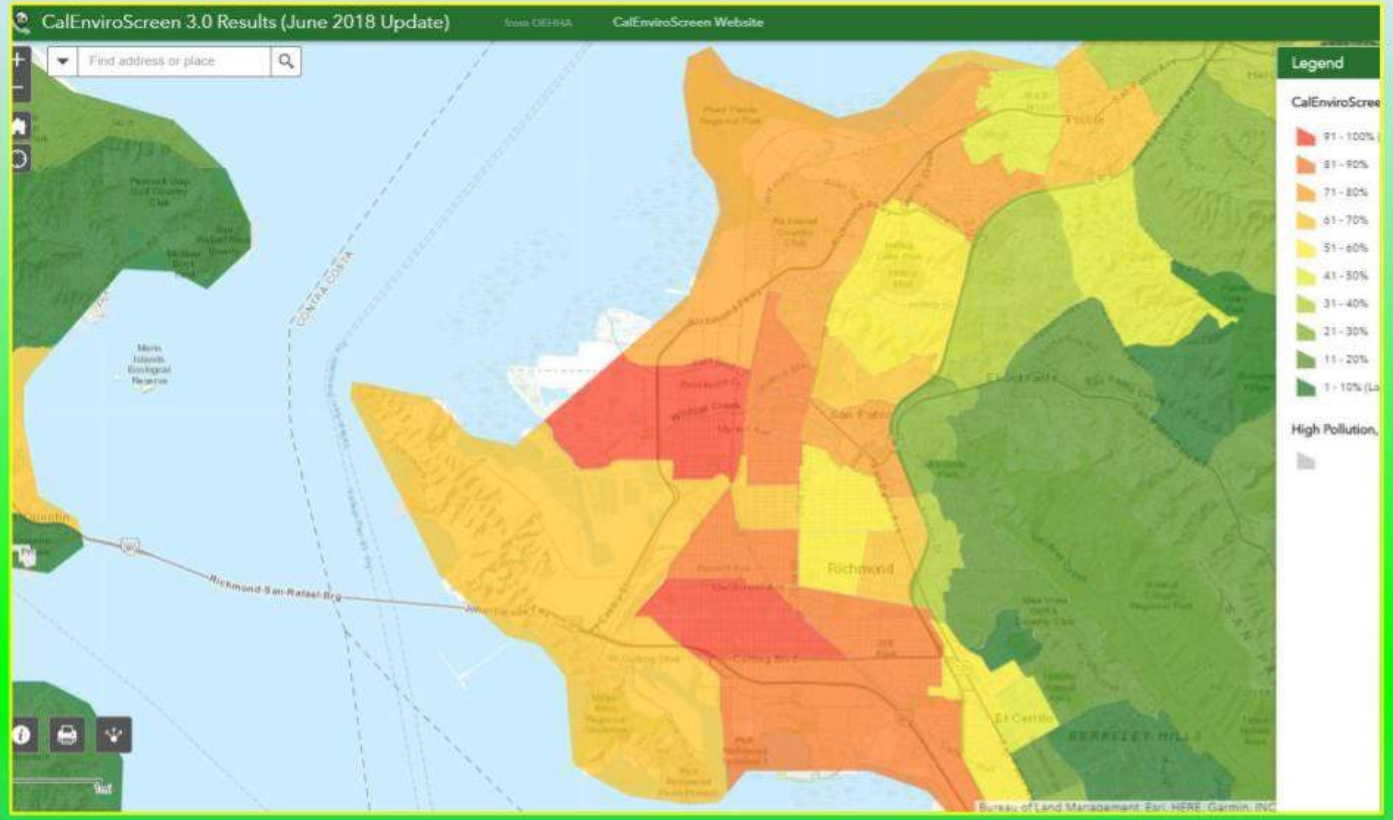
Aclima's fleet of vehicles will continue to collect data in Contra Costa County for the next two years, including Richmond-San Pablo

Thank you.


GROUNDWORK
CHANGING PLACES
CHANGING LIVES
GROUNDWORK
Richmond
Richmond Air Rangers
Monitoring, Modeling
& Job Training
California Air Resources Board
Community Air Grant Program


CalEnviroScreen 3.0 Results (June 2018 Update)
from OEHHA
CalEnviroScreen Website
Medford
HARNEY BASIN
Carson City
NEVADA
GREAT BASIN
Las Vegas
San Diego
Tijuana
Mexicali
100mi

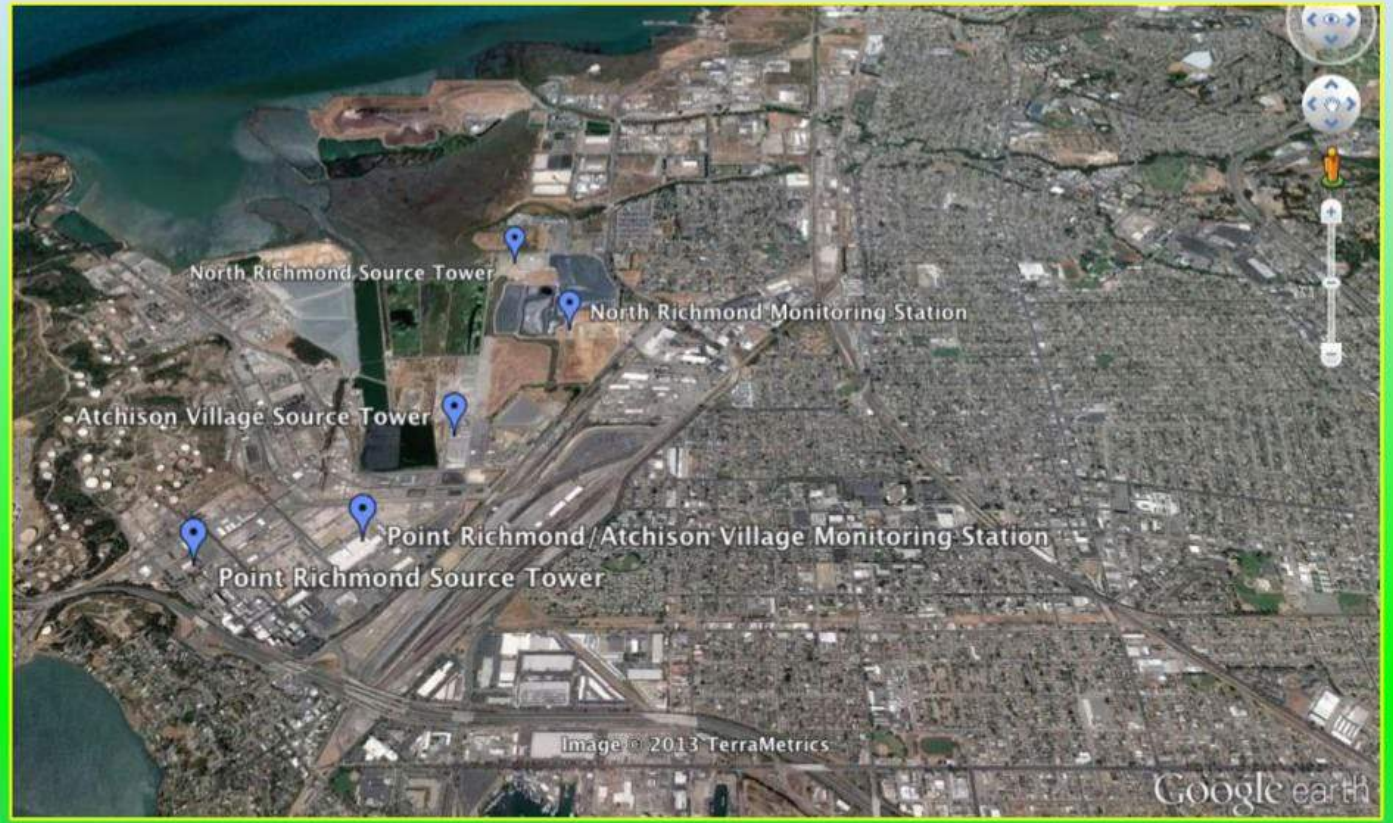

lEnviroScreen 3.0 Results (June 2018 Update)
from OEHHA
CalEnviroScreen Website
San Pablo Bay Wildlife Area
6mi



Groundwork Richmond

CARB

Changing Places. Changing Lives.



Groundwork Richmond

CARB

Changing Places. Changing Lives.


Vallejo
61
8.6
54
9.2
67
7.1
San Rafael
San Pablo*
Concord
Richmond
Walnut Creek
55
7.6
49
7.6
National health standard
Ozone = 70 ppb
PM2.5 = 12 µg/m³
Oakland
Oakland-West
49
9.5
San Francisco
Hayward
74
7.9
Daly City
Livermore
GROUNDWORK
CHANGING PLACES
CHANGING LIVES
Groundwork
Richmond
CARB
RICHMOND CALIFORNIA
AUGUST 7th 1905
Changing Places.
Changing Lives.

Groundwork Richmond

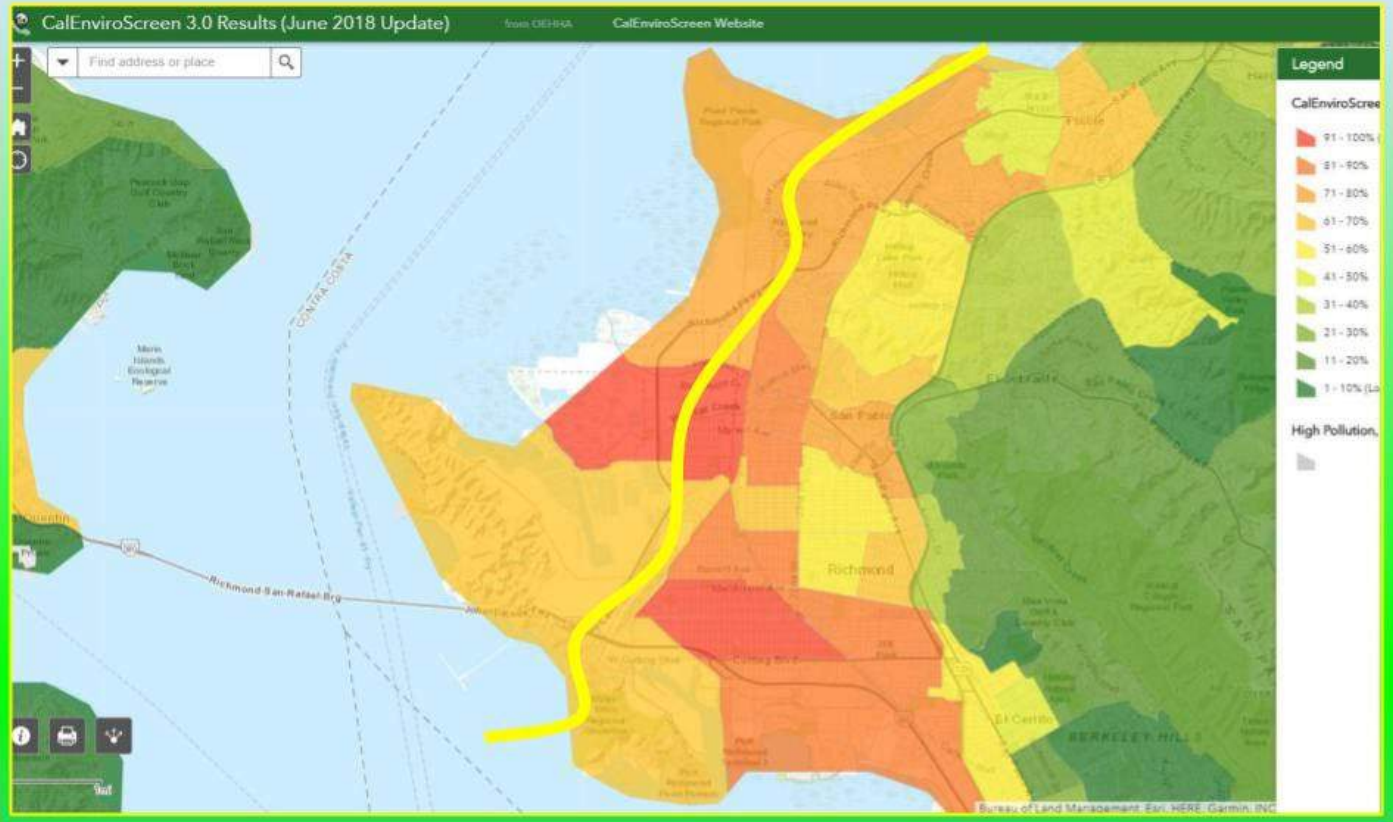
CARB

Changing Places.
Changing Lives.

Groundwork Richmond

CARB

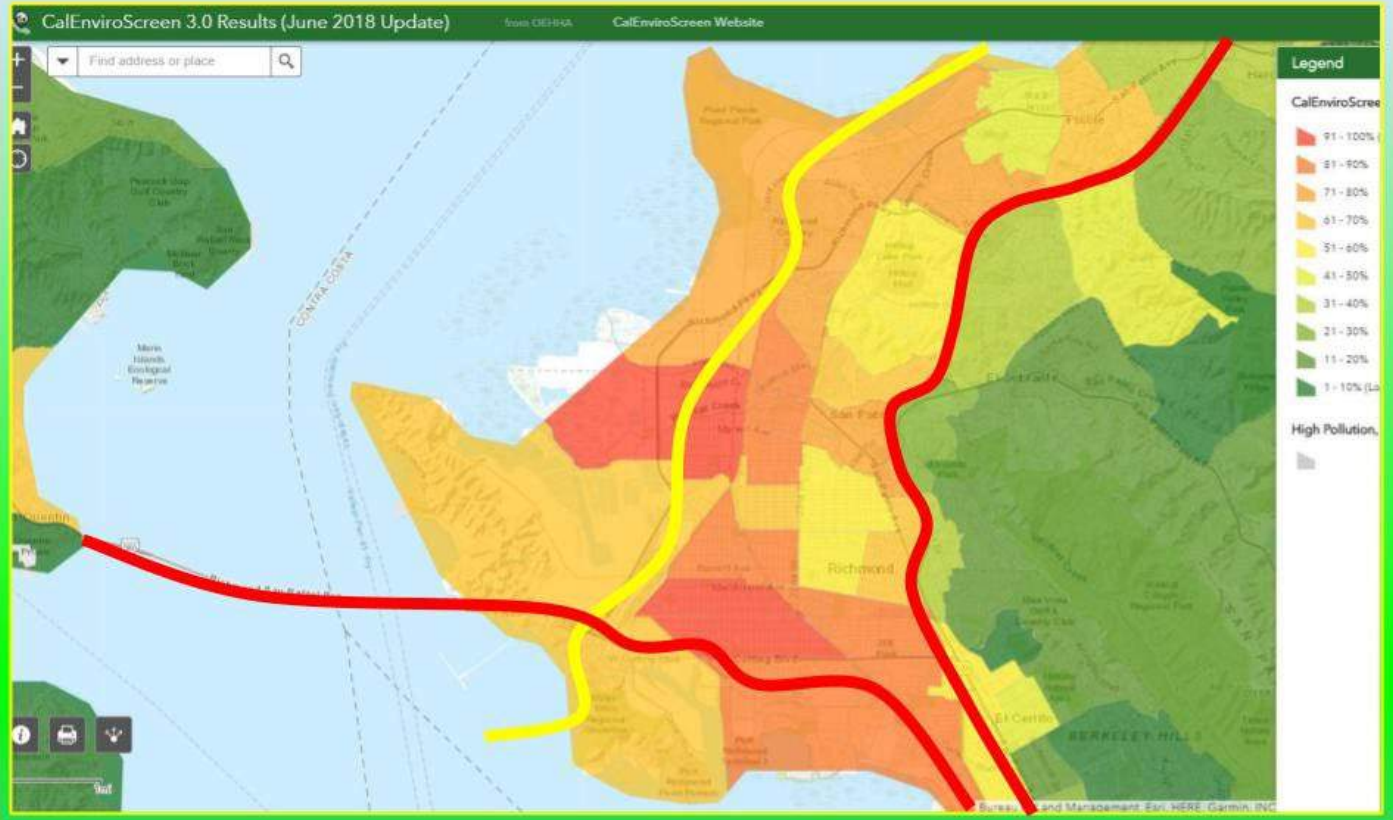
Changing Places. Changing Lives.



Groundwork Richmond

CARB

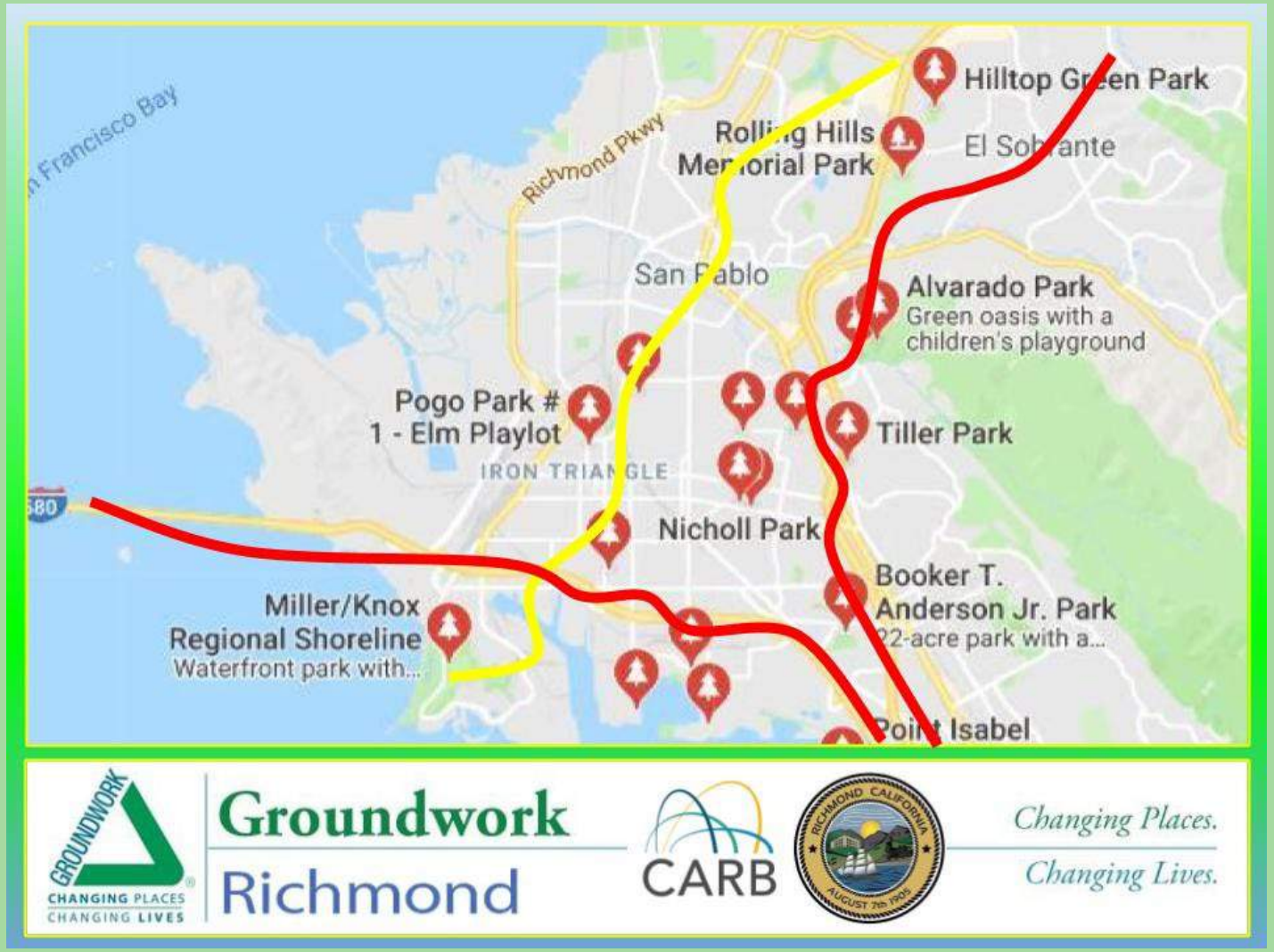
Changing Places. Changing Lives.

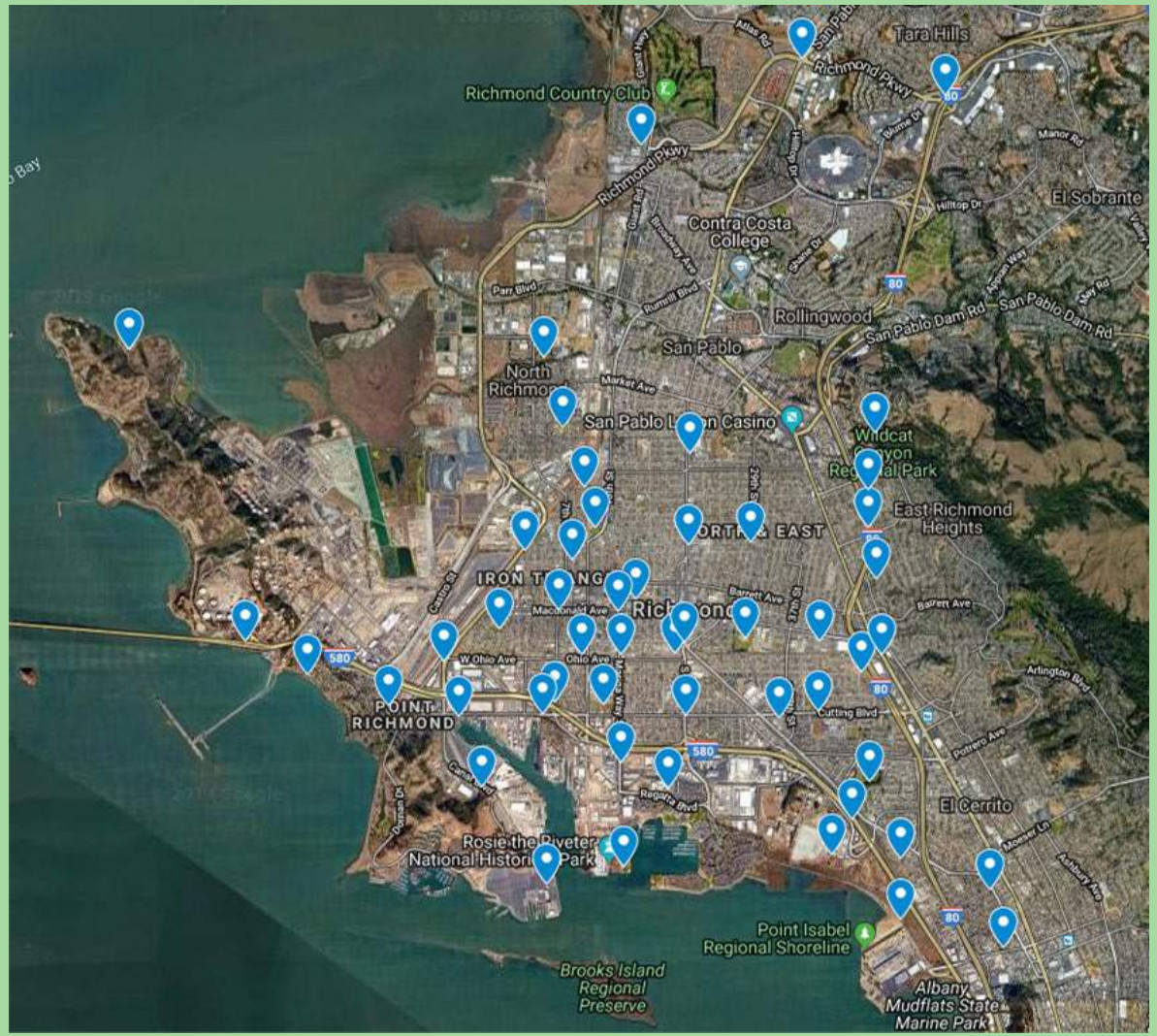


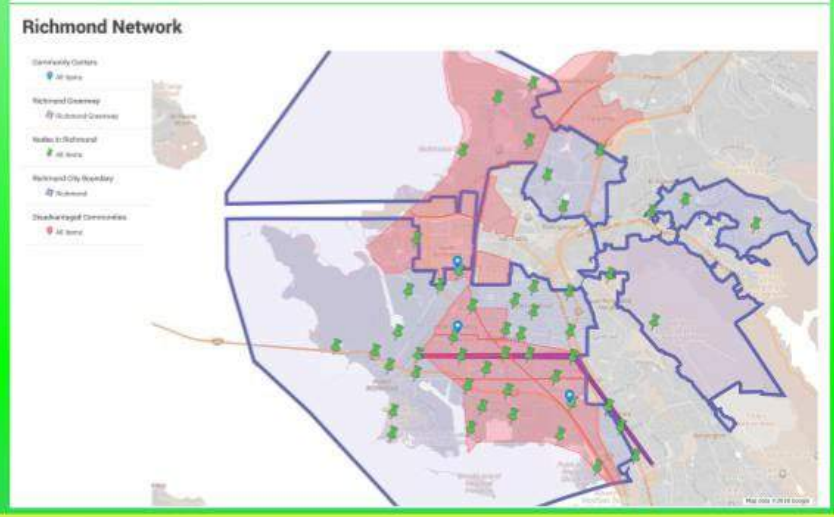
Groundwork Richmond

CARB

Changing Places. Changing Lives.


Hilltop Green Park
Rolling Hills Memorial Park
El Sobrante
Richmond Pkwy
San Pablo
Alvarado Park
Green oasis with a children's playground
Pogo Park # 1 - Elm Playlot
IRON TRIANGLE
Tiller Park
Nicholl Park
Booker T. Anderson Jr. Park
22-acre park with a...
Miller/Knox Regional Shoreline
Waterfront park with...
Point Isabel
Groundwork Richmond
CARB
Changing Places. Changing Lives.

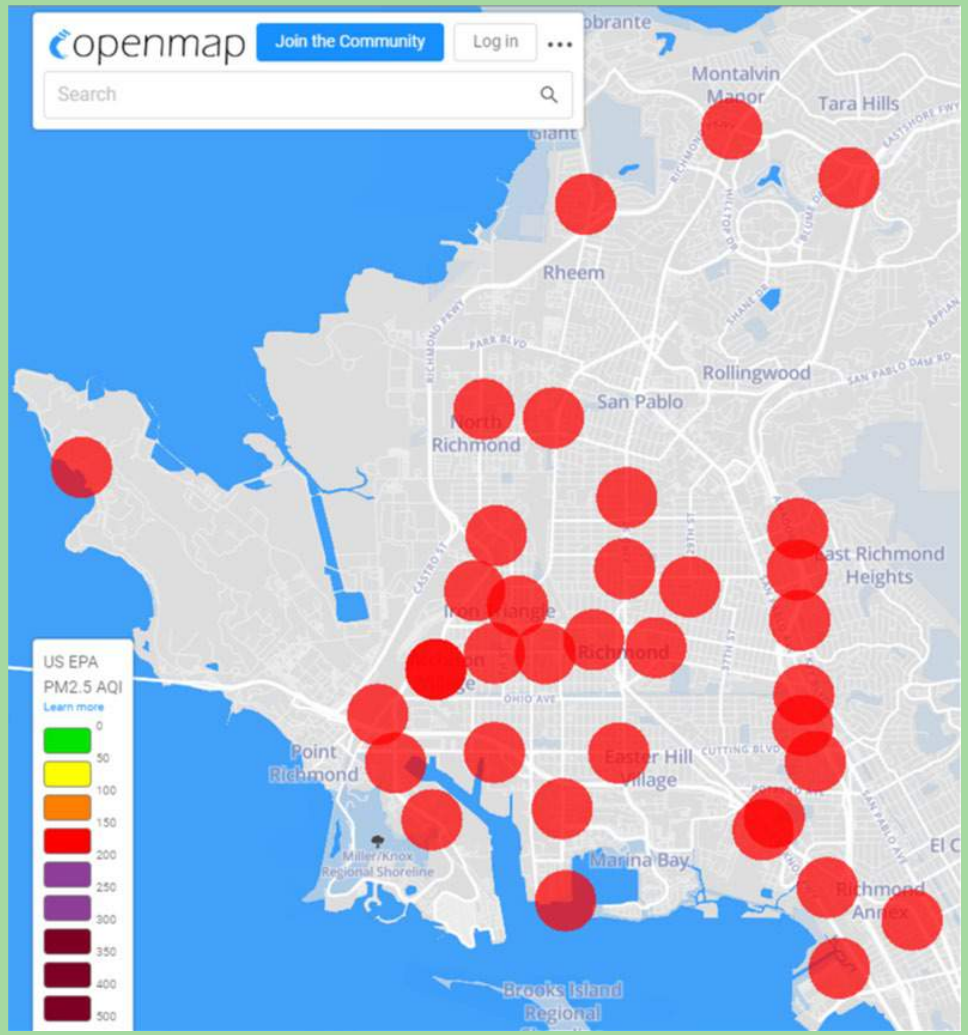

Richmond Country Club
Tara Hills
Richmond Pkwy
Contra Costa College
El Sobrante
Rollingwood
San Pablo
San Pablo Dam Rd
North Richmond
Wildcat Canyon Regional Park
East Richmond Heights
IRON TRIANGLE
Richmond
POINT RICHMOND
El Cerrito
Rosie the Riveter National Historical Park
Point Isabel Regional Shoreline
Brooks Island Regional Preserve
Albany Mudflats State Marine Park
580
80

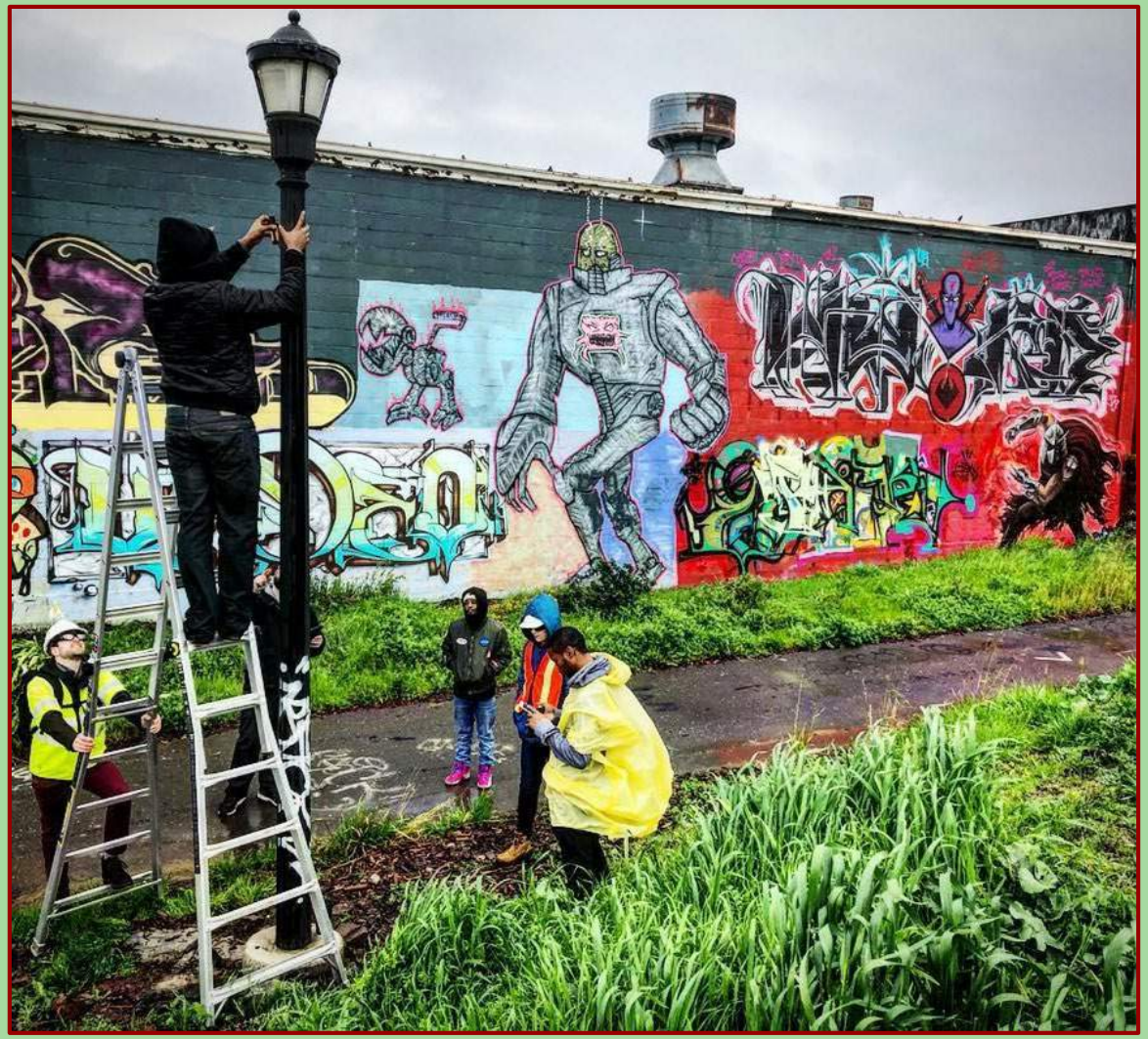


Groundwork Richmond

CARB

Changing Places. Changing Lives.


openmap
Join the Community
Log in
Search
Montalvin Manor
Tara Hills
Rheem
Rollingwood
San Pablo
North Richmond
East Richmond Heights
Point Richmond
Easter Hill Village
Marina Bay
Miller/Knox Regional Shoreline
Brooks Island Regional
US EPA PM2.5 AQI
Learn more
0
50
100
150
200
250
300
350
400
500



Jennifer Fong

Community Education
Programs Managers

Jer@groundworkrichmond.org

www.groundworkrichmond.org

Groundwork Richmond Air Rangers

Data for decision-making

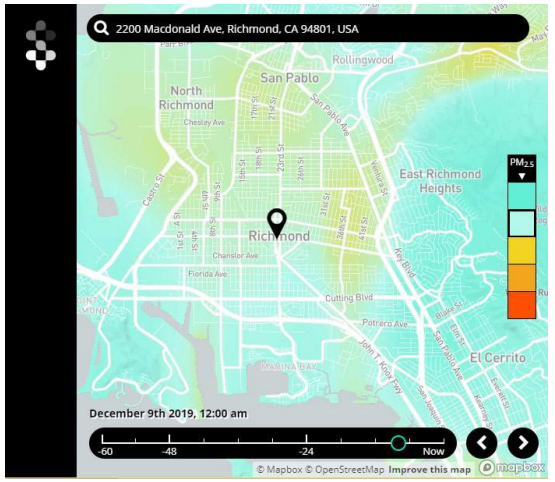
Julia Luongo,
Director, Ramboll Shair
jluongo@ramboll.com

RAMBOLL

Project Elements

Sensor Network

Real-time model for decision-making and diagnostics



Metals Sampling

$PM_{2.5}$ & NO_2 sensors

- Workforce development
- Understanding spatial gradients
- Focusing on parks, greenways, and community input

180+ responses

Name *

City/Town of Residence *

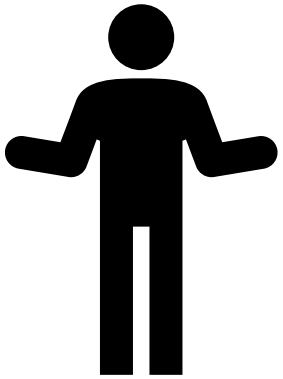
Email *

Why did you choose this location?

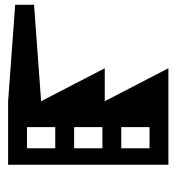
Would you be interested in hosting an air quality sensor? A location with an electrical outlet is necessary. If 'Yes' a follow-

Metals Sampling

- Workforce development
- Identifying airborne compounds of concern
- Understanding concentrations and spatial distribution of compounds of concern
- Providing insights for source identification



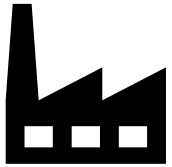
What is different about this model?



Emissions Inventories

Air Quality Monitoring

Air Quality Modelling



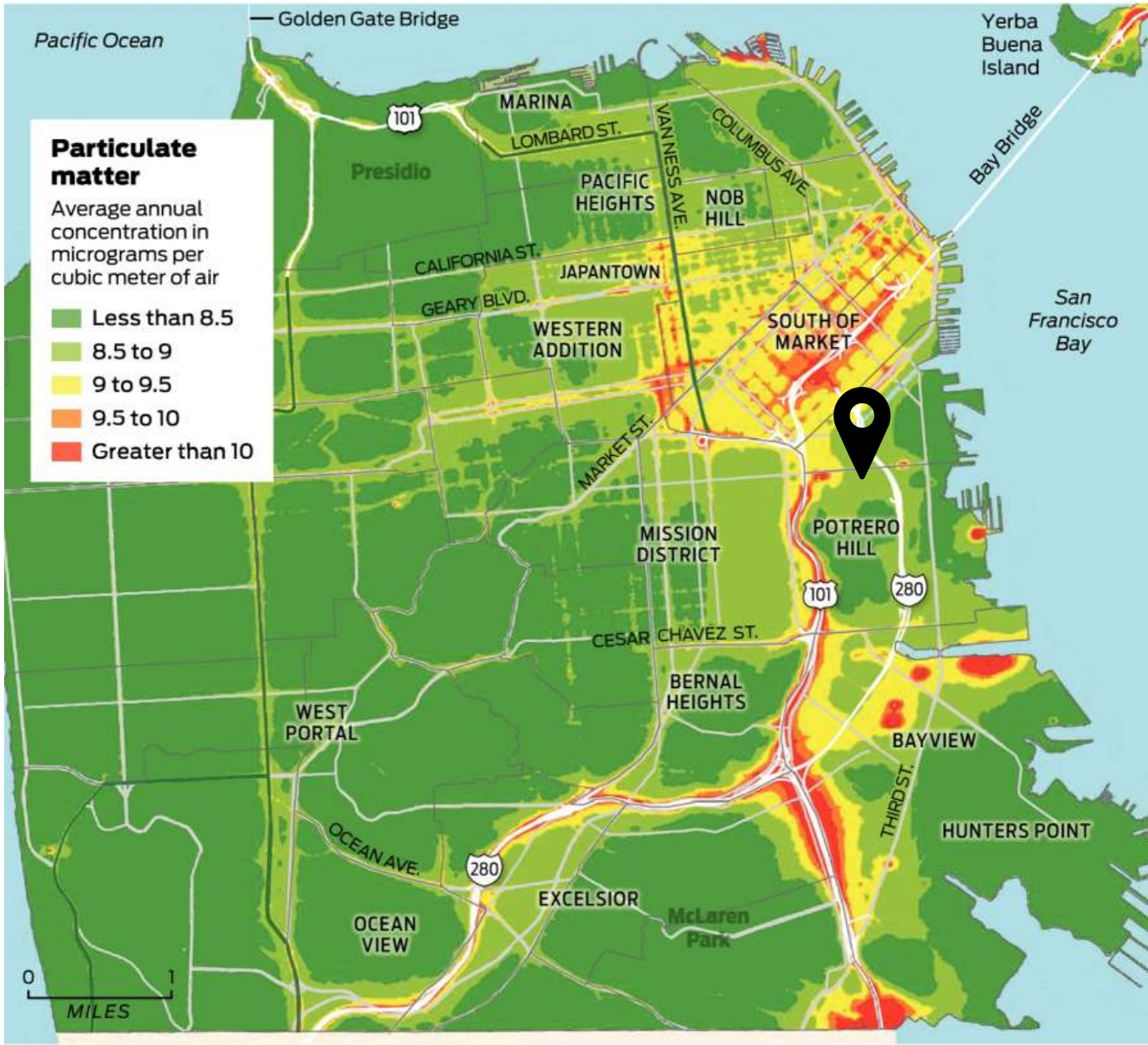
Emissions Inventories

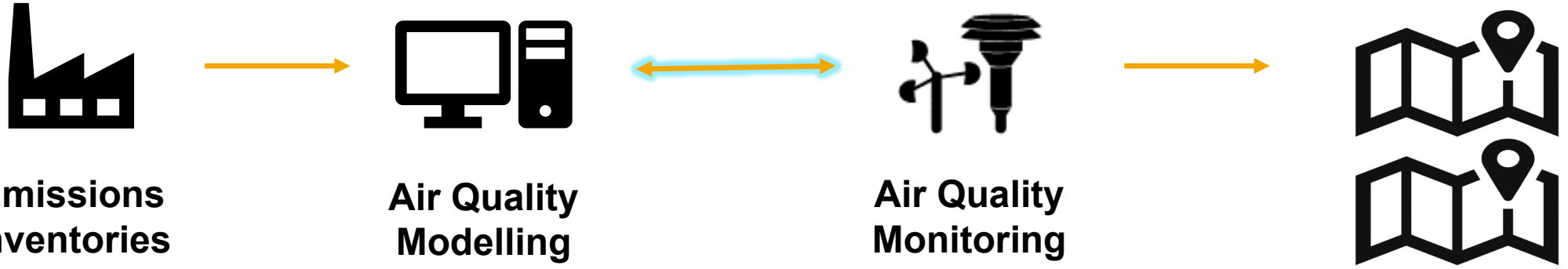
Air Quality Modelling

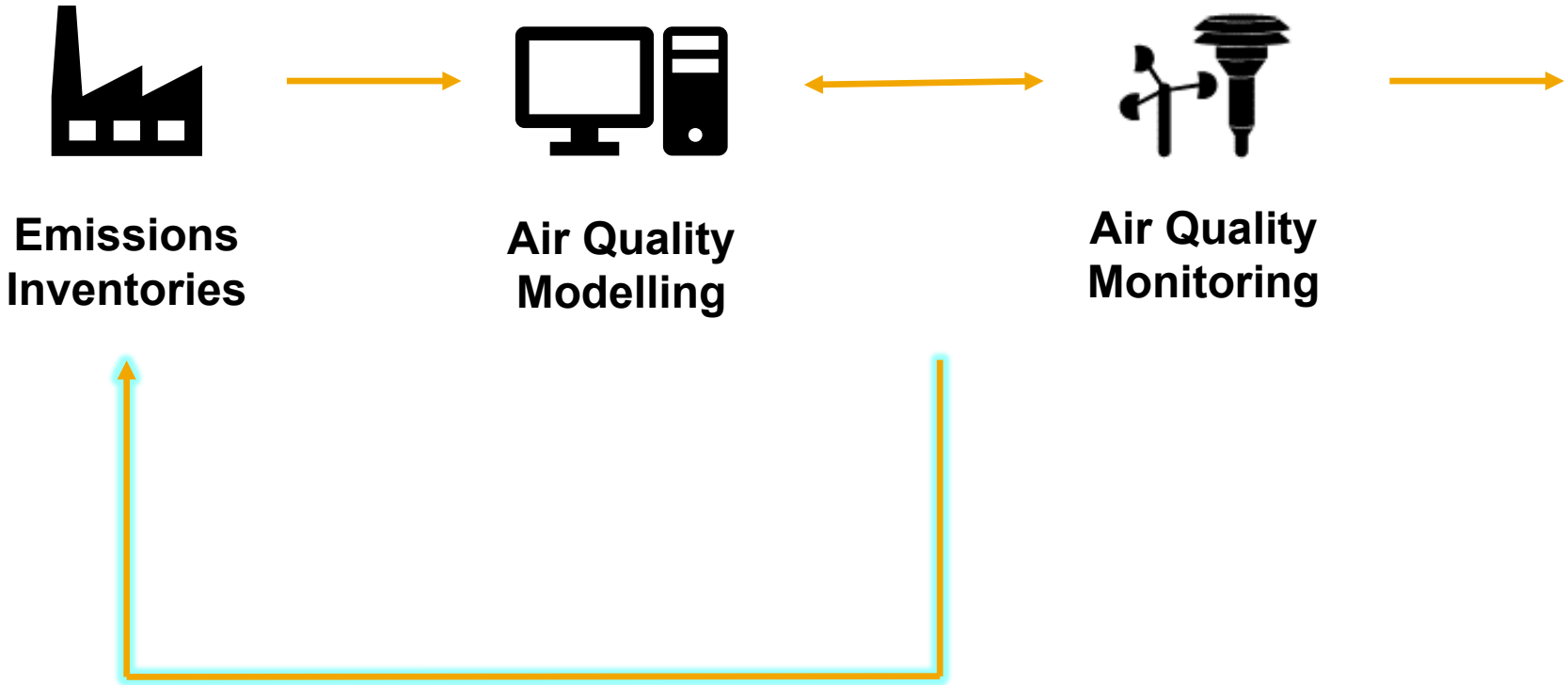
Annual Average
Max Daily
Max Hourly

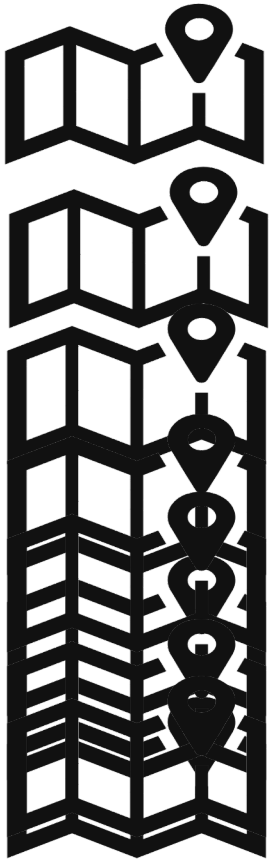
Air Quality Monitoring

How we use modeling

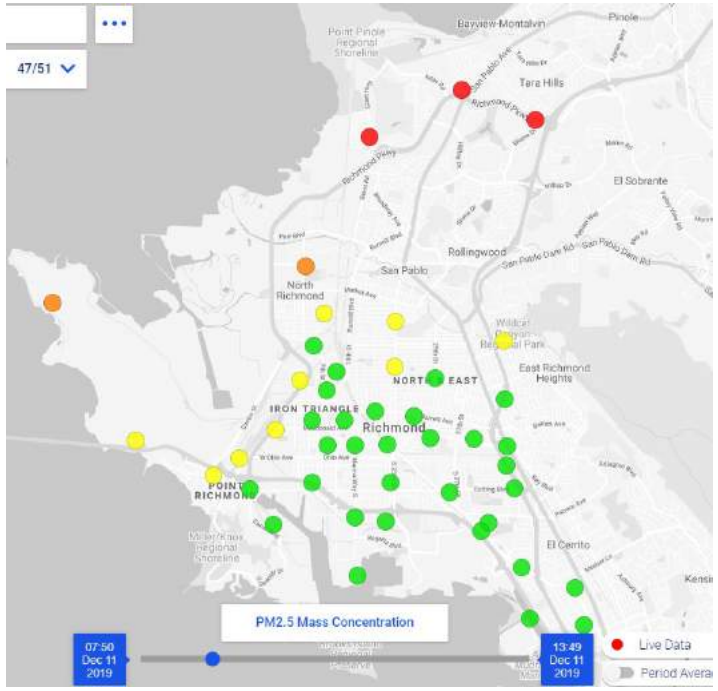


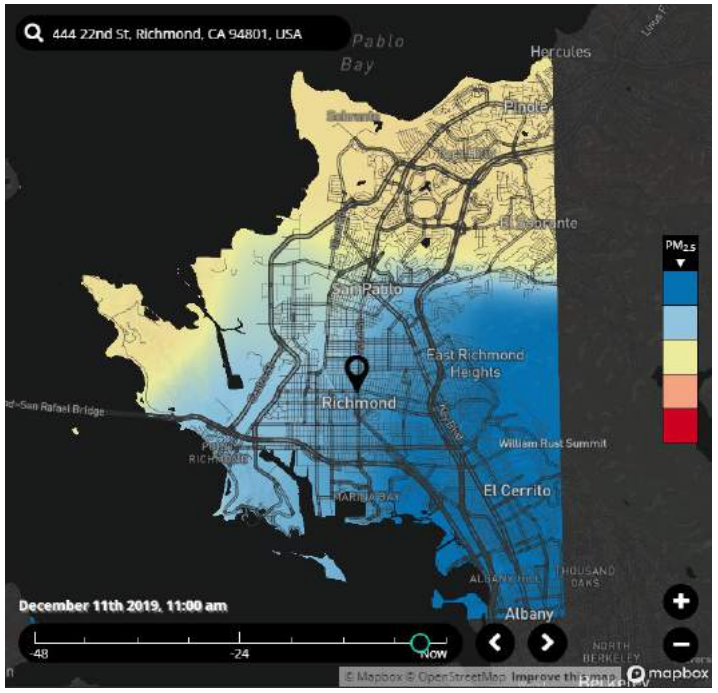

Emissions Inventories
Air Quality Modelling
Air Quality Monitoring


Emissions Inventories
Air Quality Modelling
Air Quality Monitoring



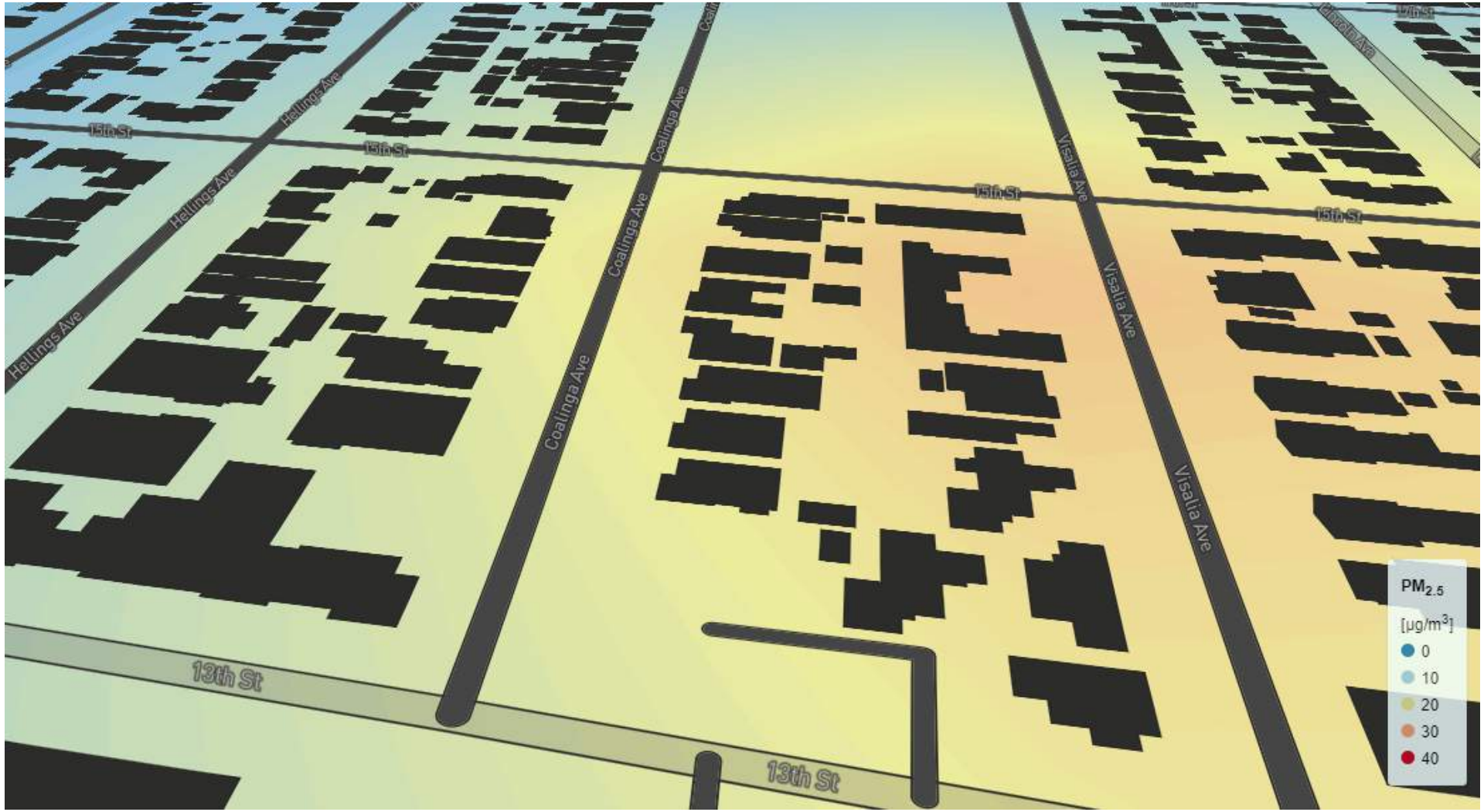
Discrete points are challenging to understand – Shair gives a full picture





Ramboll Shair
Make sense of your air quality data

More granular spatial and temporal data than ever before



Ramboll Shair
Make sense of your air quality data

The center of strategic planning

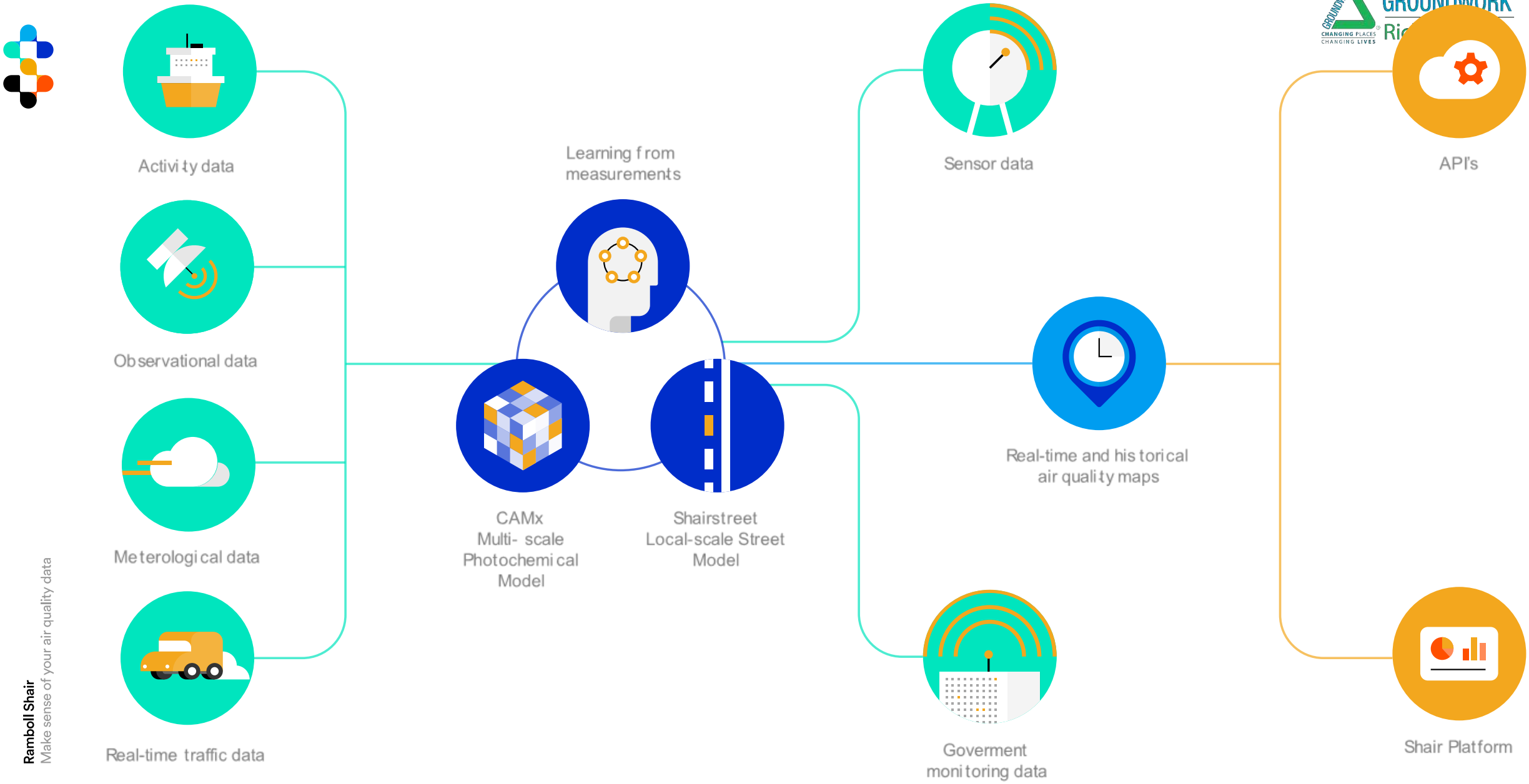
Real-time, accessible information

Locate and identify hotspots

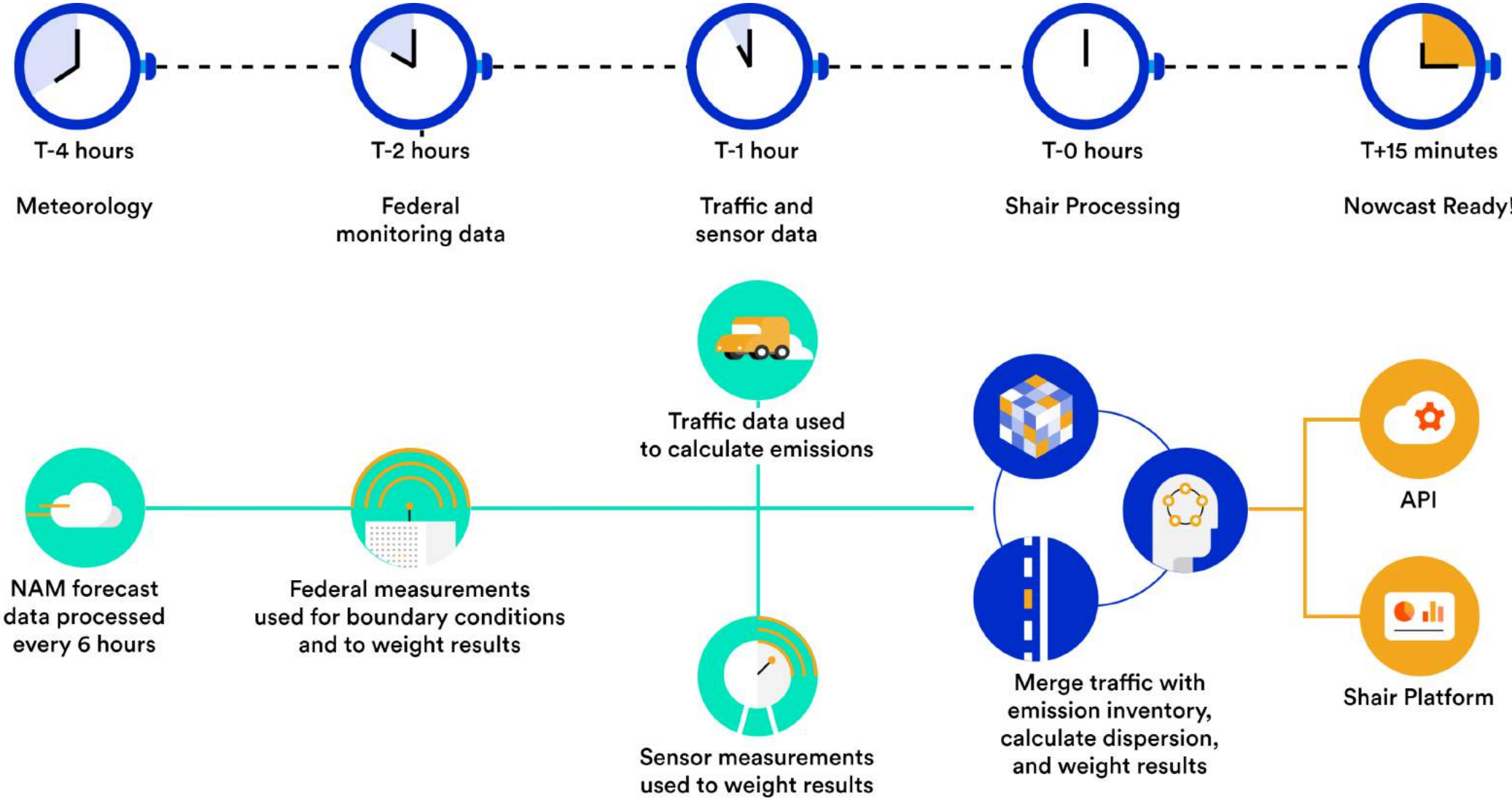
Track trends and effectiveness of strategies over time

Share information and notify when levels reach a particular threshold

Ramboll Shair
Make sense of your air quality data


Activity data
Observational data
Meterological data
Real-time traffic data
Learning from measurements
CAMx Multi- scale Photochemical Model
Shairstreet Local-scale Street Model
Sensor data
Real-time and historical air quality maps
Goverment monitoring data
API's
Shair Platform
GROUNDWORK
CHANGING PLACES CHANGING LIVES
Ramboll Shair
Make sense of your air quality data

Ramboll Shair Nowcast Data Timing



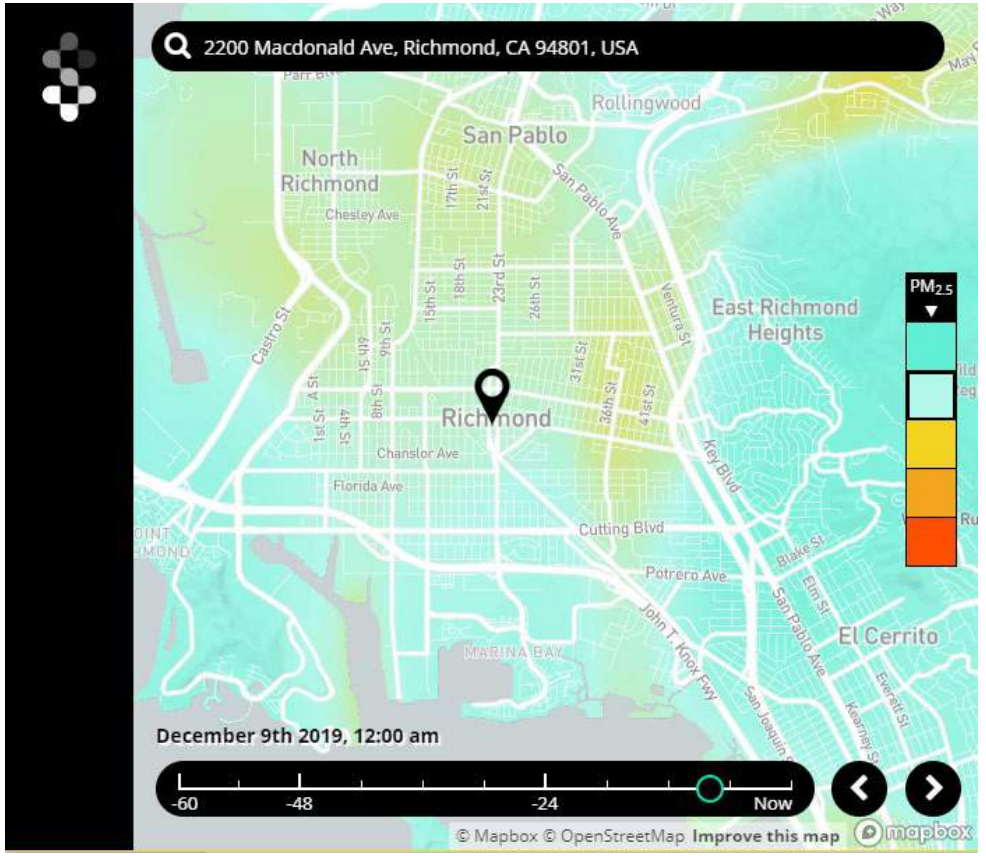
Ramboll Shair
Make sense of your air quality data

Beta launch – today!

More functionality to come but we wanted to get feedback as early as possible to design in a way that is useful to the community.

Soon to be on the City of Richmond website

Feedback button coming soon, feedback may also be sent to **shair@ramboll.com**



app.ramboll-shair.com

Ramboll Shair
Make sense of your air quality data

Thank you

Julia Luongo,
Director, Ramboll Shair
jluongo@ramboll.com

Matt Holmes,
Executive Director, Groundwork Richmond
matt@groundworkrichmond.org

app.ramboll-shair.com

RAMBOLL Bright ideas. Sustainable change.

Richmond Air Monitoring Network

PSE
Bringing science to energy policy

Boris Lukanov, PhD
Senior Scientist
PSE Healthy Energy

APEN
ASIAN PACIFIC ENVIRONMENTAL NETWORK

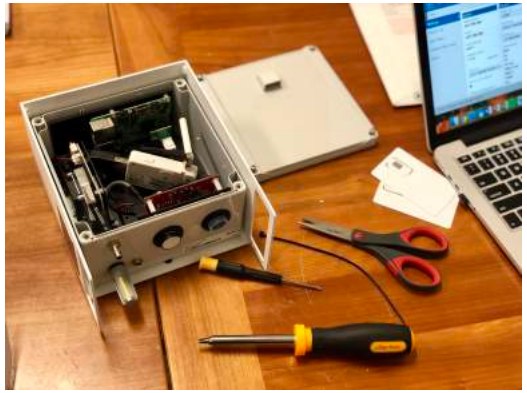
December 11, 2019

Project Goals

- **Characterize local ambient concentrations of $PM_{2.5}$, O_3, NO_2:** Provide reliable, hyper-local air quality data to the community and regulators.
- **Assess pollution variability spatially and temporally:** High-density monitoring with data collected every minute – look at hourly, daily and seasonal variability.
- **Identify priority areas and sources of emissions:** Detect short-lived pollution outbursts, identify local air pollution hotspots, and investigate areas of concern in the community.
- **Community engagement:** Raise awareness, encourage community participation and visualize the air quality data in real-time in a way that is publicly accessible and in collaboration with co-existing air quality data efforts.
- **Policy engagement:** Translate our data collection efforts into decision making on local regional, and statewide air quality policies. Inform the future development of a CERP in Richmond-San Pablo.

Project Webpage: psehealthyenergy.org/richmond-monitoring

Aeroqual AQY Air Quality Monitors

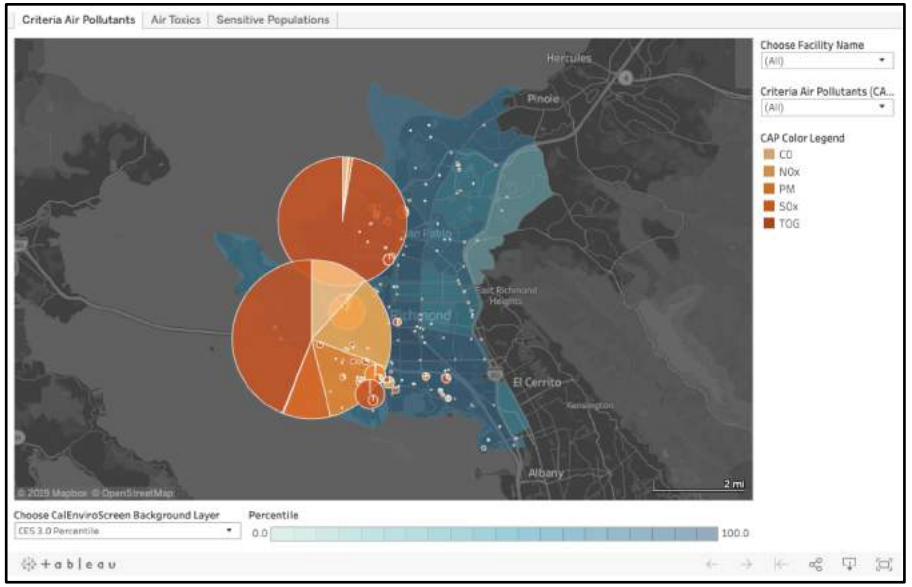


- 50 AQYs measuring $PM_{2.5}$, O_3, NO_2 and weather data – T, RH, DP. Five Prototype monitors with VOC and CO sensors
- Measurements reported every minute
- Small, portable, easy to install
- Wi-Fi and cellular enabled
- Validated by AQ-SPEC program
- Cost: ~ $3000

Community Outreach & Monitor Site Selection

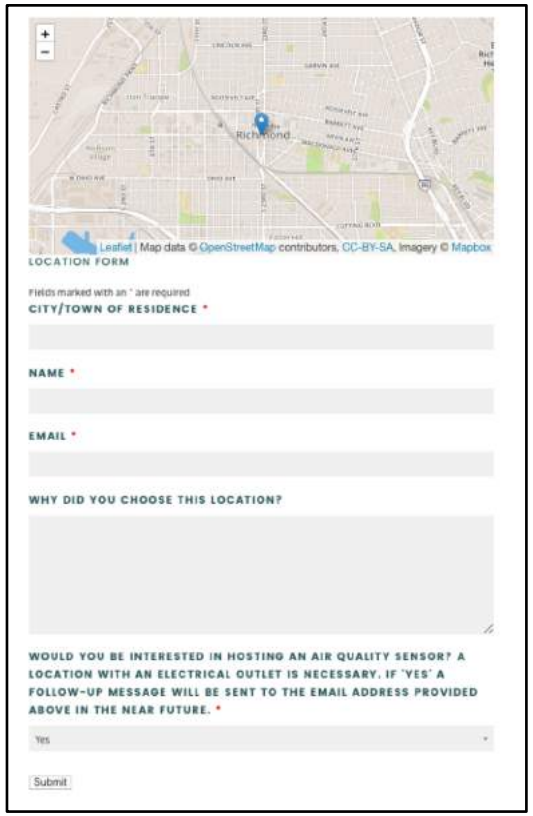
Outreach at APEN Members Meeting

Emissions Inventory Tool



https://www.psehealthyenergy.org/richmond-emissions-inventory-beta/

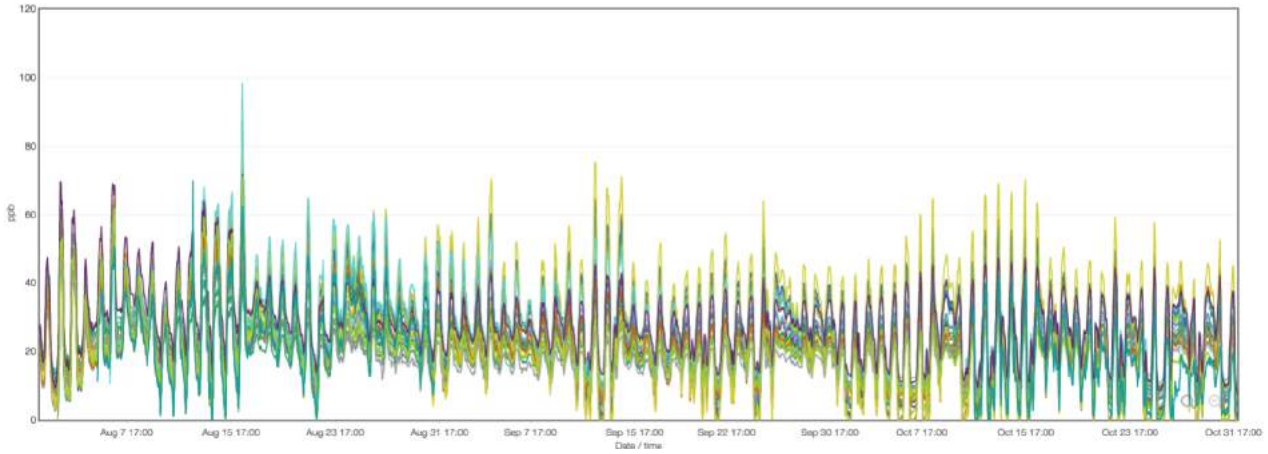
Online Sensor Feedback Form



Initial field calibration in Sacramento

- Traditional co-location at a regulatory site
- Deployed at CARB Monitoring and Laboratory Division in Sacramento
- 24 monitors calibrated, 26 currently deployed at CARB

Ozone (ppb) August – November

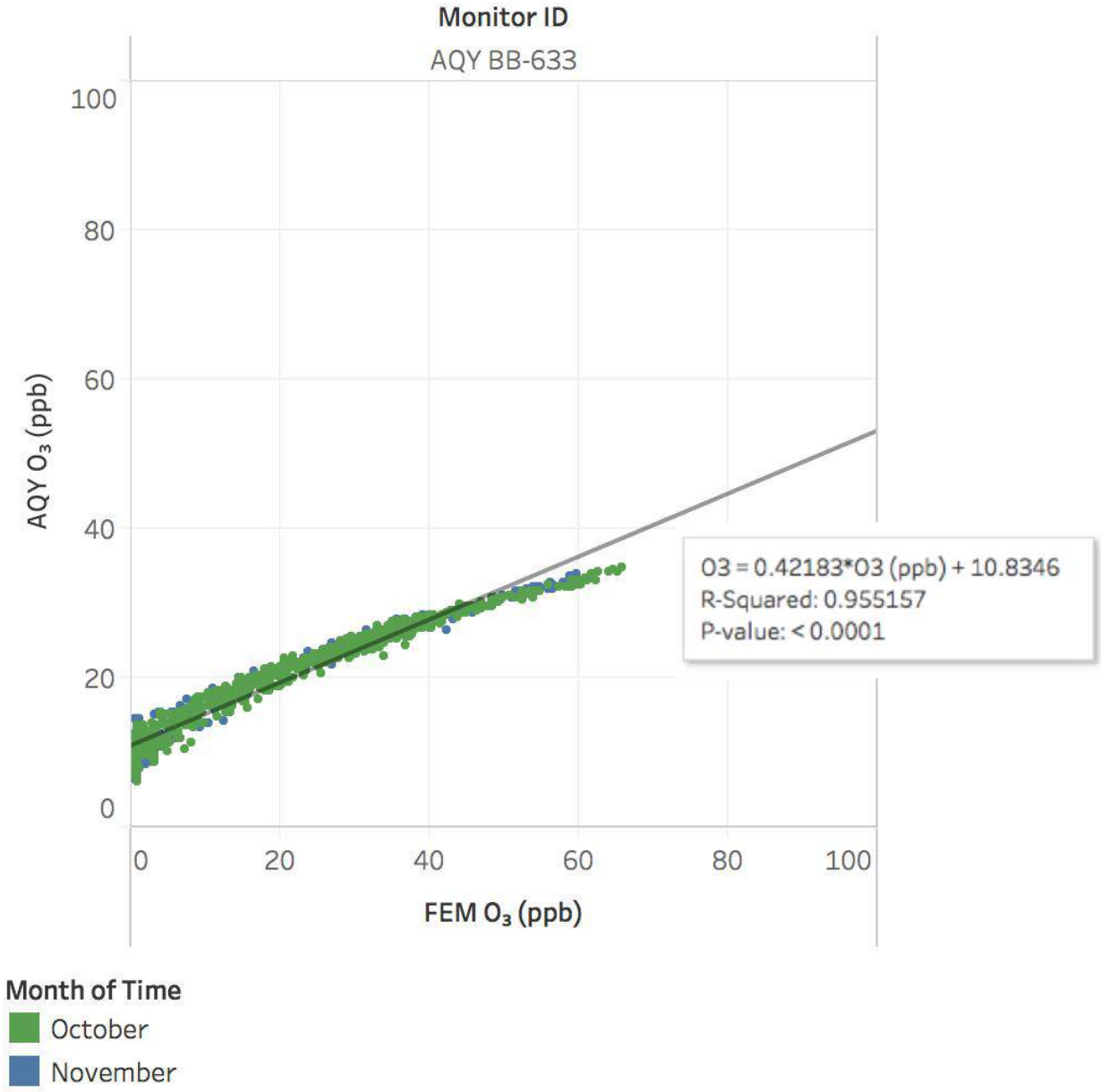


Why is initial field calibration important?

- Evaluate overall sensor performance (**accuracy**).
- Assess inter-device variability (**precision**).
- Obtain calibration parameters (**bias**).
- Monitor for changes over time (**drift**).

Important things to look at:

- Linearity of response (R^2). R^2 varies between 0 - 1
- Sensitivity (slope).
- Zero offset (intercept).

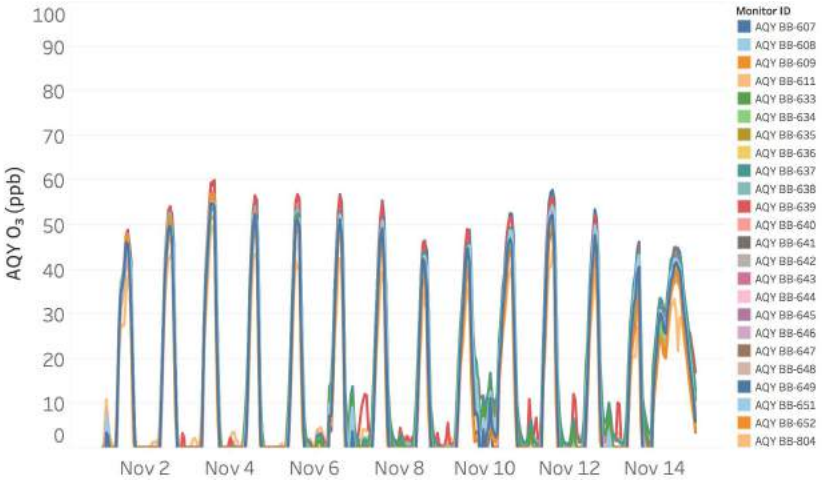


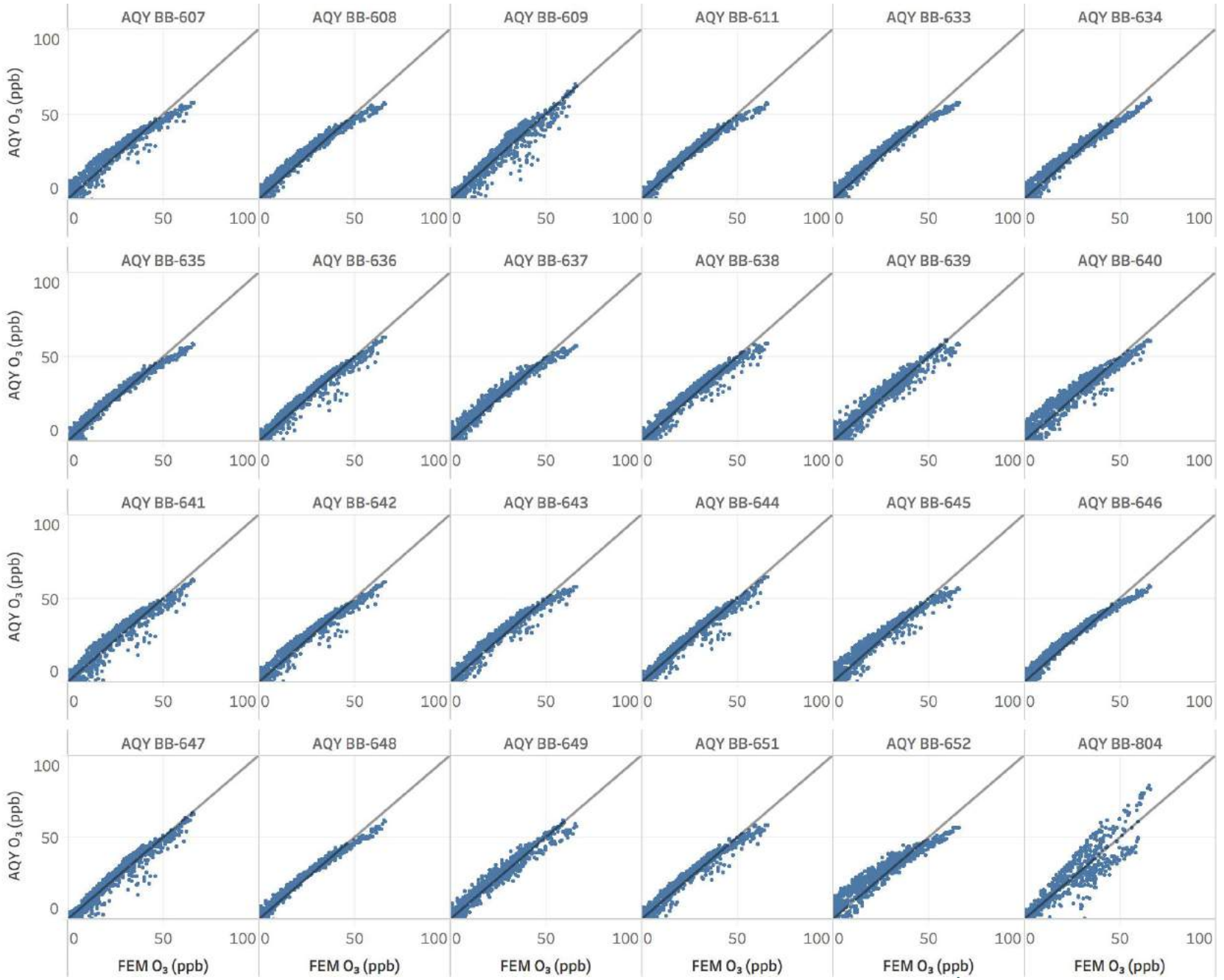
O_3 sensor performance

Comparison with reference

- Excellent correlation with reference data (R^2 ~ 0.95)
- Some O_3 sensors experienced drift in the first month, then stabilized.

Low Inter-device variability:



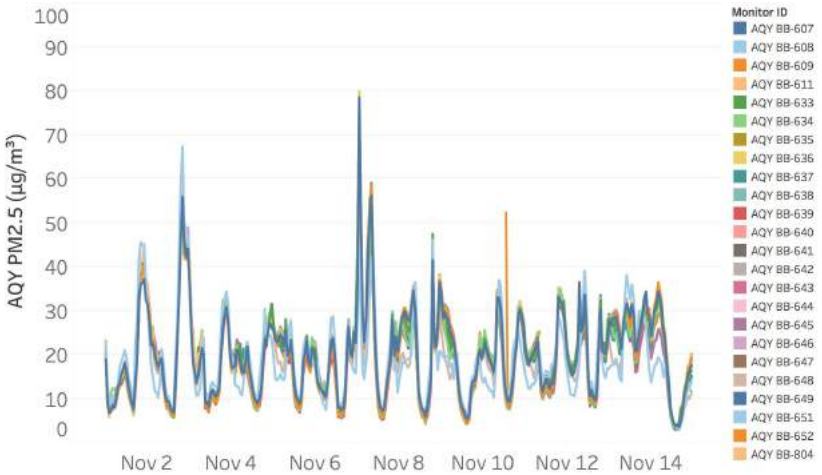


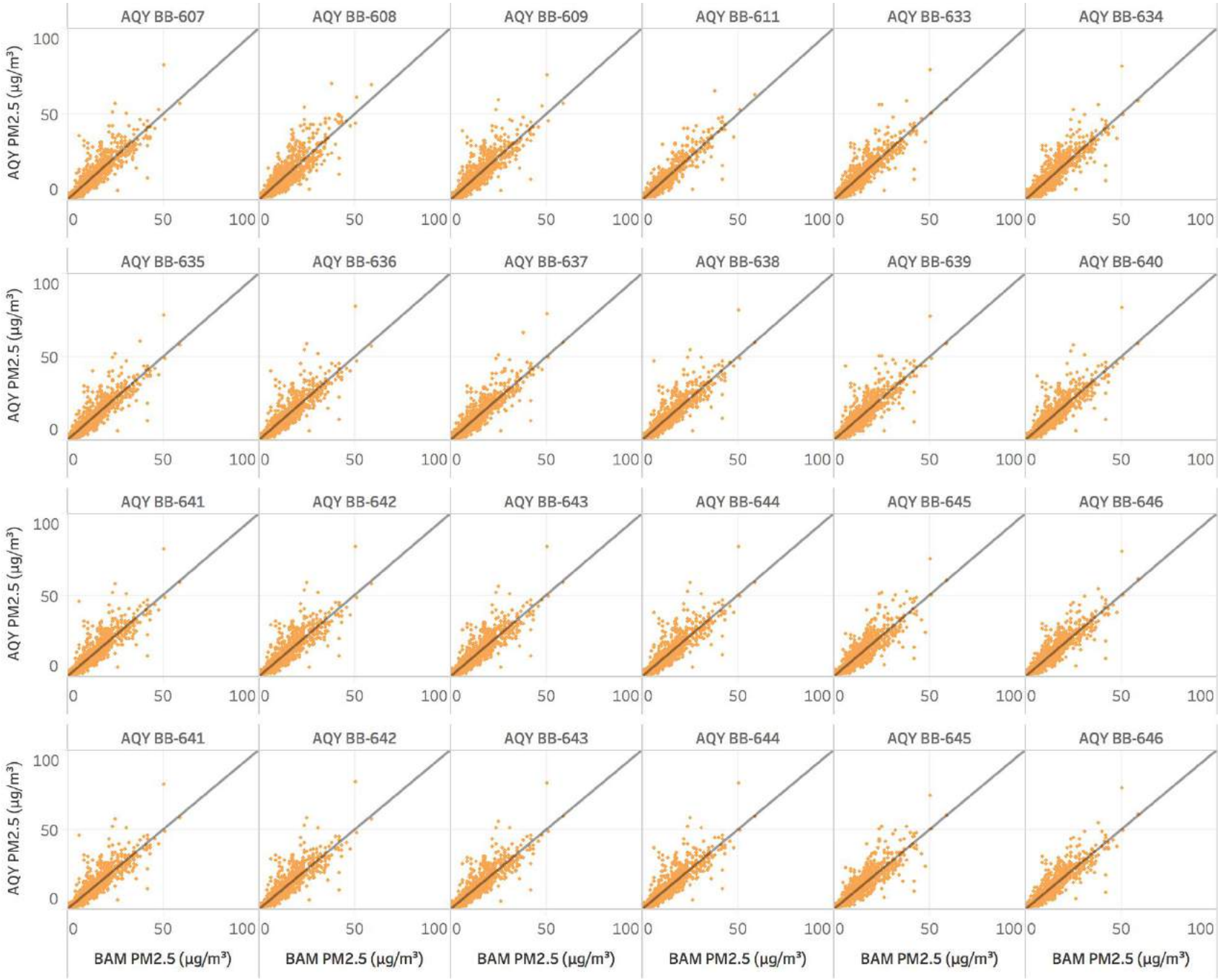
$PM_{2.5}$ sensor performance

Comparison with reference

- Good correlation with reference data (R^2 ~ 0.8)
- No drift observed. Known variability based on PM composition

Low Inter-device variability:



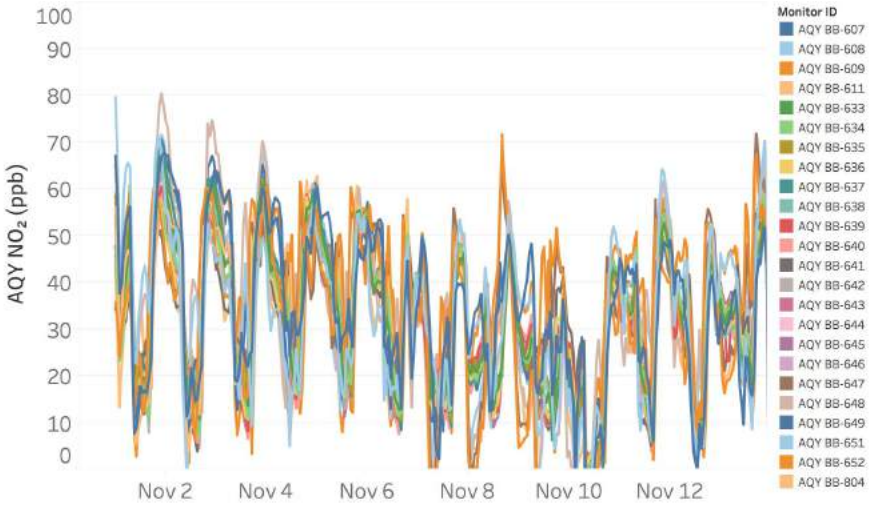


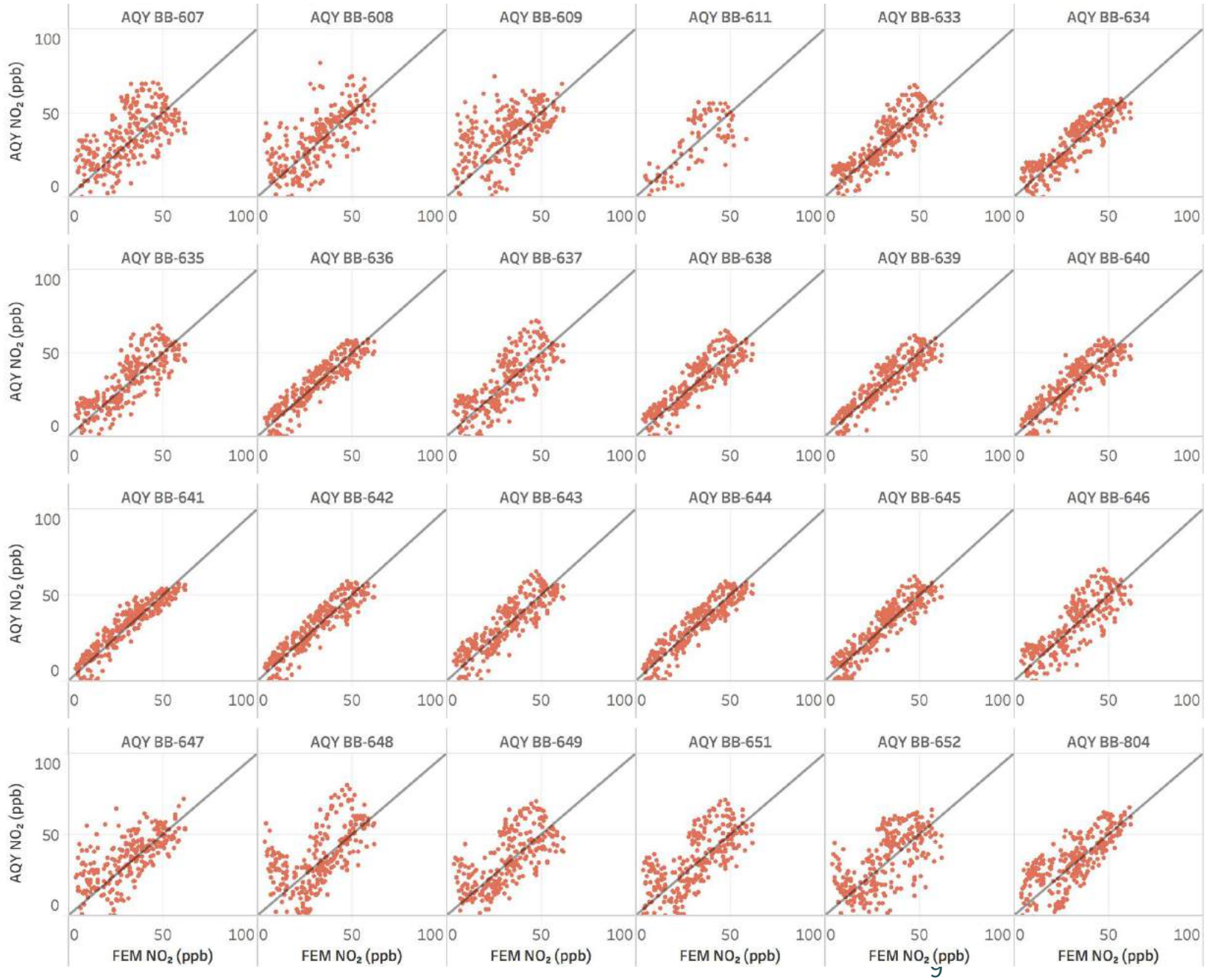
NO_2 sensor performance

Comparison with reference

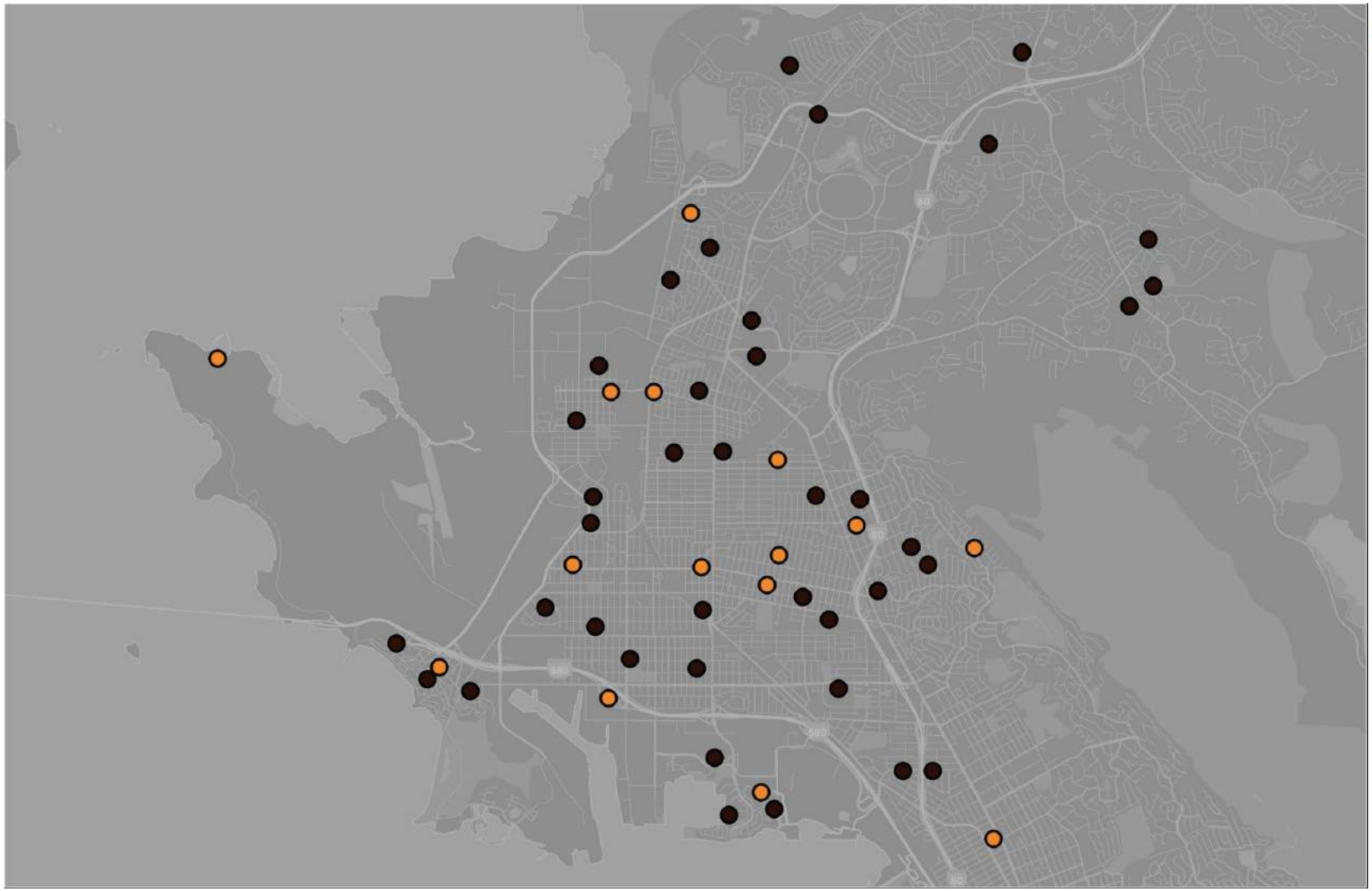
- Acceptable correlation with reference data (R^2 ~ 0.5- 0.8)
- Observed inaccurate values at low NO_2 concentrations in the first months

Some Inter-device variability:



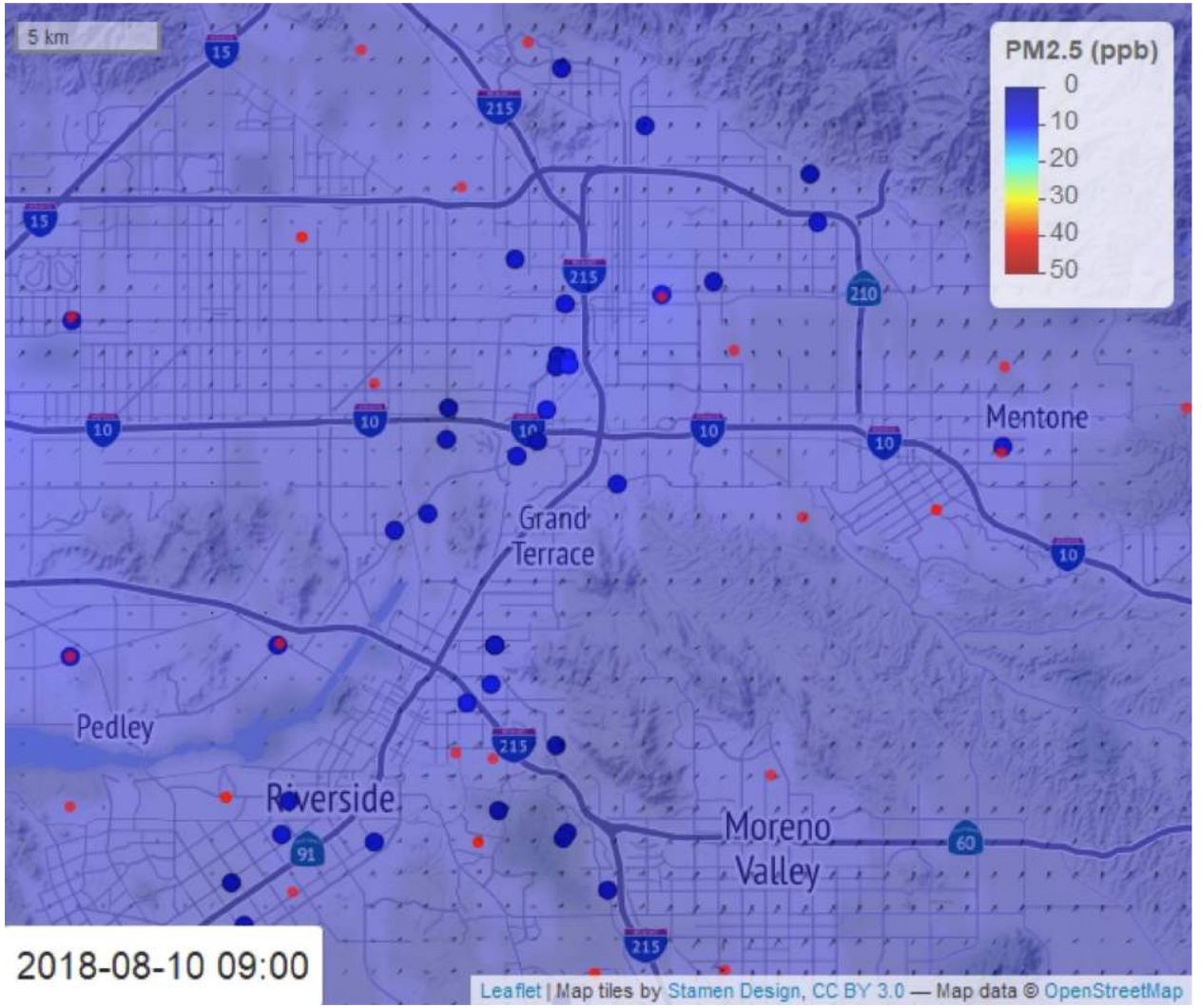


Current Monitor Deployment



- 14 monitors deployed
- 10 more monitors scheduled for deployment this month
- 26 monitors scheduled for deployment in January pending calibration completion

Plume detection with a network of AQYs - video



Video by Aeroqual

Technical Advisory Committee (TAC)

This technical advisory committee includes experts on air pollution and public health. Committee members will provide valuable oversight to support the scientific integrity of the air monitoring project.

John Balmes, MD

UCSF/UC Berkeley
CARB Board Member

Katharine Hammond, PhD

UC Berkeley

Thomas Kirchstetter, PhD

UC Berkeley
LBNL

Rachel Morello-Frosch, PhD

UC Berkeley

Ajay Pillarisetti, PhD

UC Berkeley

https://www.psehealthyenergy.org/our-work/richmond/technical-advisory-committee/

Questions?

PSE
Bringing science to energy policy

Boris Lukanov, PhD
Senior Scientist
PSE Healthy Energy
blukanov@psehealthyenergy.org

APEN
ASIAN PACIFIC ENVIRONMENTAL NETWORK

For more information about the Richmond Air Monitoring Network, visit:
psehealthyenergy.org/richmond-monitoring