Community Air Monitoring Showcase Block 2

9:50 – 10:50 AM

Cambustion

Roadside and urban NOx hot spots:

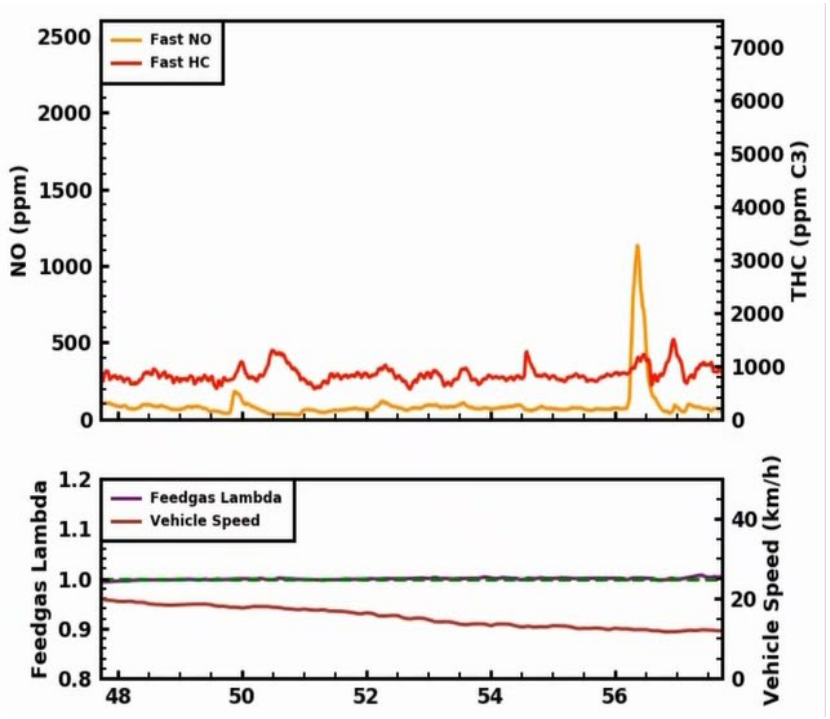
some applications of millisecond analyzers

NAAMC 2024 – New Orleans, LA

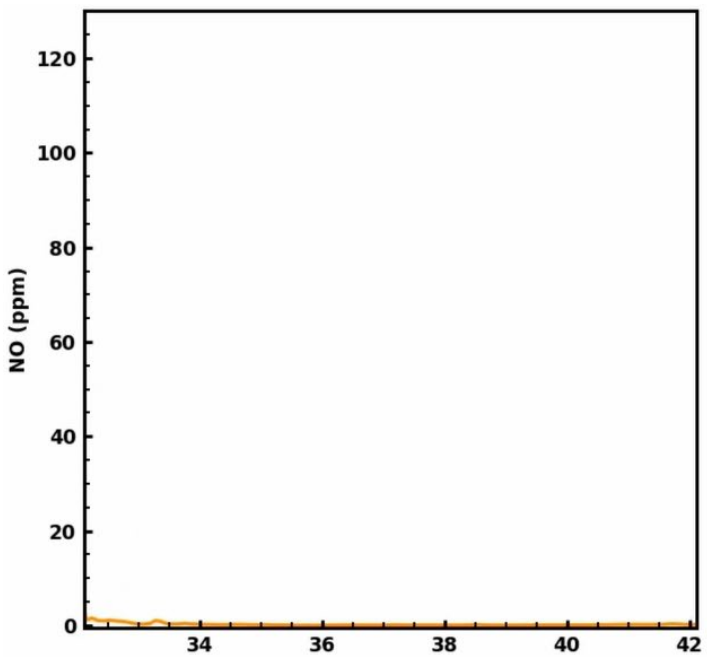
Jamie Parnell *MEng*

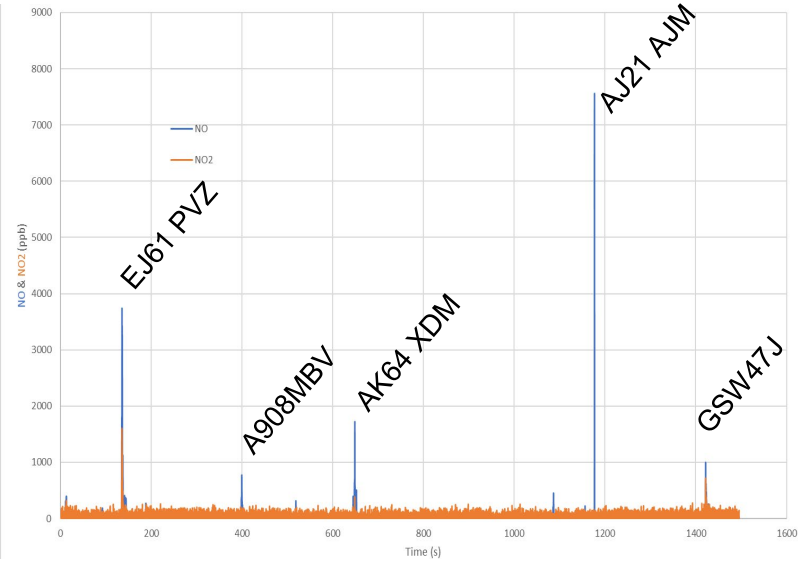
Fast Response Gas and Particle Measurements

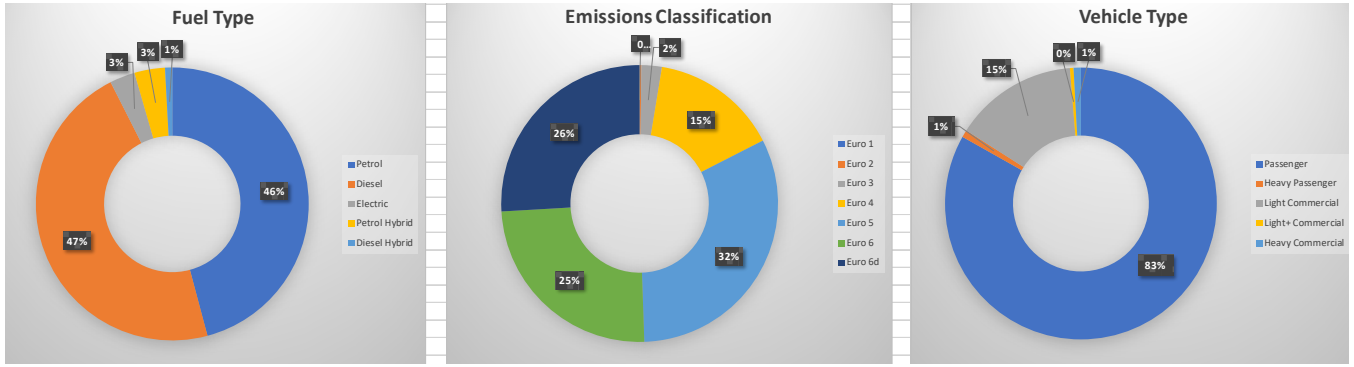
- Fast response analyzers to measure transient emissions (cold start, gear changes etc)
- Typical gas analyzers will respond in seconds
- Fast analyzers respond within *milliseconds*
- HC, NO & NO2, CO& CO2



Roadside Measurements of Passing Gross Emitter

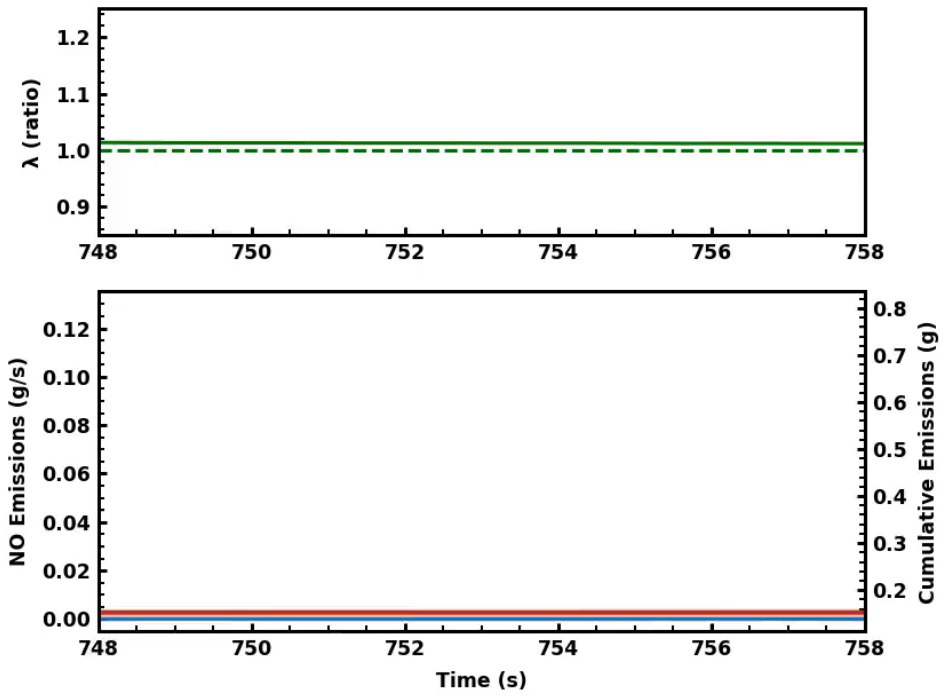


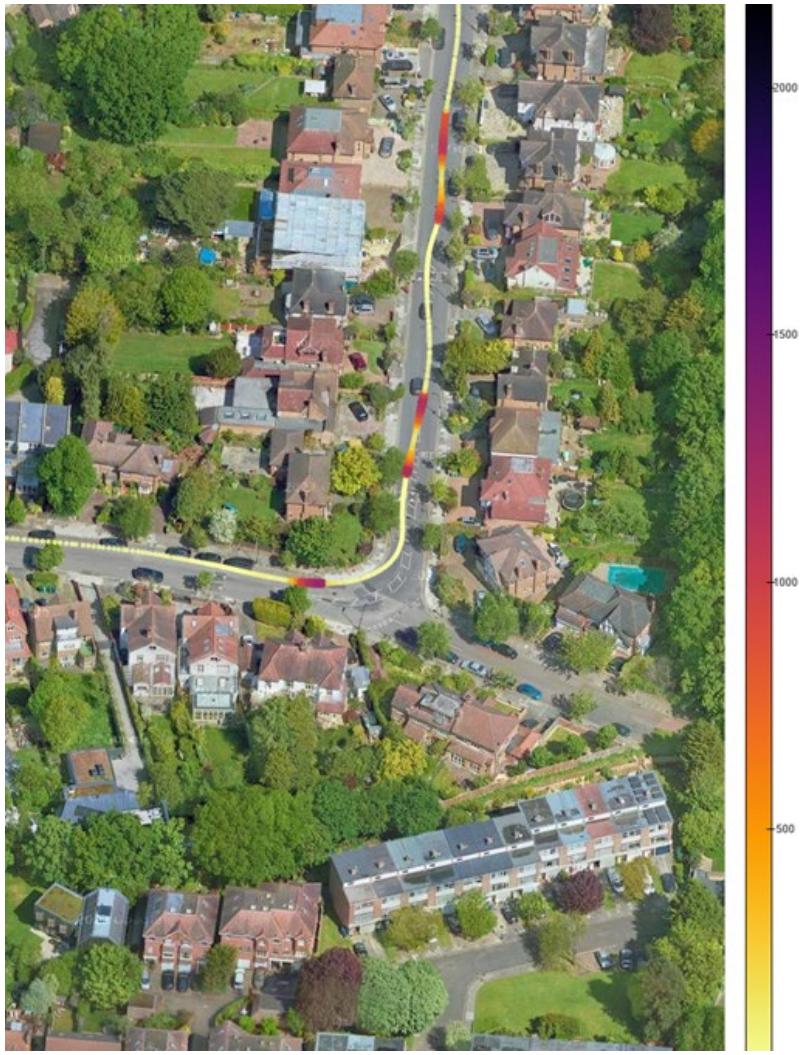




Human Exposure

Effect of Road Design on Vehicle Emissions

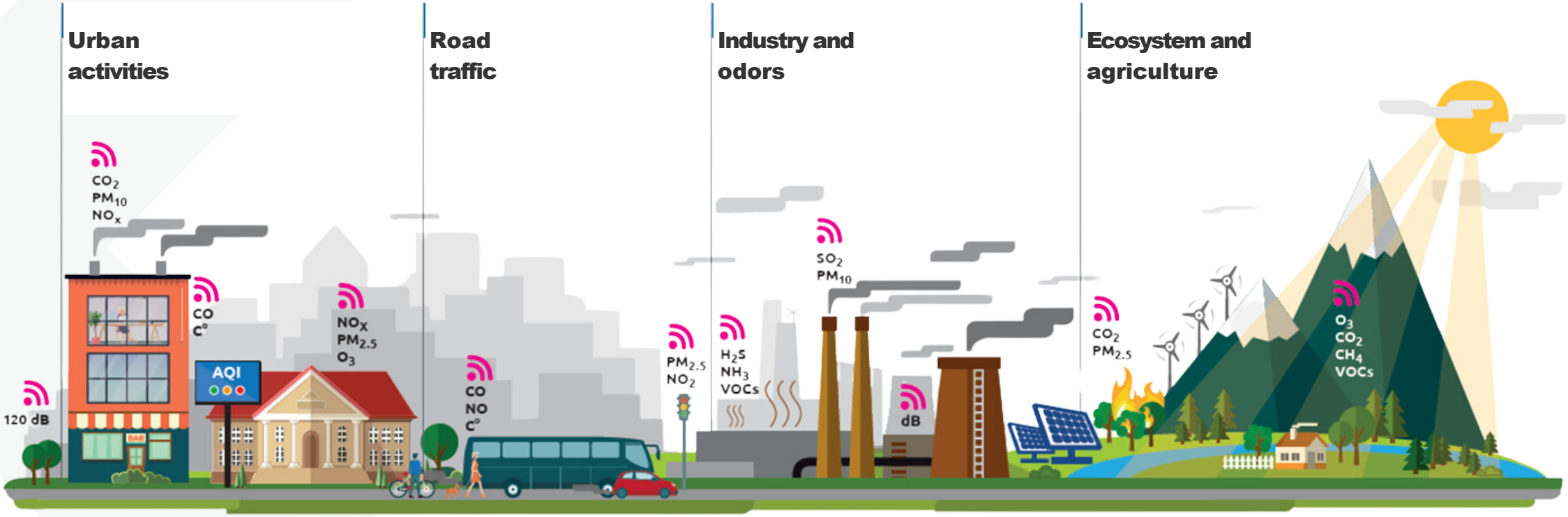




Enhancing air quality with advanced sensors technology

Claudia Barrios Obregón
International sales director

Community concerns
and associated pollutants



Advanced
air quality sensors

Reference stations

>300k€

Sensor-based stations

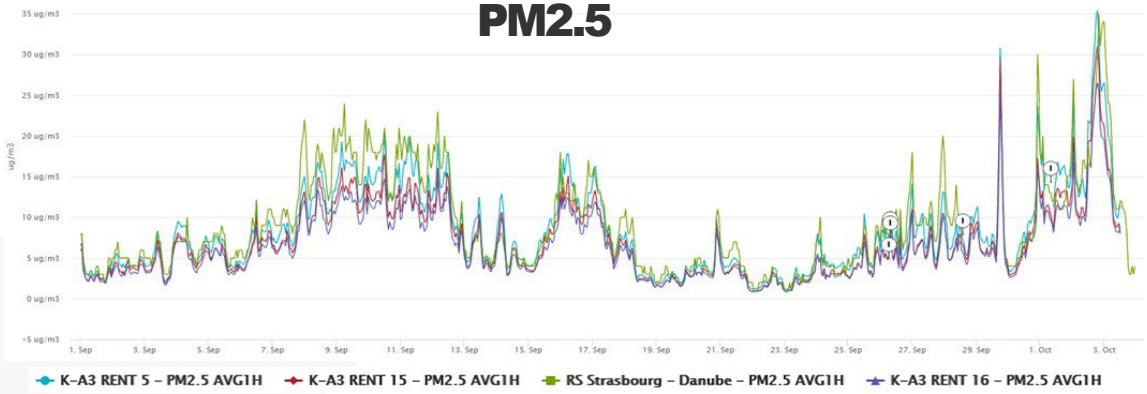
- 85% accuracy
- 2,500 times smaller
- Remote maintenance
- 97% cheaper

<10k€

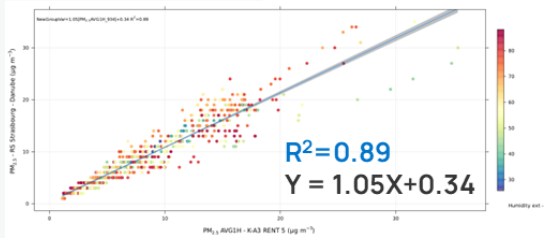
www.kunakair.com

EPA testing protocols
sensors performance

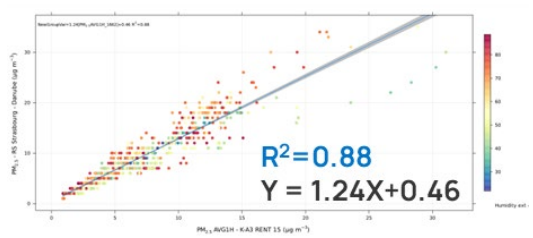
PM2.5



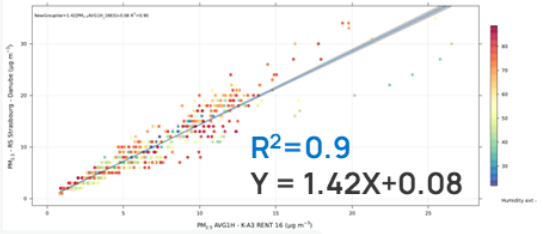
Kunak AIR Pro - 1



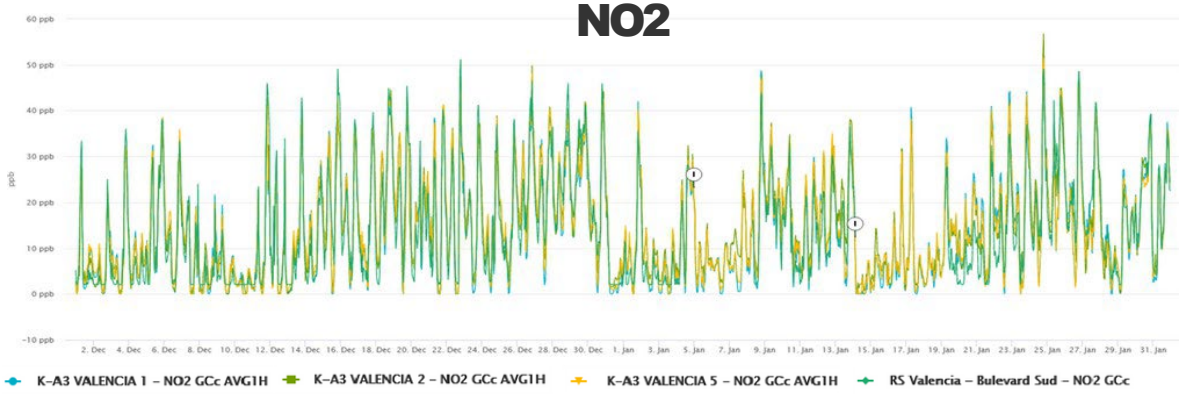
Kunak AIR Pro - 2



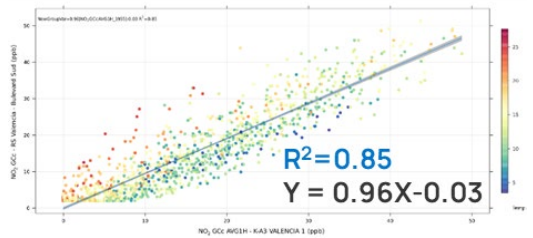
Kunak AIR Pro - 3



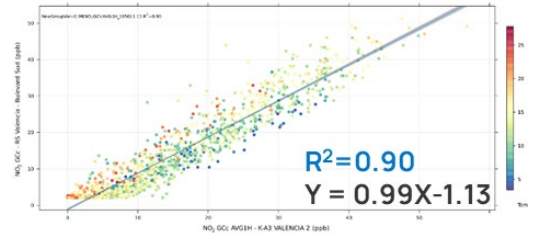
NO2



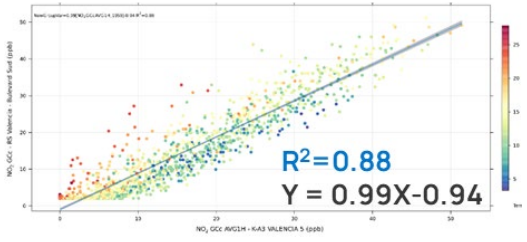
Kunak AIR Pro - 1



Kunak AIR Pro - 2



Kunak AIR Pro - 3

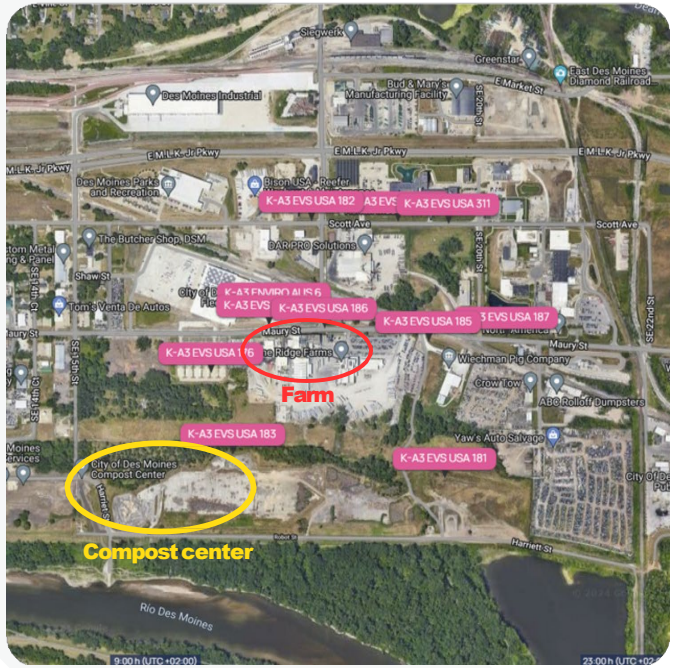


Kunak devices meet the EPA target performance values for air sensors

Case study

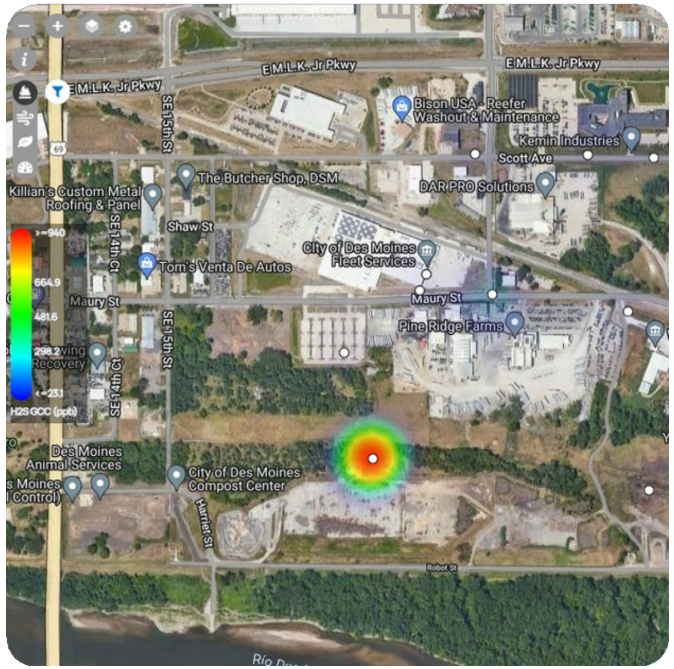
What's that smell?

- Community close to a compost site
- Acceptable odor levels for the community
- New odor ordinance for the city
- Data quality consistent with local regulation
- Promote cooperation between the city and industry



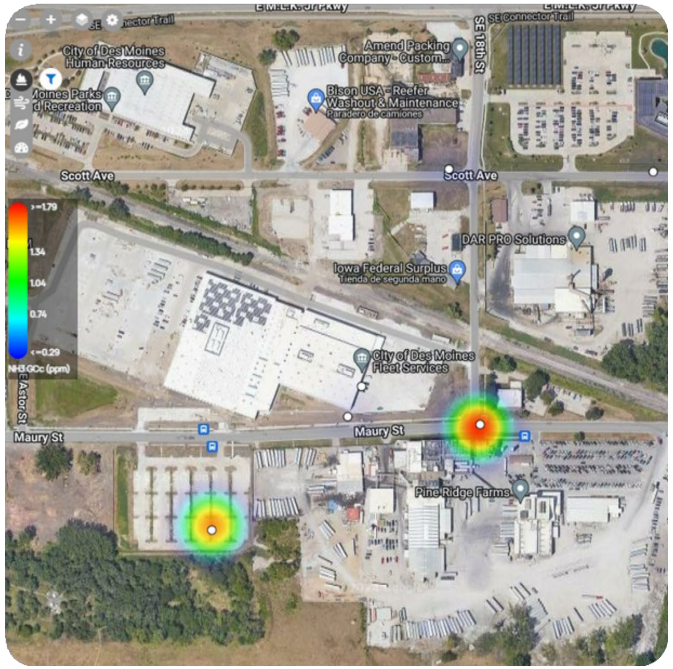
Odour monitoring network

Data-driven initiative



H2S-producing sources

"Rotten eggs" smell



NH3-releasing sources

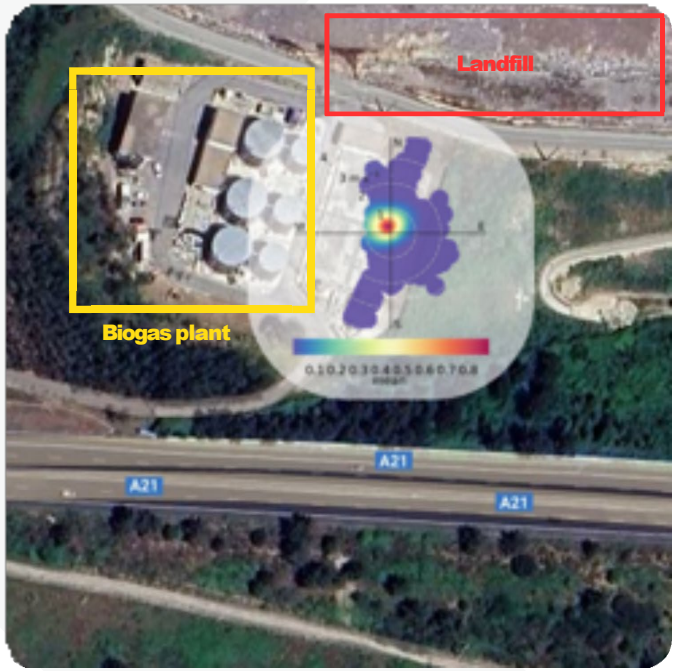
"fishy" smell or urine

www.kunakair.com

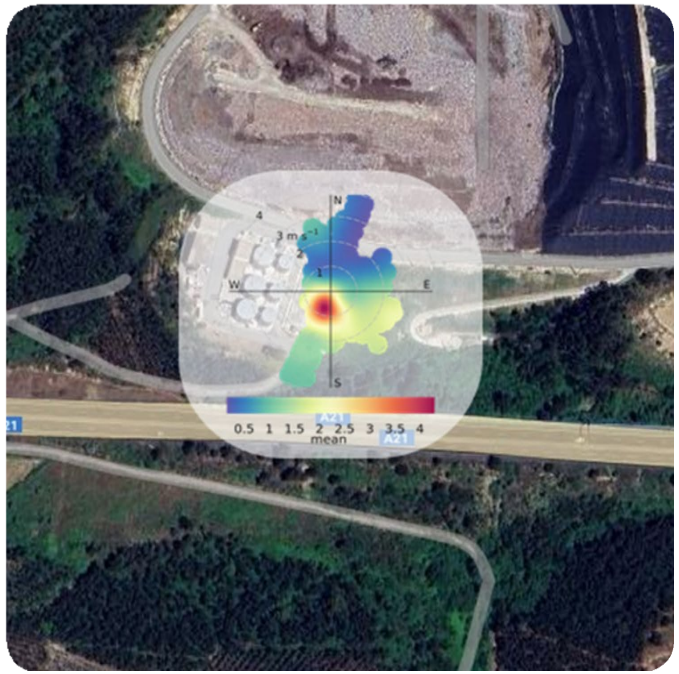
Case study

Where does each emission come from?

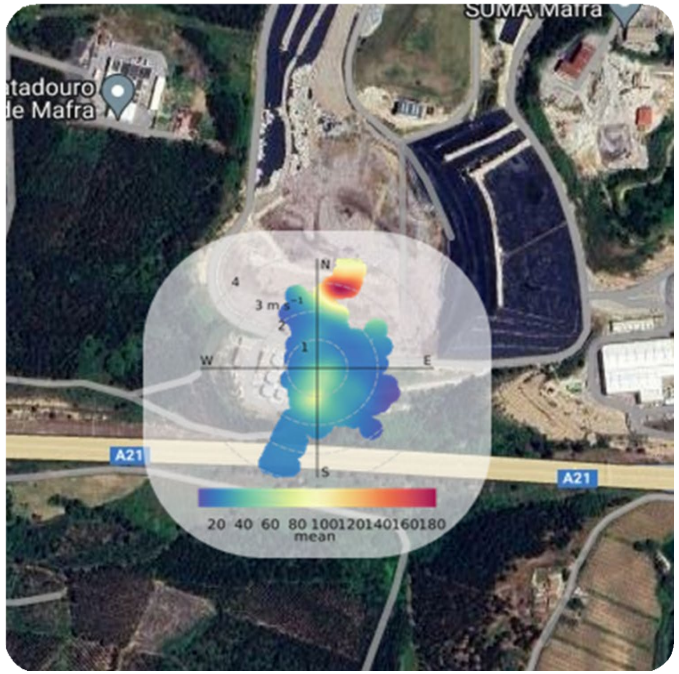
- Community close to a biogas plant
- Monitoring system to prevent odor nuisances
- Detection of pollutants from different sources
- Wind data helped to identify source direction
- Effective control to mitigate air pollution in the city



CH4 leakage detection
coming from Biogas plant



NO2 identification
coming from the road



PM10 contribution
coming from different sites

www.kunakair.com

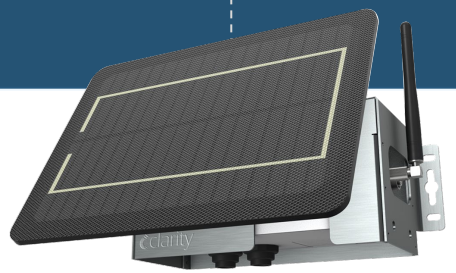
Want to learn more?

Let's connect
/claudia-barrios-obregon/

Reach out to
cobregon@kunak.es

Request a demo
+34 603 608 687

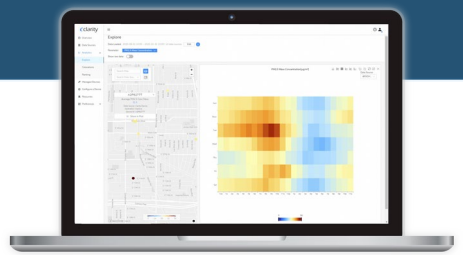
Sensing-as-a-Service℠



Clarity Node Platform

Measures all key air pollutants

- Solar-powered
- Cellular-connected
- Easily installed within 5 minutes
- Add-On Modules for additional pollutants



Clarity Cloud

Cloud-based data analysis

- Natively-integrated IoT dashboard
- Secure data pipeline & storage
- Powerful APIs, analytics and visualization

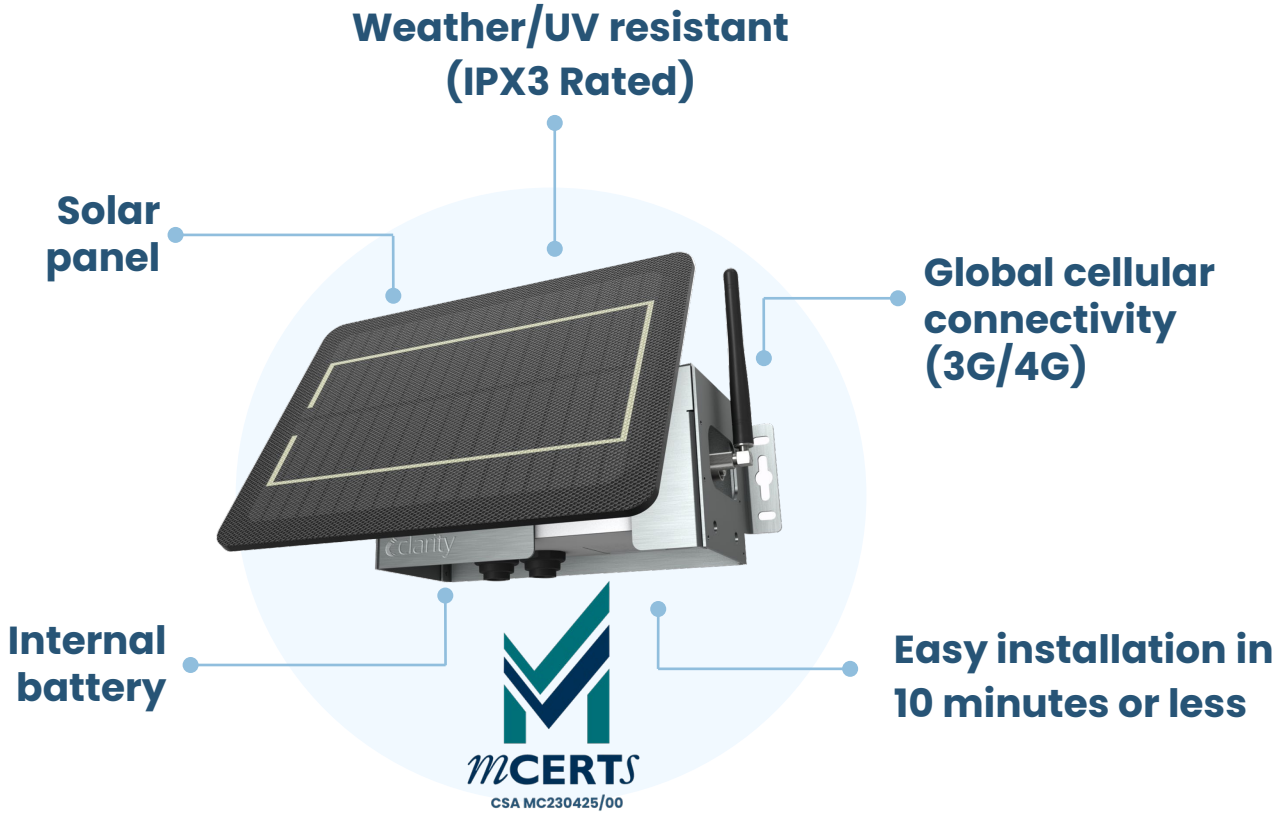
Clarity Expert Support

Scalable project support

- Highly qualified air quality experts
- Accurate and reliable data through Remote Calibration
- Responsive project management enabled by modern software stack

Clarity Node-S

Solar-powered, cellular-connected



Measures **PM** and **NO2**.

FCC + CE certified and designed for **easy deployment** everywhere, and **reliable operation** in adverse weather conditions.

Clarity Add-On Modules

Easily measure additional pollutants

Black Carbon Module

Understand the composition and sources of particulates.

Ozone Module

Confirm ozone attainment with this FEM-capable device.

Wind Module

Determine where air pollution is coming from.

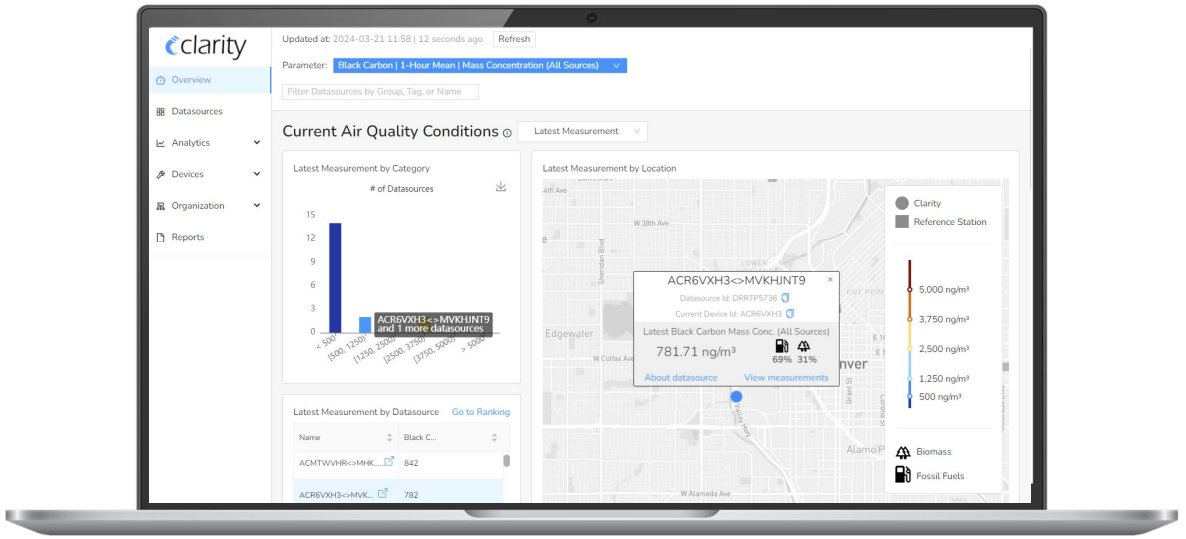
What makes the Black Carbon Module unique?

1
Ease of deployment

2
Seamless data access

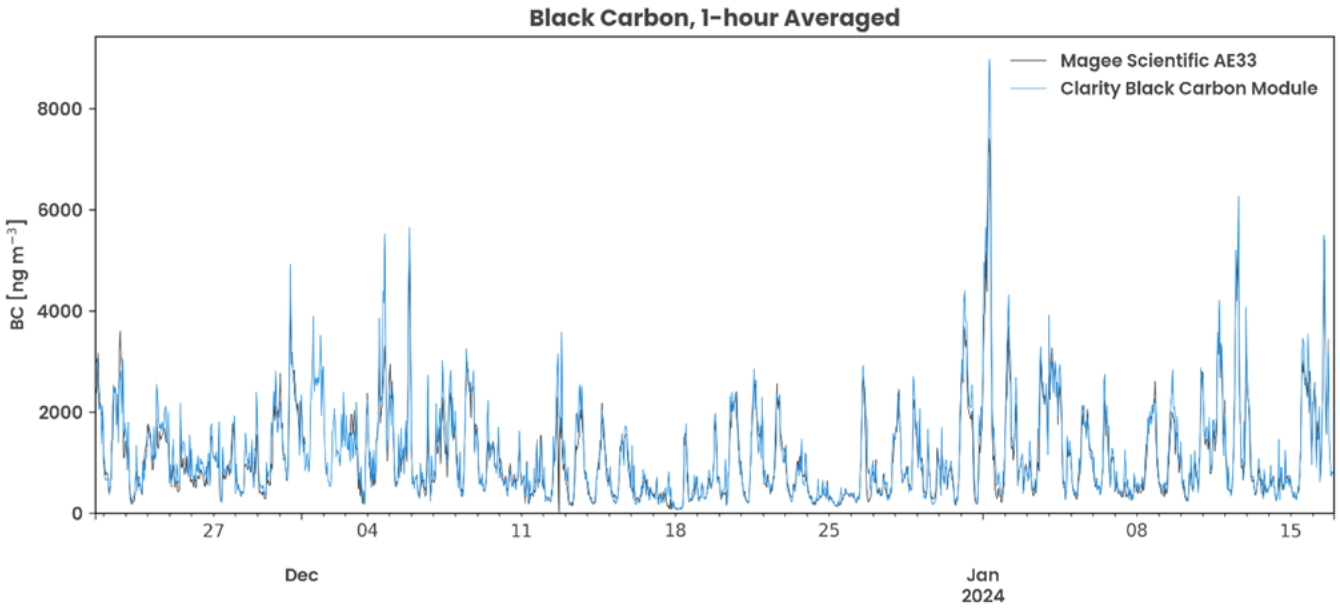
3
Collocated PM2.5 and BC

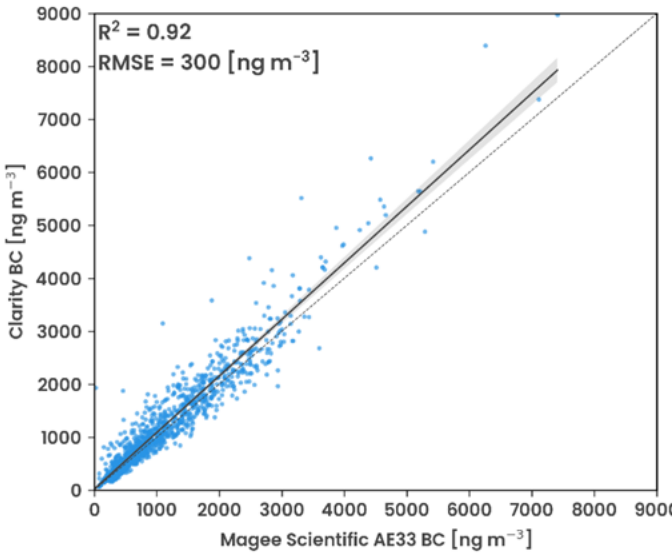
4
Best-in-class data quality



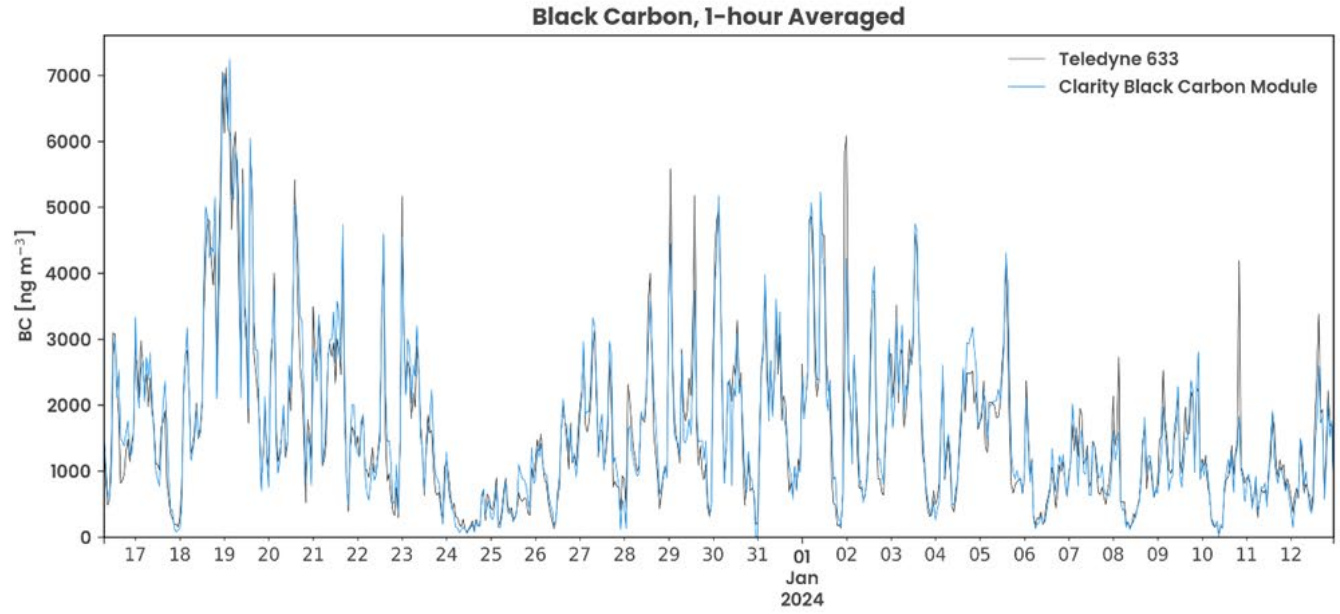
Black Carbon Module: Comparison with Reference

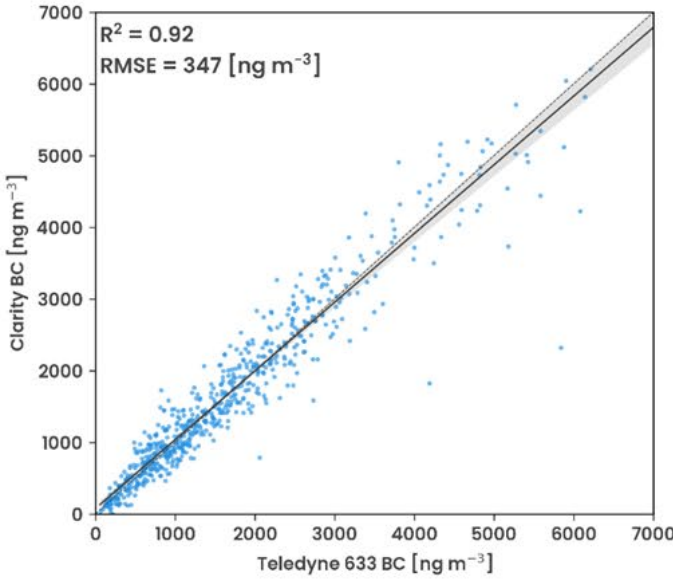
Collocation w/ Magee Scientific AE33 in Broward County, FL





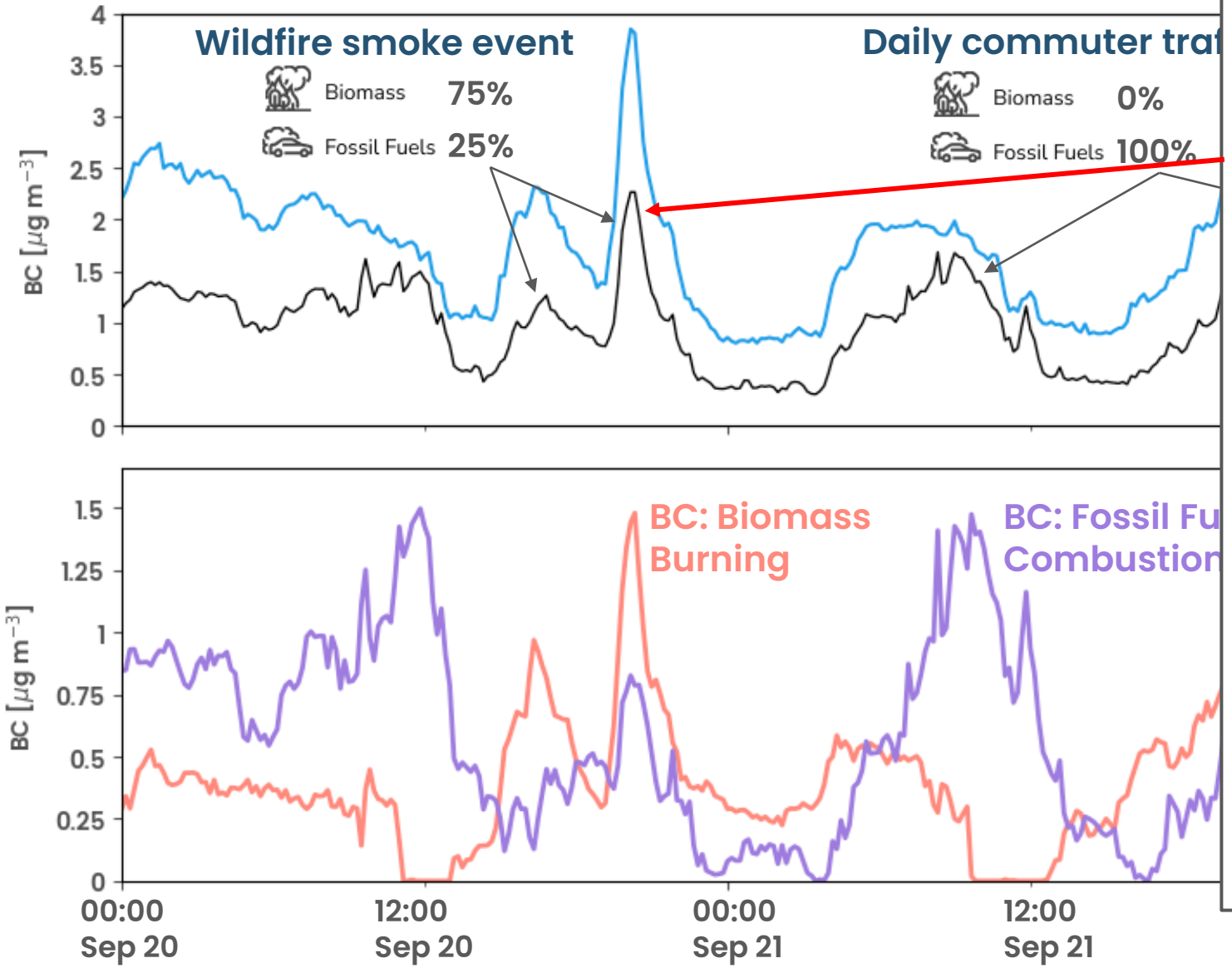
Collocation w/ Teledyne 633 in Denver, CO





Case Study

What's driving $PM_{2.5}$ air pollution in Berk

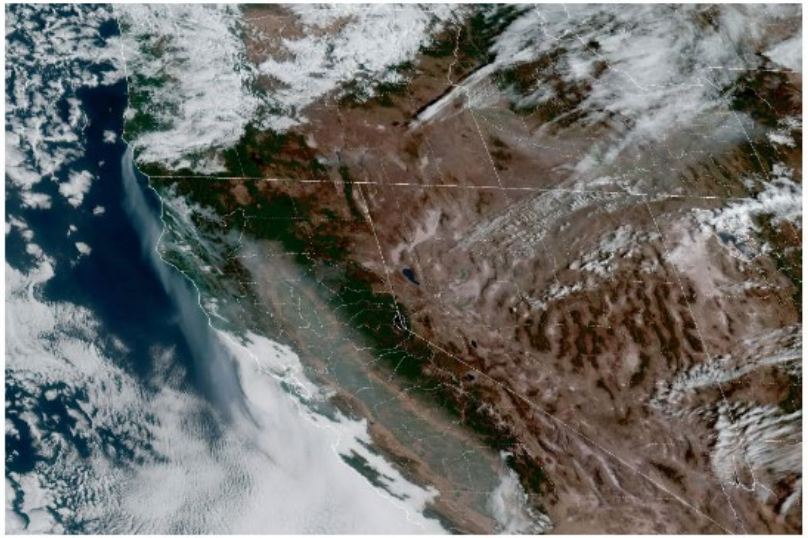


The New York Times

Unhealthy Air Lingers in Bay Area After Wildfires

Smoke from northwestern California and southwestern Oregon has blown over from the Bay Area. Some relief is expected on Friday.

Share full article



A satellite image of Northern California and Southern Oregon on Wednesday morning. Smoke from wildfires has negatively affected air quality in parts of both states. NOAA

By Rebecca Carballo

Published Sept. 20, 2023 Updated Sept. 21, 2023

APEX INSTRUMENTS

Scoping and Selecting Community Air Monitoring Technology

Community Air Monitoring Showcase

NAAMC – 2024

Kat Masse, Ph.D.

Director, Ambient Air Division

Scoping Your Community Air Quality Monitoring Project

Location

- Environnemental conditions
- Physical structures

Pollutants

- Target pollutants
- Approximate concentrations

Data Requirements

- Data quality and frequency
- Data storage, visualization, analysis, and integration needs

Constraints

- Initial cost
- Annual costs
- Power and connectivity options
- Versatility

Ease of Use

- Expected maintenance
- Calibration options
- Necessary technical aptitude
- Connect to 3rd party website

Final Selection

1. Be clear on your needs
2. Be clear on limitations

Select technology that meets your project's needs

Customize an Apex Air Quality Monitoring to your Solutions

1. Select PM sensor and cartridges to detect target pollutants

Smart Gas Cartridges

2. Select base station system functionalities

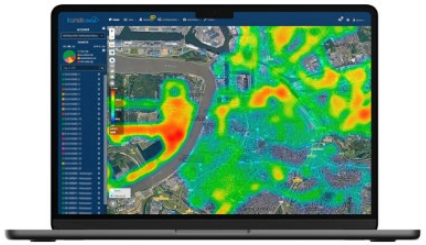
APEX AIR Pro

APEX AIR Lite

3. Select additional probes, power supply, and software options

Accessories

Cloud Software



Data Tools

Integrate external source data

https://apexambientair.com/

APEX INSTRUMENTS

ambientair@apexinst.com

Wide Range of Sensors

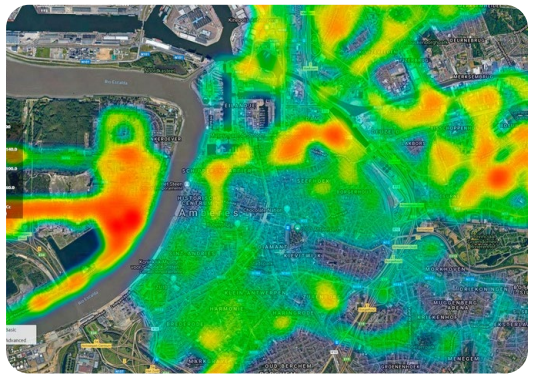
Patented Plug & Play Sensors

- CO — Carbon monoxide
- O_3 — Ozone
- VOC — Volatile organic compounds
- Wind
- CO_2 — Carbon dioxide
- H_2S — Hydrogen sulfide
- CH_4 — Methane
- Noise
- NO — Nitric oxide
- SO_2 — Sulphur dioxide
- HCl — Hydrogen chloride
- Rain
- NO_2 — Nitrogen dioxide
- NH_3 — Ammonia
- PM — Particulate matter
- Radiation

With more releasing 4Q of 2024!

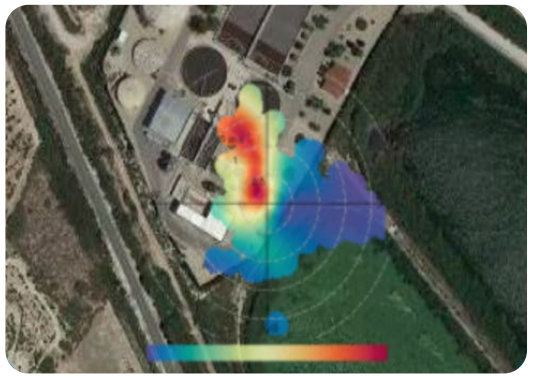
Cloud Software – Advanced Analytical Tools

Heat maps

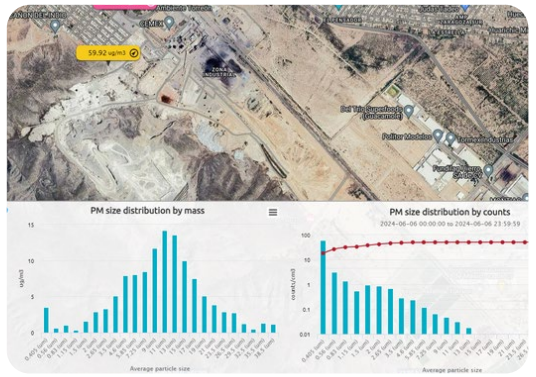


Pollution hotspots

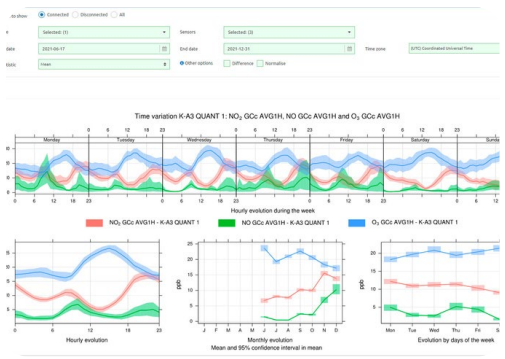
Leak detection



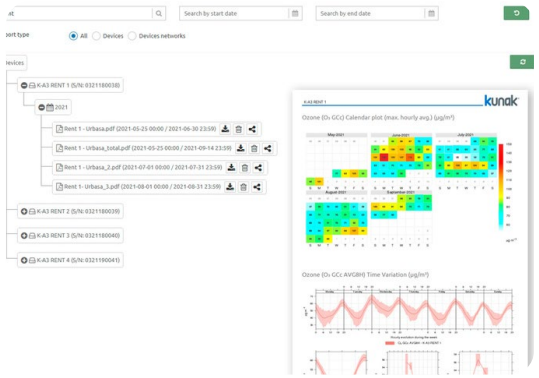
PM size/distribution



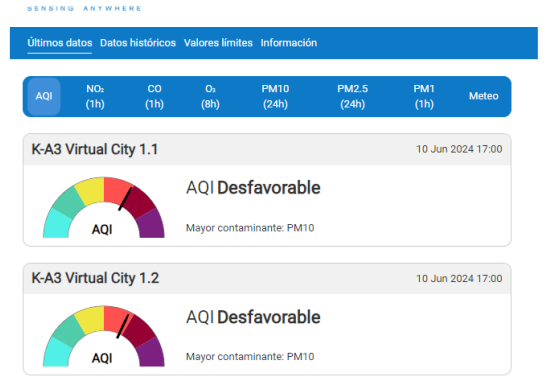
Multi-parametric analyses



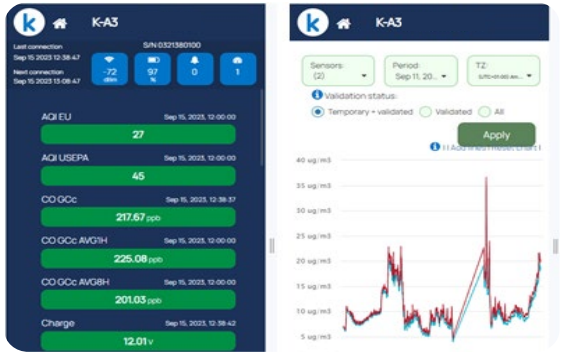
Customized reports



Embeddable Widgets



Mobile App



Market Comparison

	Apex AIR Products	Others
Accuracy	80 – 85%	50 – 75%
Versatility	Multi-pollutant w/ same device	Different devices per set of pollutants
Calibration	Co-location, correction, or reference gas cylinders	Co-location or machine learning
Particles	Accurate fine and coarse particles	Accurate fine particles
Range of pollutants	Full range: ambient, industry, meteo	Limited range
Power supply	Compact solar panel or mains + internal battery	Mains or big solar panel w/ external battery
Power consumption	Low – up to 20 days w/o power	High – up to 3 days w/o power

Thanks for listening and next steps

Request a quote

(919) 342-8122

Review prices online

apexambientair.com

Schedule a one-on-one meeting

kmasse@apexinst.com

Connect

Apex Ambient Air

Kat Masse

Delivering the Right Results for VOCs

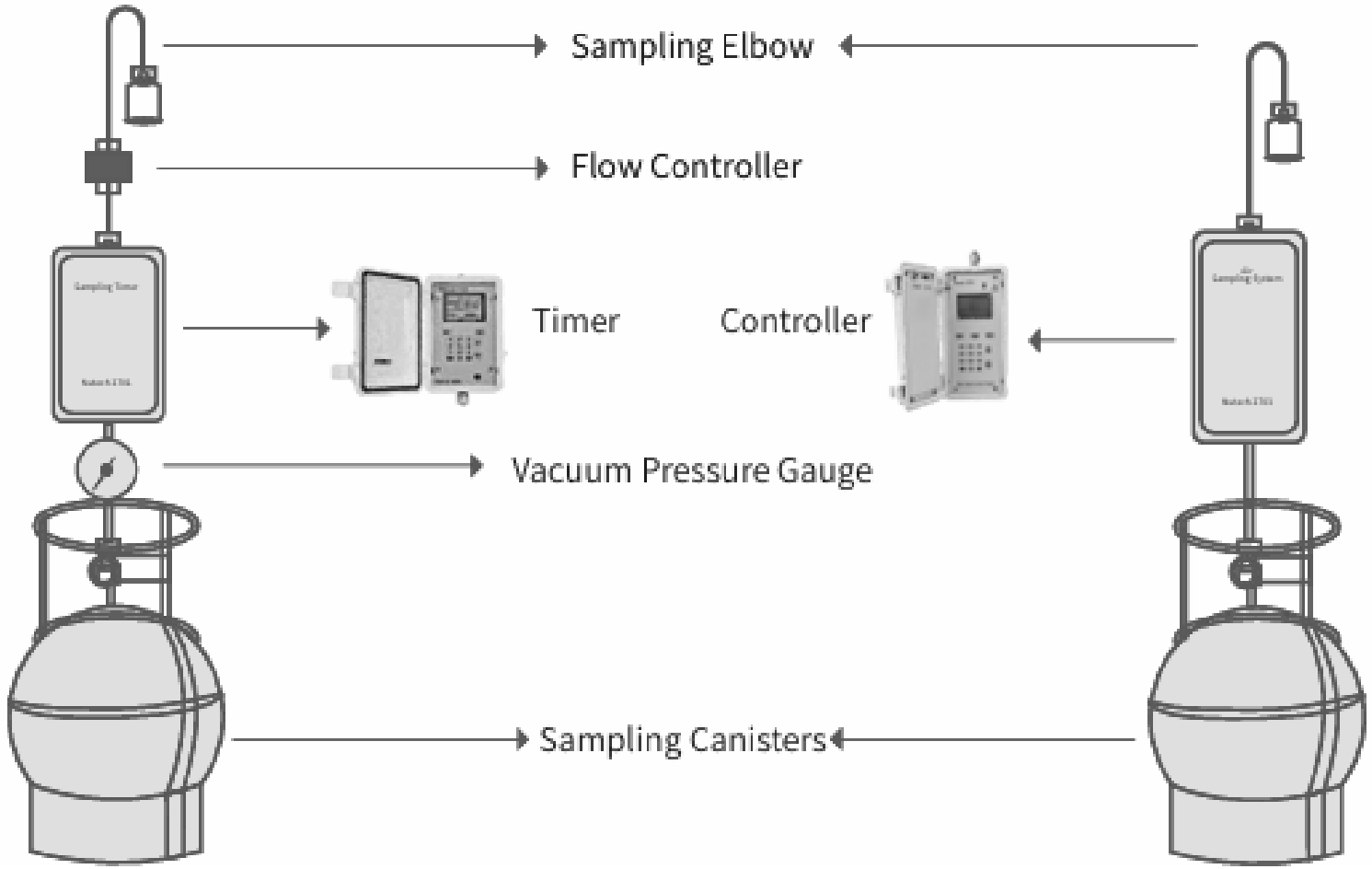
Community air monitoring

Nutech 2703 Automatic air sampling device

Accurate Measurements of VOC’s in air

Delivering the best results for VOCs

Old School vs Nutech



Nutech
Delivering the best results for VOCs

Nutech 2703

is the most advanced canister-based sampler on the market

- Integrate the functions of flow controller, flow calibrator, pressure gauge, filter, and timer
- Control by mobile App, computer or on board
- Waterproof design
- Complete quality control (graphs vacuum before, during, and after)
- Highly portable
- Change flow rate without replacing the hardware
- Programable: start time any time within 7 days

Nutech
Delivering the best results for VOCs

New Triggered version

NuTech
Delivering the best results for VOCs

Delivering the Right Results for VOCs

Please stop by Booth 409 for a hands-on demonstration of the 2703 and to further discuss your needs…

Delivering the best results for VOCs

AERIS TECHNOLOGIES

A PROJECT CANARY COMPANY

Aeris MIRA: THE NEXT GENERATION OF GAS SENSOR TECHNOLOGY

NAAMC Community Air Monitoring Showcase

Martin Yau

Martin.Yau@aerissensors.com

AERISSENSORS.COM

Aeris MIRA Platform: Middle InfraRed Analyzer

Redefining the State-of-the-Art in gas monitoring

Sensor Engine

- Direct absorption middle infrared analyzer
  - <1 ppb/s sensitivity, ppt-ppb level accuracy
  - No fragile optical cavity
- Patented Folded Multi-Pass Cell
  - Long pathlength-High Sensitivity
  - Low Volume-Compact Design and fast response time
- Meets GAW targets for precision and accuracy: CO_2, CH_4, N_2O and H_2O
- Three platforms: **Pico, Strato** & **Ultra**
  - Fixed, handheld, mobile & drone monitoring
  - >700 units fielded, 10 years development

10x reduction in size, weight, and power consumption compared to similar class analyzers

MIRA SERIES: Pico, Ultra, and Strato

MIRA PICO Series: Handheld/Portable

- <1ppb/s sensitivity typical
- Lunchbox sized (5.7 l vol., 2.75kg/6lbs)
- AC/DC, **15W**, **6hr battery built-in**, GPS, Wi-Fi, RS-232

MIRA Ultra Series: Low Drift: Fixed or Portable Versions

- Same core technology as Pico Series, except…
- Low drift via **temperature stabilized optical core**
  - 1-2ppb drift typical long term
- Rackmount or Portable version, optional battery

MIRA Strato Series: Drone Applications

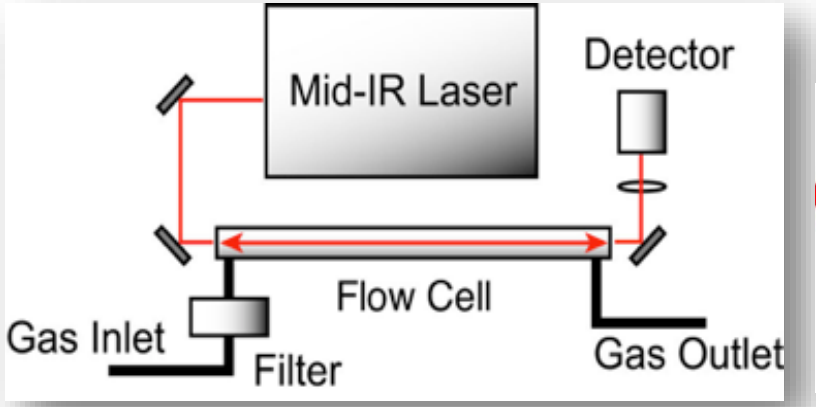
- Same as Pico, but smaller and lighter (2.8l vol., 1.9kg)
- 1.5-hour battery, ruggedized design

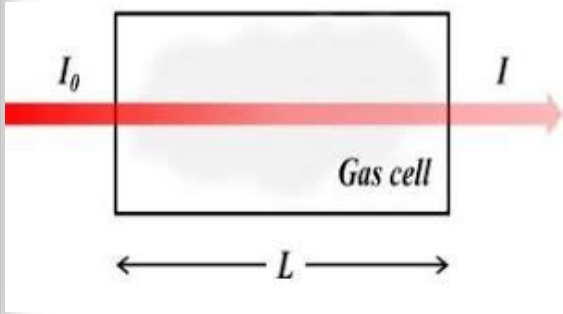
MIRA is suitable for fixed, handheld, and mobile applications

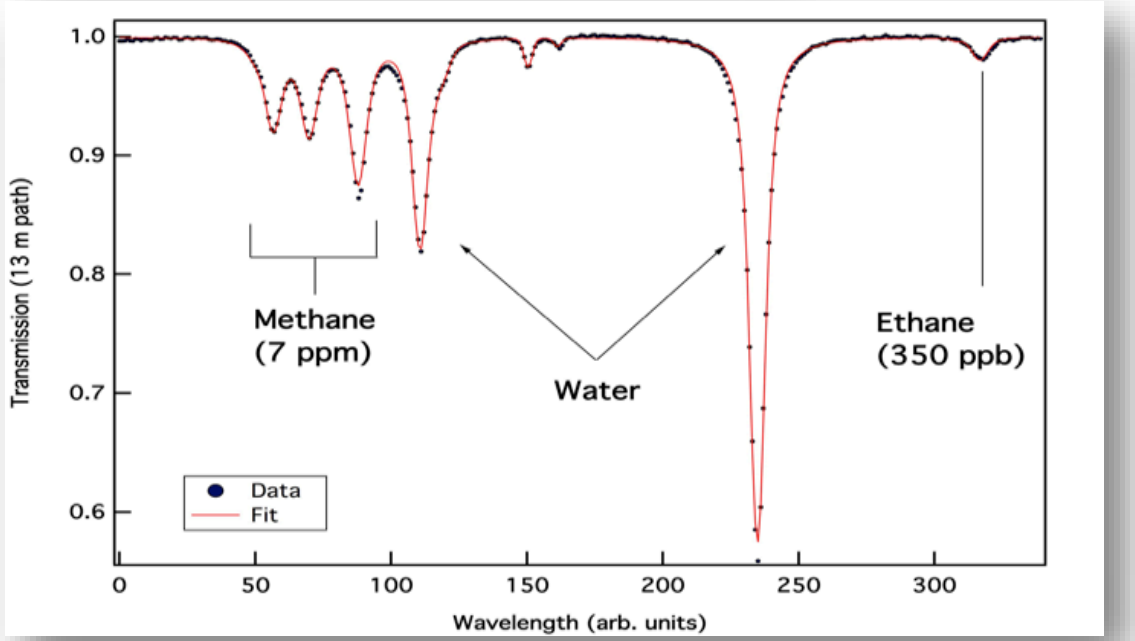
MIRA: Mid-IR Direct Absorption Spectroscopy

- **Direct Absorption Spectroscopy**
  - **Laser is scanned in wavelength, transmission is measured vs wavelength**
  - **No fragile optical cavity**
  - 100x less susceptible to optical contamination than cavity-based **systems**
  - Simple, sensitive, accurate, robust
- Wide dynamic range: ppt to % levels
- "Fingerprints" are **unique and unmistakable in the Mid-IR**
  - Traceability via saved spectra
  - Stronger absorption in MIR eliminates need for optical cavity
- **GAS TYPES AVAILABLE**

  CH_4, C_6H_6, C_2H_2, EtO, HCHO, N_2O, CO_2, CO, OCS





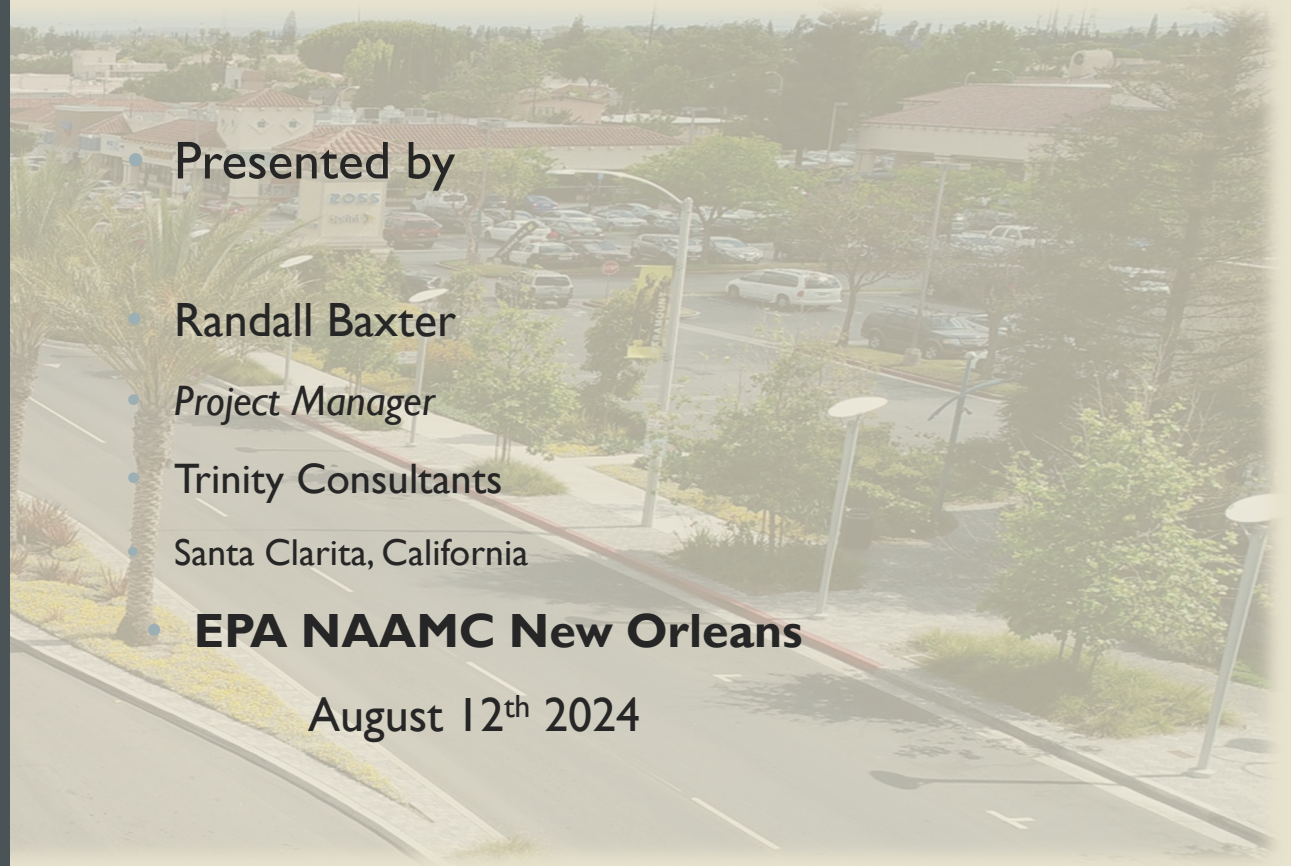


AERIS TECHNOLOGIES NEW PRODUCTS

- **MIRA ULTRA EDDY COVARIANCE**
  - Simultaneous measurement of N_2O, CH_4, CO_2 and H_2O in single enclosure
  - **Unmatched < 400 ppt for N_2O, , <250 ppb CO_2, <1.2ppb CH_4 and <15 ppm for H_2O at 10 Hz**
  - Closed path with robust optics
  - Remotely accessible
  - Built in WiFi, RS-232 and optional analog out

- **MIRA ULTRA CO_2 Isotope Analyzer**
  - Combination of precision, low drift, portability and affordability
  - **Simultaneously Measures $\delta^{13}C$ and $\delta^{18}O$ with precision of <0.25/mil**
  - Lightweight, less than 5 kg
  - Low Power (25 W)
  - Data Acquired up to 10 Hz

COMMUNITY MONITORING HEXAVALENT CHROMIUM – THE CITY OF PARAMOUNT



- Presented by
- Randall Baxter
- *Project Manager*
- Trinity Consultants
- Santa Clarita, California

- **EPA NAAMC New Orleans**

August 12th 2024

PARAMOUNT
THE CITY
Safe, Healthy, and Attractive

Trinity Consultants

CURRENT MONITORING OBJECTIVES

- In November 2021, the City of Paramount retained Trinity Consultants to continue SCAQMD's routine hexavalent chromium (Cr6+) monitoring throughout the City of Paramount to identify and investigate potential sources of Cr6+ in the adjacent communities within the City of Paramount and to provide results on the Paramount Environmental Portal : https://paramountenvironment.org/air/
- The SCAQMD has noted that Cr6+ concentrations above 1.0 ng/m3 over three consecutive days is of concern and that readings below **1.0 ng/m3 are considered as relatively normal "background" levels.**

NETWORK OPERATIONS

- Filters are run every 1-in-6 days based upon the annual EPA Sampling Schedule
- Each of the samples are operated over a 24-hour period (midnight to midnight)
- Filters are collected the day following each sample run and are shipped to laboratory for analysis

PARAMOUNT
THE CITY
Safe, Healthy, and Attractive

Trinity Consultants

SAMPLERS-CURRENT NETWORK

The network includes two types of samplers:

- **Tisch Wilbur** (three locations)

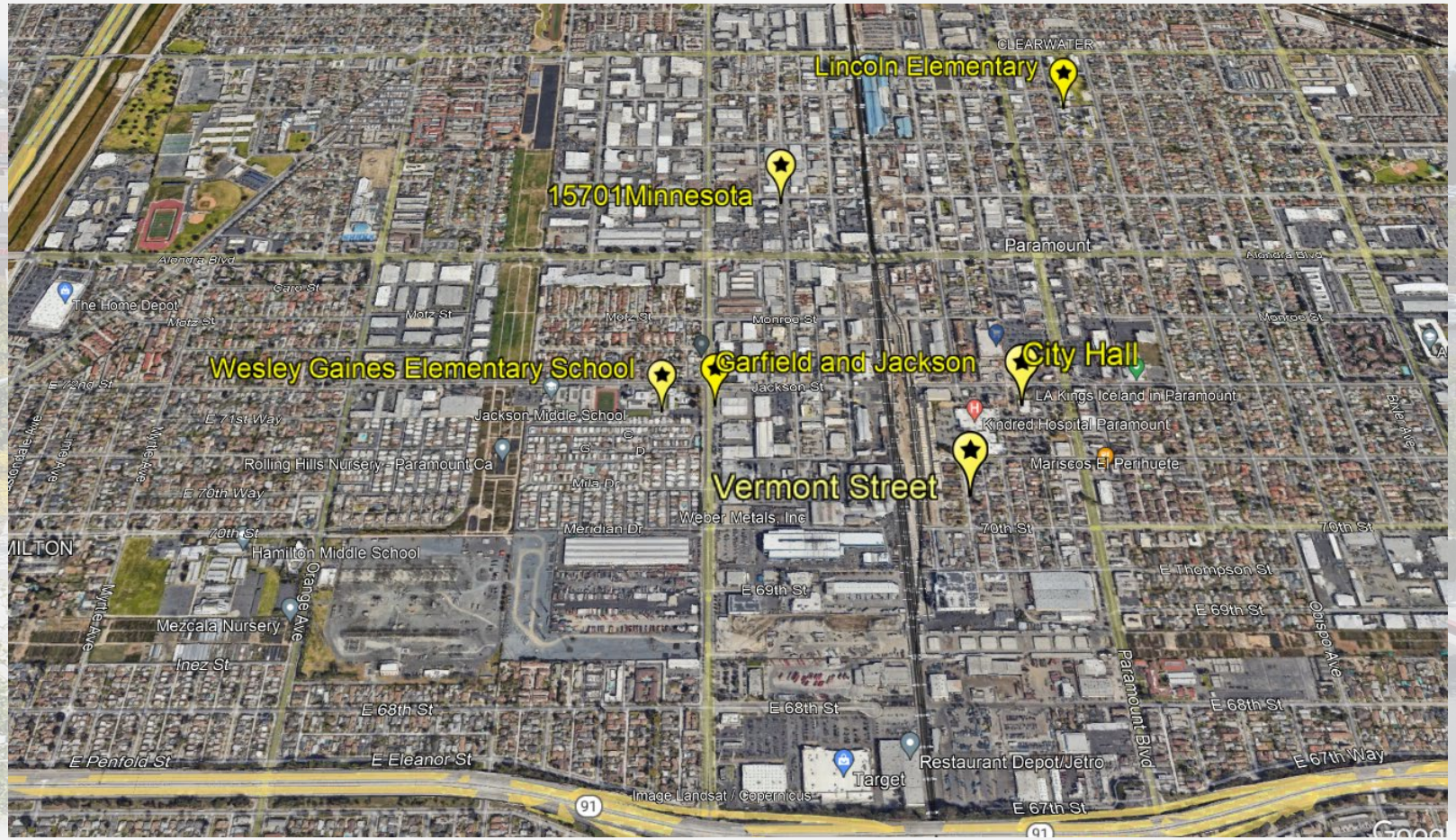
- **BGI Omni** (three locations, solar/battery-powered)

- Meteorological tripod also located at City Hall location.
- With current samplers there has been a sample recovery rate of over 95%

PARAMOUNT
THE CITY
Safe, Healthy, and Attractive

Trinity Consultants

SITE LOCATIONS



- **Current Monitoring Locations :**
- *Wesley Gaines Elementary School (Wilbur)*
- *Lincoln Elementary School (Wilbur)*
- *City Hall (Wilbur)*
- *Infront of 15701 Minnesota & Madison (Omni FT)*
- *Vermont Street (Omni FT)*
- *South East Garfield Street and Jackson Street (Omni FT)*

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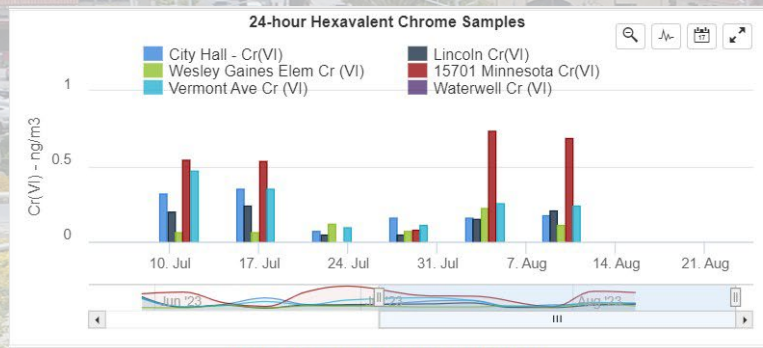
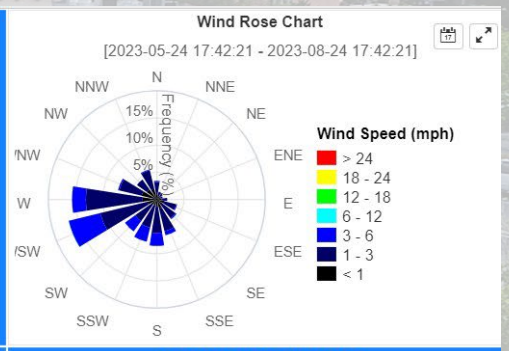
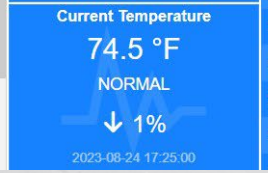
ENVIRONMENTAL PORTAL





24-hour Hexavalent Chrome Cr(VI) Samples

Time	15701 Minnesota (ng/m3)	City Hall (ng/m3)	Lincoln Elementary (ng/m3)	Vermont Ave (ng/m3)	Wesley Gaines Elementary (ng/m3)
2023-08-10 00:00:00	0.69	0.174	0.208	0.242	0.112
2023-08-04 00:00:00	0.738	0.163	0.152	0.26	0.226
2023-07-29 00:00:00	0.083	0.157	0.047	0.114	0.072
2023-07-23 00:00:00		0.072	0.049	0.1	0.117
2023-07-17 00:00:00	0.536	0.356	0.244	0.351	0.068
2023-07-11 00:00:00	0.543	0.321	0.201	0.474	0.067



Historic Meteorological Data

Time	WS (mph)	WD (°)	Temp (°F)	RH (%)
2023-08-24 07:00:00	1.4	90.0	65.9	87.3
2023-08-24 06:00:00	1.2	10.9	65.5	87.5
2023-08-24 05:00:00	0.4	61.1	64.9	89.3
2023-08-24 04:00:00	1.3	353.5	64.8	88.8
2023-08-24 03:00:00	1.8	348.5	64.7	88.7
2023-08-24 02:00:00	1.5	337.6	64.8	88.6
2023-08-24 01:00:00	1.0	326.0	65.1	88.5

Portal available for public viewing at https://paramountenvironment.org/air

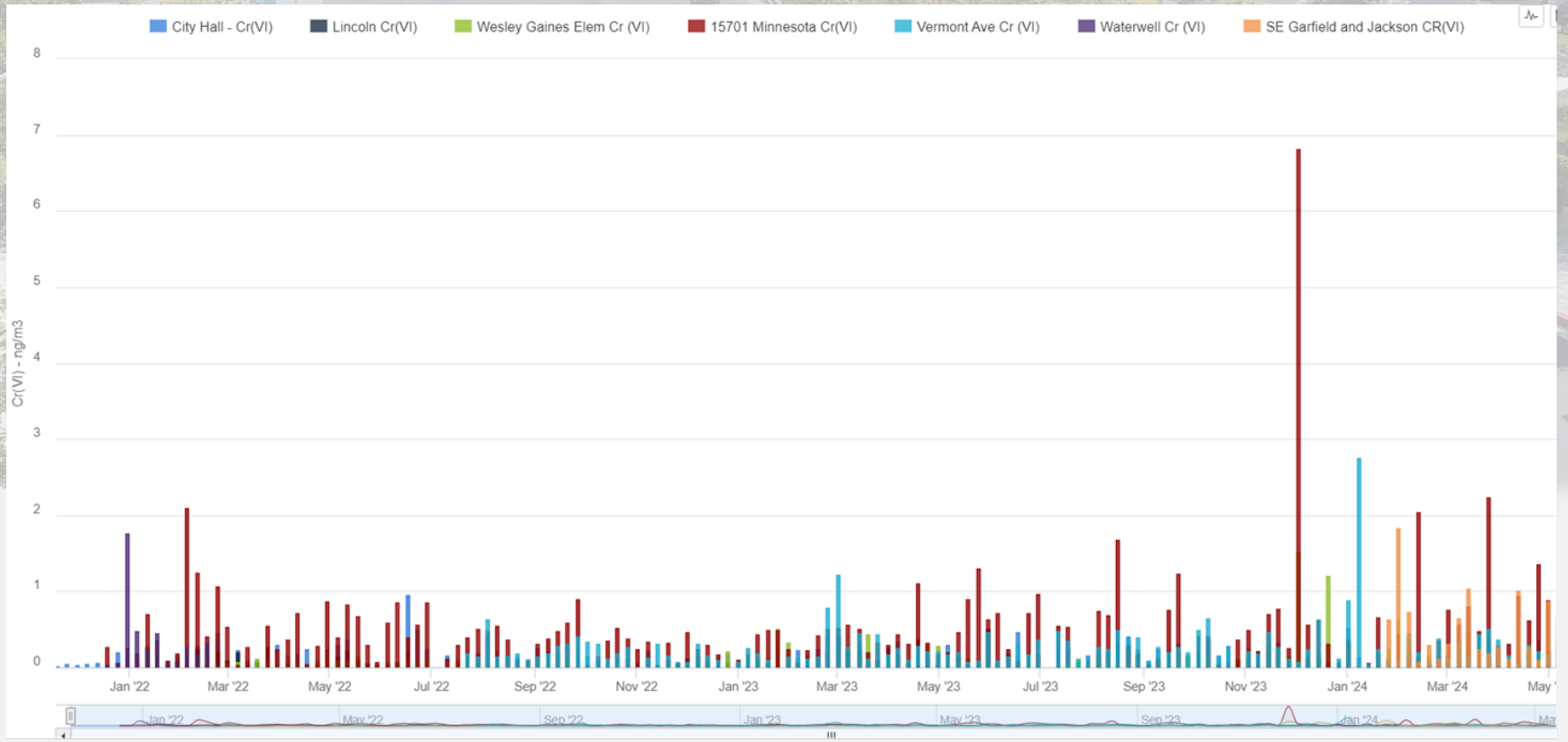
- Samples results are posted within a week of collection
- Portal include City Hall Meteorological Data
- Display also hosts historical data

PARAMOUNT
THE CITY
Safe, Healthy, and Attractive

Trinity Consultants

SAMPLE SUMMARY THROUGH 6-5-2024

	City Hall	Waterwell	Jackson & Minnesota	15701 Minnesota	Wesley Gaines	Lincoln	Vermont	Garfield & Jackson
AVERAGE	0.175	0.351	0.180	0.513	0.156	0.126	0.270	0.430
MIN	0.000	0.029	0.033	0.000	0.021	0.016	0.000	0.042
MAX	0.950	1.765	0.514	6.807	1.502	0.502	2.751	1.835
Samples	147	11	23	146	123	116	109	23



QUESTIONS?

Randall Baxter

Project Manager, Monitoring Services

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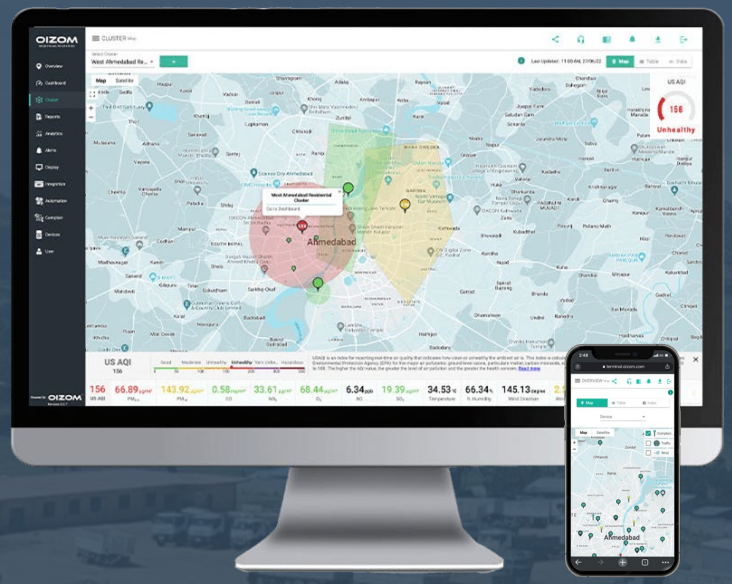
OIZOM®
REDEFINING RESOURCES

Accurate Air Quality Monitoring and Advanced Data Analytics



70+
Countries

65+
Global Cities

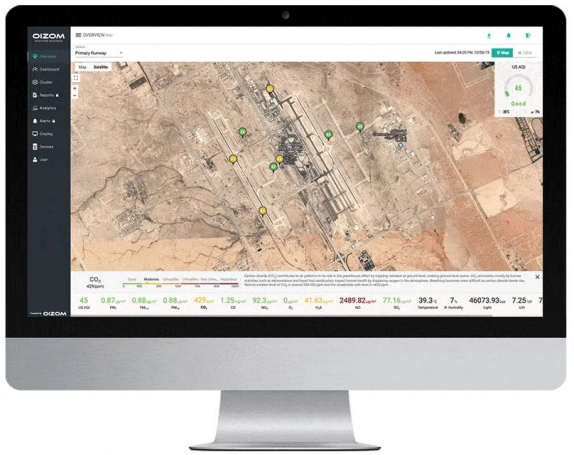
2000+
Devices Installed

200M+
Population Covered

Hardware & Software Ecosystem

30+ Environmental Parameters Monitoring Capability

- Dust
- Noise Level
- Polluting Gases
- Radiation
- Odourants
- Weather



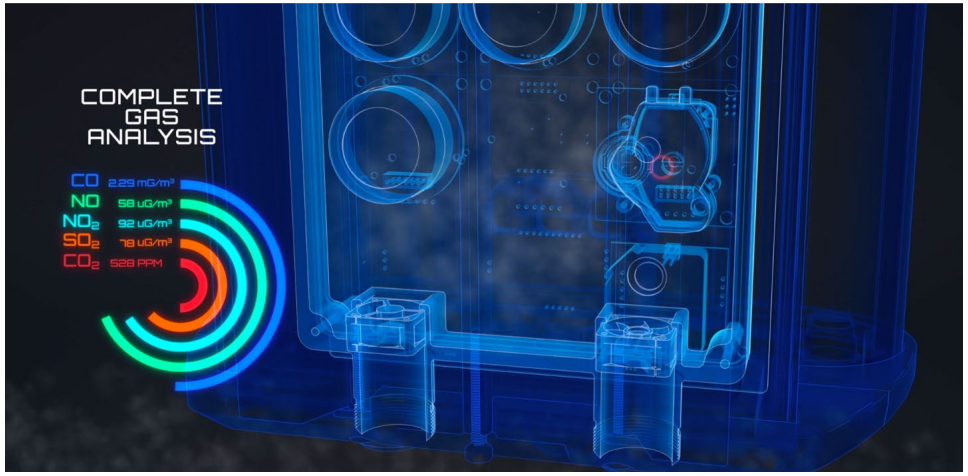
Software Features

- Actionable Alerts
- Insightful Reports
- Predictive Analytics
- Industrial Automation
- LED Display / TV / Web
- Mobile App

Jainam@oizom.com | +91-8866660039

Patented Technology

- Patented Technology on Hybrid Sampling known as **e-Breathing™ Technology**
- **OGS** – Proprietary Gas Sensing Module for optimal low concentration detection
- **3 levels of calibration** – Factory, Span & Collocation
- **On-site Calibration Capabilities** – Zero & Span



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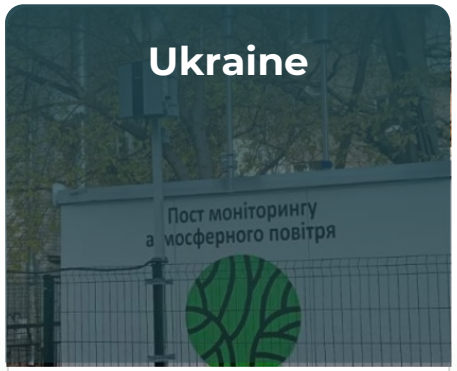
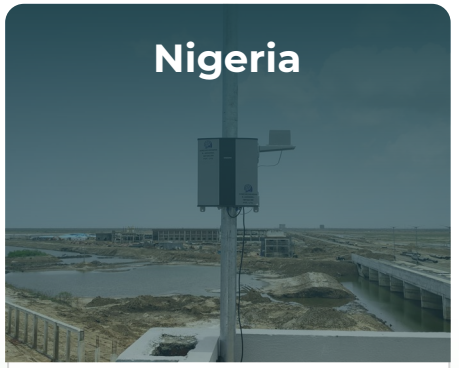
Key Projects

	United Kingdom	India	Ukraine	Nigeria
				
Project Partner	vodafone	INDIA OPEN DATA association		LASEPA
Application	DIY Air Monitoring	Open Data Monitoring	City Monitoring	Public Hotspot Monitoring
Data Use Case	Empowering teams to measure PM for data-driven decisions.	Citizen engagement towards improving Air Quality Standards	Data driven environmental analysis	City Pollution Monitoring
Impact	Raising awareness about the health impacts of dust levels	Citizen engagement to reduce pollution activities	Effective strategies to mitigate pollution hazards	Engaging citizens towards focusing on AQI and its challenges
Location	Reading, UK	New Delhi, India	Kyiv, Ukraine	Lagos, Nigeria

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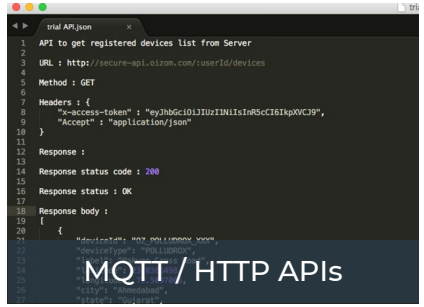
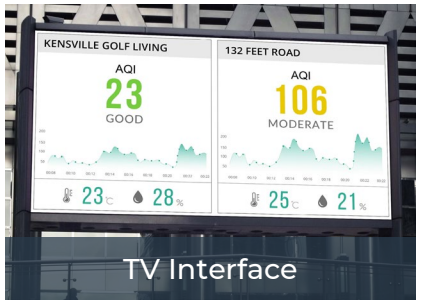
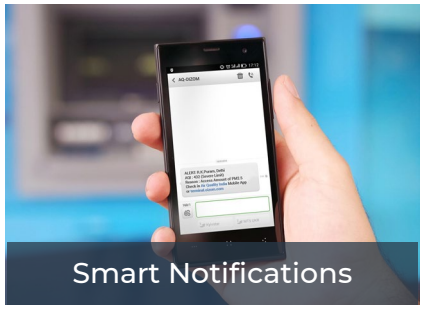
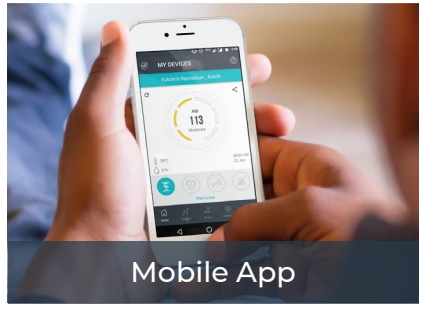
Data Accessibility & Visualization

- The accumulated data can be visualized and analyzed for optimal community engagement.
- Improved data accessibility empowers citizens to make informed decisions.
- Citizens can actively participate in efforts to mitigate air pollution challenges.









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Sky is the limit!

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STi Sonoma Technology

www.SonomaTech.com

Sonoma Technology

A Trusted Community Air Monitoring Partner

Air Quality | Community | Transportation | Climate | Emissions | Wildfire & Fuels | Forecasting

Booth #103

Helping Communities Address AQ problems

Question	Support Needs	Sonoma Technology Examples
1. Do we have air quality problems?	Monitoring, data mgt. & analysis	Maywood, CA
2. If so, what are the pollution sources?	Source apportionment, data eval.	Eden Park, DE
3. Are problems getting better or worse over time?	Data and trends analyses	Near-road (TPF)
4. Who is most exposed or at risk?	Monitoring/modeling, health risk	Fresno, CA (CHAPS)
5. What pesticides have been applied in my community?	Sampling and interactive community dashboard	San Joaquin Valley
6. How can the community assess progress?	Sensor use, real-time data access	Sacramento, CA
7. How do we educate and engage our community?	Outreach information, data access	Torrance, CA
8. How do we educate and engage our youth?	Curriculum, teacher training	Kids Making Sense

The following slides highlight common community needs

Environmental Justice (EJ) Monitoring, Source Apportionment, Emissions: Maywood, CA

- Source identification goal
- Continuous monitoring
  - $PM_{2.5}$, PM_{10}, black carbon
  - Particulate metals with Xact 625i
  - Wind speed/direction
  - Temp., relative humidity
- Filter samples for Cr-6
- 20-sensor (PurpleAir) network
  - Spatial understanding
  - Community engagement

Nearby sources

- I-710 freeway, east
- Rail lines and rail yard, north
- Arterials with heavy-duty diesel trucks
- Multiple industrial sources

Education: Kids Making Sense

Kids Making Sense® is an educational program to teach youth how to measure pollution using air quality sensors, to interpret the data they collect, and to take action to reduce emissions and air pollution exposure.

Air Quality Kits

Comprehensive classroom kits for grades 9-12

Sensor Loan Program

Sensors and a guide for a turn-key sensor loan program.

Ideal for libraries, science museums, and schools.

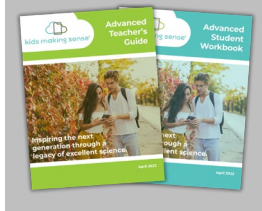
Build a Sensor Kits

Learn about the various components that make up a particle sensor, the purpose of each piece, and then build a complete sensor!

Other Items & Services

Teacher Training & Virtual Scientist Classroom Visits

Mobile PM Sensors



Advanced AQ curriculum

Curriculum Module Development

Some Recent Program Adopters:

- Blue Lake Rancheria
- Spokane Regional Clean Air Agency
- The Cleveland Division of Air Quality
- Strategic Energy Innovations
- Environmental Community Advocates of Galena Park
- Tree Fresno
- Kids Action Thru Science
- Newcastle University

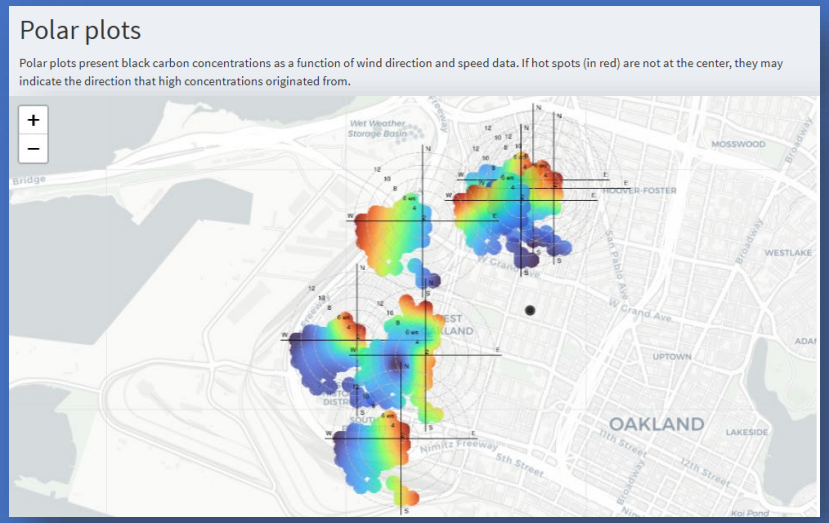
Interactive Dashboards

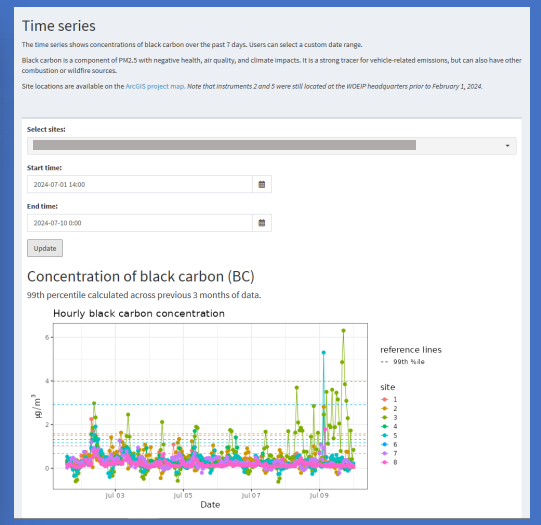
- Provide transparency, promote education, improve understanding, and encourage action
- Accessible to the public
  - Tooltips and help windows guide a user to take meaning from the data

Examples:

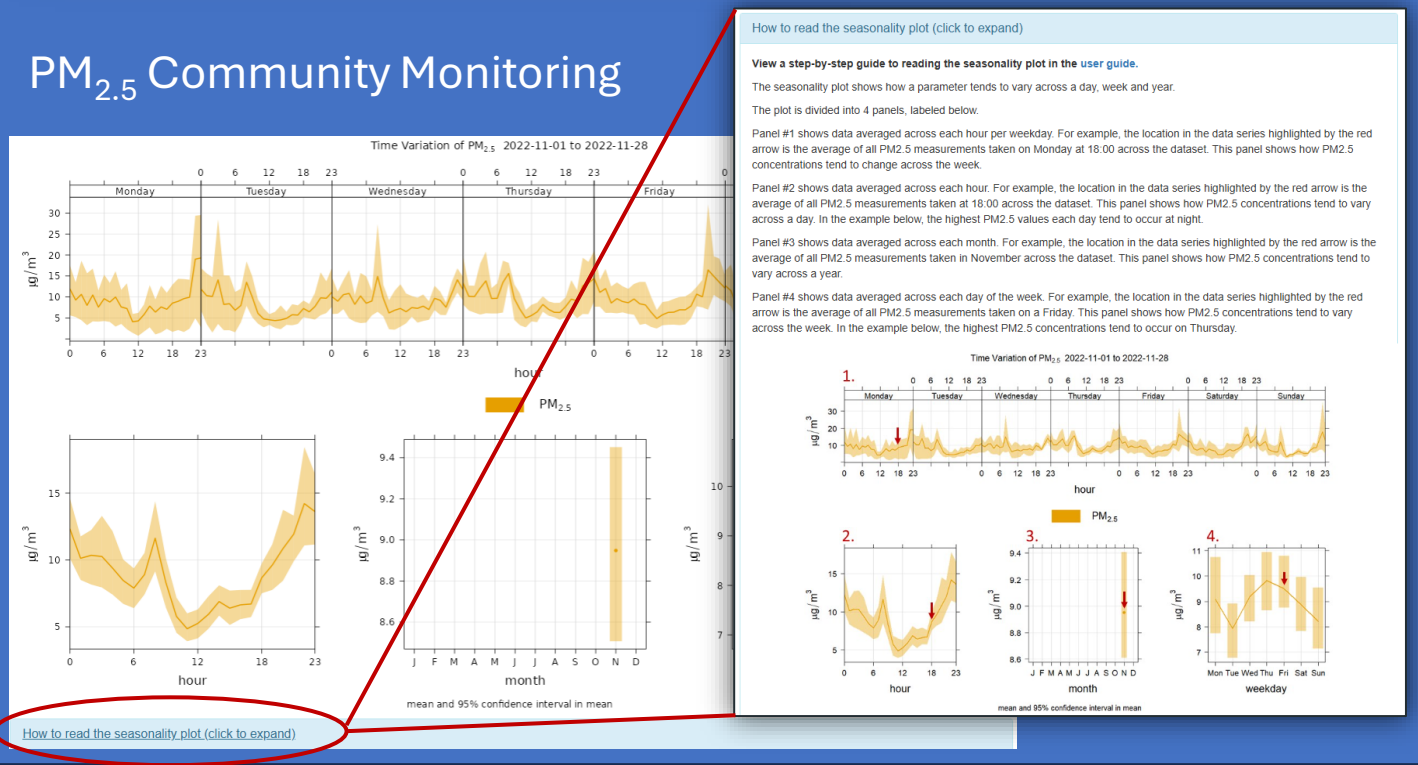
- Community group raised concern over unequally polluted neighborhoods
  - Established network of point monitors with a public dashboard to view recent measurements/insights
- Tribe in N. California concerned about effect of wildfires and residential woodburning on health
  - Assisted with installation of T640 and multiple PM sensors to measure local conditions, identify sources.

Black Carbon Community Monitoring





$PM_{2.5}$ Community Monitoring



SENSIT

INNOVATIVE DETECTION SOLUTIONS

NAAMC 2024 VENDOR SHOWCASE

SENSIT

INNOVATIVE DETECTION SOLUTIONS

- **Global supplier of gas detection technologies and solutions since 1980 to 40 countries**
- **Located in Valparaiso Indiana, with offices in Bolzano Italy and Ahmedabad India**
- **2 buildings in Valparaiso Indiana with Engineering, SMT, and assembly**
- **150+ associates globally**

Halma

ISO 9001:2015
Certified Company

COMMUNITY PRODUCTS

SENSIT®
SPOD

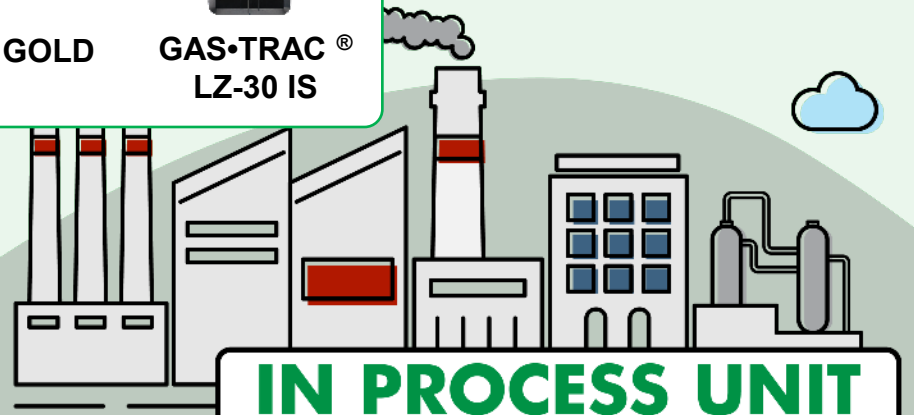
SENSIT® RAMP

AT-SOURCE PRODUCTS

SENSIT® SPOD
C1D2

SENSIT® GOLD
G3

GAS•TRAC ®
LZ-30 IS

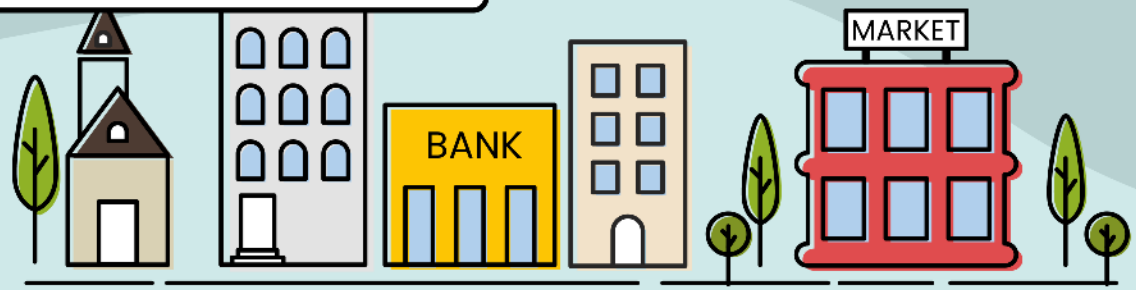


IN PROCESS UNIT
EMISSION SOURCE
[High Concentration, faster source signal]

ATMOSPHERIC DISPERSION

FENCELINE

IN COMMUNITY
Lower concentration, slower source signal



FENCELINE / NEAR SOURCE

GAS•TRAC
® FMD

SENSIT®
SPOD

SENSIT®
RAMP

Anatomy of SENSIT

Environmental Monitors

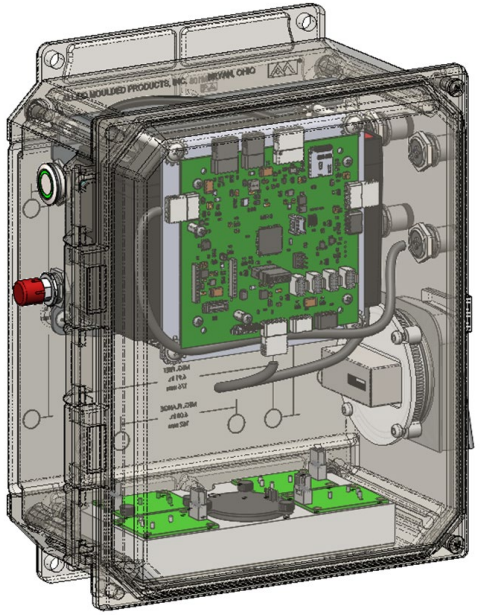
WEATHER STATION

For localization.
Options include:
[2D Ultrasonic, 3D Ultrasonic, Rotary Vane]

TELEMETRY

Customizable
Options include:
[2G/3G/4G, Xbee, WIFI, LoRa]

Local Wired Solutions Available



Auxiliary Ports

Expansion of the system
Options include:

- CVC Canister Triggering
- Additional Sensors
- Auxiliary battery pack

SENSORS

SPOD | PID / MOS

RAMP | Choice of 5 gases + PM

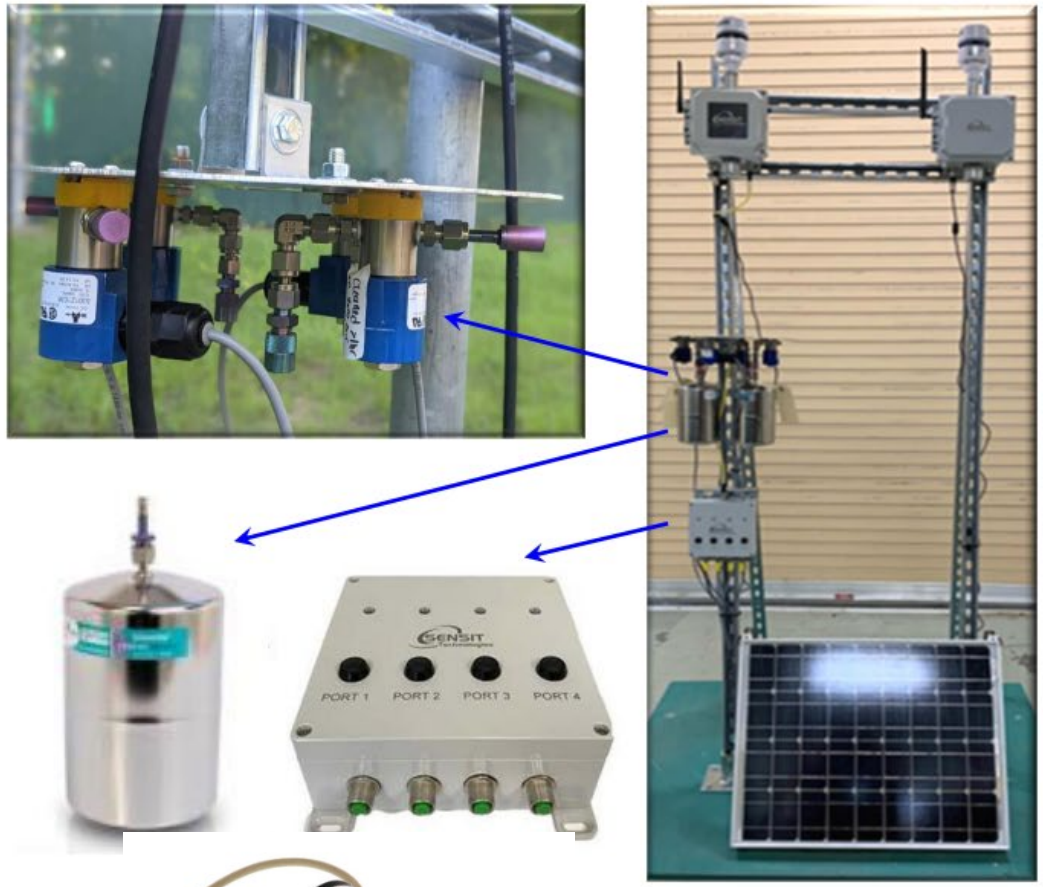
FMD | Methane (sub-PPM)

CANISTER USAGE (ALL DEVICES)

EPA United States Environmental Protection Agency

Canister Grab Samples

- SPods can automatically trigger a canister grab sample
- User-defined VOC trigger thresholds or triggered by wind sector
- We use “mini-cans” for the grab samples (easy to ship)
- Canisters analyzed in the Laboratory (e.g., TO-15 Method)
- Speciated VOC data can be compared to PID response factors to calibrate plume response



Entech Instruments® Isolatch Valve

SENTINEL: A Quality Assurance Application for Sensors EPA Tools and Resources Webinar: Sensor Pod (SPod) - An Approach for VOC Fenceline Monitoring and Data Analysis

SENSIT INNOVATIVE DETECTION SOLUTIONS

GAS•TRAC® FMD

SENSIT® SPOD

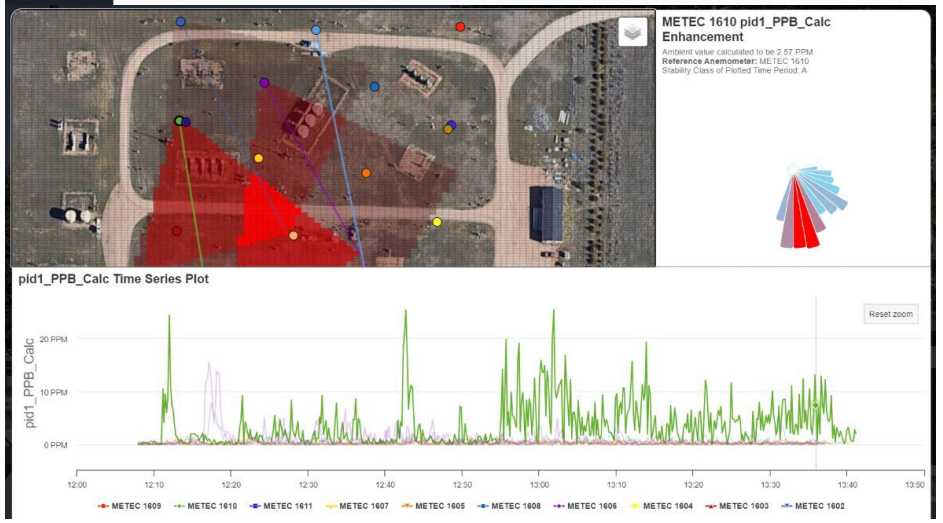
SENSIT® RAMP

SENSIT® CONNECT

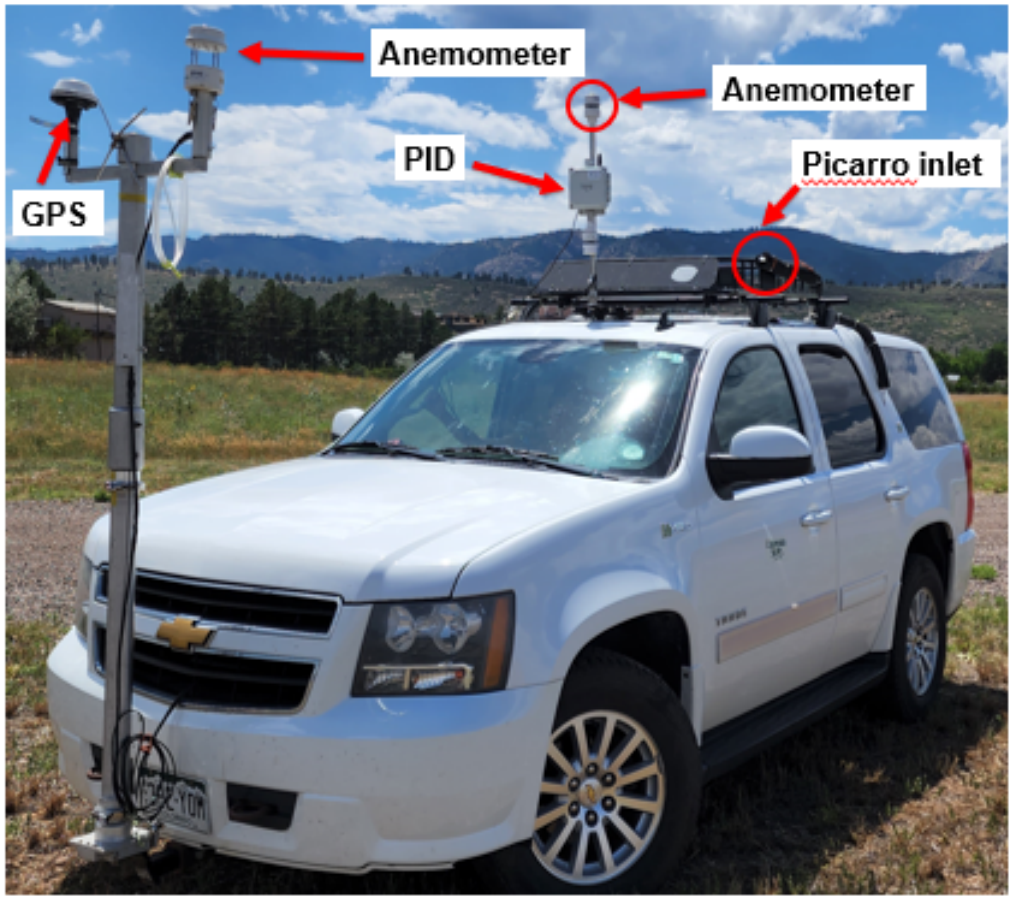
DATA STORAGE, MANAGES DEVICES/USERS
SIMPLE TIME SERIES PLOTTING
CUSTOM DASHBOARD DEVELOPMENT
EXTERNAL ACCESS VIA API

OPEN DATA MODEL

- **Customer controls where devices send data**
- **Customer decides what cellular plan to use**
- **DEVICES CAN BE OPERATED WITH NO RECURRING FEES OR MONTHLY SUBSCRIPTION TO SENSIT**



MOBILE MONITORING



Viability of Using a Photoionization Detector for Mobile Volatile Organic Compounds (VOCs) Monitoring - Poster

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[1]Iowa State University, [2]Colorado State University

Mobile PID data allows for VOC "mapping" at a fine spatial scale.

Fig. 2: This figure shows the domain over which we conducted mobile measurements near the cabinet factory in Timnath, CO, on July 26th, 2022. The shaded circles represent the VOC concentration (in ppbv of isobutylene equivalent) distributed spatially within this domain. The red star marks the location of the factory, and the red arrow shows the prevailing wind direction at the time the VOC peak was observed.

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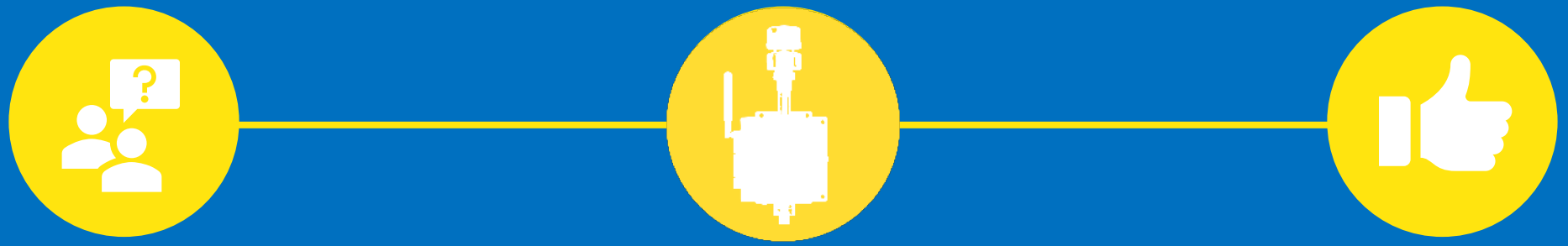

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Break

10:50 – 11:00 AM