

**STATE OF RHODE ISLAND DEPARTMENT OF  
ENVIRONMENTAL MANAGEMENT  
OFFICE OF AIR RESOURCES**

**Rhode Island 2024 Annual Monitoring Network Plan**

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## Acronyms and Abbreviations

AIRS-AQS	Aerometric Information Retrieval System - Air Quality System
AQI	Air Quality Index
BAM	Beta Attenuation Monitor
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DEM	Department of Environmental Management (RI)
DOH	Department of Health (RI)
EIS	Emissions Inventory System
EMP	Enhanced Monitoring Plan
EPA	Environmental Protection Agency
FEM	Federal equivalent method
FRM	Federal reference method
GC	Gas chromatograph
HAPs	Hazardous air pollutants
MADEP	Massachusetts Department of Environmental Protection
MDL	Method detection limit
MSA	Metropolitan statistical area
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trends Station
NCORE	National Core Multi-pollutant Monitoring Station
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
OAQPS	Office of Air Quality Planning and Standards
ORD	Office of Research and Development
OTR	Ozone Transport Region
PAMS	Photochemical Assessment Monitoring Stations
PAH	Polycyclic Aromatic Hydrocarbon
PM <sub>10</sub>	Particulate matter < 10 microns
PM <sub>2.5</sub>	Particulate matter < 2.5 microns
QAPP	Quality assurance project plan
O <sub>3</sub>	Ozone
SIPs	State implementation plans
SLAMS	State and Local Air Monitoring Station
SOP	Standard operating procedure
SO <sub>2</sub>	Sulfur dioxide
STN	Speciation Trends Network
SVOC	Semi-Volatile Compound
VOC	Volatile Organic Compound

## **Introduction and Regulatory Background**

This document will serve as Rhode Island's 2023 Annual Monitoring Network Plan, prepared by the Rhode Island Department of Environmental Management, in accordance with Section 58.10 (a) of Title 40 of the Code of Federal Regulations (40 CFR 58.10(a)), which requires states to submit a monitoring network plan to the United States Environmental Protection Agency (EPA) in July of each year. The plan provides a description of the state's current monitoring network, demonstrates that the network conforms to EPA requirements, and discusses any plans to remove or move a monitoring station in the 18 months following the plan submittal. The Annual Monitoring Network Plan must be posted for public comment 30 days prior to submittal to the EPA. Note, Rhode Island's 5- Year Network Assessment was submitted to EPA on July 24, 2020.

### **Port of Providence**

RIDEM submitted a grant application for a 2020 Community-Scale Air Toxics Monitoring Grant (EPA-OAR-OAQPS-20-05), which was awarded in August 2020 by EPA. The full scale of the project, which began in June 2021, aimed to characterize air toxic emissions near the Port of Providence. Populations near the Port of Providence include surrounding environmental justice areas, residences, schools, businesses, and hospitals. Air quality near the Port is impacted by air pollution generated from diesel trucks, marine vessels, oil and gas storage and distribution, asphalt and cement processing, metals recycling, natural gas and utility service, and large heating plants.

To best capture emissions from port-related activities five monitoring locations were selected around the Port based on proximity to the Port and prevailing wind directions. The original Providence sites selected included 455 Wickenden (Vartan Gregorian School), 89 Washington Ave (neighborhood site), and 200 Terminal Rd (in Port possible highest emission site), and 695 Eddy Street. An East Providence location was selected at 525 Veterans Memorial Parkway. However, due to tampering issues at the Vartan site and the Washington Ave site those sites were relocated to Ohio Avenue (neighborhood site) and 25 India Street (Seastreak Ferry Terminal) respectively, leaving the following as the final monitoring locations

**Table 1: Community Scale Monitoring Locations**

<b>SITE</b>	<b>Address</b>	<b>MONITORING OBJECTIVE</b>	<b>PARAMETERS</b>
<b>Providence Community Health Center</b>	695 Eddy Street Providence	Upwind of I-95 and near industrialized portion of Allens Ave in medical district	Low-cost PM 2.5/NO <sub>2</sub> Meteorology VOC 1 in 6
<b>Providence Animal Shelter</b>	200 Terminal Road Providence	Centrally located near the center of Port, heavy truck traffic, industrialized	Low-cost PM 2.5/NO <sub>2</sub> Meteorology VOC 1 in 6
<b>Seastreak Ferry Terminal</b>	25 India Street Providence	Northern edge of Narragansett Bay, downwind of Port (on prevailing W/SW flow)	Low-cost PM 2.5/NO <sub>2</sub> VOC 1 in 6
<b>Residential</b>	215 Ohio Avenue Providence	Population Exposure in Washington Park	Low-cost PM 2.5/NO <sub>2</sub> VOC 1 in 6
<b>SUEZ Pump Station</b>	525 Veterans Memorial Parkway East Providence	East Bay with possible impacts downwind of the Port	Low-cost PM 2.5/NO <sub>2</sub> Meteorology VOC 1 in 6

**MONITORING EQUIPMENT**

***PM2.5/NO<sub>2</sub>***

Clarity Node-S air sensors were selected for monitoring PM2.5 and NO<sub>2</sub>. The units are self-powered, weatherproof, and contain cellular modems to push continuous data to their custom interface showing real time data with data downloads. The PM2.5 data has been shown to correlate acceptably with FRM/FEM data after applying correction factors. Prior to deployment, RIDEM collocated all five Clarity units to our Near Road location on Park/Hayes Street Providence for approximately 30 days during Oct 2020. This time allowed Clarity staff to analyze the data and create custom correction factors for each unit using the Near Road BAM PM2.5, temperature, and relative humidity.

The Clarity Node-S units were all deployed the same day on 11/20/20.

- RIDEM was able to achieve 2 years of data capture for the Clarity-Nodes through November 2022.
- The contract for the Clarity Nodes ended November 2022.

- RIDEM still has possession of the hardware, but the subscriptions to cellular modems have been discontinued.
- As noted above, due to logistical challenges, 2 sites had to be moved mid-study.
- A Clarity monitor failed at Vartan on July 25, 2021 due to clogged intake and was replaced after the move to Sea Streak on October 19, 2021.
- A Clarity at Ohio Ave failed on September 26, 2022 due to clogged intake. The unit was not replaced before end of study, as there was a wait for new equipment which would have gone beyond the end of the study.

Upon ending the Clarity Node-S field monitoring, RIDEM staff met with Clarity techs to discuss the data set. Clarity staff evaluated the PM2.5 data and determined the data for the monitoring period was stable and no longer needed any calibration or collocation. Clarity did recommend performing a collocation of the sensors to FRM/FEM equipment at Near Road for purposes of NO<sub>2</sub> data. The sensors were deployed on the week of 1/19/23. The calibrated NO<sub>x</sub> data did not correlate well with FEM/FRM data and had other problems with diurnal cycles, making it unusable for purposes of this study.

### ***Meteorological Equipment***

For meteorological equipment, Rainwise MK4-C units were selected for use at three locations, Providence Animal Shelter, Suez, and the Providence Community Health Center. Rainwise equipment was deployed from June 2021 through October 2022. The parameters measured included temperature, dewpoint, wind direction, wind speed, wind gusts, and barometric pressure. Like Clarity Node-S, the Rainwise data was pushed by a cellular modem to an interface with real time and downloadable data capability. The data was evaluated for quality and downloaded weekly from the online database.

The Rainwise equipment also experienced technical problems including:

- Lost Rainwise communication at Animal Shelter on January 26, 2022 – repaired by February 24, 2022
- Lost Rainwise communication at Suez on January 19, 2022 – repaired by February 16, 2022

### ***VOC Monitoring Equipment***

Five monitoring shelters were deployed to house Xonteck Model 910 VOC samplers. 24-hour VOC samples were collected at each site every 6th day according to the monitoring schedules at the existing NATTS and NCore sites. Sampling began on June 3, 2021, with a focus on volatile organic compounds, benzene and 1,3 butadiene found in diesel exhaust and petroleum products. VOC samples are obtained every sixth day on the same schedule and method as PAMs VOC sampling using Method TO-15A by the Air Pollution Laboratory using an Agilent GC/MS. The same parameters measured at the NATTS and NCore sites will be evaluated for the study for



comparison to the permanent site data in the analysis. VOC sampling ending October 2022. See Table 12 for the full listing of targeted compounds.

The new GC was installed on June 23, 2021, with the Entech preconcentrator being upgraded July 21-23, 2021. There were issues tuning the new instrument including communication issues, software problems, and the need for reinstallation of a computer. The system was officially calibrated on July 27, 2021, with the first cans run on the system on July 28, 2021.

In addition to issues with the GC/MS, the VOC equipment itself was not without problems. The fleet of Xonteck samplers consisted of previously owned and newly purchased units through the grant. The purchase of the new units was complicated by the pandemic, lack of communication with the Xonteck staff, and issues with the new equipment upon delivery resulting in major delays in getting the new units. Once received, some of the new units showed toluene contamination, poorly installed and loose-fitting parts, and issues requiring the APL to return to the manufacturer.

Additionally, there were some issues of data capture in the field. The operator witnessed missed or failed runs due to power failures, flow rate issues, or low final pressure in canisters. The RIDOH Air Pollution Laboratory has processed all the data, and it's been delivered to NESCAUM staff to begin analysis.

### ***Community Outreach Activities***

Presentations on this project were conducted on the following dates for the following audiences.

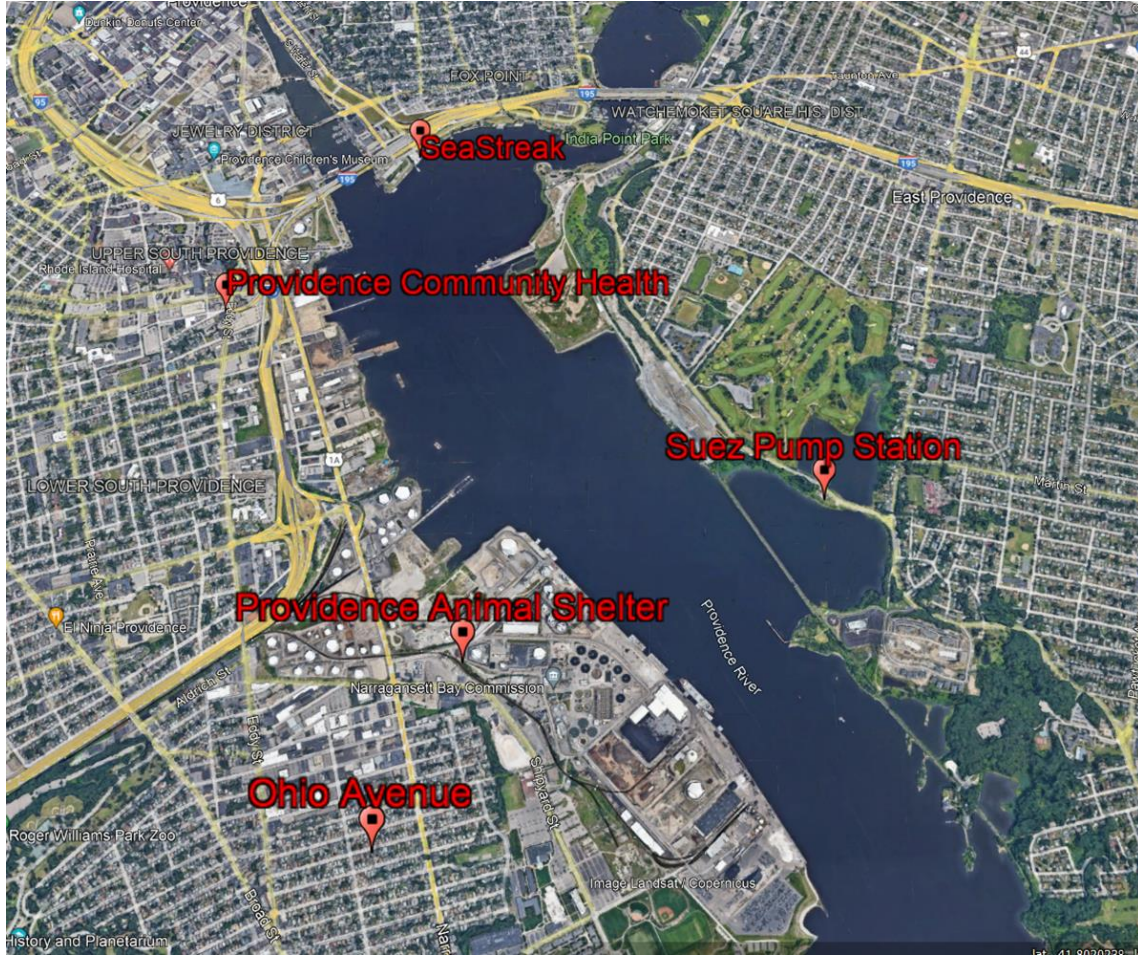
- Port Community Working Group – 8/18/2022
- Port Community Working Group – 12/7/2022
- Port Air Quality Monitoring Kickoff Group – 2/8/2023
- Port Community Working Group – Project Update 11/30/2023
- Port Community Working Group – **Final Report Presentation** (virtual) – 5/1/2024
- Port Community Working Group – **Final Report Presentation** (In person) - 5/20/2024

Direct contact was made during the planning phases and during the project, with updates on the to a variety of stakeholders, and to get input and support for further monitoring initiatives based on preliminary data collected. As a result of communication with stakeholders and community members a specific Air Quality Monitoring working group to discuss this project and other air quality issues surrounding the Port of Providence and the city was formed for the project kickoff, with a Zoom meeting on 2/8/23 and included community members, NGOs, a variety of staff from RIDEM, RIDOH, and Brown University.

A website specific to this project went live at the start of the study. The site describes the project background, has an interactive map of Port emission sources, links to emissions inventory data, and mapped real time PM 2.5 data while the Clarity Node-S units were operating. The Clarity

Nodes stopped running operationally at the end of the study.  
<http://www.dem.ri.gov/programs/air/port-providence.php>

**Figure 1: Community Scale Monitoring Locations**



**Additional Port Activities**

The comprehensive study also includes a survey of all sources in the area for chemical and fuel use and compliance inspections at all facilities located in the Port area. The strategy also includes routine staff odor checks, compliance inspections, and a regular presence in the Port of Providence by inspectors. In total, 45 source inspections have been conducted in the Port of Providence since the Fall of 2021.

A joint mobile monitoring effort with RIDEM and led by EPA, included the use of a DART (data acquisition in real time) mobile monitoring system, which measured TVOC and meteorology from September 13-17, 2021, around the state of Rhode Island, with a focus on the Port. Additionally,

a more robust monitoring effort using a GMAP mobile monitoring platform was conducted September 27-29, again statewide, but with a focus on the Port. Both projects provided information on emission sources around the Port, and informed future compliance inspections and planning for future monitoring. The DART platform was once again deployed around the Port of Providence on Monday, June 3, 2024.

The Final Report was completed during December 2023 and has been presented publicly twice as of this report.

***The full report is posted and available at the following link:***

<https://dem.ri.gov/sites/g/files/xkgbur861/files/2024-03/community-scale-report-2020.pdf>

### **Future Monitoring Plans in the Port of Providence and other Community Monitoring**

RIDEM currently has four different funding sources for monitoring activities not only focusing on the Port of Providence, but other locations around the state where there are monitoring needs. RIDEM Office of Air Resources, as part of a Clean Air Act Grant of the Inflation Reduction Act, is receiving direct award funding. OAR is set to receive some Congressionally Directed Spending specific for monitoring in Environmental Justice Areas in Rhode Island. OAR may also be in position to be awarded a small amount of money by EPA for low-cost sensors, as part of the Inflation Reduction Act (IRA) of 2022, Air Quality Sensor Grants §60105(c). EPA has also recently awarded RIDEM IRA funding for Air Monitoring to update existing monitoring infrastructure, but also includes new permanent monitoring efforts, which are in the early planning stages of an Environmental Justice area in Woonsocket as part of the Inflation Reduction Act of 2022 (IRA), Air Monitoring Direct Award §60105(a)and (b).

Although not related directly to air quality monitoring, RIDEM has been in contact with Create Lab, out of Carnegie Mellon University to expand the Smell My City odor smartphone application specific to Rhode Island and Providence. The application allows citizens to report odor complaints with the possibility of additional details and functions, such as notifying RIDEM of the complaint.

Tentative workplans are still in early development for each specific pool of money. However, the general monitoring plans are listed below.

### **Volatile Organic Compounds**

NESCAUM assisted RIDEM in preparing the study's final report for the monitoring project. In summary, there was found elevated levels of several toxic volatile organic compounds (VOCs), including benzene, 1,3-butadiene, and naphthalene, at a site on the Port property. Concentrations of some VOCs in nearby neighborhoods were somewhat higher than at sites farther from the Port.

With evidence of elevated VOCs in some of the 24-hr samples around the Port, there is still a need for additional monitoring to better characterize air quality in the Port. The VOC sampling only provides 24-hour samples once every six days. For samples with elevated VOCs, it's very difficult to determine the timing of the elevated VOC (short lived spike versus continuously elevated readings) and any possible source, as winds often change frequently during a 24-hour period. Additionally, the lag time between the collected sample and processing can be many weeks, even months, as processing VOC samples is labor intensive.

As part of a continuing effort to characterize air quality around the Port of Providence, RIDEM is looking to deploy real time monitoring and sampling of VOCs. There are numerous sources of VOCs around the Port, along with historical odor issues.

The list below is the monitoring objectives for VOCs:

1. Screening level real-time total VOCs (tVOCs) using Sensit Technologies SPOD VOC Monitoring system (SPOD).
2. Screening level wind speed and direction (ultrasonic anemometer) which is incorporated into the SPOD system.
3. Summa cannister VOC grab samples will be taken when the SPOD eclipses a set tVOC threshold. This threshold and length of sample can be programmed and set by the user.

With the fixed tVOC monitoring, the objective is to establish baseline real time monitoring information for the Animal Shelter location. Using that information, the RIDEM may be able to establish a tVOC concentration threshold at which point the system can activate a Summa cannister for a grab sample. The samples will be analyzed by the RIDOH Air Pollution Laboratory (Lab) using gas chromatograph mass spectrometry equipment with EPA Method TO-15 to determine species and concentration. This type of speciated VOC information provides limited information in determining health impacts but may be helpful in determining the species and source of elevated VOCs at a specific time, especially when paired with wind data. Historically, the VOC samples the Lab analyzes with Summa cannisters are taken 24-hour period. During that length of time, it's nearly impossible to determine when a high VOC reading may have occurred. Additionally, Rhode Island has a dynamic wind environment due to its proximity to Narragansett Bay, the Atlantic Ocean, and being in Northern Latitudes with often rapidly shifting weather patterns. The wind can shift quite frequently over a 24-hour period and with diurnal cycles, so determining where a high concentration may have originated from is often impossible. And lastly, with only 1 in 6 day sampling, elevated VOC events that did not occur on sampling days would be missed. It's anticipated at this time, the Summa samples will be taken for a 1-hour duration. The East Providence NCORE/PAMs site has been using an Auto GC to take hourly VOC readings since 2017 seasonally, during the months of June, July, and August. Therefore, there is some comparative data for the 1-hour SPOD grab samples.

This equipment has the potential for real time readings, which can be displayed on a public website.

The primary site for tVOC monitoring will be the Providence Animal Shelter, 200 Terminal Rd, Providence, which was also used during the previous Community Scale monitoring study. This site is located on a heavily truck trafficked Terminal Road, and about 800 feet from also heavily truck tracked Allen's Avenue. There is also a density of point sources to the west, north, east, and southeast including bulk petroleum storage, chemical storage, wastewater treatment, and other miscellaneous sources. The site is roughly centered in the southern portion of Port industrial activities, allows reliable power, security of equipment, and access. It is anticipated several other sites will be considered surrounding the Port of Providence to capture tVOC on a variety of wind directions and situations.

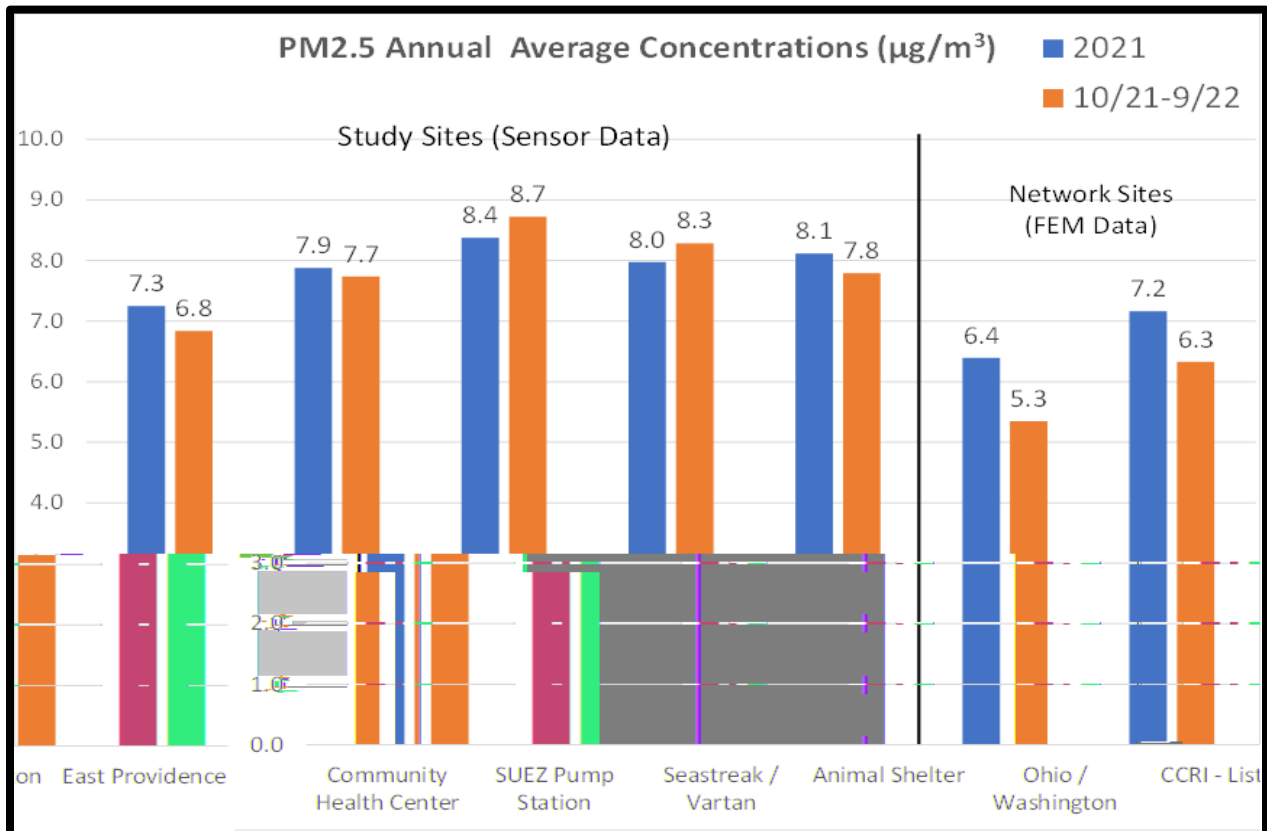
Note, the equipment being proposed has been used in very limited capacity for community ambient air monitoring and has been primarily used with fence line monitoring projects with much larger oil and gas facilities associated with refineries, with much larger emissions.

**RIDEM hopes to make informed decisions of a possible sources of pollution, to support compliance actions to find fugitive emissions sources for correction, to find possible new or previously unknown emission sources, with the ultimate goal of correcting problems and reducing exposures of potentially harmful air quality.**

### **Particulate Monitoring**

Fine particle data from the Port study was not drastically different from our permanent monitoring locations nearby. Per Figure XX below, the average concentrations of Clarity PM 2.5 data (left) was higher than our FEM data (right). However, lower cost equipment typically shown to have a high bias, which is why the data required correction factors.

**Figure 2: Annual PM 2.5 Average Concentrations**



But there is value in having mid-tier cost particulate monitoring to establish baselines and provide ongoing forward facing data real time to the community. It is anticipated screening level  $\text{PM}_{1.0}$ ,  $\text{PM}_{2.5}$ , and  $\text{PM}_{10}$  will be conducted using low-cost sensors. Monitoring is currently planned at Animal Shelter and at a heavily trafficked location along Allens Avenue, and possibly one other location downwind of the Port (specific sites to be determined).

The new equipment will need to be able to provide a quality reading of  $\text{PM}_{10}$ , which historically, many of the low-cost sensors on the market have been unable to provide a reliable reading which correlates well with reference monitors. There are concerns of coarser particles and dust from many of the industrial operations, truck traffic, and materials storage along Allens Avenue and there is value in characterizing that size particle.

### **Particulate Monitoring – Purple Air**

Following the historic smoke events experienced during June 2023, the Purple Air network was a valuable to track smoke plumes on a more granular spatial scale. There were days smoke was most often highest along coastal RI. Additionally, the Purple Air map revealed there were some

monitoring gaps in both the northwest and extreme southern coastal portions of the state that could be of value in tracking, predicting, and monitoring smoke plumes from wildfire smoke events. Although this most recent event was historic and rare, it was very impactful and RIDEM would be able to fill these spatial gaps at very little cost.

During 2023, the Northeast US experienced several days of poor air quality from significant Canadian wildfire smoke. Although not completely unprecedented, the number of days and duration of the 2023 event was significant, as was the acreage burned in Canada.

At this point, we are assuming that the current public Purple Air monitors on the current public site, but operated by private homeowners remain public on the following map:

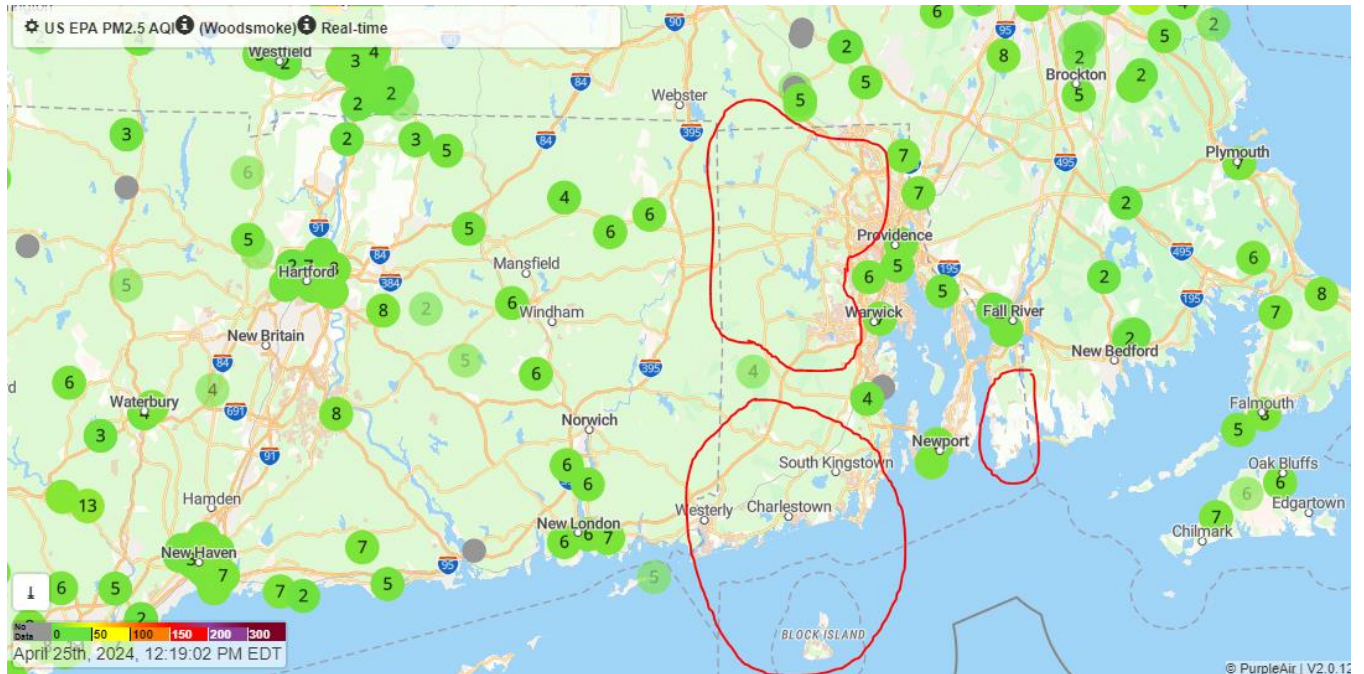
<https://map.purpleair.com/1/m/i/mPM25/a60/p0/cC6#8/41.725/-72.032>

However, if any of these privately operated Purple Air monitors come offline, RIDEM may elect to replace in a nearby location to be determined. See the list for possible sites and locations on Table 2.

With a fleet of low-cost sensors, we intend to have several available for public loan for special situations when and where monitoring may be valuable, and we intend to have sensors available for citizen science and educational purposes. It is also hoped to have added coverage around Providence's urban core, where more community monitoring has been specifically requested by residents.

**Deploying Purple Air monitors is reliant upon a dedicated outdoor power source and wifi.**

**Figure 3: Purple Air Monitoring Locations and Gaps (red)**



**Table 2: Potential Purple Air Locations**

TOWN/CITY	POSSIBLE LOCATIONS
Westerly	Westerly Public Library
Charlestown	Cross Mills Public Library
Block Island	Block Island Free Library
Richmond	Clark Memorial Library
Little Compton	Brownell Library
Coventry	Coventry Public Library
Western Coventry	Green Public Library
Smithfield	Douglas and Judith Krupp Library (Bryant)
Burrillville	Jessie M Smith Memorial Library
Foster	Public Library
Providence	Washington Park Library – Broad Street
Providence	South Providence Library – Praire Avenue
Providence	Knight Memorial Library – Elmwood Avenue
Cranston	William Hall Library – Broad Street
East Providence	Weaver Library – Grove Avenue
West Warwick	Public Library – Main Street
Newport	Newport Public Library – Spring Street
Pawtucket	Public Library – Summer Street



## **Portable and Handheld Equipment**

RIDEM OAR is also looking to supplement the fixed monitoring equipment with portable handheld monitoring equipment to be deployed during field inspections to support compliance work. Elevated VOCs detected on the SPOD could be further investigated along with specific odor complaints. Handheld equipment will be incorporated during compliance inspections, for screening and canvassing industrialized portions of the state, and compliance investigations. The areas of interest could include asphalt plants, petroleum storage, chemical storage, crematories, and any other source of interest in the Port of Providence, other Environmental Justice areas in Rhode Island, or other possible problematic facilities statewide. For the Port of Providence specifically, the objective is to pair both fixed air quality monitoring where there may be a lack of information with more portable/mobile handheld equipment that can cover much larger spatial scales.

It is proposed the following handheld monitoring equipment will be employed.

### **Teledyne FLIR Camera – Optical Gas Imaging**

RIDEM field staff have partnered in the field with EPA using optical gas imaging (OGI) and EPA's Teledyne FLIR Gx320 camera with their enforcement staff. The FLIR camera uses optical gas imaging technology for detecting and visualizing VOC emissions from emissions sources. This tool allows survey capabilities on a large scale and real time. The camera can visualize leaks, and detect fugitive emission, often without stepping foot on facility property and from a safe distance. The camera has been proven to visualize VOC emissions from stacks, bulk petroleum tanks, piping and fittings, loading racks, and many other applications.

The real time capability of the equipment allows for possible real time communication of the problem to the facility along with visualization of the issue. The newer FLIR Gx320 is advertised to not only detect and visualize hydrocarbons and number of species, but also may provide estimates of concentrations.

This camera would be used with several objectives in mind.

- To be used as part of routine compliance inspections at Title V Sources, Synthetic Minors, Miscellaneous Minor sources to detect fugitive emissions.
- To be used in following up of citizen odor complaints at facilities nearby the complaint.
- To be used during routine field screenings by OAR inspectors around known emissions sources, sources of odor, and problematic facilities.
- To be deployed following elevated tVOC readings from specific wind directions from the SPOD system for investigation.

The GX Series FLIR cameras have three different sensitivity modes, each with its own application. For a full list of gases the G-series camera can detect.

<https://www.flir.com/globalassets/industrial/instruments/ogi/full-oil-gas-matrix-download.pdf>

### **Ionscience Tiger XT Handheld VOC Detector**

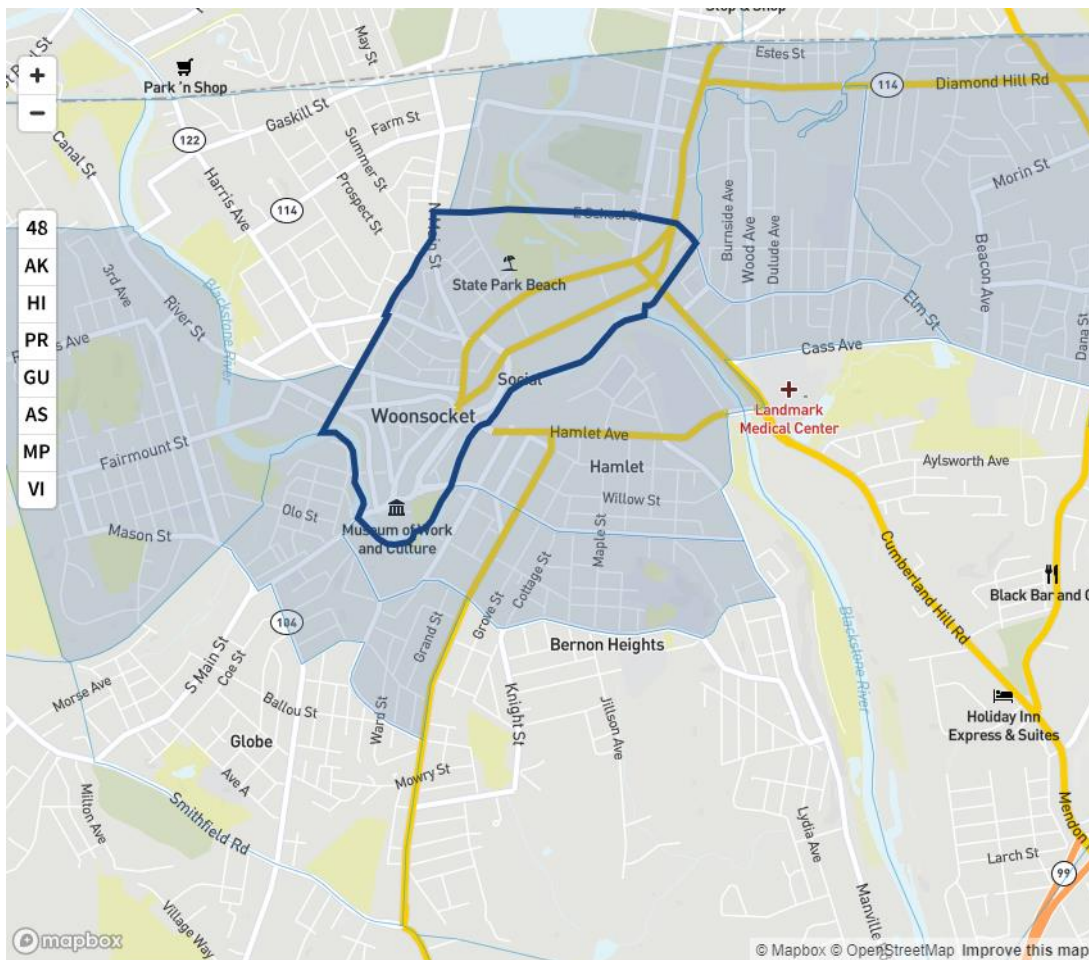
Using photoionization detection (PID), this handheld device had the capability to accurately detect gases down to 1 part per billion (ppb) with a 2 second respond time. The system is advertised to detect nearly 750 different VOCs and toxic compounds.

This unit would provide additional information for field staff for VOC concentrations at breathing level at facility fence-lines, responding to odor complaints, and on facility inspections in an easy-to-use handheld package. The Tiger could also be used for canvassing tVOC spikes in neighborhoods to find undocumented VOC sources. Information is presented real time on an LCD screen, but also can be downloaded and graphed on a laptop using a provided interface. The units also have some capabilities to speciate VOC for further details on emission sources and the nature of the pollutants.

### **NEW Monitoring Site**

In supporting the Justice40 initiative, an investment will be made in upgrading and modernizing air monitoring equipment at all permanent network monitoring sites in Rhode Island. The upgraded equipment will lower the amount or disruptions in monitoring due to downtime from our current aging equipment. Consistent monitoring will help us to identify and address potential air pollution issues.

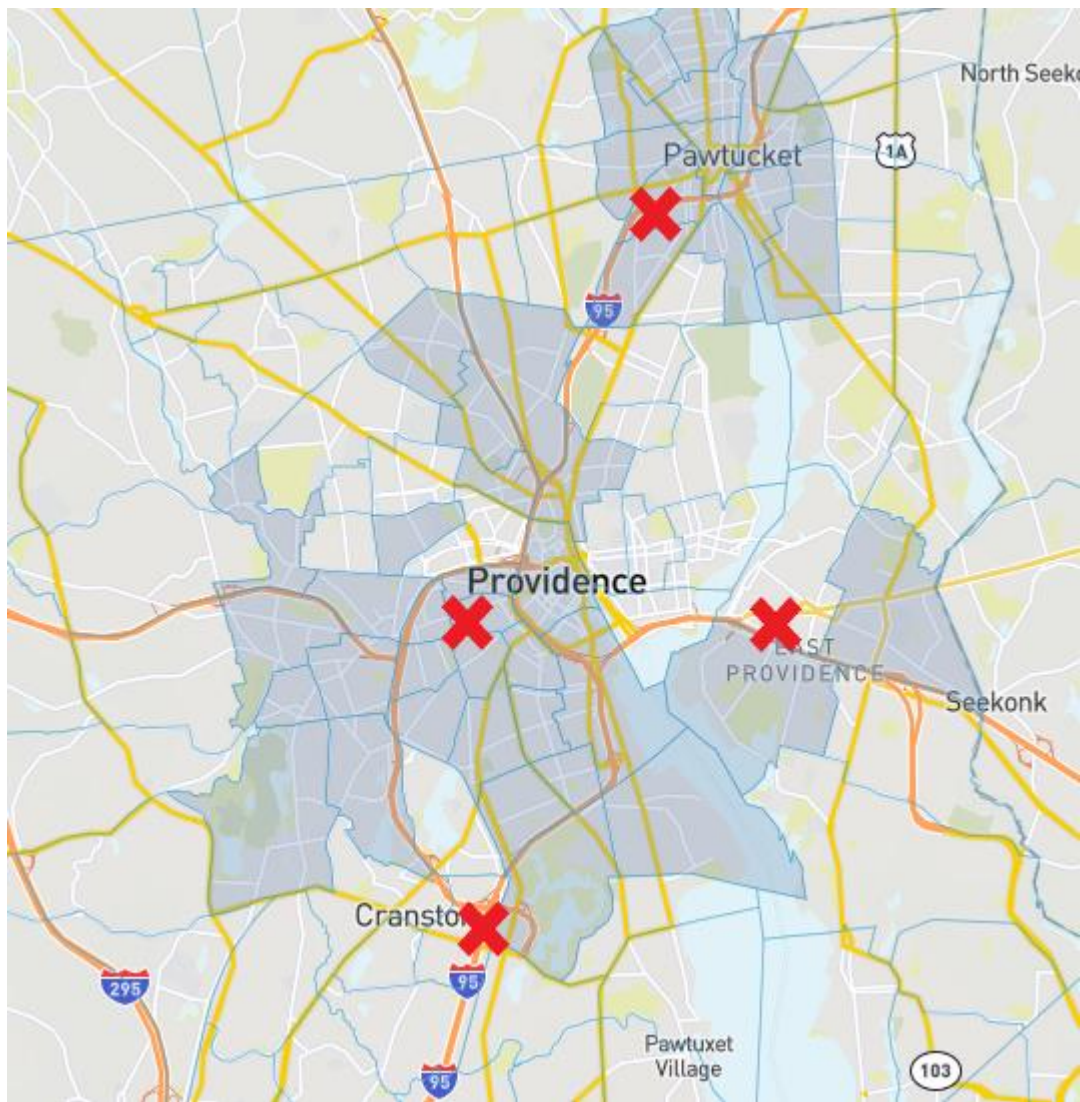
Although it's dependent on the funding source mentioned, and very early in the planning stages, RIDEM intends to build a new multipollutant site in Woonsocket. The site will be in one of the disadvantaged census tracts in the Woonsocket area. There are several census tracts in Woonsocket considered disadvantaged meeting more than one burden thresholds and the associated socioeconomic threshold. We will further investigate these areas to determine which sites will be best suited for air monitoring and provide us with useful data for analysis that can be us for policy and decision making.



**Figure 4: Woonsocket Census Tracts Identified as Overburdened and Underserved (Climate and Economic Justice Screening Tool)**

It is initially planned to monitor for PM 2.5 using a BAM, and VOCs using a Xontech sampler (Method TO-15).

In addition to the new multipollutant site, the funding will be used to purchase new equipment across all our permanent monitoring sites. Vernon St, Near Rd, CCRI and East Providence are all indicated on the CEJST MAP below (red X) and all fall within areas of the map highlighted as disadvantaged areas. Investing in these air monitoring sites assures sustainability of the monitoring programs for future generations.



**Figure 5: Location of Current Monitoring Sites in or near Disadvantaged Census Tracts (Climate and Economic Justice Screening Tool)**

### **Rhode Island Monitoring Network**

The Rhode Island Department of Environmental Management (RIDEM), in conjunction with the Rhode Island Department of Health (RIDOH), operate a network of air monitoring stations to measure ambient concentrations of pollutants for which the EPA has established a National Ambient Air Quality Standard (NAAQS). Those pollutants, which are known as criteria pollutants, include ozone (O<sub>3</sub>), particulate matter smaller than 10 microns (PM<sub>10</sub>), particulate matter smaller than 2.5 microns (PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO) and lead. The criteria pollutant monitoring sites are part of the EPA’s State or Local Air Monitoring Stations network (SLAMS).

In addition, RIDEM and RIDOH monitor ambient levels of toxic air pollutants and ozone precursors, which are compounds that react in the atmosphere to form ground-level ozone. The State operates one monitoring site that is part of the National Air Toxics Trends Sites (NATTS) network (CCRI), one that is part of the Photochemical Assessment Monitoring Stations (PAMS) network (East Providence), one that is part of the PM<sub>2.5</sub> Speciation Trends Network (STN), and one that is part of the network of core multipollutant monitoring stations (NCORE).

Table 1 summarizes the NAAQS and Table 2 and 3 list the locations of the six air monitoring sites operating in the State in 2021 and operate currently, along with the parameters monitored and methods. The locations of those sites are shown in Figure 15. These sites have been approved by EPA Region 1 as meeting applicable siting criteria, as specified in Subpart B of 40 CFR Part 58. All criteria pollutants are monitored, as required in the CFR, using Federal Reference Methods (FRMs) or Federal Equivalent Methods (FEMs) and monitors are operated according to the procedures specified in Quality Assurance Project Plans (QAPPs)<sup>1</sup> that have been approved by EPA. Sites are in the Providence-New Bedford-Fall River, RI-MA Metropolitan Statistical Area (MSA), which encompasses all of Rhode Island as well as Bristol County in Massachusetts.

### **Summary of Recent and Proposed Changes in the Rhode Island Monitoring Network**

- In February 2022, EPA awarded RIDEM an ARP Direct Award for requests for funding to upgrade the East Providence Trailer. A full update of this process can be reviewed under the East Providence site information section later in this document. The site is currently not operational, as work on the new structure has begun.
- The new Met One BAM at the Vernon Street location began reporting to AirNOW during June 2023.
- The RI Department of Health is currently constructing a new laboratory building at 150 Richmond Street, Providence, which will be replacing the current building located at 50 Orms Street, Providence. The Air Pollution Laboratory will be moving into this building, with move in tentatively scheduled for summer of 2025. There will be some operational impact during the move.

RIDEM understands that all network modifications that involve discontinuation or moving of any sites are subject to EPA approval, even if the remaining network meets EPA's minimum requirements.

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<sup>1</sup> RI DEM and RI DOH, "QAPP for Criteria Pollutants Including Particulates and NCORE Parameters, Revision 1.0," approved by EPA March 2018, revised November 2021 and "QAPP: Air Toxics and PAMS Monitoring Programs, Revision 6.1," approved by EPA March 2018, revised November 2021.

**Table 3: National Ambient Air Quality Standards (NAAQS)**

<b>POLLUTANT</b> (links to historical tables of NAAQS reviews)	<b>AVERAGING TIME</b>	<b>PRIMARY STANDARD</b>	<b>SECONDARY STANDARD</b>
<a href="#">Sulfur Dioxide (SO<sub>2</sub>)</a>	3-Hour <sup>A</sup>	None	0.5 ppm (1300 µg/m <sup>3</sup> )
	1-Hour <sup>B</sup>	0.075 ppm (75 ppb)	None
<a href="#">Carbon Monoxide (CO)</a>	8-Hour <sup>A</sup>	9 ppm	None
	1-Hour <sup>A</sup>	35 ppm	None
<a href="#">Ozone (O<sub>3</sub>)</a>	8-Hour <sup>C</sup>	0.070 ppm (70 ppb)	Same as Primary Standard
<a href="#">Nitrogen Dioxide (NO<sub>2</sub>)</a>	Annual Arithmetic Mean	0.053 ppm (53 ppb)	Same as Primary Standard
	1-Hour <sup>D</sup>	100 ppb	None
<a href="#">Particulate Matter (PM<sub>10</sub>)</a>	24-Hour <sup>E</sup>	150 µg/m <sup>3</sup>	Same as Primary Standard
<a href="#">Particulate Matter (PM<sub>2.5</sub>)</a>	Annual Arithmetic Mean <sup>F</sup>	9.0 µg/m <sup>3</sup>	15.0 µg/m <sup>3</sup>
	24-Hour <sup>G</sup>	35 µg/m <sup>3</sup>	Same as Primary Standard
<a href="#">Lead (Pb)</a>	Rolling 3-Month Average	0.15 µg/m <sup>3</sup>	Same as Primary Standard

**Primary standards** protect against adverse health effects.

**Secondary standards** protect against welfare effects such as damage to crops, vegetation, and buildings.

<sup>A</sup> Not to be exceeded more than once a year.

<sup>B</sup> To attain the 1-hour NAAQS, the 3-year average of the 99th percentile of the daily maximum 1-hour average SO<sub>2</sub> level at each monitor must not exceed 75 ppb.

<sup>C</sup> The ozone NAAQS is violated when the average of the 4th highest daily eight-hour concentration measured in 3 consecutive years exceeds 0.070 ppm (70 ppb).

<sup>D</sup> To attain the 1-hour NO<sub>2</sub> NAAQS, the 3-year average of the 98th percentile of the daily maximum 1-hour average NO<sub>2</sub> concentration at each monitor must not exceed 100 ppb.

<sup>E</sup> To attain the PM<sub>10</sub> standard, the 24-hour concentration at each site must not exceed 150 µg/m<sup>3</sup> more than once per year, on average over 3 years.

<sup>F</sup> To attain the PM<sub>2.5</sub> annual standard, the 3-year average of the weighted annual means of the 24-hour concentrations must not exceed the NAAQS value. The annual PM 2.5 standard was lowered during February 2024.

<sup>G</sup> To attain the PM<sub>2.5</sub> 24-hour standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 35 µg/m<sup>3</sup>.

**µg/m<sup>3</sup>** = micrograms per cubic meter

**mg/m<sup>3</sup>** = milligrams per cubic meter

**ppb** = parts per billion

**ppm** = parts per million

**Table 4: Monitoring Site Information**

Site	PM2.5 (FRM), 1:3	PM2.5 (FRM, Collocated), 1:6	PM2.5 (Continuous - FEM)	PM10/PM- (Hi Vol), 1:6	PM10/PM- (Hi Vol), Collocated, 1:6	PM10/PM-Coarse(lo-Vol), 1:3	Polycyclic aromatic hydrocarbons (PAH), 1:6	Speciation, PM2.5, SASS (CSN), 1:3	PM2.5 Carbon (URG)\(CSN).1:3	Ozone	SO2	CO	Direct NO <sub>2</sub>	NO/NO <sub>2</sub> /NOx	NO/NOy	VOCs 24-HR Canister (NATTS, State)	VOCs Hourly PAMS	Black Carbon	Black Carbon, Collocated	Carbonyls, 1:6, Collocated 1:12	Carbonyls, PAMS 8-hr	Particle Counter	Wind Speed and Direction	Ceilmeter	Temperature	Dew Point / Rel. Humidity	Barometric Pressure	Solar Radiation	UV Radiation	Precipitation	
Vernon Street	X	X	X													X															
EPA Labs			X						S													X		X							
East Prov.	X		X	X		X	X	X	X	X	X	X	X	X	X	X	S	X	X	X	X	S	S	X	X	X	X	X	S	S	S
CCRI			X	X	X	X										X		X		X		X	X		X	X	X				
Alton Jones			X						S							X						X		X	S	X	S				
Near Road			X									X		X				X				X									
East Matunuck									S																						

X = Existing

S= Seasonal (June 1-August 31)

S= Seasonal (March 1 – September 30)

\* Includes metals

\*\* Includes collocated metals 1:12



**Table 5: Additional Monitoring Site Information**

Site	AQS ID	Latitude Longitude	Parameter Measured	Method Of Sampling	EPA Method Designation
Vernon Vernon Street Pawtucket	440070026	41.874683°	PM <sub>2.5</sub>	Lo Vol	Reference
			PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
		-71.379936°	VOC	Canisters, GC/FID/MS	Reference
USEPA Laboratory 27 Tarzwell Drive Narragansett	440090007	41.495060°	Ozone	U.V. Photometric	Reference
			PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
		-71.423713°	Wind <sub>2</sub> Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Temperature	Spot Reading	N/A
Myron Francis School 64 Bourne Avenue E. Providence	440071010	41.840954°	Oxides of Nitrogen	Chemiluminescence (low range)	Reference
			Nitrogen Dioxide		
		-71.360976°	NO/NO <sub>y</sub>	Chemiluminescence (low range)	Reference
			Carbon Monoxide	Gas Filter Correlation (low range)	Equivalent
			Sulfur dioxide	Pulsed Fluorescence (low range)	Equivalent
			Ozone	U.V. Photometric	Reference
			PM <sub>2.5</sub>	Lo Vol	Reference
			PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
			Speciated PM <sub>2.5</sub>	Speciation Monitor	N/A
			Coarse PM (PM <sub>10-2.5</sub> )	Lo Vols (PM <sub>10</sub> & PM <sub>2.5</sub> )	Reference
			Black Carbon	Aethalometer	N/A
			VOC	Canisters, GC/FID/MS	Reference
			VOC	Continuous GC	Reference
			Carbonyls	HPLC Cartridges	Reference
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Barometric Pressure	Barometer	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
			so <sub>l</sub> ar Radiation	Pyranometric	N/A
			UV Radiation	UV Photometric	N/A
Precipitation	Bucket/Continuous	N/A			
Direct NO <sub>2</sub>	Cavity Attenuated Phase Shift (CAPS)	Equivalent			

Site	AQS ID	Latitude Longitude	Parameter Measured	Method Of Sampling	EPA Method Designation
			Ceilmeter	LIDAR	N/A
			NO <sub>2</sub> and Ozone	NASA Pandora Spectrometer	N/A
<b>CCRI Liston Campus</b> 1 Hilton Street Providence	440070022	41.807523°  -71.413920°	PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
			PM <sub>10</sub> /Metals	Hi Vol	Reference
			VOC	Canisters, GC/FID/MS	Reference
			Carbonyls	HPLC Cartridges	Reference
			Black Carbon	Aethalometer	N/A
			Semi-volatiles	PUF/XAD, GC/MS	N/A
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
Particle Count	Water Based Condensation	N/A			
<b>Alton Jones Campus</b> Victory Highway West Greenwich	440030002	41.615316°  -71.720032°	Ozone	U.V. Photometric	Reference
			VOC	Canisters, GC/FID/MS	Reference
			PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
			Wind Speed	Anemometer	N/A
			Wind Direction	Wind Vane	N/A
			Barometric Pressure	Barometer	N/A
			Temperature	Spot Reading	N/A
			Relative Humidity	Plastic Film	N/A
Solar Radiation	Pyranometric	N/A			
<b>Near-Road Site</b> Wellington Avenue Cranston	440070040	41.769880°  -71.428489°	Oxides of Nitrogen	Chemiluminescence (low range)	Reference
			Nitrogen Dioxide		
			Carbon Monoxide	Gas Filter Correlation (low range)	Equivalent
			PM <sub>2.5</sub>	Beta Attenuation/Cont	Equivalent
			Black Carbon	Aethalometer	N/A
Particle Count	Water Based Condensation	N/A			
<b>East Matunuck State Beach Pavilion</b> 950 Succotash Road South Kingstown	440090008	41.377451°  -71.52485°	Ozone	U.V. Photometric	Equivalent

## Network Evaluation

Following is a discussion, by pollutant, of:

- The current monitoring network,
- The NAAQS and a comparison of recent measurements with the NAAQS,
- Whether that network meets EPA's monitoring criteria,
- Whether new sites are needed,
- Whether any existing sites are no longer needed, and
- Plans for modification of the network in the next 18 months.

### Ozone (O3)

The sites in the current ozone monitoring network are listed in Table 4 below.

**Table 6: Rhode Island Ozone Monitoring Sites**

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
<b>Alton Jones Campus</b> Victory Highway West Greenwich	Regional	Upwind background Population exposure	Continuous Ozone Season March-September
<b>USEPA Laboratory</b> 27 Tarzwell Drive Narragansett	Regional	Population exposure	Continuous Ozone Season March-September
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Neighborhood (PAMS, NCORE)	Maximum precursor emissions impact Population exposure	Continuous Year-Round
<b>East Matunuck State Beach Pavillion</b> 950 Succotash Road, South Kingstown	Regional	Upwind background Population exposure Coastal and Long Island Sound	Continuous Ozone Season March-September

The ozone NAAQS is 70 ppb over an 8-hour average. A site is in violation of that NAAQS when the average of the 4<sup>th</sup> highest daily eight-hour ozone concentration measured in 3 consecutive years (the design value) at that site exceeds 70 ppb.

Ozone design values (DVs) have been generally flatlined or decreased slightly over the past 5 years. At the time of the new standard, Rhode Island was in attainment using the 2014-2016 DV. Because Rhode Island is in the Ozone Transport Region (OTR), it continues to be designated as Nonattainment/Unclassifiable.

Ozone at East Providence will not be monitored during summer 2024, as the structure is being replaced and the site is currently not operational.

### 2023 Ozone Design Values

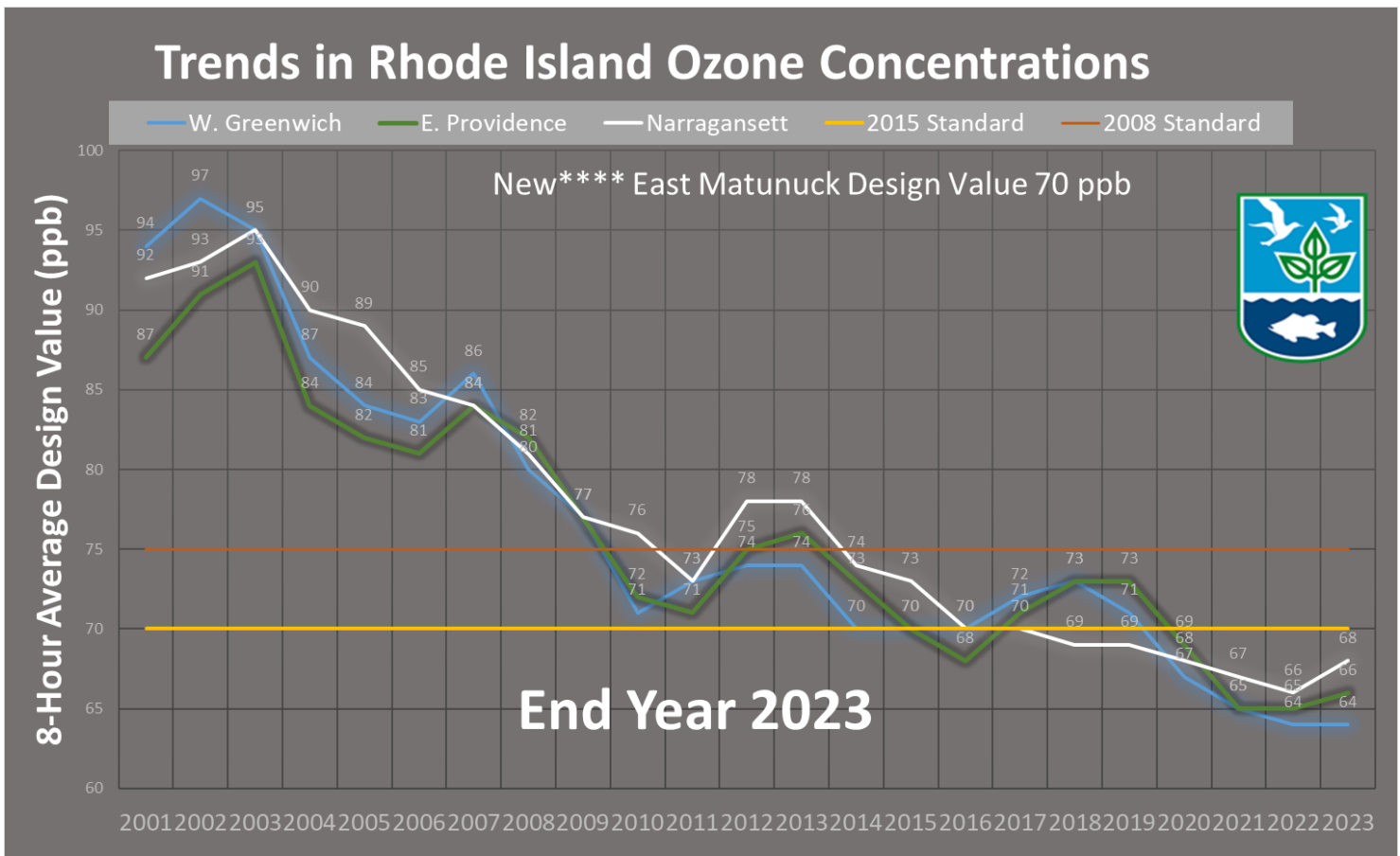
**Table 7: Ozone Design Values (ppb)**

	W. Greenwich	Narragansett	E. Providence	East Matunuck
2002 - 2004	87	90	84	N/A
2003 - 2005	84	89	82	N/A
2004 - 2006	83	85	81	N/A
2005 - 2007	86	84	84	N/A
2006 - 2008	80	81	82	N/A
2007 - 2009	77	77	77	N/A
2008 - 2010	71	76	72	N/A
2009 - 2011	73	73	71	N/A
2010 - 2012	74	78	75	N/A
2011 - 2013	74	78	76	N/A
2012 - 2014	70	74	73	N/A
2013 - 2015	70	73	70	N/A
2014- 2016	70	70	68	N/A
2015- 2017	72	71	70	N/A
2016- 2018	73	69	73	N/A
2017- 2019	71	69	73	N/A
2018-2020	67	68	69	N/A
2019-2021	65	67	65	N/A
2020-2022	64	66	65	N/A
2021-2023	64	66	68	70

The 2020 season was the first year RIDEM achieved AQS level data at East Matunuck by installing a heating system for the cold early weeks of ozone monitoring in April/May in attempts to maintaining a stable warm enough temperature in the uninsulated lifeguard tower. The main issue was maintaining temperature and performance of the calibrator, along with siting criteria for the 2B. Another challenge with East Matunuck site is that early in the season is logistical, as access to the lifeguard tower can be difficult. However, even with these challenges, the site is fully operational during the peak of the ozone season and is the more critical time of year RIDEM is hoping to capture

ozone transport along the coast from Long Island Sound. Note, 2023 is the first year for a completed design value for East Matunuck for 2021-2023 of 70 ppb.

**Figure 6: Ozone Design Value Trends 2001-2023**



Since EPA’s rules require Rhode Island to operate at least two ozone monitors, RI has two more monitors than the minimum number required. Continued operation of all existing monitors is important and will not be changing for the following reasons:

- Ozone concentrations continue to reach unhealthy levels several days each summer, with moderate levels on many days.
- The four sites represent three distinct geographical and micro-climates that are affected by different localized weather patterns and can experience very different ozone levels on some days.
- The availability of real-time ozone data from the four ozone sites enables RIDEM to issue and track area-specific health advisories as appropriate and understand and provide residents with real-time information about ozone concentrations and associated health risks in their region of the state.
- The East Matunuck site has continued to provide critical information on transport of ozone

along Long Island Sound corridor and the immediate coastline. This site has also experienced two recent seasons with the **highest daily 8-hr average in the entire Northeast**.

As part of RIDEM’s Enhanced Monitoring Plan (EMP), additional ozone monitoring continues during 2024 at East Matunuck as described in the EMP section of this plan with an EPA 2B Ozone Monitor on loan through their Sensor Loan Program. The 2B Monitor has proven to be reliable and is much quieter, as the lifeguard tower is often occupied. There are no other changes planned in the next 18 months, although RIDEM is looking to purchase a new 2B Monitor. Refer to the Enhanced Monitoring portion of this document regarding possible future plans of the East Matunuck monitor.

**Carbon Monoxide (CO)**

The current CO monitoring network is listed in Table 6 below.

**Table 8: Carbon Monoxide Monitoring Network**

<b>SITE</b>	<b>MEASUREMENT SCALE</b>	<b>MONITORING OBJECTIVE</b>	<b>SCHEDULE</b>
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Neighborhood	Maximum precursor emissions impact Population exposure	Continuous Year-Round
<b>Near-Road Site</b> Hayes and Park Streets Providence	Microscale	Maximum emissions Near-road	Continuous Year-Round

The NAAQS for CO are:

- 35 ppm as a 1-hour average, not to be exceeded more than once per year (design value is the highest annual 2<sup>nd</sup> maximum 1-hour concentration) and
- 9 ppm as an 8-hour average, not to be exceeded more than once per year (design value is the highest annual 2<sup>nd</sup> maximum non-overlapping 8-hour concentration)

The CO design values for Rhode Island are:

Near Road 2023:

- 1.6 ppm – 1-hour average, 4.5 % of NAAQS
- 1.8 ppm – 8-hour average, 20 % of NAAQS

East Providence 2023:

- 0.9 ppm – 1-hour average, 2.5 % of NAAQS
- 1.3 ppm – 8-hour average, 14 % of NAAQS

The CO NAAQS has not been exceeded in Rhode Island since 1984. Since 2001, all CO levels recorded in Rhode Island have been in the “Good” category of the EPA’s Air Quality Index (AQI).

EPA’s regulations do not specify a minimum number of CO monitors that must be operated in a state, except that CO monitoring is required at NCORE sites (40 CFR 58, Appendix D 3(b)) and EPA regulations require a certain number of CO monitors to be operating near road based upon population. Since the East Providence site is both a PAMS site and the State’s NCORE site, carbon monoxide monitoring will continue at that site using a low range monitor, consistent with NCORE requirements.

Near-road sites are required in all urban areas which, like the Providence-New Bedford-Fall River, RI-MA MSA, have a population of 1,000,000 or more. Near-road CO monitoring was not required until January 1, 2017; however, Rhode Island began operating a low-range CO monitor at a site adjacent to Interstate Route 95 that meets the above near-road specifications in April 2014. This site has been located off Wellington Avenue near the gantry in Cranston on the northbound side of the highway. Relocation was completed during April 2022 and the site became operational in during October of 2022.

The CO monitor at East Providence is not currently operational, as the structure is in process of being replaced.

No other changes to the CO monitoring network are planned in the next 18 months.

## Sulfur Dioxide (SO<sub>2</sub>)

The current SO<sub>2</sub> monitoring network is listed in in Table 7 below.

**Table 9: Sulfur Dioxide Monitoring Network**

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Neighborhood	NCORE	Continuous Year-Round

The NAAQS for SO<sub>2</sub> are:

- 75 ppb, 1-hour average. The design value is the average of the 99th percentile maximum daily hour measured in 3 consecutive years.
- 0.5 ppm (500 ppb), 3-hour average (secondary standard) not to be exceeded more than once per year.

The SO<sub>2</sub> design value (2021 – 2023) in Rhode Island is as follows:

- 2 ppb -- 1-hour average 2.6 % of primary NAAQS – East Providence monitor

The SO<sub>2</sub> NAAQS has never been exceeded in the State. One-hour design values for SO<sub>2</sub> have been below 75 ppb since 1994. All measurements have been in the “Good” range of the AQI since 2007.

EPA’s 2006 amended monitoring regulation requires SO<sub>2</sub> monitoring only at NCORE sites. However, the 2010 SO<sub>2</sub> NAAQS rule requires at least one SO<sub>2</sub> monitor in the Providence-New Bedford-Fall River RI, MA MSA, which includes all of Rhode Island and Bristol County, Massachusetts. That SO<sub>2</sub> monitor must be sited to meet one or more of the following objectives: (1) characterizing concentrations around emissions sources, (2) measuring the highest concentrations in an area, (3) determining population exposure, (4) establishing general background levels and (5) evaluating regional transport.

The State of Massachusetts also operates an SO<sub>2</sub> monitor in the Providence Warwick RI-MA MSA, located in Fall River. Per EPA, this monitor is the required monitor in the MSA. The Fall River monitor represents the highest concentrations in the MSA, as the design values have been approximately twice as high as East Providence for the past 3 years.

The SO<sub>2</sub> monitor at East Providence is not currently operational, as the structure is in process of being replaced.



## Nitrogen Dioxide (NO<sub>2</sub>)

The current NO<sub>2</sub> monitoring network is listed in Table 8 below.

**Table 10: Nitrogen Dioxide Monitoring Network**

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Neighborhood (PAMS)	Population exposure	Continuous Year-Round True NO <sub>2</sub> during PAMS season only
<b>Near-Road Site</b> Wellington Avenue Cranston	Microscale	Maximum emissions Near-road	Continuous Year-Round

The NO<sub>2</sub> NAAQS are:

- 100 ppb – 1-hour average. The design value is the average of the 98<sup>th</sup> percentile maximum daily hour measured in 3 consecutive years.
- 0.053 ppm (53 ppb) - annual average

The 1-hour average design values for 2021-2023 are:

- 37 ppb – 1-hour average, 37 % of NAAQS - East Providence
- 42 ppb – 1-hour average, 42 % of NAAQS – Near Road

The annual averages for 2023 are:

- 6 ppb annual average, 11 % of NAAQS – East Providence
- 13 ppb annual average, 24 % of NAAQS – New Near Road

Because of shutdown for relocation, the old Near Road site (Park/Hayes) and New Near Road Site (Wellington) did not achieve enough data capture and has invalid design values. The NO<sub>2</sub> NAAQS have never been exceeded in Rhode Island. Since there was no short-term NAAQS for NO<sub>2</sub> until the standard was amended in 2010, this pollutant was not used for the Air Quality Index (AQI) before that date. The amended NO<sub>2</sub> NAAQS rule, which was published on February 9, 2010, establishes hourly concentrations of 54 -100 ppb as the range for a “Moderate” AQI<sup>2</sup>.

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<sup>2</sup>USEPA, “Primary National Ambient Air Quality Standards for Nitrogen Dioxide: Final Rule, “FR 75(26):6474, 9 February 2010. <http://www.epa.gov/ttn/naaqs/standards/nox/fr/20100209.pdf>

The 2010 amended NO<sub>2</sub> NAAQS requires Rhode Island to operate two NO<sub>2</sub> monitoring sites, one at “a location of expected highest NO<sub>2</sub> concentrations representing the neighborhood or larger spatial scales” and a second monitor at a near-road location where maximum microscale-representative concentrations are expected.

The East Providence location fulfills the neighborhood monitoring scale for NO<sub>2</sub> and operates year-round to fulfill the neighborhood or larger spatial scale requirements. To fulfill PAMS requirements, Direct/True NO<sub>2</sub> is monitored at East Providence June 1 to August 31. A low range monitor that measures NO and NO<sub>y</sub> (total reactive nitrogen oxides) has been operated at the East Providence site since January 2011, consistent with the NCORE requirements.

In April 2014, RIDEM began operating a near-road site on the east side of the Interstate Route 95 near downtown Providence, monitoring for NO<sub>2</sub>/NO<sub>x</sub>, CO, PM<sub>2.5</sub> and black carbon to characterize those pollutants from the highway, downwind of the climatological prevailing wind direction. Construction of the northbound highway and bridge forced the relocation of the site to the Wellington Avenue site in Cranston.

The NO<sub>2</sub> monitor at East Providence is not currently operational, as the structure is in process of being replaced.

**Particles smaller than 10 microns (PM<sub>10</sub>)**

The current PM<sub>10</sub> monitoring network is listed in Table 9 below.

**Table 11: PM<sub>10</sub> Monitoring Network**

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
<b>CCRI Liston Campus</b> 1 Hilton Street Providence	Neighborhood (NATTS)	Population exposure Highest concentration	24-hour 1 in 6 day Co-located 1 in 6 day
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Neighborhood (NCORE)	Population exposure (Lead discontinued 6/30/16) and PM <sub>10-2.5</sub> )	24-hour 1 in 3 (PM <sub>10-2.5</sub> )

The PM<sub>10</sub> NAAQS is:

- 150 µg/m<sup>3</sup> – 24-hour average, not to be exceeded more than once per year on average over 3 years (design value is 4<sup>th</sup> high value in a 3-year period)

There were no exceedances in 2023. The highest 24-hour average value for PM<sub>10</sub> recorded at a Rhode Island site for the past 3 years is:

2021	32 µg/m <sup>3</sup> – 24-hour average, 21 % of NAAQS, recorded at East Providence
2022	49 µg/m <sup>3</sup> – 24-hour average, 32 % of NAAQS, recorded at East Providence
2023	34 µg/m <sup>3</sup> – 24-hour average, 23 % of NAAQS, recorded at CCRI Liston

The PM<sub>10</sub> NAAQS has never been exceeded in Rhode Island. Since PM<sub>10</sub> is measured using a filter-based method, results are not immediately available and cannot be used for Air Quality Index calculations. PM<sub>10</sub> levels appear to have slightly decreased over the past decade.

EPA's monitoring regulations require areas like the Providence-New Bedford-Fall River, RI-MA Metropolitan Statistical Area (MSA), which has a population greater than 1,000,000 and measured PM<sub>10</sub> concentrations below 80% of the NAAQS, to operate a minimum of 2 - 4 PM<sub>10</sub> monitoring sites.

PM<sub>10</sub> is measured at the East Providence NCORE site once every three days using a lo-vol sampler. The PM<sub>10</sub> measurements are used, in conjunction with PM<sub>2.5</sub> measurements at that site, for calculating PM<sub>10-2.5</sub> levels. PM<sub>10</sub> samples collected at CCRI Providence are analyzed for metals to fulfill NATTS requirements. These 2 PM<sub>10</sub> monitors adequately characterize exposure of the sensitive populations in urban areas to PM<sub>10</sub> and fulfill the minimum monitoring requirement of the MSA.

The PM<sub>10</sub> monitor at East Providence is not currently operational, as the structure is in process of being replaced.

## Fine Particulate Matter (PM<sub>2.5</sub>)

The current Federal Reference Method/Federal Equivalent Method (FRM/FEM) PM<sub>2.5</sub> monitoring network is listed in Table 10 below.

**Table 12: PM<sub>2.5</sub> Monitoring Network**

SITE	MEASUREMENT SCALE	MONITORING OBJECTIVE	SCHEDULE
<b>Vernon</b> Vernon Street Pawtucket	Middle	Population exposure	24-hour Continuous FEM 1 in 3 days FRM
<b>CCRI Liston Campus</b> 1 Hilton Street Providence	Neighborhood	Population exposure Highest concentration	24-hour Continuous FEM
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	Urban	Population exposure Highest concentration	24-hour Continuous FEM, 1 in 3 days FRM
<b>Alton Jones Campus</b> Victory Highway West Greenwich	Regional	Population exposure General/Background Regional Transport	24-hour Continuous FEM
<b>USEPA Laboratory</b> 27 Tarzwell Drive Narragansett	Regional	Population exposure	24-hour Continuous FEM
<b>Near Road Site</b> Wellington Avenue Cranston	Microscale	Near-road	24-hour Continuous FEM

A filter based FRM (Method 145) PM<sub>2.5</sub> unit is the primary sampler at the Vernon site. RIDOH deployed a BAM at the Vernon site during 2022. The unit is pushing data to AirNOW real time. FEM (Method 170) continuous PM<sub>2.5</sub> monitors are used as the primary samplers at West Greenwich, Narragansett, East Providence, CCRI, and the new Near-Road site in Cranston. Co-located filter based FRM samplers are operated at the Vernon and East Providence sites for quality assurance purposes (Method 145).

The PM<sub>2.5</sub> NAAQS are:

- 35 µg/m<sup>3</sup> - 24-hour average (design value is the 3-year average of the 98<sup>th</sup> percentile 24-hour concentration)
- 9 µg/m<sup>3</sup> – Annual average (new design value as of 2024 is calculated by averaging the daily concentrations from each quarter, averaging these quarterly averages to obtain an annual average, and then averaging the annual averages for three consecutive years).

The highest PM<sub>2.5</sub> values for 2022 are:

- 19 µg/m<sup>3</sup> – 24-hour average, 54 % of NAAQS, recorded at Vernon St/Near Road (invalid)
- 8.1 µg/m<sup>3</sup> – annual average, 9 % of NAAQS, recorded at Near Road (invalid)

The highest PM<sub>2.5</sub> values for 2023 are:

- 28.6 µg/m<sup>3</sup> – 24-hour average, 81 % of NAAQS, recorded at Narragansett
- 8.2 µg/m<sup>3</sup> – annual average, 91 % of NAAQS, recorded at Near Road

**Table 13: Preliminary Design values for PM<sub>2.5</sub>**

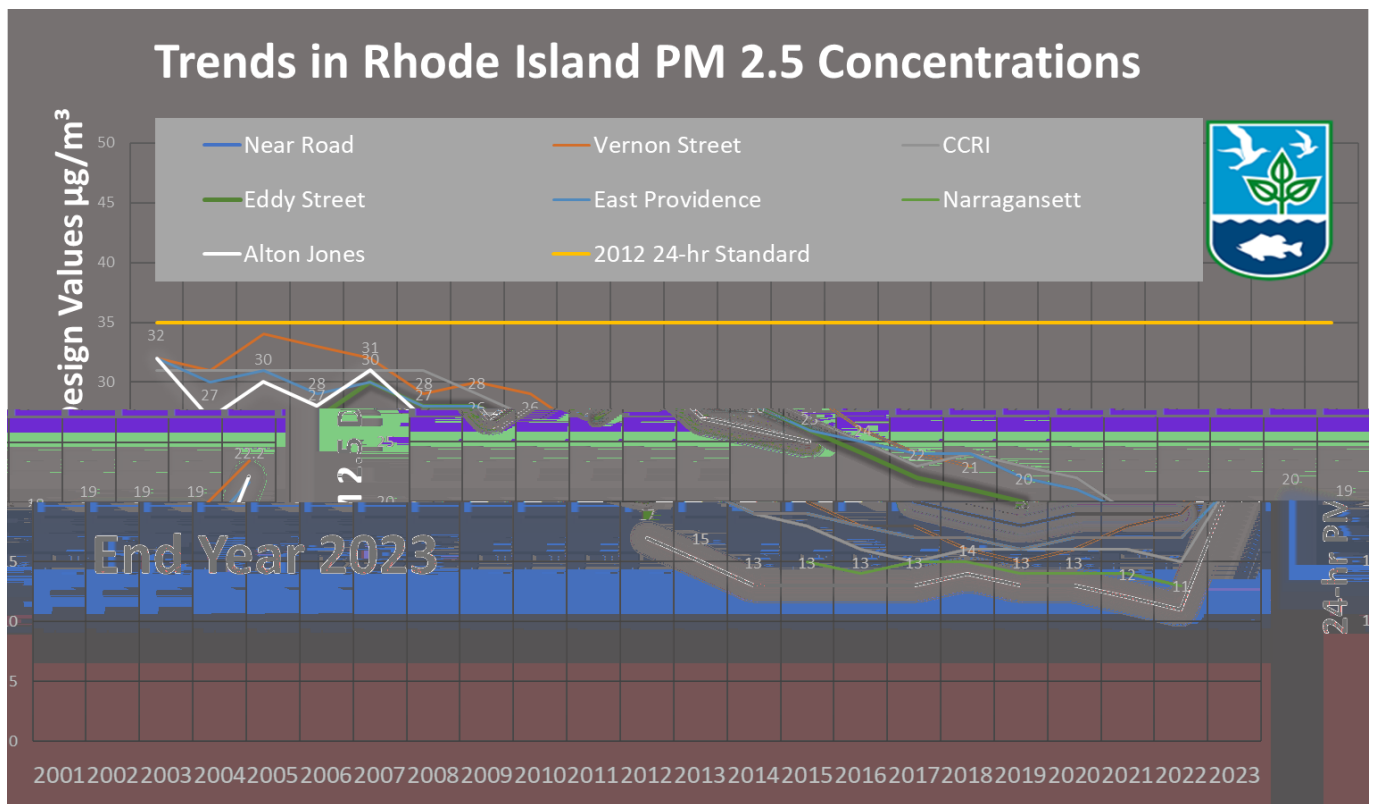
\* Design value for 2022 invalid due to relocation and lack of data capture. 2023 Near Road at Wellington Avenue, Cranston had sufficient data capture. 2022 DV's incomplete.

<b>SITE</b>	<b>24-hour DV 2019- 2021</b>	<b>24-hour DV 2020- 2022</b>	<b>24-hour DV 2021- 2023</b>	<b>Annual DV 2019- 2021</b>	<b>Annual DV 2020- 2022</b>	<b>Annual DV 2021- 2023</b>
<b>Vernon</b> Vernon Street Pawtucket	18	19	23.5	7.9	7.9	7.7
<b>CCRI Liston Campus</b> 1 Hilton Street Providence	16	15	22.2	5.9	6.0	7.0
<b>Myron Francis School</b> 64 Bourne Avenue E. Providence	17	17	21.7	6.2	6.4	6.7
<b>Alton Jones</b> Victory Highway West Greenwich	12	11	22.2	4.6	4.5	5.9
<b>USEPA Laboratory</b> 27 Tarzwell Drive Narragansett	14	13	28.6	4.5	4.3	6.3
<b>Near Road Site*</b>	N/A	16.8	22.3	N/A	7.2	8.2

Historically, annual average levels have been consistently highest at the Vernon Street site, which is adjacent to I-95, and higher at the East Providence and Urban League sites than at the rural West Greenwich site. PM<sub>2.5</sub> levels continue to slowly decrease each year. The 2020-2023 design values of PM<sub>2.5</sub> data at Near Road are the highest in the monitoring network and have been for the past three years of design values. The design values for all sites have generally remained level with only slight variations.

During summer 2023, the Northeast and Rhode Island experienced some of the heaviest wildfire smoke events of the past 20 years from Canadian fires with several days of unhealthy PM 2.5 values and some of the highest hourly average concentrations ever experienced in Rhode Island.

**Figure 7: PM 2.5 Design Value Trends from 2001-2023 (2023 Preliminary)**



EPA regulations require a minimum of two PM<sub>2.5</sub> Rhode Island monitoring sites to characterize the following:

- Community-wide air quality
- Background PM<sub>2.5</sub> levels in the RI
- Regional transport of PM<sub>2.5</sub>

Although Rhode Island operates more PM<sub>2.5</sub> sites than required, each site fulfills a specific informational need or EPA requirement. The West Greenwich site fulfills EPA's requirements for measurement of background and regional transport concentrations of PM<sub>2.5</sub> into the state. The 24-hour and annual PM<sub>2.5</sub> design values for the Vernon Street, Pawtucket site, which is immediately adjacent to Interstate Rte. 95, tend to be higher than those at the other sites. The Near Road site has been the highest design values since it began in 2014. The East Providence monitor cannot be removed because PM<sub>2.5</sub> monitoring is required at NCORE sites, and the CCRI and Narragansett monitors fulfill the need for air quality data for urban and coastal areas of the State, respectively.

As discussed above, Near Road PM<sub>2.5</sub> monitoring began in April 2014 and continued until construction of the I-95N viaduct forced relocation. Infrastructure and relocation of the new Wellington Avenue Near Road site in Cranston was completed in early April 2022. Immediately upon installation, the site experienced a fire during summer 2022. Repairs were made and the site became fully operational during October 2022.

RIDEM relocated the Urban League monitor to the Community College of Rhode Island, Liston Campus in June 2019. Since CCRI could not accommodate all the equipment from the Urban League site, the filter based FRM PM<sub>2.5</sub> from that location was moved to Vernon Street for co-locating with the existing FRM on April 1, 2017.

RIDEM has assigned the FEM PM<sub>2.5</sub> monitor at East Providence to be the primary monitor and uses the FEM and FRM data from that site to evaluate FEM-FRM comparability. The advantages of using the East Providence, rather than the West Greenwich site for this purpose include:

- PM<sub>2.5</sub> levels at the East Providence site, although still substantially below the NAAQS, tend to be higher than those at the West Greenwich site.
- Since the East Providence FRM runs 1 in 3 days, it generates more comparative data than West Greenwich.

Historical data has demonstrated that the East Providence FEM and FRM measurements have better correlation and less bias than is observed at the W. Greenwich site.



The PM<sub>2.5</sub> monitor at East Providence is not currently operational, as the structure is in process of being replaced. There are no other changes to the PM<sub>2.5</sub> network anticipated in the next 18 months.

### **Speciation Monitoring**

The EPA's PM<sub>2.5</sub> Speciation Trends Network (STN) is designed to characterize metal, ion and carbon constituents of PM<sub>2.5</sub>. Per NCORE requirements, the speciation equipment, including the carbon sampler, has been in operation at the East Providence NCORE site in January 2011 and is now being operated there on a 1-in-3 schedule. Speciation filters are analyzed by an EPA contractor.

### **Lead (Pb)**

As specified in the lead NAAQS rule, sampling of lead was previously conducted on a one-in-six-day schedule. EPA deleted the requirement to monitor for non-source Pb at NCORE sites from Appendix D of 40 CFR part 58.16 and to allow monitoring agencies to request permission to discontinue non-source monitoring following the collection of at least 3 years of data at urban NCORE sites. Since ambient lead monitoring was conducted in the State for more than 3 years and the lead levels were consistently considerably lower than the NAAQS since the inception of monitoring, RI DEM was granted permission to discontinue monitoring as of June 30, 2016.

### **Ozone Precursor and Air Toxics Measurements**

#### ***Photochemical Assessment Monitoring Stations (PAMS)***

The Clean Air Act Amendments of 1990 (CAAA) required serious, severe and extreme ozone nonattainment areas to establish enhanced monitoring networks to measure ozone and ozone precursors. In response to that mandate, the US EPA promulgated rules in 1993 that required the establishment of a network of Photochemical Assessment Monitoring Stations (PAMS) to measure ozone, NO<sub>x</sub>, volatile organic compounds (VOCs), carbonyls, and meteorological parameters in serious and above nonattainment areas. This network was designed to provide comprehensive data on trends in ambient concentrations of ozone and ozone precursors and to evaluate the spatial and diurnal variability of those pollutants to track the formation and transport of ozone across large areas and to evaluate the effectiveness of strategies implemented to reduce levels of that pollutant.

#### ***PAMS Monitoring Implementation Network Plan***

RIDEM operated two Photochemical Assessment Monitoring Stations (PAMS) sites in the air monitoring network in 2017, at the West Greenwich and East Providence sites. West Greenwich is no longer designated a PAMS site. The NCORE site located at Francis School in East Providence continues to serve as the location of the required PAMS site and will measure the following parameters described below. An inventory of equipment used at the site is provided in Table 13.

The following PAMs pollutant were monitored during the 2023 PAMs season. Due to the construction of the new East Providence site, a large portion, if not all of the 2024 PAMs season will not be operational:

- The NCORE site located at Francis School in East Providence serves as the PAMS site and measures parameters described below.
- 24-hour speciated VOC samples are collected every sixth day year-round at the Alton Jones and East Providence site. As of June, July and August of 2017, VOC samples were collected hourly at East Providence using an Auto-GC. Hourly VOC sampling was measured for June-August for 2023 at East Providence. A complete list of the targeted compounds is found in Table 12. For 2023, hourly speciated VOC measurements were measured with an auto-gas chromatograph (GC) using Chromatec GC 866 Airmo VOC.
- 24-hour carbonyl samples were collected every sixth day year-round at the East Providence site using an ATEC 8000 Sampler. Three 8-hour carbonyl samples per day were collected every third day during June, July, and August for 2023. A complete list of the target carbonyl compounds may be found in Table 12. The TO-11A test method is used, as in the National Air Toxics Trends (NATTS)<sup>3</sup> program.
- Rhode Island has measured reactive nitrogen oxides (NO and NO<sub>y</sub>) at East Providence since January 2011 to fulfill NCORE requirements. New EPA regulations required NO, NO<sub>y</sub>, true NO<sub>2</sub> and mixing height measurements at required PAMS sites during the ozone season. True NO<sub>2</sub> and mixing heights began in 2019 and continued for 2023. True NO<sub>2</sub> is measured by cavity attenuated phase shift (CAPS) spectroscopy with a Teledyne API T500U. NO and NO<sub>y</sub> are measured using a Thermo 42iY.
- Ozone is measured at the West Greenwich and Narragansett in March through September beginning in 2017. Ozone is measured year-round at East Providence to fulfill NCORE requirements. At East Matunuck and for 2022 and 2023 ozone monitoring couldn't begin until April due to access with the seasonal lifeguard tower. 2024 monitoring began in March.
- Surface meteorological parameters are measured at West Greenwich, Narragansett, and East Providence year-round.
- RIDEM measured wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, and ultraviolet radiation at East Providence during 2023. For measuring mixing height, a Vaisala CL51 ceilometer was purchased in August 2018 and was installed at East Providence in 2019. The RIDOH has worked with the University of Maryland Baltimore to push real time ceilometer data to UMBC for image processing. Real time images have been extremely helpful in tracking the boundary layer and wildfire smoke in the area and are available online. <https://ucn-portal.org/site/prov/>

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<sup>3</sup> See NATTS Technical Assistance Document for TO-11A method

**Table 14: PAMS Target Compound List**

Priority Chemical Parameters (Required)	AQS Parameter Code	Compound Class	Optional Chemical Parameters	AQS Parameter Code	Compound Class
1,2,3-trimethylbenzene	45225	aromatic	1,3,5-trimethylbenzene	45207	aromatic
1,2,4-trimethylbenzene	45208	aromatic	1-pentene	43224	olefin
1-butene	43280	olefin	2,2-dimethylbutane	43244	paraffin
2,2,4-trimethylpentane	43250	paraffin	2,3,4-trimethylpentane	43252	paraffin
Acetaldehyde	43503	carbonyl	2,3-dimethylbutane	43284	paraffin
Benzene	45201	aromatic	2,3-dimethylpentane	43291	paraffin
cis-2-butene	43217	olefin	2,4-dimethylpentane	43247	paraffin
Ethane	43202	paraffin	2-methylheptane	43960	paraffin
Ethylbenzene	45203	aromatic	2-methylhexane	43263	paraffin
Ethylene	43203	olefin	2-methylpentane	43285	paraffin
Formaldehyde	43502	carbonyl	3-methylheptane	43253	paraffin
Isobutane	43214	paraffin	3-methylhexane	43249	paraffin
Isopentane	43221	paraffin	3-methylpentane	43230	paraffin
Isoprene	43243	olefin	Acetone	43551	carbonyl
m&p-xylenes	45109	aromatic	Acetylene	43206	alkyne
m-ethyltoluene	45212	aromatic	cis-2-pentene	43227	olefin
n-butane	43212	paraffin	Cyclohexane	43248	paraffin
n-hexane	43231	paraffin	cyclopentane	43242	paraffin

Priority Chemical Parameters (Required)	AQS Parameter Code	Compound Class	Optional Chemical Parameters	AQS Parameter Code	Compound Class
n-pentane	43220	paraffin	isopropylbenzene	45210	aromatic
o-ethyltoluene	45211	aromatic	m-diethylbenzene	45218	aromatic
o-xylene	45204	aromatic	methylcyclohexane	43261	paraffin
p-ethyltoluene	45213	aromatic	Methylcyclopentane	43262	paraffin
Propane	43204	paraffin	n-decane	43238	paraffin
Propylene	43205	olefin	n-heptane	43232	paraffin
Styrene	45220	aromatic	n-nonane	43235	paraffin
Toluene	45202	aromatic	n-octane	43233	paraffin
trans-2-butene	43216	olefin	n-propylbenzene	45209	aromatic
Ozone	44201	criteria pollutant	n-undecane	43954	paraffin
true NO <sub>2</sub>	42602	criteria pollutant	p-diethylbenzene	45219	aromatic
total non-methane organic carbon	43102	total VOCs, non-methane	trans-2-pentene	43226	olefin
			α-pinene	43256	monoterpene olefin
			β-pinene	43257	monoterpene olefin
			1,3 butadiene	43218	olefin
			benzaldehyde	45501	carbonyl
			carbon tetrachloride	43804	halogenated
			Ethanol	43302	alcohol
			Tetrachloroethylene	43817	halogenated

**Table 15: Equipment Inventory at East Providence Site**

<b>NAME</b>	<b>Manufacturer</b>	<b>Model</b>
Black Carbon-Aethalometer	Teldyne	M633
Black Carbon-Aethalometer	Magee	AE16-ER
Carbonyl sampler	Atec	2200
Carbonyl sampler	Atec	2200
Wind direction sensor	MetOne	590S (6929)
Pure air generator	Aadco	737-R-12A
Chemiluminescence NO-NO2-NOx Analyzer	Thermo	42ITL
Sulphur Dioxide analyzer	Thermo	43ITLE
Caron Monoxide analyzer	Thermo	TE48i
Data logger	Agilaire	8832
Hydrogen generator	Packard	H2PD-150NA
Translator module	MetOne	126
Translator module	MetOne	2270
Barometric pressure sensor	MetOne	091
Rain sensor	MetOne	370-8"
Relative Humidity/temp sensor	MetOne	083D-1-35
Met Station Tower	MetOne	
Ultraviolet radiation sensor	EPLAB	TUVR
Wind Speed sensor	MetOne	014A
Solar Radiation pyranometer sensor	LI-COR	LI-200SZ
Chemiluminescence NO-DIF-NOy Analyzer	Thermo	TE42iY
Ozone analyzer	Thermo	TE49i
PM2.5 Sampler	MetOne	1020
PM2.5 Speciation	MetOne	SASS
PM2.5 Partisol-Plus	R&P	2025
PM2.5 Partisol-Plus	R&P	2025
Standard Calibrator,	API	M700E
Standard Calibrator	Enviroics	6103
Standard-Zero Air	Teledyne	701
VOC sampler	Xontech	910A
VOC sampler	Xontech	910A
Compac II AC units	Marvair	
Compac II AC units	Marvair	
GC custom	Agilent	7890A
Mass Spec	Agilent	5973N
Auto GC	Chromatotec	866
Ceilometer	Vaisala	CL51
Carbonyl Sampler	Atec	8000
True NO <sub>2</sub>	Teledyne API	T500U

## **Enhanced Monitoring Plan Update**

RIDEM has developed an Enhanced Monitoring Plan (EMP) for implementing additional applicable PAMS requirements. Full details on the siting for the initial EMP can be reviewed in the 2018 ANP.

Because of the immediate coastal location of the East Matunuck monitor has proven to uniquely capture ozone transport moving along Long Island Sound coming ashore. These measurements have enhanced the existing network of Rhode Island ozone monitors to complement transport movement into the state from the more inland West Greenwich site, and now, the immediate coastline.

During the 2018 and 2019 PAMs seasons, the East Matunuck ozone analyzer did not meet EPA siting criteria and the data did not meet EPA AQS criteria. For the 2020 season, RIDEM attempted to have the 2B Analyzer meet regulatory grade monitoring by tracking operating temperature, performing required calibration checks, and having established proper inlet configuration outside the lifeguard tower. However, cooler spring temperatures in the unheated building made calibration checks difficult due to instability of the calibrator. Baseboard heating was installed in April of 2021, which has stabilized the temperature of the tower and RIDEM has been able to achieve EPA AQS criteria data at East Matunuck since that time. Early season accessibility continues to be an issue, and it has not been possible to deploy and have the ozone monitor stable in time for March.

RIDEM has considered that the coastal stretch of Westerly, Rhode Island may possibly experience very high ozone, which is often hinted in daily air quality models. Specifically, the stretch of Misquamicut lies further south than East Matunuck, and further west, often closest to the higher ozone readings in Coastal Connecticut. After capturing 3 years of data and additional Design Values for East Matunuck, RIDEM may explore the logistics of moving the 2B monitor from East Matunuck to Misquamicut. RIDEM continues to operate an EPA 2B monitor on loan from EPA as part of their sensor loan program.

However, Misquamicut Beach specifically has been susceptible to coastal storms and flooding, with the El Nino winter of 2024 being particularly impactful. The barrier beach was breached on three separation occasions with serious flooding and coastal damage. Any potential move to that zone would have need to be strategically situated safe from flooding impacts.

## **Air Toxics**

Rhode Island operates one site that is part of the National Air Toxics Trends Stations (NATTS) network. The primary purposes of the NATTS network are to track trends in ambient air toxics levels, to characterize exposures, and to measure progress toward emission and risk reduction goals.

The Rhode Island NATTS site was originally located on the roof of the Urban League building in an urban residential neighborhood on the south side of Providence, approximately ½ mile west of I-95. This site was chosen as the State's NATTS site because it is not dominated by local sources and because levels of air toxics at this site appear to be representative of those in urban areas in the State.

In early July 2019 relocation to the CCRI Liston Campus was completed. This new location is approximately 315 feet (0.06 miles) to the south and east Urban League.

In keeping with EPA requirements, the following pollutants, at a minimum, are measured at the Rhode Island NATTS site:

**Volatile Organic Compounds (VOC)**

- Acrolein
- Perchloroethylene (tetrachloroethylene)
- Benzene
- Carbon tetrachloride
- Chloroform
- Trichloroethylene
- 1,3-butadiene
- Vinyl Chloride

**Carbonyls**

- Formaldehyde
- Acetaldehyde

**Metals**

- Nickel compounds (PM<sub>10</sub>)
- Arsenic compounds (PM<sub>10</sub>)
- Cadmium compounds (PM<sub>10</sub>)
- Manganese compounds (PM<sub>10</sub>)
- Beryllium (PM<sub>10</sub>)

**Semi-Volatile Organic Compounds (SVOC)**

- Benzo(a)pyrene
- Napthalene

VOCs, carbonyls and PM<sub>10</sub> metal samples are analyzed by RIDOH. Semi-Volatile Organic Compounds (SVOC) samples are analyzed by an EPA contractor. Sampling at the NATTS site is conducted for the above parameters for 24-hour periods every sixth day. 24-hour VOC samples are also collected every sixth day at the West Greenwich site, East Providence site, and at the Vernon Street site, which is adjacent to I-95 in Pawtucket. 24-hour carbonyl samples are collected at the East Providence site on the same schedule.

In addition, RIDEM operates aethalometers, which measure black carbon, an indicator of diesel exhaust, at the CCRI NATTS site, at the East Providence PAMS/NCORE site, and the Near Road site in Cranston.

As part of an EPA initiative to characterize Ethylene Oxide (EtO) concentrations as part of a national network for sites away from known sources of EtO, measurement of this toxic and known carcinogen began at the CCRI NATTS site in January 2020. Previous national monitoring efforts in 2018-2019 showed measurable EtO readings away from known sources. The goals of this effort are to increase national analytical capacity of EtO, to support analysis of local monitoring programs, to determine seasonal variability and sources of EtO, and to determine persistence in the atmosphere. No other changes are planned for the ozone precursor or air toxics monitoring sites in the next 18 months.

### **National Core Multi-Pollutant Monitoring Stations Network**

As required in an October 17, 2006, Federal Register notice (FR 71:61236), Rhode Island began operating a site that is part of EPA's network of core multipollutant monitoring (NCORE) stations in January 2011. This network is designed to address the following monitoring objectives:

- Timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms
- Supporting development of emission strategies through air quality model evaluation and other observational methods
- Accessing accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors
- Supporting long-term health assessments that contribute to ongoing reviews of the NAAQS
- Establishing nonattainment/attainment areas by comparison with the NAAQS
- Supporting disciplines of scientific research, including public health, atmospheric and ecological.

The East Providence site is operating as the State's NCORE site. Ozone, low-range NO<sub>2</sub>/NO<sub>x</sub>, reactive oxides of nitrogen (NO and NO<sub>y</sub>), low-range CO, low range SO<sub>2</sub>, PM<sub>2.5</sub> (FRM, FEM continuous, and speciated), coarse PM (PM<sub>10-2.5</sub>), VOCs, carbonyls, black carbon, and meteorological parameters are monitored at that site. PM<sub>10-2.5</sub> is measured as the difference between lo-vol PM<sub>10</sub> and lo-vol PM<sub>2.5</sub> concentrations. True NO<sub>2</sub> is being measured by cavity attenuated phase shift (CAPS) spectroscopy with a Teledyne API T500U CAPS.

**As mentioned earlier, RIDEM and RIDOH are currently in the construction stage of replacing the East Providence location structure. The site is currently NOT operational. The new structure will be in the same location as the current with a similar footprint. It is hoped the East Providence construction will be completed by end of summer 2024, but there are too many variables to predict a timeline.**

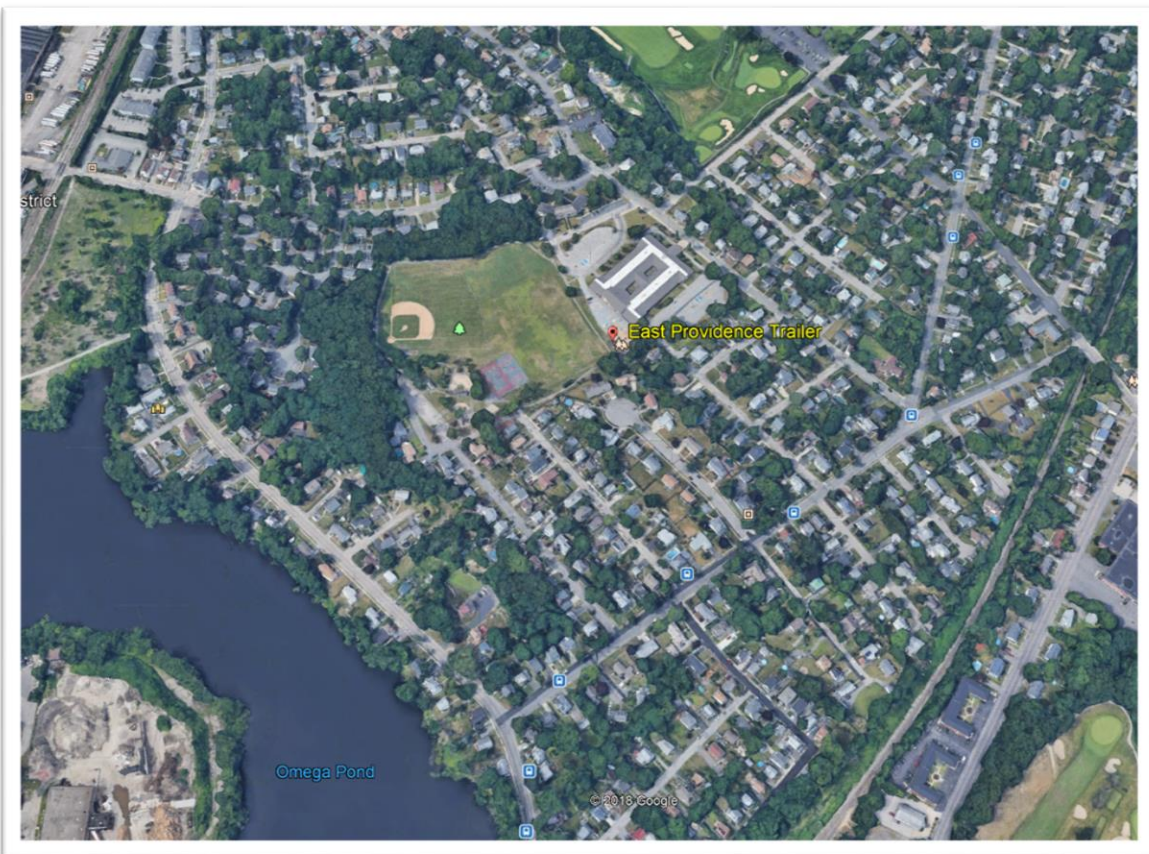


**Detailed Site Information:**

The following section presents detailed information for each monitoring site, such as: identification code, location, history, monitored parameters, monitoring objectives, history and descriptive information.

**Table 16: Myron Francis School – East Providence – CURRENTLY DECOMMISSIONED**

Myron Francis School – East Providence			
County	Providence	Latitude	41.840954°
Address	64 Bourne Avenue	Longitude	-71.360976°
AQS Site ID	440071010	Elevation	62 feet
<b>Spatial Scale</b>	Neighborhood/Urban	Year Established	1993
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The Myron Francis school is a neighborhood scale site located in a residential suburban area in East Providence in northeastern Rhode Island on city property. The site is operated by RIDEM as part of the NCORE and PAMS program. South of the site is residential neighborhoods, west is sports fields and recreation space, immediately northeast is a playground and school building, with additional residential neighborhoods due east. Interstate I-195 is approximately 2 miles due south. The former trailer is approximately 12’X29’, while the new structure will be 10’X20’.</p>			
<p>Monitoring Objectives: To collect long term measurements to assess trends as part of the national NCORE and PAMS Networks.</p>			
<p>Planned changes for 2024-2025: Complete the installation of the new structure by late summer.</p>			



**Figure 8: East Providence Monitoring Location**

## New Monitoring Structure Update

- The build of the structure at an offsite location was completed during mid-May by the contractor Willscot.
- The structure will be delivered once preparations at the site are complete.
- All equipment has been removed from the current location as of May 2024.
- National Grid has decommissioned power and removed the meter.
- Contractors for the electrical disconnect and pest inspection have been completed.
- RIDEM is awaiting a purchase order for demolition. The demolition company will be also handling asbestos compliance.
- Following delivery of the structure, work will begin to secure contractors to reconnect power, install safety railings, provide landscaping, stairs to the roof, and fencing.
- The City of East Providence, the property owner of Glenlyon Park, has been updated on the stages process, and has provided input for the project.
- It has been requested by the City of East Providence to conduct construction activities only when the neighboring elementary school is not in session. School is still in session until mid-June, so demolition or delivery of the structure cannot occur until that time the earliest.

**Figure 9: East Providence Monitoring Trailer**



**Table 17: W. Alton Jones Campus – West Greenwich**

West Greenwich – W. Alton Jones Campus			
County	Kent	Latitude	41.615316°
Address	401 Victory Highway	Longitude	-71.720032°
AQS Site ID	440030002	Elevation	210 feet
<b>Spatial Scale</b>	Regional/Background	Year Established	1976
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The Alton Jones site is a regional scale site located in a meadow surrounded by trees in Rhode Island in the town of West Greenwich. This site is operated by RIDEM as part of the SLAMS State Toxics network. Land use type: Forest and recreation field. It is located near RT 102 approximately 2.5 miles east, and Interstate I-95, 5 miles south. The trailer approximately 12'X12', with a pressure treated deck off to the east side of the trailer. A meteorological tower sits on the west side of the trailer. As the photo below reveals, the shelter is in a very rural region of the state miles from any public roads or neighborhood residences.</p>			
<p>Monitoring Objectives: To collect long term measurements to assess transport into the Rhode Island as part of the SLAMS and State Toxics networks.</p>			

Planned changes for 2024-2025: There has been no further information on the future of the Alton Jones campus. RIDOH staff continues to have access. The alternative site continues to be Arcadia Headquarters on 260 Arcadia Road, West Greenwich, 02832.

**Figure 10: West Greenwich Monitoring Location**



**Figure 11: West Greenwich Monitoring Site**



**Table 18: US EPA Lab - Narragansett**

Narragansett – US EPA Lab			
County	Washington	Latitude	41.495060°
Address	27 Tarzwell Drive	Longitude	-71.423713°
AQS Site ID	440090007	Elevation	106 feet
<b>Spatial Scale</b>	Regional	Year Established	1997
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The Narragansett USEPA laboratory site is a regional scale site located 650 feet west of Narragansett Bay in the town of Narragansett. Route 1 is 1.75 miles to the west. This site is operated by RIDEM as part of SLAMS network. The ozone monitor, datalogger and other equipment is in a small office on the south side of the EPA building. A staircase on the north side of the building leads to the roof where the continuous PM 2.5 sampler is placed. A meteorological tower sits on the east side of the building.</p>			
<p>Monitoring Objectives: To collect long term measurements to assess trends in Rhode Island as part of the national SLAMS network.</p>			
<p>Planned changes for 2024-2025: None</p>			

**Figure 12: Narragansett Monitoring Location**



**Figure 13: Narragansett Monitoring Shelter**



**Table 19: CCRI Liston Campus - Providence**

Providence – CCRI Liston Campus			
County	Providence	Latitude	41.807523°
Address	1 Hilton Street	Longitude	-71.413920°
AQS Site ID	440070022	Elevation	75 feet
<b>Spatial Scale</b>	Neighborhood	Year Established	1999 (Urban) 2019 (CCRI)
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The CCRI Liston Campus site is a neighborhood scale in an urban community in South Providence. This site is operated by RIDEM as part of the SLAMS and NATTS air toxics network. This rooftop site is on the main campus building approximately 30 feet off the ground. North of the building is parking, an open lot, and some commercial buildings. To the south is parking and residential homes. To the west is parking and the former monitoring site at Urban League. To the east is parking and eventually some mixed commercial and residential properties. The campus is not on a main road. I-95 is 0.45 miles east.</p>			
<p>Monitoring Objectives: The CCRI monitoring site objective is to collect air quality measurements to assess long-term trends as part of the SLAMS and NATTS network.</p>			
<p>Planned changes for 2024-2025: None</p>			

**Figure 14: CCRI Providence Monitoring Location**

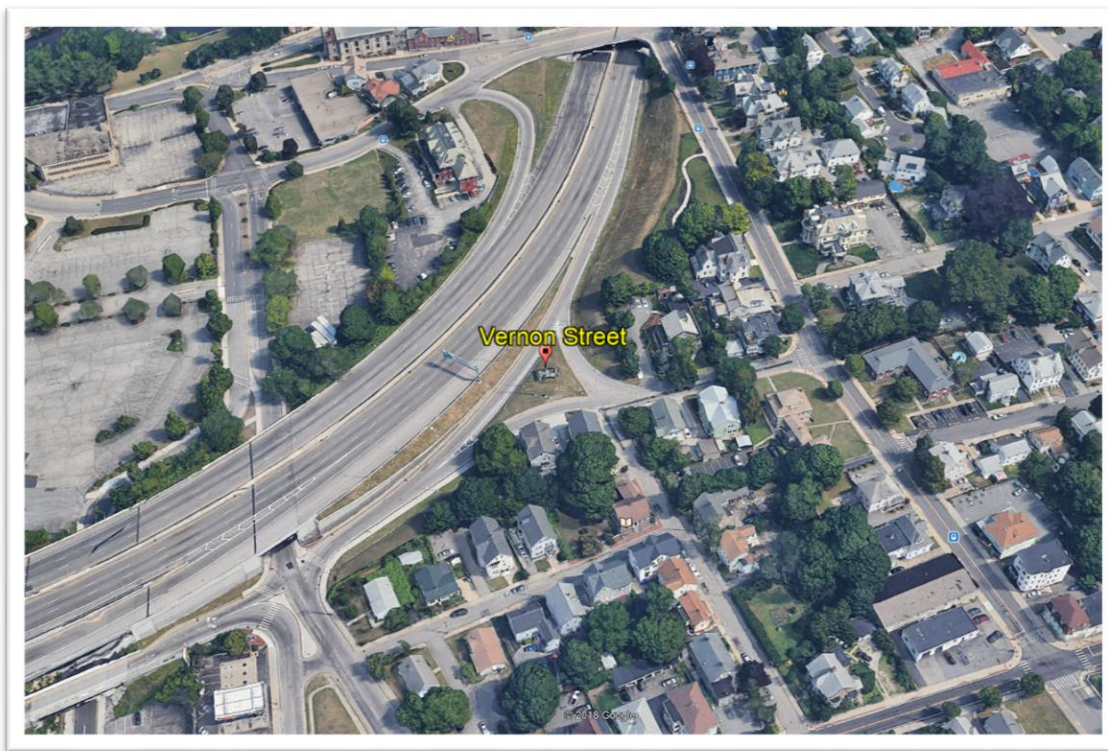




**Table 20: Vernon St - Pawtucket**

Pawtucket – Vernon Street			
County	Providence	Latitude	41.874683°
Address	Vernon Street	Longitude	-71.379936°
AQS Site ID	440070026	Elevation	82 feet
<b>Spatial Scale</b>	Middle	Year Established	2001
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The Vernon Street site is a middle scale site located in a suburban area in north-eastern Rhode Island in the City of Pawtucket. This site is operated by RIDEM as part of the SLAMS and State Toxics networks. Land use type: Highway/ Residential. It is located at grass level adjacent to Interstate RT I-95 and sits midway on a hill near the on-ramp with houses on the east-south sides. This site is a small grassy median situated 22 meters from I-95 North and 8 meters to the ramp leading to the highway. The samplers are placed on a cement platform and pressure treated deck. The area is surrounded by a chain link fence.</p>			
<p>Monitoring Objectives: to collect air quality measurements to assess long-terms trends as part of the national SLAMS and Toxics network.</p>			
<p>Planned changes for 2024-2025: None</p>			

**Figure 15: Pawtucket Monitoring Location**



**Table 21: Cranston – Near -Road**

Cranston – Near Road			
County	Providence	Latitude	41.769880°
Address	750 Wellington Ave	Longitude	-71.428489°
AQS Site ID	440070040	Elevation	31 feet
<b>Spatial Scale</b>	Microscale	Year Established	April 2022
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
<p>Site Description: The shelter sits in an open grassy spot north of the gantry at highway grade, less than 10m from the slow traffic lane. There are no roadside barriers, high structures, thick vegetation, sound walls, or complex terrain along this flat open section of road. The east side of the highway is very open along Wellington Avenue, while the west side has very slight elevation and some larger trees. Doric Park is very heavily used for recreation and is directly across from the proposed site on the west side of the highway, with residential homes south of Doric Park. The site has a new AQS ID listed above.</p>			
<p>Monitoring Objectives: To collect near road air quality measurements to assess long-term trends as part of the Near Road Network.</p>			
<p>Planned changes for 2024-2025: None</p>			

**Figure 16: Cranston Near-Road Monitoring Location**



**Figure 17: Cranston Near-Road Monitoring Location**



The former RIDEM/RIDOH Near Road monitoring station began operating in April 2014. The site was positioned along a segment of I-95 with the highest AADT traffic counts. Monitoring began in April of 2014 and ended in Fall of 2021. RIDOT speed profile data from 2012 indicate the current segment experienced some of the highest congestion profiles in the state.

It was known at the time of construction of the current Near Road location, that once the I-95 South viaduct bridge was completed, at some point the northbound bridge construction would take place and force the relocation of the Near Road location.

At the new location, a playground is situated about 300 feet across the highway on the southbound side. To the north and south of the park are residential neighborhoods. The east side of the highway is commercial use, with the closest businesses a roofing supply company and moving/storage facility. There are no large structures nearby (all about 1 to 1.5 stories), which are downwind across Wellington Avenue, which is a 2-way, 2 lane road.

The location is oriented very similarly to the previous Near Road site, with SSW to NNE orientation. The current site is just very slightly more northerly oriented with the new site down wind of the target road segment. It is known that the predominant flows in that region have a westerly component year-round.

There are no tall buildings to obstruct air flow significantly from any direction. This site is 2 miles west of Narragansett Bay and would seldomly be impacted by bay or sea breezes. As mentioned, there is very little grade in this area, with unobstructed flows off the highway.

For additional details on the reasoning for this site selection, please refer to the 2021 Annual Monitoring Network Plan.

**Table 22: RIDEM State Beach Pavilion - East Matunuck**

<b>East Matunuck – State Beach Pavilion</b>			
County	Washington	Latitude	41.377451°
Address	950 Succotash Road	Longitude	-71.52485°
AQS Site ID	440090008	Elevation	20 feet
<b>Spatial Scale</b>	Regional	Year Established	2020
<b>Statistical Area</b>	Providence, New Bedford, Fall River, RI-MA Metropolitan Statistical Area		
Site Description: The East Matunuck site is a regional scale site established to capture ozone concentrations on the coast.			
Monitoring Objectives: Because of its immediate coastal location, this monitor will capture ozone plumes migrating over water along Long Island Sound as they come ashore. These measurements will enhance the existing network of Rhode Island ozone monitors to complement transport arriving inland, and now, the immediate coastline. Additionally, in summertime, the open ocean beaches along the Southern Rhode Island coastline are highly populated and it is important to understand the ground-based ozone health risk in a region where hundreds of thousands of people visit and recreate. RIDEM expects to meet AQS level criteria again for 2023.			
Planned changes for 2024-2025: None			

**Figure 18: East Matunuck Monitoring Site Location**



**Figure 19: East Matunuck Monitoring Site Location (facing S from tower)**



**Table 23: Rhode Island Monitoring Sites**

1	Vernon Street	Vernon Street, Pawtucket RI	41.874675	-71.379953
2	Myron Francis School	64 Bourne Avenue, East Providence RI	41.84092	-71.4236587
3	CCRI Liston Campus	1 Hilton Street, Providence RI	41.807523	-71.41392
4	Near Road	750 Wellington Avenue, Cranston RI	41.76988	-71.428489
5	Alton Jones Campus	Victory Highway, West Greenwich RI	41.6156	-71.7199
6	USEPA Laboratory	27 Tarzwell Drive, Narragansett RI	41.4950779	-71.4236587
7	East Matunuck	950 Succotash Road, South Kingstown RI	41.377451	-71.52485

**Figure 20: RI Monitoring Network**

