

2020 Community-Scale Air Toxics Monitoring Study

**Characterization of Volatile Organic Air Toxic Compound Levels in Communities Located
Adjacent to the Port of Providence**

Interim Final Report

**Rhode Island Department of Environmental Management
Office Of Air Resources**

March 2023

Introduction

In 2020, the United States Environmental Protection Agency (USEPA) awarded the Rhode Island Department of Environmental Management, Office of Air Resources (RIDEM OAR) a Community-Scale Air Toxics Monitoring (CSAT) grant to conduct a study entitled “Characterization of Volatile Organic Air Toxic Compound Levels in Communities Located Adjacent to the Port of Providence.”

The CSAT monitoring project will characterize air toxic emissions near the Port of Providence to characterize risk to the most highly impacted populations including surrounding environmental justice areas, schools, 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.

This study will focus on volatile organic compounds, in particular benzene and 1,3 butadiene found in diesel exhaust and petroleum products. In addition to monitoring for VOCs, as part of the comprehensive study of the Port, the RIDEM OAR monitored PM_{2.5} and NO₂ using low-cost sensors co-located with the VOC monitors. The comprehensive study includes a survey of all sources in the area for chemical and fuel use, as well as compliance inspections at all facilities located in the Port area.

The USEPA requires recipients of CSAT grants to submit interim and final reports to document study progress and findings. This document will serve as the interim report for the Rhode Island project. The monitoring associated with the Rhode Island project was completed at the end October 2022. A final report, including findings and recommendations, will be submitted at the end of 2023.

Study Elements

Quality Assurance Project Plan

The Draft Quality Assurance Project Plan (QAPP) was submitted to EPA in October 2021 and finalized in Marc 2022. The QAPP described the project details, responsible parties, projected timeline, and how the project would be completed. In preparing the interim report it is noted that we have met all elements identified in the QAPP.

Monitoring Locations

In an effort 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 sites selected included 455 Wickenden (Vartan Gregorian School), 89 Washington Ave (neighborhood site), and 200 Terminal Rd (in Port worst case site) all in Providence and 525 Veterans Memorial Parkway in East Providence, however, due to issues at the Vartan site and the Washington Ave site these two sites needed to be relocated, further discussion is below, leaving the following as the final monitoring locations:

Providence Community Health Center
695 Eddy Street
Providence, RI 02905

Providence Animal Shelter
200 Terminal Road
Providence, RI 02905

Seastreak
25 India Street
Providence, RI 02903

Residential
215 Ohio Avenue
Providence, RI 02905

SUEZ Pump Station
525 Veterans Memorial Parkway
East Providence, RI 02914

Issues at the Vartan Gregoria Elementary School included, tampering with the equipment, vandalism, and ultimately theft of the power supply cords, requiring RIDEM to find a new location. The move was officially made during September 2021 to the Seastreak Ferry Depot, located right along the northern portion of Narragansett Bay, which proved to be a better location in terms of capturing flows from the Port. The Seastreak location is very secure, and allows less possible interference of emissions from I-195 as it is located south of I-195, while Vartan was north of the freeway, which may have captured highway emissions with prevailing flows.

RIDEM also had to relocate from a private residence on Washington Avenue to a private residence on Ohio Avenue. The resident at the original site on Washington Avenue was regularly doing work near the monitoring equipment and unplugging power to the shelter, resulting in missed VOC runs. There were no longer power issues once moved to the new location at Ohio Avenue during October 2021.

MONITORING EQUIPMENT

PM_{2.5}/NO₂

Clarity Node-S air sensors were selected for monitoring PM_{2.5} and NO₂. 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 PM_{2.5} data has been shown to correlate quite well with FRM/FEM data. 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 PM_{2.5}, 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.
- 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 PM_{2.5} 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 NO₂ data. The sensors were deployed on the week of 1/19/23. Updated calibration factors will be applied to the NO₂ at the end of this collocation with the Thermo 42i NO_x monitor at Near Road.

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. 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 samples are analyzed using Method TO-15a by the RIDOH, Air Pollution Laboratory (APL) using the Agilent GC/MS purchased for the study. VOC samples began during June 2021 ending October 2022.

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 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 APL is still processing these cans due to a backlog, but as of this report, VOC analysis has been completed through March 2022. More details on the data capture and analysis will be provided in the final report.

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

Direct contact was made to provide updates on the project 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. The kickoff Zoom meeting occurred on 2/8/23 and included community members, NGOs, a variety of staff from RIDEM, RIDOH, and Brown University. The group will continue to meet quarterly.

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 were operating. The website continues to be updated as data is collected is analyzed.

<https://dem.ri.gov/environmental-protection-bureau/air-resources/air-toxics-monitoring-port-providence>

Compliance Activities

Point Source Inspections

As part of this project, RIDEM has put together a list of 62 sites that are in the process of being inspected for compliance with air pollution control regulations. Now that all pandemic restrictions have been lifted, more resources will be directed to having all sites inspected by June 2023. Compliance findings and actions are summarized and updated on the study webpage noted above.

Odor Checks

Driven by a combination of public complaints, RIDEM staff regularly in the area working on the equipment as part of this study, as well as random visits along Allens Avenue, RIDEM inspectors logged 114 odor observations from November 2020 through the time of this report

The observations yielded:

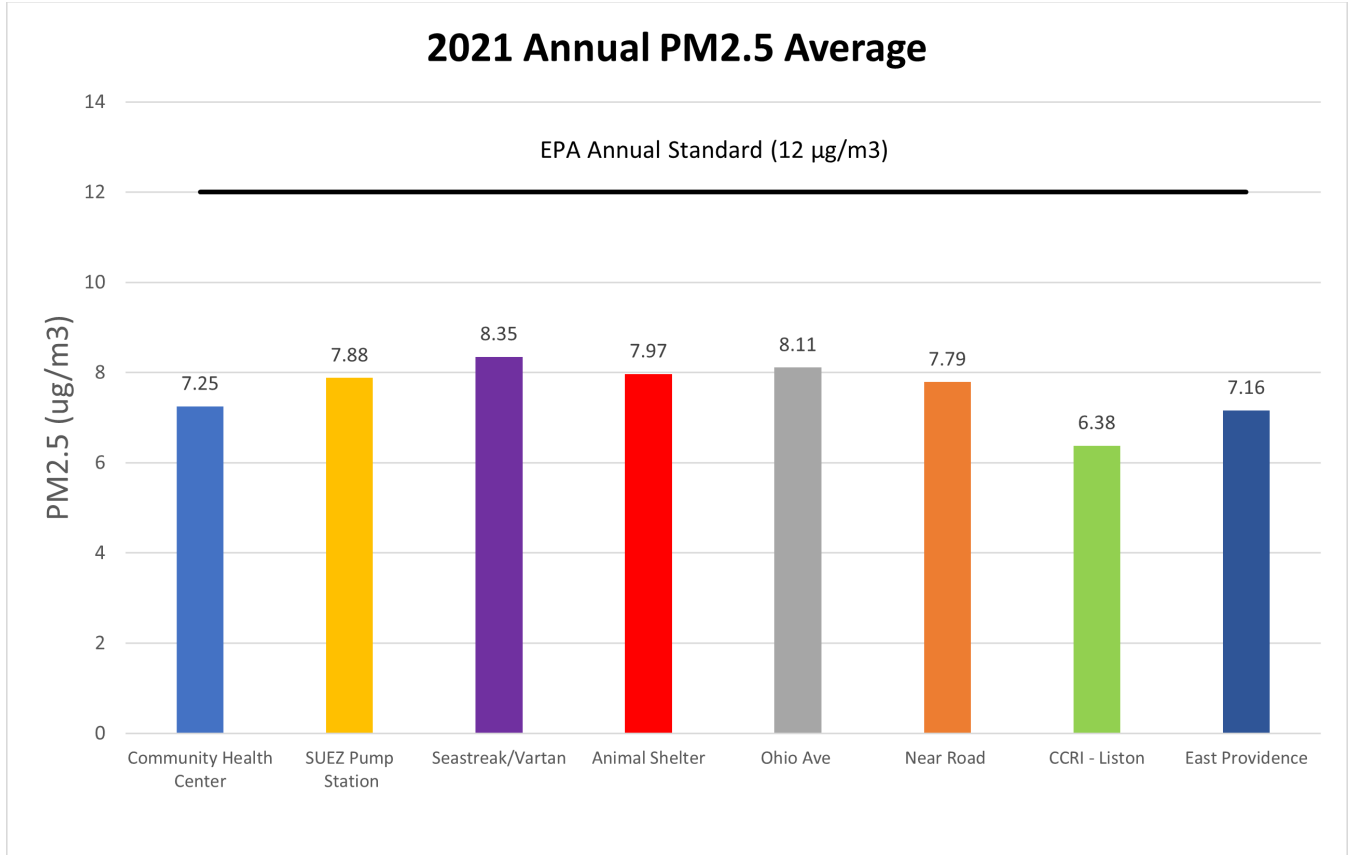
- 30 detected no odor
- 4 detected “objectionable” odors
- 70 detected an “asphalt” odor
- 10 detected “wastewater/sewage” type odor
- 24 detected “gas/petroleum/propane” type odor
- 5 detected “visible dust/debris” from Narragansett Improvement

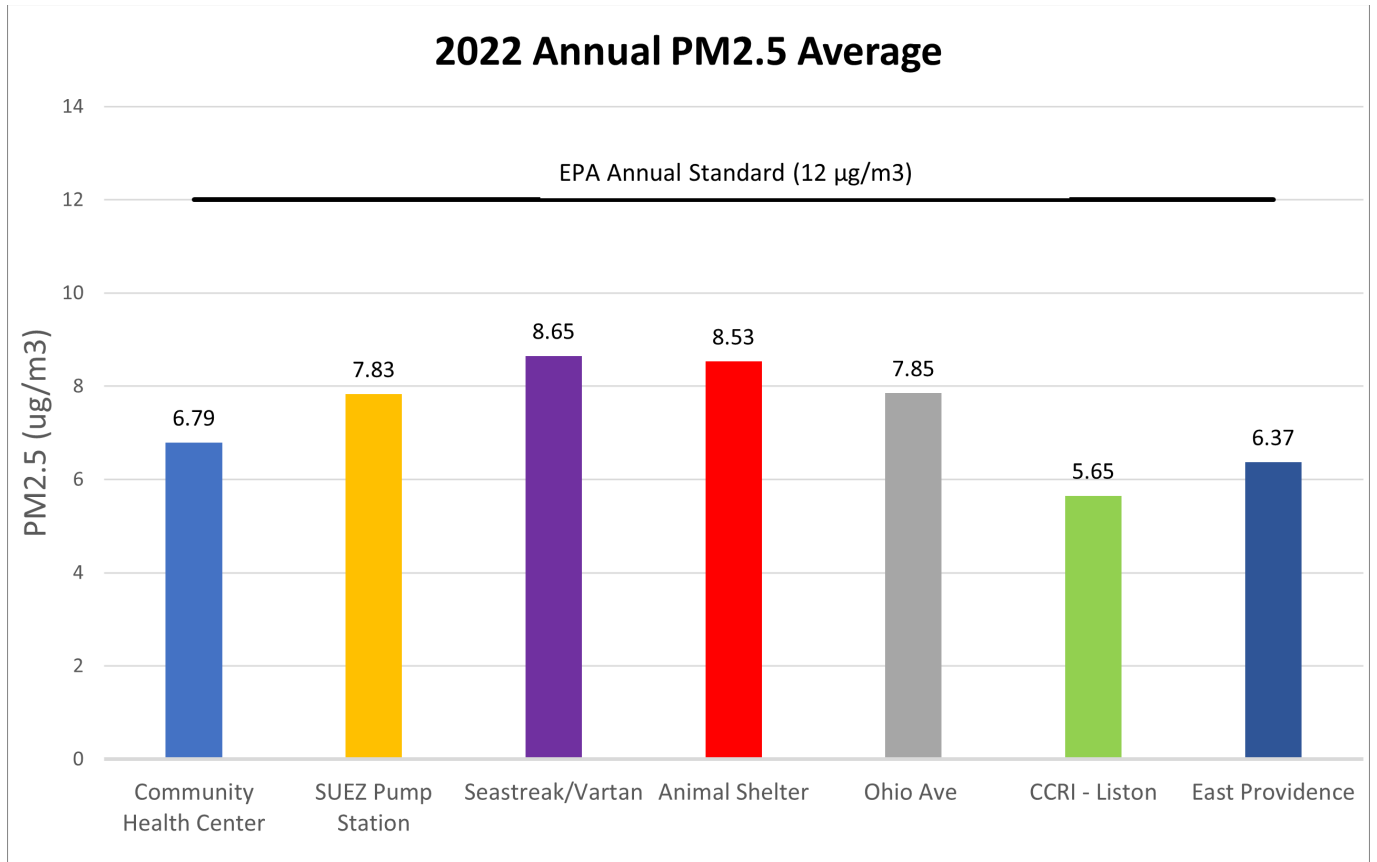
As a result of the objectionable odor detected the potential source was issued a Notice of Noncompliance and continues to be monitored. Odor checks and enforcement actions will continue around the Port for the foreseeable future. The RI Attorney General’s Office has also began assisting us in the enforcement effort.

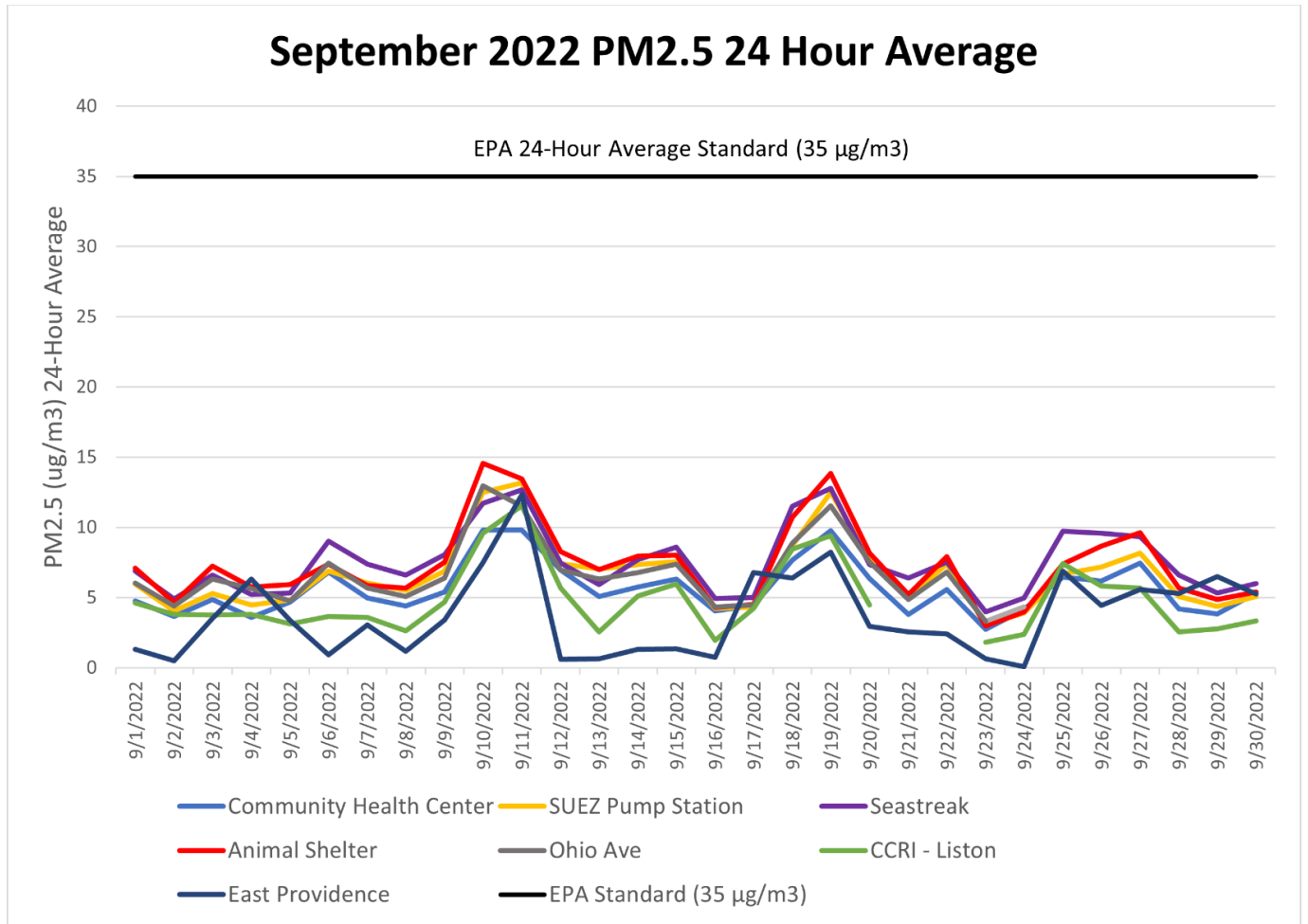
Preliminary Data Analysis

PM2.5

Data from Clarity nodes has been calibrated and a preliminary review of the data has been performed for the data collected 2021 and 2022. It is noted that the annual averages fall well below the EPA annual standard at all sites. As expected from sensor data, the annual averages run slightly higher than the FEM/FRM equipment annual averages. Preliminary analysis of PM 2.5 data is below.







VOC

VOC data is in the process of being analyzed. A full analysis will be provided in the final report.

Output Goals and Objectives and Outcomes

As stated in the grant proposal the interim final report will include documentation of the degree to which the output goals and objectives were met and a prognosis for the achievement of short- and mid-term project outcomes, as presented below.

Outputs

The output goals and objectives achieved include:

- Data from the five monitoring stations input into the EPA’s AQS database as data is processed.
- All relevant pollutant measurements and meteorological data uploaded to an Excel workbook which will be used for data analysis and will be available to researchers and other interested parties as received.

- A profile for each sampling location, including a site description, pollutant information, and an analysis of the conditions that affect air pollutant levels at that location has been developed.

Outcomes

Short term project outcomes completed and/or ongoing include:

- Continue to work with the community partners through quarterly Zoom calls and Port related meetings to discuss and identify sites and conditions of concern.
- Through presentation and meetings increased community awareness about air pollution near the Port.
- Completed one year collection of pollutant and meteorological data to determine the nature and extent of impacts of the Port on adjacent communities.

Mid-term:

- Continued conversations with the Mobile Sources Section of the RIDEM-OAR on implementation of diesel emission reduction strategies through DERA Grant assistance program.
- Facility inspections to assure compliance of point sources operating in the Port area is ongoing and projected to be completed by June 1, 2023.
- Data analysis to understand the impacts of emissions from Port activities at sensitive receptors located near the Port and the factors that affect those impacts is in the beginning stages to be reported in the final report.
- Dissemination of preliminary information has begun through Port meeting presentations.
- Data review is currently underway, and we are in the process of developing recommendations concerning mitigation procedures for existing sensitive receptors, where applicable and for siting of future sensitive receptors.
- RIDEM OAR has made preliminary determinations for recommendations for future and long-term monitoring that will be discussed in the final report after all the data is analyzed.
- Preliminary data had been provided, as available, to interested parties.

Additional completed work outcomes, not specifically noted in the grant proposal include:

- NO₂ data was collected using the Clarity sensors and will be evaluated as part of the study. RIDEM OAR will continue to work with Clarity to finalize NO₂ data through collocation with Near Road Monitor and complete correction factors.
- Recently RIDEM OAR was made aware of an additional community monitoring projects taking place in the same area. RIDEM OAR will continue to coordinate with research partners (Brown University and RIDOH) to exchange any relevant information
- RIDEM OAR has recently partnered with the RI Attorney General's Office to increase enforcement in the Port area and will continue to work with the Attorney General's office to support their compliance activities.
- RIDEM OAR continues to seek funding opportunities to explore future monitoring work and/or monitoring tools to support compliance activities, such as mobile TVOC monitoring.

RIDEM is in the process of analyzing data for the final report to EPA, HEALTH, health researchers, other states, and other interested parties. Excel data files will also be made available to interested parties with the final report. RIDEM intends to present findings to stakeholders in a public format. The finding will also be made available on RIDEM website.