

Puerto Rico Air Monitoring Network Plan 2023



Commonwealth of Puerto Rico Air Quality Area



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ACRONYMS AND ABBREVIATIONS

AQA: Air Quality Area AQI: Air Quality Index AQS: Air Quality System **CFR: Code of Federal Regulations** CPR: Commonwealth of Puerto Rico CBSA: Core-based Statistical Area DNER: Department Natural and Environmental Resources EPA: Environmental Protection Agency FEM: Federal Equivalent Method FRM: Federal Reference Method MSA: Metropolitan Statistical Area NAAQS: National Ambient Air Quality Standards NAMS: National Air Monitoring Stations NCore: National Core Multi-Pollutant Monitoring Stations NO₂: Nitrogen Dioxide O₃: Ozone **OSI: Information System Office** PAMS: Photochemical Assessment Monitoring Stations Pb: Lead PM₁₀: Particulate Matter PM_{2.5}: Fine Particulate Matter ppm: parts per million PR: Puerto Rico PRAMN: Puerto Rico Air Monitoring Network PRDNER: Puerto Rico Department of Natural and Environmental Resources PRERL: Puerto Rico Environmental Research Laboratory PREPA: Puerto Rico Power Electrical Authority QA: Quality Assurance QC: Quality Control QAQCO: Quality Assurance and Quality Control Office QAMP: Quality Assurance Monitoring Plan QAPP: Quality Assurance Project Plan QMP: Quality Management Plan RCAP: Regulation for the Control of Atmospheric Pollution of Puerto Rico SLAMS: State and Local Air Monitoring Stations SO₂: Sulfur Dioxide SO₄: Sulfate SPM: Special Purpose Monitor **TEOM:** Tapered Element Oscillating Microbalance **TSD: Temporary Shutdown** TSP: Total Suspended Particulate



INTRODUCTION

The Commonwealth of Puerto Rico through the 2023 –Puerto Rico Air Monitoring Network (PRAMN), provides evidence that meets current federal air monitoring requirements. The PRAMN Plan details any proposed changes for the next 18 months after publication, provides specific information for each of the existing and proposed monitoring stations, and offers to the public the opportunity to comment on air sampling activities implemented by the PRDNER.

The air quality data of the PRAMN is used to determine compliance with the National Ambient Air Quality Standards (NAAQS). In 1970, the Clean Air Act (CAA) established NAAQS for the six pollutants: Lead (Pb), Particulates (PM₁₀ and PM_{2.5}), Ozone (O₃), Sulfur dioxide (SO₂), Nitrogen dioxide (NO₂) and Carbon monoxide (CO). Under CAA, PRDNER is required to adopt enforceable plans to achieve and maintain air quality meeting the air quality standards. PRDNER, shall have the primary responsibility for assuring air quality within the entire geographic area comprising Puerto Rico region by submitting an implementation plan which will specify the manner in which national primary and secondary ambient air quality standards will be achieved and maintained within each air quality control region to monitor these criteria pollutants. Also, PRDNER shall report the collected data to the Environmental Protection Agency (EPA)

The operation of the ambient air monitoring network by PRDNER is a critical component for the protection of public health and the environment. The operation of the network is to meet the following requirements necessary to demonstrate:

<u>Infrastructure SIP requirements</u>: Clean Air Act Section (CAA) 110(a)(2)(B) provides for the establishment and operation of monitoring systems for ambient air quality and that the air quality data collected be available.

<u>Nonattainment Areas</u>: Ambient air monitoring is crucial for the nonattainment areas for determining whether the areas are meeting the National Ambient Air Quality Standards (NAAQS). Air monitoring is also vital in providing air quality information about areas not meeting the NAAQS to the public because their health may be directly impacted providing air quality information to the public.

<u>Providing air quality information to the public:</u> The air monitoring network is crucial in providing air quality information to the public. This information helps the public make air quality-based decisions about what activities they can participate in or whether they are exposed to pollutant concentrations above healthy Air Quality Index (AQI) levels.



The PRAMN plan describes the Puerto Rico Air Sampling Network and includes updates and modifications to the network for 2023. The air sampling network is reviewed annually as part of federal regulation under Title 40, Part 58, Section 10 of the Code of Federal Regulations (40 CFR § 58.10) to identify changes in accordance with regulations or incorporate revisions to the National Ambient Air Quality Standards (NAAQS). This plan will be presented to the Environmental Protection Agency (EPA) on or before July 1 of each year, after a public comment period of 30 days.

The revision to the plan focuses on the current and future strategies of the air sampling network. The network modifications are made in consultation with the EPA. Also, it evaluates the operating cost of the network in accordance with the available budget for the 2023 fiscal year.

PUBLIC COMMENTS

In accordance with federal regulations, the plan will be available for public review and comment period for 30 days before submitting the final plan to the EPA. Comments received during the public consultation period will be forwarded to the Environmental Protection Agency (EPA) at the same time the plan is submitted. Due the COVID-19 Pandemic, this plan will be only available at the DNER website, <u>http://www.drna.pr.gov/acai/muestreo/</u>. Written comments should be sent to **aire@drna.pr.gov**. The final document will be submitted to the EPA on or before July 1, 2023, along with the public comments received to comply with the federal regulatory requirements.

MONITORING DATA QUALITY ASSURANCE

The purpose of the Quality Assurance and Quality Control Program (QA/QC) is to ensure the quality of data obtained from air monitoring networks. This program also identify if the PRAMN meets or exceeds the requirements defined in 40 CFR Part 58 and all applicable appendices.

The Quality Assurance and Quality Control Program includes, but is not limited to, the following activities:

- Instrument performance audits
- Monitor siting criteria inspections
- Precision and span checks
- Bias determinations
- Flow rate audits
- Leak checks



The National Performance Audit Program (NPAP) and the Performance Evaluation Program (PEP) are independents activities where the PRDNER participates to ensure the quality of the criteria pollutant monitoring data.

The PRAMN operates under a Quality Management Plan (QMP) and Quality Assurance Project Plans (QAPP's) approved by the EPA. The QMP was prepared by the PRDNER-AQA and reviewed by QAQCO, to finally be approved by EPA Region 2. The PRAMN comply with the criteria identified in the QMP.

Each monitoring site is evaluated to ensure that comply with the EPA siting criteria as stablished in CFR Part 58, App. D. In addition, it includes a safety inspection to guarantee a secure work environment for the field personnel. The air sampling instruments, and PM samplers are audited as part of the required Performance Audit.

NETWORK DESIGN

The PRAMN has seventeen (17) locations with forty-four (44)¹ monitors around the island where the air quality for criteria pollutants (gaseous and particulate) is measured. The goal of the network is to maintain information about air pollution. The information is available on maps, Internet sites, and / or public notices. The PRAMN is a backbone for air quality management programs, provides the public with information on current conditions and the progress in improving air quality, and is used by health researchers, business interests, environmental groups, and others.

The air sampling network has the collection of pollutant data such as particles with a diameter of 2.5 micrometers or less ($PM_{2.5}$), particles with a diameter of 10 micrometers or less (PM_{10}), ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxide (NO_2) and lead (Pb). Meteorological data are also collected. Also, the network has an NCore station with a $PM_{2.5}$ speciation monitor and, two NO_2 stations near roads. These last ones with the purpose of analyzing and describing the nature of air quality problems to the population on the Island.

The data obtained from the FRM and FEM monitors for the criteria pollutants are compared with NAAQS, to develop achievement and maintenance plans. Sites classified as SLAMS, and especially NCore, are used to evaluate air quality and provide data that is used in the development of strategies and explore trends in the impact of control measures. The air sampling near major emission sources can give an idea of how these sources control their pollutants by their operations and the engineering controls implemented.

¹ Include the new QA monitors.



The characteristic data of an NCore station and / or of SLAMS stations are comparable with the data collected by research on the effects on health and atmospheric events, or very well for the work of method development.

Currently, Puerto Rico meets all minimum air monitoring requirements. The EPA in Appendix D of 40 CFR Part 58 establishes the minimum number of monitoring sites necessary to meet the environmental monitoring objectives. The minimum monitoring requirements are specific for each of the pollutants based on objectives (NCore, ozone, PM_{2.5}, NO₂ near roads). Generally, the monitoring requirements are related to the population and to the air emissions of the area.

		Country	Соо	rdinates	Deremeter				
PR Id.	AQS NUM.	County	Latitude	Longitude	Parameter				
Metropolitan Area San Juan - Caguas									
EQB 7	72-061-0001	Guaynabo	18.177318	-66.115845	PM10				
EQB 20	72-061-0006	Guaynabo	18.4218472	-66.1206861	CO, NO ₂				
EQB 21	72-025-0007	Caguas	18.198092	-66.052719	PM2.5, NO2, CO				
EQB 22	72-053-0003	Fajardo	18.381414	-65.617799	PM _{2.5} , PM ₁₀				
EQB 24	72-061-0005	Guaynabo	18.432122	-66.114702	PM2.5, PM10, PM10 QA PM2.5QA,				
EQB 30	72-127-0003	San Juan	18.4478145	-66.0525095	со				
EQB 37	72-021-0010	Bayamón	18.419231	-66.150429	NCore (PM _{2.5} , SO ₂ , CO, NOx, O ₃ ,				
					PM10, PM2.5 Spec, PM2.5 AQI)				
EQB 40	72-033-0004	Cataño	18.428427	-66.141648	SO ₂ , PM _{2.5} AQI, PM ₁₀ AQI				
Metropolitan /	Area Ponce								
EQB 13	72-001-0002	Adjuntas	18.17537759	-66.725988	PM _{2.5}				
EQB 56	72-113-0004	Ponce	18.0095583	-66.6272249	CO, PM _{2.5} , PM ₁₀ , PM ₁₀ AQI, PM _{2.5}				
					AQI				
EQB 57	72-059-0016	Guayanilla	N	ew	PM _{2.5}				
Metropolitan /	Area Guayama - Salii	nas							
EQB 15	72-057-0012	Guayama	17.955378	-66.162122	PM2.5, PM10				
EQB 18	72-123-0002	Salinas	17.968352	-66.261365	SO ₂				
EQB 69	72-057-0011	Guayama	17.965713	-66.186803	SO ₂				
New		Salinas			NO2, PM2.5 AQI				
Metropolitan /	Area Mayaguez								
EQB 59	072-097-0007	Mayagüez	18.21428	-67.14461	O ₃ , PM _{2.5}				
Metropolitan	Area Arecibo								
EQB 74	72-013-0001	Arecibo	18.457166	-66.696468	Pb				
EQB 75	72-013-0002	Arecibo	18.453062	-66.695688	Pb, Pb-QA				
New		Barceloneta			O ₃				

Table 1: Site Information – Puerto Rico Stations



The network design proposed in this document is according to the Clean Air Act, the 40 Code of the Federal Regulations (CFR) Part 58, which presents a balance between the desired number of monitors, the sampling frequency, the available budget, and the employees necessary for its management and operation. The recommended changes will be implemented during the period from July 2023 to December 2024, depending on the available budget. The operation of the network may change over the years without public notification based on unexpected circumstances. Examples of unexpected circumstances include equipment failures due catastrophic events, construction or demolition activities, and loss of access to the site, monitor obstructions or natural events (hurricanes, storms, etc.).







4.1 Network Status

Since the Puerto Rico Environmental Research Laboratory (PRERL) has not resumed analysis of PM_{2.5} and Lead, the Air Quality Area (AQA) will use the services of the EPA National Laboratory and Contract Laboratory to carry out the analysis. The AQA maintains continuous communication with EPA Region 2. All the changes are made in coordination with EPA.



Table 2: Puerto Rico Network

PR Id	AQS Num.	County	Parameter	Active	Comments
EQB 7	72-061-0001	Guaynabo	PM10	٧	
EQB 13	72-001-0002	Adjuntas	PM2.5	TSD	
EQB 15	72-057-0012	Guayama	PM2.5	V	Change equipment for BAM 1022 Met-One
			PM10	V	
EQB 18	72-123-0002	Salinas	SO ₂	V	
EQB 20	72-061-0006	Guaynabo	CO	TSD	TSD; injured by traffic accident 2020/01/26
			NO ₂	TSD	TSD; injured by traffic accident 2020/01/26
EQB 21	72-025-0007	Caguas	PM2.5	V	
			NO ₂	V	
			CO	V	
EQB 22	72-053-0003	Fajardo	PM2.5	V	
			PM10	V	
EQB 24	72-061-0005	Guaynabo	PM2.5	V	
			PM2.5 QA	V	
			PM10	٧	
			PM ₁₀ QA	٧	
EQB 30	72-127-0003	San Juan	CO	TSD	TSD 2021/01/01(due to lack of personnel)
EQB 37	72-021-0010	Bayamon	PM2.5	V	
			PM10	V	
			SO ₂	V	
			CO	V	
			O3	٧	
			NOx	TSD	TSD 2020/08/06
			PM _{2.5} Spec.	TSD	Waiting for the new equipment
			AQI PM _{2.5}	TSD	Waiting for the new equipment
			PM _{2.5} Cont.	V	Waiting for the new equipment
EQB 40	072-33-0004	Cataño	SO ₂	V	
			AQI PM _{2.5}	V	Change equipment for BAM 1022 Met-One
			AQI PM ₁₀	V	
EQB 56	72-113-0004	Ponce	CO	V	
			PM2.5	V	
			PM10	V	
			AQI PM ₁₀	V	
			AQI PM _{2.5}	TSD	Change equipment for BAM 1022 Met-One
EQB 59	072-97-0007	Mayagüez	O ₃	V	
			PM2.5	V	Change equipment for BAM 1022 Met-One
EQB 69	72-057-0011	Guayama	SO ₂	V	
EQB 74	72-013-0001	Arecibo	Pb	V	
EQB 75	72-013-0002	Arecibo	Pb	V	
			Pb-QA	V	



4.2 Network Equipment

The PRAMN uses the equipment recommended and approved in the *List of Designated Reference and Equivalents Method* of Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53) to carry out the sampling according to each parameter being sampled. These consist of two types, continuous monitoring and intermittent (manual) sampling.

- Intermittent or manual sampling is used for the particulate stations (PM₁₀, PM_{2.5} and Pb). These stations take samples for 24-hours period, with different frequencies, PM₁₀ and Lead every six days (1-6 days) and PM_{2.5} every three days (1-3 days). These equipments uses filters that are weighted (gravimetrical analysis), and analyzed through chemical processes Lead (Pb) analysis either in the DNER environmental laboratory or by EPA National Contract Laboratory.
- Continuous monitoring is used for NO₂, CO, SO₂, O₃, PM₁₀, and PM_{2.5}. The continuous equipment takes samples continuously 24-hours every day. This equipment calculates averages of five (5) minutes and hourly averages from the values taken.

Both types of equipment are calibrated and are subjected to a preventive maintenance according to the *QA Handbook Vol. II App D Measurement Quality Objectives and Validation Templates*. All the equipment has and meets the specifications of quality assurance control; and the captured data is reliable for comparison with the NAAQS.

Parameter	Equipment	Туре
Particulate Matter	Thermo Scientific Hi-Vol SA/GMW-321B	manual
(PM_{10})	Met-One E-Seq-FRM PM ₁₀	manual
	Thermo Scientific TEOM 1405 _AVF 246-B Inlet	continuous
Particulate Matter	Met-One E-Seq-FRM PM _{2.5} / VSCC	manual
(PM _{2.5})	Met-One Beta 1022 Attenuation Particulate / VSCC	continuous
Sulfur Dioxide (SO ₂)	Teledyne T-100 Pulsed Fluorescence	continuous
Nitrogen Dioxide (NO2)	Teledyne T-200 Chemiluminescence	continuous
<i>Ozone (0₃)</i>	Teledyne T-400 Instrumental Ultraviolet Abs.	continuous
Lead (Pb)	Thermo Scientific TSP VFC Hi-Vol	manual
Carbon Monoxide (CO)	Teledyne T-300 Gas Filter Corr. CO Analyzer	continuous
PM _{2.5} Speciation	Met-One SASS Teflon Energy Dispersive XRF	manual

Table 3: Equipment used in the PRAMN by parameter.



4.3 PM_{2.5} Air-Monitoring Network

The PRAMN operates twelve (12) sites of $PM_{2.5}$ in the air sampling network, seven (7) use the FRM, four (4) continuous FEM sampling and one (1) collocated (QA). The FRM $PM_{2.5}$ sampling equipment is reference sampling equipment included in the EPA-Designated Reference List as Met One E-SEQ-FRM $PM_{2.5}$ / VSCC. All FRM sites operate one every three days (1-3). The monitor placed FRM QA operates one day every 6 days.



Figure 2: PM_{2.5} Network



The continuous $PM_{2.5}$ monitors operate throughout the year and data is sent to EPA's AQS database in one-hour values. The equipment used for continuous $PM_{2.5}$ sampling will be replaced by VSCC Met-One Beta 1022 Attenuation Particulate monitors. This analyzer is part of the new equipment financed with the funds from the American Rescue Plan. Details of these sites are in Appendix I and Figure 2.

4.4 PM₁₀ Air-Monitoring Network

The PRAMN operates seven (7) PM_{10} sites and is broken down into five (5) intermittent FRM monitors, one (1) collocated and two (2) PM_{10} continuous monitors in the air sampling network.



Figure 3: PM₁₀ Network



The FRM PM_{10} sampling equipment used in the network is the Hi-Vol SA/GMW-321B. The monitor located at Bayamón operates every three days (1 in 3) and while the other five (5) monitors, including the QA monitor, operate every six days (1 in 6).

The continuous PM₁₀ monitors take samples throughout the year and the concentrations are sent to the AQS of the EPA and the monitors are used for AQI purposes. The equipment used is a TEOM 1405F-AVF. The details of the sites are included in Appendix I and Figure 3.

4.5 Ozone Air-Monitoring Network

The PRAMN operates two (2) ozone sites in the air sampling network. The ozone monitors operate throughout the year and the concentrations are sent in one-hour values to AQS of the EPA. The monitors are classified as SLAMS and the equipment used is FEM (Teledyne T-400 Instrumental Ultraviolet Abs).

The station located at Juncos EQB 8 (72-077-00010) and Cataño EQB 5 (72-033-0008) were closed. The closing date for the Cataño site was January 14, 2021, and the Juncos station's end date for sampling was on December 31, 2020.

The details of the location of the sites are included in Appendix I and Figure 4.



Figure 4: O₃ Network



4.6 SO₂ Air-Monitoring Network

The PRAMN operates four (4) sites of sulfur dioxide (SO_2) in the air sampling network; one of these monitors is at the NCore station. All SO₂ monitors are operated throughout the year. The concentrations are sent in one (1) hour values and five (5) minutes to AQS of the EPA. All SO₂ monitors are oriented to the sources. The equipment used is FEM (Teledyne T-100 Pulsed Fluorescence).

The details of the location of the sites are included in Appendix I and Figure 5.



Figure 5: SO₂ Network



4.7 Lead Air-Monitoring Network

The PRAMN operates two (2) Lead sites (Pb) in the air sampling network, both in Arecibo, the monitoring concentrations obtained by industries that handle lead. All Pb monitors, including the collocate (QA) are operated one (1) in every six (6) days (1-6) throughout the year and the concentrations are sent in day values to EPA AQS.

The monitors for lead are SLAMS and use the method (FRM). The sampler used is a Hi-Vol ICP-MS. The details of the sites are included in Appendix I and in Figure 6.



Figure 6: Lead Network



4.8 NO₂ Air-Monitoring Network

The PRAMN operates three (3) nitrogen oxide (NO_2) sites in the air-monitoring network, two (2) as parts of the near roads program, (at Guaynabo and Caguas); and one (1) at Bayamón NCore site. The NO₂ samplers are operated year-round, and the measurements are sent to the EPA AQS on an hourly basis. The SLAMS NO₂ sites are used FRM; and the equipment used is Teledyne T-200 Chemiluminescence.

The details of the sites are included in Appendix 1 and Figure 7.

Figure 7: NO₂ Network





4.9 CO Air-Monitoring Network

The PRAMN operates five (5) carbon monoxide (CO) sites in the air-monitoring network, one (1) of them at Bayamón NCore site. All CO samplers are operated year-round, and the measurements are sent to the EPA AQS on an hourly basis. The SLAMS CO sites use FRM monitors. The equipment used is Teledyne T-300 Gas Filter Corr. CO Analyzer. The details of these sites are included in Appendix 1 and Figure 8.



Figure 8: CO Network



4.10 NCore – Air Monitoring Network

In PR an NCore site was established in March 2011. This site is part of the sampling network that uses various advanced equipment for measuring particles, gases, and meteorology. The EPA requires each state to have at least one NCore site. The parameters sampled are CO, O₃, NO₂, NO_y, NO, SO₂, PM_{2.5}, PM₁₀, PM_{10-2.5}, PM_{2.5} Speciation, PM_{2.5} AQI and basic meteorology.

Puerto Rico is required to have an NCore site. Bayamón (AQS: 72-021-0010) was established as the NCore site for Puerto Rico. The monitor of $PM_{2.5}$ continuous is a Metone Bam 1022. The details of the monitors are in Appendix I and in Figure 9.

Figure 9 NCore Site





5. SPECIAL PURPOSE MONITORS (SPM) PUERTO RICO NON-ATTAINMENT STATE IMPLEMENTATION PLAN FOR SULFUR DIOXIDE (SO₂)

Twelve (12) SO₂ monitoring stations are proposed to be installed as SPM stations as part of the Puerto Rico Non-Attainment State Implementation Plan for Sulfur Dioxide (SO₂) National Ambient Air Quality Standard. Of which, six (6) monitoring stations will be in the northern area (San Juan) and the other six (6) monitoring stations in the southern area (Guayama - Salinas). That is, six monitors in each of the two areas classified as non-attainment for SO₂. The location of the twelve (12) stations will be based on the areas where the maximum concentrations are predicted to occur using the results of the AERMOD10 mathematical modeling program and which were included as part of the Puerto Rico Non-Attainment State Implementation Plan Sulfur Dioxide (SO₂) National Ambient Air Quality Standard that was submitted to EPA for approval.

6. NETWORK BUDGET AND LIMITATIONS

The PRAMN has several limitations that affect its implementation, operation, and maintenance. Although the sampling network has new equipment, the maintenance will be affected if the following limitations are not resolved.

- The lack of personnel for the maintenance, checks, and data handling of the air monitoring network. The staff responsible for these functions are only two (2) field technicians, one (1) electronics technician and three (3) statisticians.
- The allocation of funds for the operation and purchase of materials that have been approved and are available for the period that is needed should be expedited. Since the PRAMN is federally funded under Section 103 and Section 105 of the Clean Air Act, the PRAMN must be approved by EPA Region 2. Once funds are allocated, they cannot be used immediately. These funds require state funds to match, the DNER requires approval from outside government agencies.
- To make the purchasing process more flexible since all PR Government purchases are made by the General Services Administration regardless of the amount of the purchase and the urgency of the purchase. The AQA unknown the status of the orders. In addition, if the amount of the order exceeds \$10,000, authorization from another External Agency, Office of Management and Budget, is also required. All these new administrative requirements delay the orders and therefore the operation of the sampling network.
- Also, make the purchasing process more flexible in terms of the purchase of equipment, since the sampling equipment used in the network is not manufactured in PR. This requirement delays ordering by not being able to purchase directly from the manufacturer, and sometimes increases the cost of parts. PR Government regulation even limits the amount of money for purchases and requires prior approval from the Office of Management and Budget.



• Improve cooperation between Government Agencies to facilitate processes when establishing a new site. Any new site is complicated as it depends on the topography of the area, available electrical utility infrastructure, security, use permit and site owner approval.

7. NETWORK CHANGES

Given the situation of limited budgetary and personnel resources, during 2023, efforts will be concentrated on reestablishing the entire sampling network and continuing maximize the data capture over 75%.

Changes to the sampling network are made after determining whether the sampling sites meet the objectives for which they were established. Based on this evaluation, by 2023 two stations that no longer represent the objectives will be closed and three new monitors are proposed to be established. Details of these activities are provided below.

All changes involving the relocation, closure, and/or establishment of a new site will require approval by EPA. Each change request will be submitted to EPA when additional details regarding the sites are available.

- a. Activities to be carried out existing Sites:
 - 1. Repair the Guaynabo station (Metropista) and restart the site.
 - 2. Reestablish operation of stations closed due to lack of personnel.
 - 3. Implement the plan of American Rescue Plan funding to replace aging ambient air monitoring equipment for new monitoring equipment.
 - 4. Close the Cataño O_3 monitor EQB 5 (72-033-0008). The area will be covered by the Bayamon (72-033-0010) monitor.
 - 5. Close the Juncos O₃ monitor EQB 8 (72-077-0001)
- b. New sites

Based on the emission inventories, it is proposed to establish monitors in other areas of Puerto Rico where air quality data is lacking. It is intended to use the analyzers and equipment from the sites that were closed in the new sites.

- 1. New PM_{2.5} Guayanilla.
- 2. New O₃ site, Barceloneta

According to the 2022 emissions inventory, the Arecibo and Barceloneta areas are among the areas with the highest concentration of O_3 emissions. Also, these are areas for which we do not have ozone data.

The equipment to be used will be the equipment that was used at the Juncos station, which was closed. The location of the new station in Barceloneta will be determined



based on the results of the mathematical model that shows the areas with the greatest impact of O_3 emissions. Figure 10 shows the results, and the total emissions (tons) for Puerto Rico. The location of the station will be done in coordination with the EPA.

Figure 10: Proposed New O₃ site, Barceloneta



3. New NO_2 and $PM_{2.5}$ monitors to the Salinas Area

According to the 2022 emissions inventory, the Salinas and Guayama areas are among the areas with the highest concentration of NO_2 emissions and $PM_{2.5.}$ This area emits approximately more than 5,000 tons per year of NO_2 and more than 400 tons per year of $PM_{2.5.}$ Determining the monitor locations was based on the results of the mathematical model and will be located at the existing site of EQB 18 (72-72-123-0002). Figure 11 shows the results and total emissions (tons) for Puerto Rico.



Figure 11: Total emissions (tons) for Puerto Rico



7.1 Limitations to Implement the Proposed Changes.

To implement all the proposed changes, it is necessary to comply with the following:

- a. A request to EPA for approval of changes and posting to new sites is required.
- b. PR must have the budget to purchase the necessary equipment to establish the station.
- c. PR must have the personnel requested for the maintenance, operation and management of the network and the data handling.
- d. Have the required sitting criteria to establish the sampling sites. That is, the topography and infrastructure of the area allows it with access to the site, the area has electricity service for the operation of the equipment.



8. NETWORK MODIFICATIONS FORMS

A network modification document will be prepared with full details of the proposed changes to be submitted to EPA Region 2 to implement the network changes identified in this plan.

9. SUMMARY AND CONCLUSIONS

The PRAMN presented in this plan meets the monitoring requirements of federal regulations. The procedures that are used and the instruments that are operated meet the standards that have been established by EPA.

The most significant changes are to replace the continuous $PM_{2.5}$ samplers and to establish the remote data management and reporting system. Also, select the proposed sites for the new stations in Guayanilla and Barceloneta; and install the analyzers $PM_{2.5}$ and NO_2 at Salinas site.

APPENDIX: Site Description

Site Name		EQB 13					
Address		Road #123					
City		Adjuntas					
AQS Code		72-001-0002					
PR County		Adjuntas					
MSA/CSA		N/A					
Latitude		+18.172695					
Longitude		-66.726262					
Suitable for Compariso	n to PM _{2.5} NAAQS?	Yes					
Monitor Type		SLAMS					
Parameter	Method	Analysis	Schedule	Spatial	Objective	Begin Date	
		Method		Scale			
Ambient Average	Instrumental	Electronic	1 in 3	Urban	Extreme	2005/01/01	
Temperature					Downwind		
Sample Average	Instrumental	Barometric	1 in 3	Urban	Extreme	2005/01/01	
Barometric Pressure		Sensor			Downwind		
PM _{2.5}	E-Seq-FRM/VSCC	Gravimetric	1 in 3	Urban	Upwind	2005/01/01	
					Background		
Site Purpose		Reference for Extreme downwind					
Plans for the next 18 months		Re-start					
Other Comments		TSD 2021/01/20 (due lack or personnel)					

Station EQB 13 Adjuntas



Site Name		EQB 74					
Address		Victor Santoni Cordero Road					
City		Arecibo					
AQS Code		72-013-0001					
PR County		Arecibo					
MSA/CSA		Arecibo					
Latitude		+18.457166					
Longitude		-66.696468					
Suitable for Comparisor	n to PM2.5 NAAQS?	N/A					
Monitor Type		SLAMS					
Parameter	Method	Analysis	Schedule	Spatial	Objective	Begin Date	
		Method		Scale			
Ambient Average	Instrumental	Offsite Avg.	1 in 6	Micro	Source	2010/01/02	
Temperature		Pressure			Oriented		
Sample Average	Instrumental	Offsite Avg.	1 in 6	Micro	Source	2010/01/02	
Barometric Pressure		Pressure			Oriented		
Lead	Hi-Vol	ICP-MS	1 in 6	Micro	Source	2010/01/02	
					Oriented		
Site Purpose		Population Protection					
Plans for the next 18 m	onths	No Changes					
Other Comments		Part of Lead SIP					

Station EQB 74 Arecibo



Site Name		EQB #75							
Address	PR Road #2								
City		Arecibo							
AQS Code		72-013-0002							
PR County		Arecibo							
MSA/CSA		Arecibo							
Latitude		+18.453062							
Longitude		-66.695688							
Suitable for Compariso	n to PM2.5 NAAQS?	N/A	N/A						
Monitor Type		SLAMS							
Parameter	Method	Analysis	Schedule	Spatial	Objective	Begin Date			
		Method		Scale					
Ambient Average	Instrumental	Offsite Avg.	1 in 6	Micro	Source	2012/08/19			
Temperature		Pressure			Oriented				
Sample Average	Instrumental	Offsite Avg.	1 in 6	Micro	Source	2012/08/19			
Barometric Pressure		Pressure			Oriented				
Lead	Hi-Vol	ICP-MS	1 in 6	Micro	Source	2012/08/19			
					Oriented				
Site Purpose		Population Protection							
Plans for the next 18 m	Plans for the next 18 months		No Changes						
Other comments		Pb collocated (QA), Part of Lead SIP							

Station EQB 75 Arecibo



APPENDIX: Site Description

Site Name		EQB 21					
Address		Highway 22 Caguas South Toll					
City		Caguas					
AQS Code		72-25-0007					
PR County		Caguas					
MSA/CSA		San Juan-Caguas					
Latitude		+18.198712					
Longitude		-66.052237					
Suitable for Compari	son to PM _{2.5} NAAQS?	N/A					
Monitor Type		SLAMS					
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
NO ₂	Teledyne T200u	Chemiluminescence	Continuous	Urban	High Concentration	2016/12/19	
СО	Teledyne T300U	Gas filter Correlation CO analyzer	Continuous	Urban	High concentration	2017/02/06	
PM _{2.5}	Met-One E-Seq- FRM/VSCC	Gravimetric	1 in 3	Urban	High concentration	2017/06/01	
Ambient Average Temperature	Instrumental	Electronic	1 in 3	Urban	High concentration	2017/06/01	
Sample Average	Instrumental	Barometric Sensor	1 in 3	Urban	High	2017/06/01	
Barometric Pressure					concentration		
Site Purpose		Near Roads					
Plans for the next 18	months	No Changes					
Other comments							

Station EQB 21 Caguas





Site Name		EQB 40					
Address		11 Final St. Las Vegas					
City		Cataño					
AQS Code		72-033-0004					
PR County		Cataño					
MSA/CSA		San Juan-Caguas					
Latitude		+18.428427					
Longitude		-66.141648					
Suitable for Comparisor	n to PM2.5 NAAQS?	N/A					
Monitor Type		SLAMS					
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
SO ₂	Teledyne T100u	Ultraviolet Pulsed	Continuous	Neighborhood	Population	1993/12/07	
		Fluorescent			Exposure		
PM ₁₀ Continuous	Met-One Beta	Beta 1022	Continuous	Urban	Population	2000/07/13	
	1022 / VSCC	Attenuation			Exposure		
PM _{2.5} Continuous	TEOM PM _{2.5}	FDMS Gravimetric	Continuous	Urban	Population	2015/01/01	
	VSCC				Exposure		
Site Purpose		Population Protection					
Plans for the next 18 m	onths	Replace the PM _{2.5} analyzer for Beta 1022 Met-One / VSCC					
Other comments		AQI (PM ₁₀ , PM _{2.5}) PM _{2.5} continuous monitor					

Station EQB 40 Cataño





Site Name		EQB 22						
Address		Fajardo Lighthouse						
City		Fajardo						
AQS Code		72-053-0003						
PR County		Fajardo						
MSA/CSA		San Juan-Caguas						
Latitude		+18.381414						
Longitude		-66.617799						
Suitable for Comparis	son to PM _{2.5} NAAQS?	Yes						
Monitor Type		SLAMS						
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date		
PM10	Hi-Vol SA/GMW-	Gravimetric	1 in 6	neighborhood	Regional	1989/03/05		
	1200				Transport			
PM _{2.5}	Met-One E-Seq-	Gravimetric	1 in 3	Regional	Background	1999/04/20		
	FRM /VSCC							
Ambient	Instrumental	Electronic	1 in 3	Regional	Background	1999/04/20		
Temperature								
Average								
Ambient Pressure	Instrumental	Barometric Sensor	1 in 3	Regional	Background	1999/04/20		
Average								
Site Purpose		Background / Regional Transport						
Plans for the next 18	months	No Changes						
Other comments								

Station EQB 22 Fajardo



Site Name		EQB 15						
Address		PR Rd. 3						
City		Guayama						
AQS Code		72-057-0012						
PR County		Guayama						
MSA/CSA		Guayama-Salinas						
Latitude		17.955378						
Longitude		-66.617792						
Suitable for Comparis	son to PM _{2.5} NAAQS?	Yes						
Monitor Type		SLAMS						
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date		
PM10	Hi-Vol SA/GMW-	Gravimetric	1 in 6	neighborhood	Population	2019/10/30		
	1200				Exposure			
PM _{2.5}	Met-One Beta	Beta 1022	continuous	neighborhood	Population	2019/10/03		
	1022 / VSCC	Attenuation			Exposure			
Ambient	Instrumental	Electronic	1 in 3	neighborhood	Population	2019/10/03		
Temperature					Exposure			
Average								
Ambient Pressure	Instrumental	Barometric Sensor	1 in 3	neighborhood	Population	2019/10/03		
Average					Exposure			
Site Purpose		Protection for the Population						
Plans for the next 18	months	Replace the PM _{2.5} ana	lyzer for Beta 10	22 Met-One / VSCC				
Other comments								

Station EQB 15 Guayama





Site Name		EQB 69	EQB 69			
Address		PR Police Station, Sto	len Vehicles Divis	sion		
City		Guayama				
AQS Code		72-057-0011				
PR County		Guayama				
MSA/CSA		Guayama-Salinas				
Latitude		+17.965713				
Longitude		-66.186803				
Suitable for Comparison	n to PM2.5 NAAQS?	N/A				
Monitor Type		SLAMS				
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date
SO ₂	Teledyne	Ultraviolet	continuous	neighborhood	Source	2017/04/06
					oriented	
	T100u	Fluorescence				
Site Purpose Protection for the population						
Plans for the next 18 months No Changes						
Other comments						

Station EQB 69 Guayama





Site Name		EQB 7	EQB 7			
Address		USGS & Water Resou	rces Bldg.			
City		Guaynabo				
AQS Code		72-061-0001				
PR County		Guaynabo				
MSA/CSA		San Juan- Caguas				
Latitude	+18.423559					
Longitude -66.114453						
Suitable for Comparisor	n to PM2.5 NAAQS?	No				
Monitor Type		SLAMS				
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date
PM ₁₀	Hi-Vol	Volumetric	1 in 6	Micro Scale	Highest	1999/02/28
	SA/GMW-1200				Concentration	
Site Purpose		Determine High Concentration				
Plans for the next 18 m	lans for the next 18 months No changes					
Other comments		Part of the LMP PM ₁₀	of Guaynabo			

Station EQB 7 Guaynabo



Site Name		EQB 24					
Address		Electrical Substation					
City		Guaynabo					
AQS Code		72-061-0005					
PR County		Guaynabo					
MSA/CSA		San Juan- Caguas					
Latitude		+18.432122					
Longitude		-66.114702					
Suitable for Comparison to PM2.5 NAAQS? yes							
Monitor Type		SLAMS					
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
PM _{2.5}	E-Seq FRM/	Gravimetric	1 in 3	Neighborhood	Population	1999/01/15	
	VSCC				Exposure		
PM ₁₀	Hi-Vol	Volumetric	1 in 3	Neighborhood	Population	1988/01/05	
	SA/GMW-321B				Exposure		
Ambient Average	Instrumental	Electronic	1 in 3	Neighborhood	Population	1999/01/15	
Temperature					Exposure		
Average Barometric	Instrumental	Barometric Sensor	1 in 3	Neighborhood	Population	1999/01/15	
Pressure					Exposure		
Site Purpose Population Protection							
Plans for the next 18 m	No Changes	Changes					
Other comments	comments PM ₁₀ & PM _{2.5} collocate (QA), Part of the LMP PM ₁₀ of Guaynabo						

Station EQB 24 Guaynabo



EQB 24 Guaynabo Substation S

Site Name		EQB 20	EQB 20			
Address		Highway 22 Buchanan	Toll			
City		Guaynabo				
AQS Code		72-061-0006				
PR County		Guaynabo				
MSA/CSA		San Juan- Caguas				
Latitude		+18.422595				
Longitude		-66.120012				
Suitable for Comparison to PM _{2.5} NAAQS? n/a						
Monitor Type		SLAMS				
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date
CO	Teledyne	Gas filter Correlation	Continuous	Urban	High	2014/07/08
	T300U	CO			concentration	
NO ₂	Teledyne T200u	Chemiluminescence	Continuous	Urban	High	2015/02/20
					concentration	
Site Purpose Near Roads						
Plans for the next 18 months Re- Start						
Other comments		TSD 2020/01/26, the si	te was affected b	y traffic accident in	Jan. 2020	

Station EQB 20 Guaynabo



Site Name		EQB 8	EQB 8				
Address		Road 183					
City		Juncos					
AQS Code		72-077-0001					
PR County		Juncos					
MSA/CSA		San Juan - Caguas					
Latitude	+18.177318						
Longitude	-65.916041						
Suitable for Comparison	n to PM2.5 NAAQS?	No	No				
Monitor Type		SLAMS					
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
Ozone	Teledyne	Ultraviolet Abs	Continuous	Neighborhood	Population	2007/10/03	
	T400U				exposure		
Site Purpose		AQI purpose, Population Protection					
Plans for the next 18 months To be closed							
Other comments		Ozone (AQI) TSD 2020/	12/31 (due to lack	<pre>< of personnel)</pre>			

Site Name		EQB 59	EQB 59			
Address		University of PR Mayag	guez Campus			
City		Mayagüez				
AQS Code		72-097-0007				
PR County		Mayagüez				
MSA/CSA		Mayagüez				
Latitude		18.21428				
Longitude		-67.14461				
Suitable for Comparison to PM _{2.5} NAAQS? No						
Monitor Type		SLAMS				
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date
PM _{2.5} Continuous	Met-One Beta	Beta 1022	Continuous	neighborhood	Population	2019/06/11
	1022 / VSCC	Attenuation			exposure	
O ₃	Teledyne	Ultraviolet Abs	Continuous	Urban	Population	2019/06/11
	T400U				exposure	
Site Purpose	AQI purpose AQI purpose					
Plans for the next 18 months Replace the PM _{2.5} analyzer for Beta 1022 Metone / VSCC						
Other comments		PM _{2.5} & Ozone (AQI)				

Station EQB 59 Mayaguez



Site Name		EQB56	EQB56				
Address		Civil Defense Bldg. Url	b. San Antonio				
City		Ponce					
AQS Code		72-113-0004					
PR County		Ponce					
MSA/CSA		Ponce					
Latitude		+18.009558					
Longitude		-66.627249					
Suitable for Comparison	n to PM2.5 NAAQS?	yes					
Monitor Type	•	SLAMS				•	
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
PM _{2.5}	E-Seq VSCC	Gravimetric	1 in 3	Neighborhood	Population	1999/01/15	
		Gravimetric			Exposure		
PM ₁₀	Hi-Vol	Volumetric	1 in 6	Neighborhood	High	1999/01/06	
	SA/GMW-1200				Concentration		
CO	Instrumental	T300U Gas filter	Continuous	Neighborhood	Population	2011/10/01	
		Correlation CO			Exposure		
PM ₁₀ continuous	TEOM 1405	TEOM Continuous	Continuous	Neighborhood	Source	2011/10/05	
	246-B Inlet				oriented		
PM _{2.5} continuous	Met-One Beta	Beta 1022	Continuous	Neighborhood	Source	2017/07/05	
	1022 / VSCC	Attenuation			Oriented		
Ambient Average		Barometric Sensor		Neighborhood	Source	1999/01/15	
Temperature					Oriented		
Sample Average		Electronic		Neighborhood		1999/01/15	
Barometric Pressure							
Site Purpose AQI purpose, Population Protection							
Plans for the next 18 m	onths	Replace the PM _{2.5} continuous analyzer for Beta 1022 Metone / VSCC					
Other comments		AQI (PM _{2.5} & PM ₁₀)					

Station EQB 56 Ponce



Site Name		EQB 18	EQB 18			
Address		PR Rd. 3 (Inside Syngen	ita Company área)		
City		Salinas				
AQS Code		72-123-0002				
PR County		Salinas				
MSA/CSA		Guayama - Salinas				
Latitude		+17.9688373				
Longitude		-66.261423				
Suitable for Comparison	n to PM2.5 NAAQS?	N/A				
Monitor Type		SLAMS				
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date
SO ₂	Teledyne T-100u	Ultraviolet Fluorescence Continuous Neighborhood High new Concentration				
Site Purpose		Population Protection & High Concentration				
Plans for the next 18 m	onths	ths Add analyzers (PM _{2.5} continuous & NO ₂)				
Other comments						

Station EQB 18 Salinas



Site Name		EQB 30	EQB 30				
Address		Baldorioty de Castro A	ve.				
City		San Juan					
AQS Code		72-127-0003					
PR County		San Juan					
MSA/CSA		San Juan- Bayamón					
Latitude		+18.449814					
Longitude		-66.052510					
Suitable for Comparison	n to PM2.5 NAAQS?	No					
Monitor Type		SLAMS					
Parameter	Method	Analysis Method	Schedule	Spatial Scale	Objective	Begin Date	
СО	Teledyne		Continuous	Middle	High	1995/04/01	
		Gas Filter Corr. CO			Concentration		
	T- 300U						
Site Purpose Determine High Concentration and protection of population							
Plans for the next 18 months Re-Start							
Other comments		TSD 2021/01/01 (due t	o lack of personn	el)			

Station EQB 30 San Juan





Site Name	EQB #37 NCore Station
Address	Regional Jail of Bayamón
City	Bayamón
AQS Code	72-021-0010
PR County	Bayamón
MSA/CSA	San Juan - Bayamón
Latitude	+18.420089
Longitude	-66.150615
Suitable for Comparison to	N/A
PM2.5 NAAQS?	

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
SO ₂	Teledyne T100u	Ultraviolet Fluorescent	Continuous	Neighborhood	Population Exposure	2011/03/16
со	Teledyne T300u	Gas Filter Corr. CO Analyzer	Continuous	Neighborhood	Population Exposure	2011/03/16
NO	Teledyne T200u	Chemiluminescence	Continuous	Neighborhood	Population Exposure	2014/05/21
NOy	Teledyne T200u	Chemiluminescence	Continuous	Neighborhood	Population Exposure	2014/05/21
NOy-NO	Teledyne T200u	Chemiluminescence	Continuous	Neighborhood	Population Exposure	2014/05/21
PM10	E-FRM PM ₁₀	Gravimetric	1-3	Neighborhood	Population Exposure	2015/05/09
PM _{2.5}	E-Seq FRM PM2.5/VSCC	Gravimetric	1-3	Neighborhood	Population Exposure	2015/04/12
PM _{10-2.5}	E-FRM PM _{10-2.5} Sampler Pair	Paired Gravimetric	1-3	Neighborhood	Population Exposure	2015/05/09
PM _{2.5} AQI	BAM 1022 Metone VSCC	Beta Attenuation Mass	Continuous	Neighborhood	Source Oriented	

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
O ₃	Teledyne T–400	Ultraviolet	Continuous	Neighborhood	Population Exposure	2014/05/21
Wind Speed Resultant	Instrumental	RM Young Ultrasonic Anemometer Model 81000	Continuous	Neighborhood	Population Exposure	2014/05/21
Wind Direction Resultant	Instrumental	RM Young Ultrasonic Anemometer Model 81000	Continuous	Neighborhood	Population Exposure	2014/05/21
Outdoor Temperature	Instrumental	Met One 083D	Continuous	Neighborhood	Population Exposure	2014/05/21
Relative Humidity	Instrumental	Met One 083D	Continuous	Neighborhood	Population Exposure	2014/05/21
Barometric Pressure	Instrumental	Barometric sensor	Continuous	Neighborhood	Population Exposure	2014/05/21
PM _{2.5} /PM ₁₀	Met-One Beta	Attenuation Particulate Monitor	Continuous	Neighborhood	Population Exposure	TSD
PM _{2.5} Speciation	Met-One SASS Teflon	Energy Dispersive XRF	1-3	Neighborhood	Population Exposure	2015/11/20

Parameter	Monitor Type
Sulfur Dioxide	SLAMS
Carbon Monoxide	SLAMS
Oxide Nitrogen	SLAMS
Oxide Nitrogen (NOy)	SLAMS
Ozone	SLAMS
PM _{2.5}	SLAMS
PM10	SLAMS
PM _{2.5} /PM ₁₀	SLAMS
PM _{2.5} Speciation	SLAMS

Site Purpose	NCore Site
Plans for the next 18 months	Replace and install the new equipment (Met-One Bam 1022)
Comments	NO2 TSD 2020/08/06