Commonwealth of Puerto Rico
Air Quality Area

Puerto Rico Air Monitoring Network Plan

2019

TABLE OF CONTENTS

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AQS: Air Quality System
CFR: Code of Federal Regulations
CPR: Commonwealth of Puerto Rico
CBSA: Core-based Statistical Area
EPA: Environmental Protection Agency
FEM: Federal Equivalent Method
FRM: Federal Reference Method
MSA: Metropolitan Statistical Area
NAAQS: National Air Ambient Quality Standards
NAMS: National Air Monitoring Stations
NCore: National Core Multi-pollutant Monitoring Stations
NO_2: Nitrogen Dioxide
O_3: Ozone
OSI: Information System Office
PAMS: Photochemical Assessment Monitoring Stations
Pb: Lead
PM_{10}: Particulate Matter
$PM_{2.5}$: Fine Particulate Matter
ppm: parts per million
PR: Puerto Rico
PRAMN: Puerto Rico Air Monitoring Network
PREPA: Puerto Rico Power Electrical Authority
QAMP: Quality Assurance Monitoring Plan
QAPP: Quality Assurance Project Plan
RCAP: Regulation for the Control of Atmospheric Pollution of Puerto Rico
SLAMS: State and Local Air Monitoring Stations
SO_2: Sulfur Dioxide
SO_4: Sulfate
SPM: Special Purpose Monitor
TEOM: Tapered Element Oscillating Microbalance
TSD: Temporary Shutdown
TSP: Total Suspended Particulate

1.0 INTRODUCTION

The Commonwealth of Puerto Rico (CPR), through its air sampling network, provides evidence that meets current federal monitoring requirements. The Air Sampling Plan details any proposed changes for the next 18 months after publication, provides specific information for each of the existing and proposed sampling stations, and offers to the public the opportunity to comment on air sampling activities made by the EQB.

The CPR sampling the six (6) criteria pollutants existing; Lead (Pb), Particulates (PM_{10} and $PM_{2.5}$), Ozone (O_3), Sulfur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO). The data collected by the PR Air Monitoring Network (PRAMN) help to determine the main sources of air pollution in Puerto Rico, a standard is provided at the primary level to protect the population in general and mainly the sensitive sector such as asthmatics, children and the elderly and a secondary level to protect public welfare such as visibility, damage to animals, planting, vegetation and buildings.

The air quality data of the PRAMN is used to determine compliance with the National Environmental Air Quality Standards (NAAQS). In 1970, the Clean Air Act (CAA) established NAAQS for the six pollutants. The CAA requires the CPR to monitor these pollutants, called criteria pollutants, and report the findings to the Environmental Protection Agency (EPA).

The plan describes updates and modifications to the Puerto Rico Air Sampling Network of 2019. 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 Air Quality Standards (NAAQS). In addition, it includes a review of the measures adopted during fiscal year 2019 and the action plans for next year. 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 and modifications to the network are made in consultation with the EPA. In addition, it evaluates the operating cost of the network in accordance with the available budget for 2019 fiscal year.

2.0 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. This plan can be found on the EQB website, www.jca.pr.gov and paper copies are available for review at the offices of the Air Quality Manager, from 8:00 a.m. to 12: 00 and from 1:00 to 4:00 pm, Monday through Friday. Written comments should be sent to air@jca.pr.gov. The final document will be submitted to the EPA on or before July 1, 2019, along with the public comments received to comply with the federal regulatory requirements.

3.0 MONITORING DATA QUALITY ASSURANCE

The purpose of the Quality and Certainty Program (QA / QC) is to ensure the degree of data obtained from air monitoring networks. The PR air monitoring network meets or exceeds the requirements defined in 40 CFR Part 58 and all applicable appendices.

The Quality and Certainty program includes, but is not limited to, the following activities:

- Instrument performance audits
- Monitor siting evaluations
- Precision and span checks
- Bias determinations
- Flow rate audits
- Leak checks
- Data validation

The National Performance Audit Program and the Performance Evaluation Program are independent activities where the CPR participates to ensure the quality of the criteria pollutant monitoring data.

The Agency operates under a Quality Management Plan (QMP) approved by the EPA and develops a Quality Assurance Project Plan (QAPP) for the PR Air Sampling Network. The Management and Quality Assurance Plan (QAMP) was prepared by the CPR and approved by EPA Region 2. The air monitoring network complies with the criteria identified in the QAMP.

The main objectives of the QAPP are the evaluation of the quality of the monitoring data by estimating precision and accuracy, and the control and improvement of the quality of the data through the implementation of quality control policies, procedures and corrective actions. The document is supported by all standard operating procedures (SOP) prepared for this purpose.

Each sampling site is evaluated to ensure that all EPA location requirements are met, as part of the performance audit of the instruments. In addition, it includes a safety inspection to guarantee a work environment for the personnel who work the stations.

4.0 NETWORK STATUS AND RESTORATION AFTER HURRICANE MARIA

After the passage of Hurricane Irma and María, the Commonwealth of PR focus the resources in reestablish the PRAMN. Given that resources were limited, the determination was made the EQB focus resources on the monitors that would provide the most beneficial information to initially protect public health and then work on the remaining monitors. The restart process was established in the following priority criteria when evaluating the monitors as:

- Location: monitors that could provide information to the largest number of people.

- Pollutants: monitoring sites that provided data on pollutant of most concern. $PM_{2.5}$ was identified as one of the primary pollutants of greatest concern for the many electricity generators that were used. The sites that report the air quality index (AQI, in English) also had priority.
- Site or monitor status: the monitors that were physically more accessible, those that have access to electricity and that required minimal repair, were put to work quickly.
- Resources: limited budget and human resources, coordinated on the best way to allocate resources to startup monitors.
- Filter analysis: availability of laboratory analysis, shipping capabilities, grant funds, etc. was determined. Otherwise, these sites were given lower priority.
- Communication: remote information could be received from some sites.

Several equipments were repairs but the majority were replaced with new equipment acquired by FEMA funds. At beginning of 2019 the PRAMN is working at 100%, with the exception of the new site and other that continue without electricity (Juncos Site). The services of the national laboratory of the EPA were contracted to carry out the $PM_{2.5}$ and lead analyzes to do not affect the SIPS of Puerto Rico. All the time PR maintain communication with EPA Region 2 and the changes were in coordination with EPA.

Table 1: Status Air Monitoring After Hurricane Maria

PR Id	AQS Num.	County	Parameter	Status	Comments
5	72-033-0008	Cataño	O_3	Yes	Re-Start (2018/01/01)
7	72-061-0001	Guaynabo	PM_{10}	Yes	Re-Start (2018/10/05)
			SO_4	No	Waiting for CPR Lab
8	72-077-0001	Juncos	O_3	No	Out (Without Electricity)
13	72-001-0002	Adjuntas	$PM_{2.5}$	Yes	Re-start (2018/10/02)
15	72-057-0008	Guayama	$PM_{2.5}$	No	Re location
			PM_{10}	No	Re location
			SO_4	No	Re location
18	72-123-0002	Salinas	SO_2	No	Re location
20	72-061-0006	Guaynabo	CO	Yes	Re-start (2018/03/15)
			NO_2	Yes	Re-start (2018/08/01)
21	72-025-0007	Caguas	$PM_{2.5}$	Yes	Re-start (2018/10/05)
			NO_2	Yes	Re-start (2018/08/01)
			CO	Yes	Re-start (2018/06/07)
22	72-053-0003	Fajardo	$PM_{2.5}$	Yes	Re-start (2018/10/05)
			PM_{10}	No	TSS
			SO_4	No	Waiting for CPR Lab
24	72-061-0005	Guaynabo	$PM_{2.5}$	Yes	Re-start (2018/01/11)
			$PM_{2.5}$ QA	Yes	Re-start (2018/01/11)
			PM_{10}	Yes	Re-start (2018/10/05)
			PM_{10} QA	Yes	Re-start (2018/10/05)
			SO_4	No	Waiting for CPR Lab
30	72-127-0003	San Juan	CO	Yes	Re start (2019/03/13)
37	72-021-0010	Bayamón	$PM_{2.5}$	Yes	Re start (2018/01/11)

			PM_{10}	Yes	Re start (2018/01/11)
			SO_2	Yes	Re start (2018/05/25)
			CO	No	TSS
			NOx	No	TSS
			$PM_{2.5}$ Spec.	No	TSS
			AQI PM_{10}	Yes	Re start (2018/02/01)
			AQI $PM_{2.5}$	Yes	Re start (2018/02/01)
			O_3	No	Re start (2019/04/15)
40	072-33-0004	Cataño	SO_2	Yes	Re start (2018/03/08)
			AQI $PM_{2.5}$	Yes	Re start (2018/01/22)
			AQI PM_{10}	Yes	Re start (2018/10/31)
56	72-113-0004	Ponce	CO	Yes	Re start (2018/01/01)
			$PM_{2.5}$	Yes	Re start (2018/01/11)
			PM_{10}	Yes	Re start (2018/10/05)
			AQI PM_{10}	Yes	Re start (2018/01/01)
			AQI $PM_{2.5}$	Yes	Re start (2018/02/05)
57	72-059-0016	Guayanilla	$PM_{2.5}$	No	Re location
59	072-97-0007	Mayagüez	O_3	No	Start (2019/05/14)
			$PM_{2.5}$	No	Start (2019/05/14)
69	72-057-0009	Guayama	SO_2	Yes	Re start (2018/01/10)
74	72-013-0001	Arecibo	Pb	Yes	Re start (2018/01/01)
75	72-013-0002	Arecibo	Pb	Yes	Re start (2018/01/01)
			Pb-QA	Yes	Re start (2018/01/01)

5.0 NETWORK DESIGN

The sample network in Puerto Rico has nineteen (19) locations around the island where the air quality for criteria pollutants (gaseous and particulate) is measured at ground level. The goal of the network is, almost instantaneously, to maintain information about pollution. The information is available on maps, Internet sites, and / or public notices. The PRAMN is a backbone for air quality management programs, provide the public with information on current conditions and the progress in improving air quality, and are used by health researchers, business interests, environmental groups, and others.

The data obtained from the FRM, FEM and ARM monitors for the criteria pollutants are compared with National Standards, in order to develop achievement and maintenance plans. Sites classified as SLAMS, and especially NCore, are used to evaluate air quality prototypes used in the development of strategies and explore trends in the impact of control measures. Air sampling near major emission sources can give an idea of how these sources control their pollutants as a result of their operations.

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.

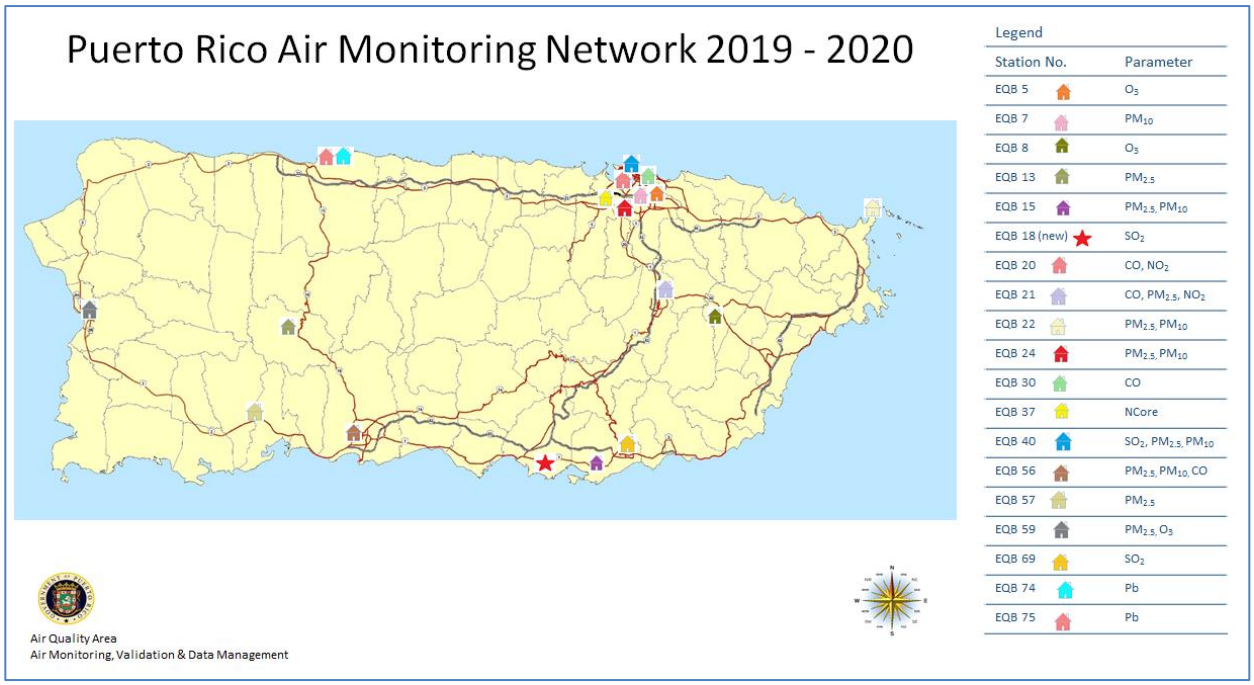
Currently, Puerto Rico meets all minimum air monitoring requirements. The EPA in Appendix D of 40 CFR Part 58, establishes the minimum number of monitoring sites necessary to meet the environmental monitoring objectives. The minimum monitoring requirements are specific for each of the pollutants or based on objectives (NCore, ozone, $PM_{2.5}$, NO_2 near roads). Generally, the monitoring requirements of the population and the air emissions of the area.

Table 2: Site Information – Puerto Rico Sites

PR Id.	AQS Num.	County	Coordinates		Parameter
			Latitude	longitude	
5	72-033-0008	Cataño	18.431208	-66.141683	O_3
7	72-061-0001	Guaynabo	18.42565192	-66.115845	PM_{10}, SO_4
8	72-077-0001	Juncos	18.17793873	-65.915482	O_3
13	72-001-0002	Adjuntas	18.17537759	-66.725988	$PM_{2.5}$
15	72-057-0008	Guayama	17.95789438	-66.1650159	$PM_{2.5}$, PM_{10}, SO_4
18	72-123-0002	Salinas	17.9500579	-66.2614611	Met Tower
20	72-061-0006	Guaynabo	18.4218472	-66.1206861	CO, NO_2
21	72-025-0007	Caguas	18.198092	-66.052719	$PM_{2.5}$, NO_2, CO
22	72-053-0003	Fajardo	18.381291	-65.61718	$PM_{2.5}$, PM_{10}, SO_4
24	72-061-0005	Guaynabo	18.4400954	-66.1144597	$PM_{2.5}$, PM_{10}, PM_{10}QA $PM_{2.5}$-QA, SO_4
30	72-127-0003	San Juan	18.4478145	-66.0525095	CO
37	72-021-0010	Bayamón	18.4200891	-66.1506155	NCore ($PM_{2.5}$, SO_2, CO, NOx, PM_{10}, $PM_{2.5}$ Spec, AQI)
40	72-33-0004	Cataño	18.4312075	-66.1416826	SO_2, AQI ($PM_{2.5}$, PM_{10})
56	72-113-0004	Ponce	18.0095583	-66.6272249	CO, $PM_{2.5}$, PM_{10}, AQI
57	72-059-0016	Guayanilla	18.0451106	-66.8025253	$PM_{2.5}$
59	072-97-0007	Mayagüez	18.21428	-67.14461	O_3, $PM_{2.5}$
69	72-057-0009	Guayama	17.9676377	-66.1874706	SO_2
74	72-013-0001	Arecibo	18.45703907	-66.696697	Pb
75	72-013-0002	Arecibo	18.45338923	-66.694986	Pb, Pb-QA

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), PM_{10} - sulfates (SO_4) and lead (Pb). In addition, meteorological data are also collected, in addition to the network, it has an NCore station and NO_2 stations near roads. These last one with the purpose of analyzing and describing the nature of air quality problems to the population on the Island.

Figure 1: Puerto Rico Air Monitoring Network



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 in this network will be implemented during the period from July 2019 to December 2020, 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 catastrophic equipment failures, construction or demolition activities, and loss of access to the site, monitor obstructions or natural events (hurricanes or storms).

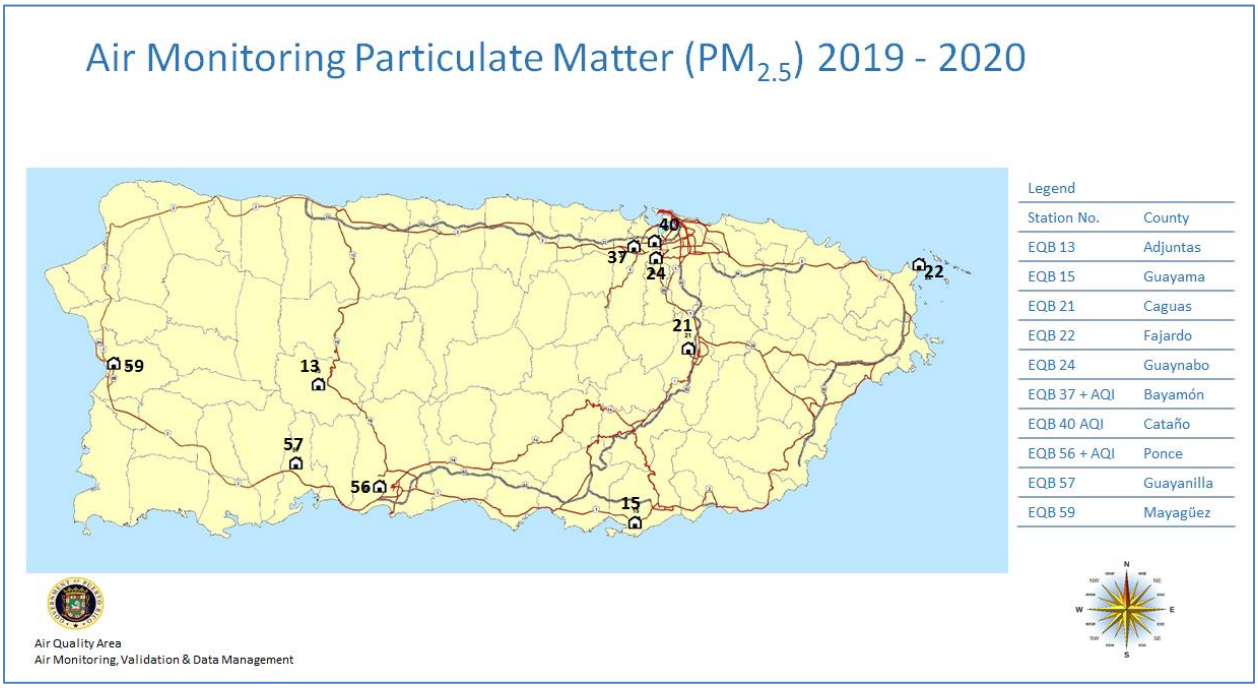
5.1 $PM_{2.5}$ Air-Monitoring Network

The CPR operates ten (10) 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) $PM_{2.5}$ FRM sampling. The network has a new site in the western area, in Mayaguez. All FRM sites operate one every three days (1-3). The monitor placed FRM QA operate one day every 6 days.

The $PM_{2.5}$ continuous monitors operate throughout the year and the data is sent to the EPA AQS system database in one hour values. The continuous sampling of $PM_{2.5}$ uses the TEOM 1405 and Beta 602. The continuous monitors of $PM_{2.5}$ are used to report the AQI. The details of these sites are included in Appendix I and Figure 2

The FRM $PM_{2.5}$ sampling equipment was changed for a reference sampling equipment included in the EPA-Designated Reference List as Met One E-SEQ-FRM.

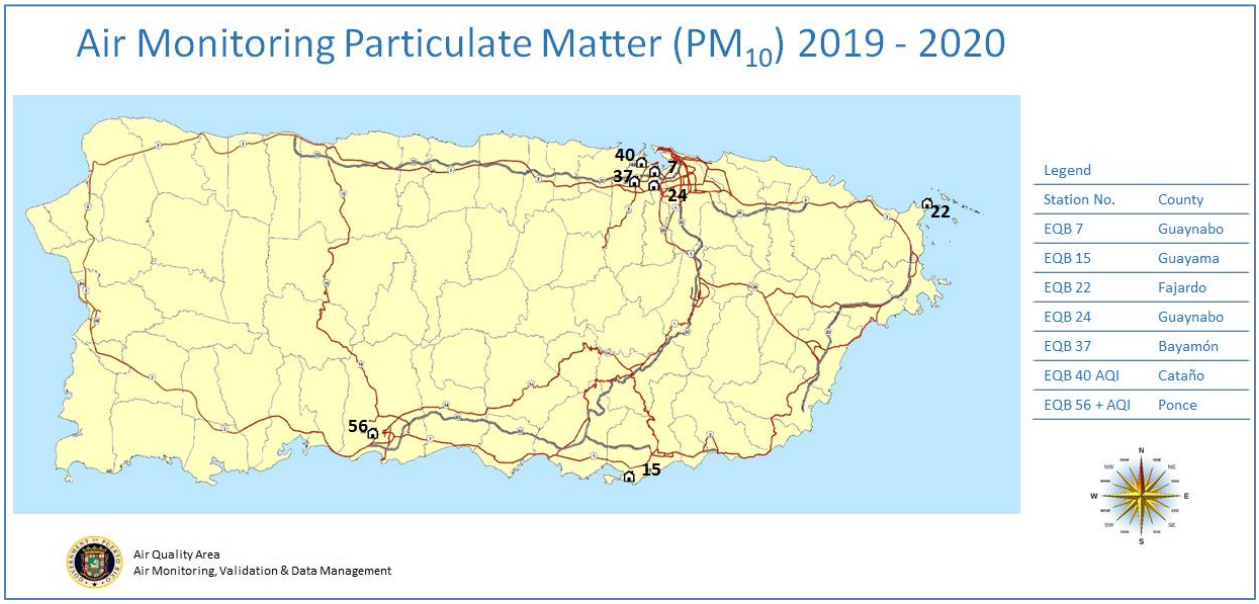
Figure 2: $PM_{2.5}$ Network



5.2 PM_{10} Air-Monitoring Network

The CPR operates seven (7) PM_{10} sites and is broken down into five (5) intermittent FRM monitors and three (3) PM_{10} continuous monitors in the air sampling network. One (1) of the FRM sites operate every three days (1 in 3) and five (4) sites are operated every six days (1 in 6). In addition, the CPR operates one (1) PM_{10} FRM placed monitor (QA) with frequency of 1 in 6 days. The continuous PM10 monitors take samples throughout the year and the concentrations are sent to the AQS system of the EPA and are used for AQI purposes. The details of these sites are included in Appendix I and Figure 3

Figure 3: PM_{10} Network



5.3 Ozone Air-Monitoring Network

The CPR operates four (4) ozone sites in the air sampling network with one (1) monitor located at the NCore site, and an additional one will be included in the municipality of Mayaguez, in the western zone of the Island. 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. The details of the location of the sites are included in Appendix I and Figure 4

Figure 4: O_3 Network

5.4 SO_2 Air-Monitoring Network

The CPR operates four (4) sites of sulfur dioxide (SO_2) in the air sampling network; one of these monitors is at the NCore station. All SO_2 monitors are operated throughout the year. The concentrations are sent in one hour values to AQS of the EPA. All SO_2 monitors are oriented to the sources.

The Salinas station 72-123-0002 will be relocated to a new location in the same municipality. The relocation of the station is due to the dangerous conditions of the area after the passage of Hurricane Maria. A new location will be located near an area where maximum SO2 concentrations are expected to occur based on the results of air modeling.

The relocation has already been approved by the EPA, but to meet the site criteria it has been difficult to select the new location since the maximum concentrations are over mangrove areas or in areas without electric service. The map below shows the area with maximum concentration of SO^2 according with the air models results. See Figures 5.

The details of the existing sites are including at Appendix 1: Site Description and in Figure 6: SO_2 Network.

Figure 5: Maximum SO_2 Concentration Salinas

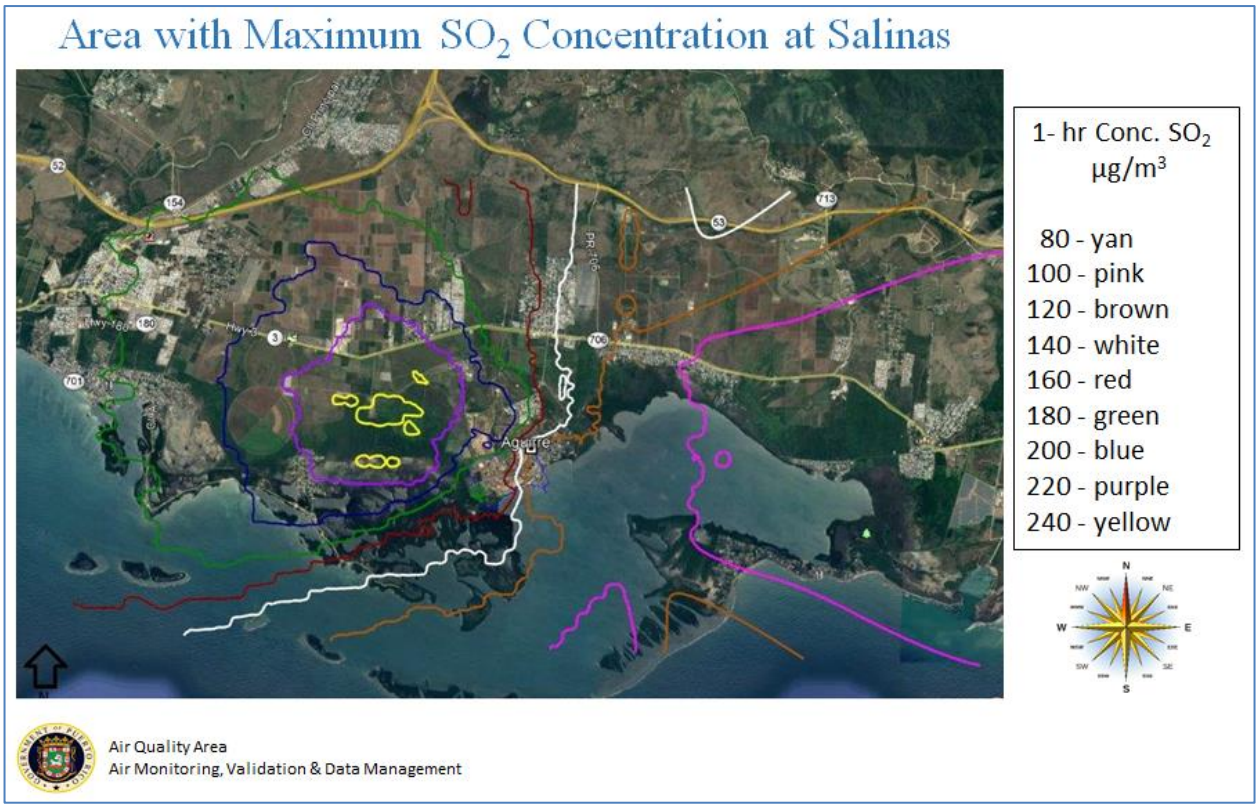
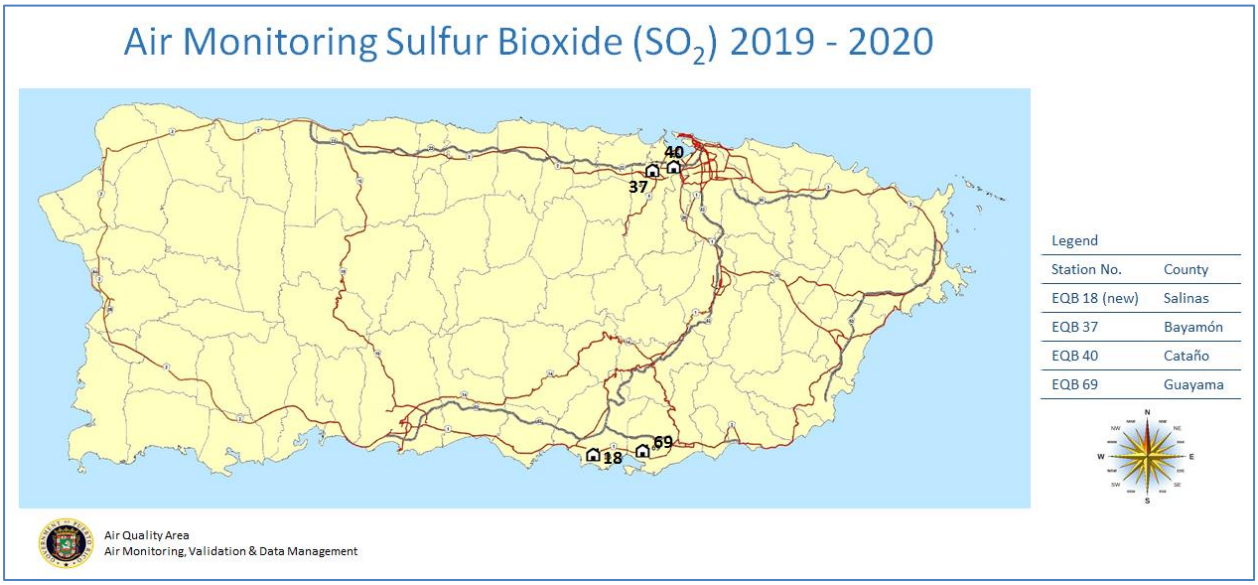


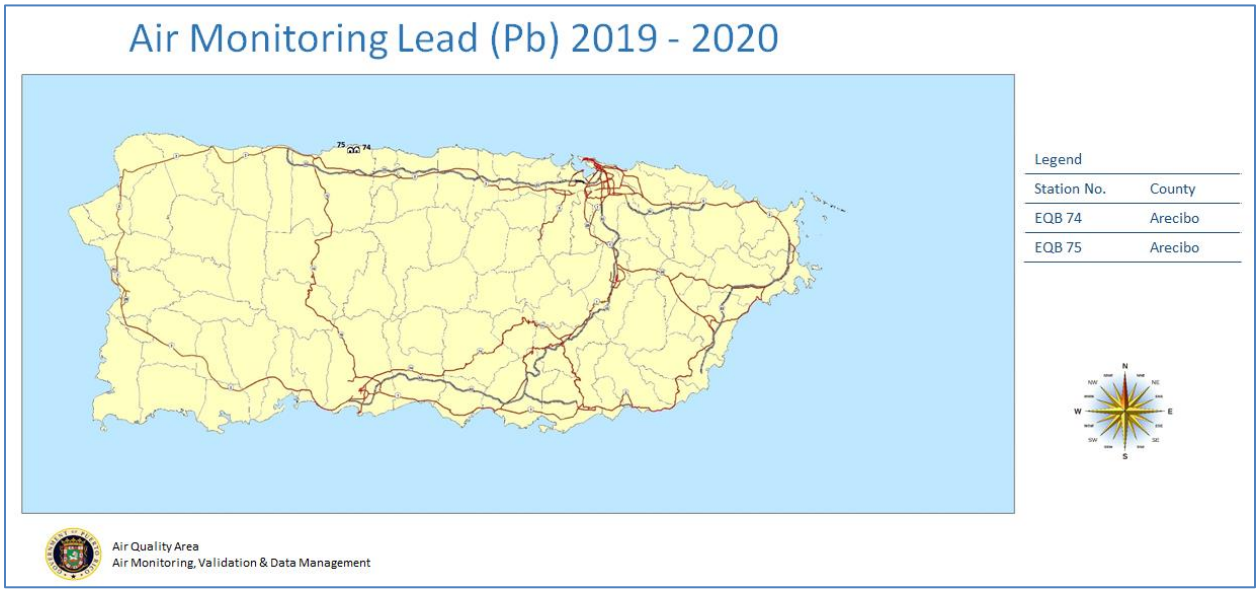
Figure 6: SO_2 Network



5.5 Lead Air-Monitoring Network

The CPR 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 placed one (QA) are operated one in every six 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 details of the sites are included in Appendix I: Description of the Sites and in Figure 7: Lead Sampling Network

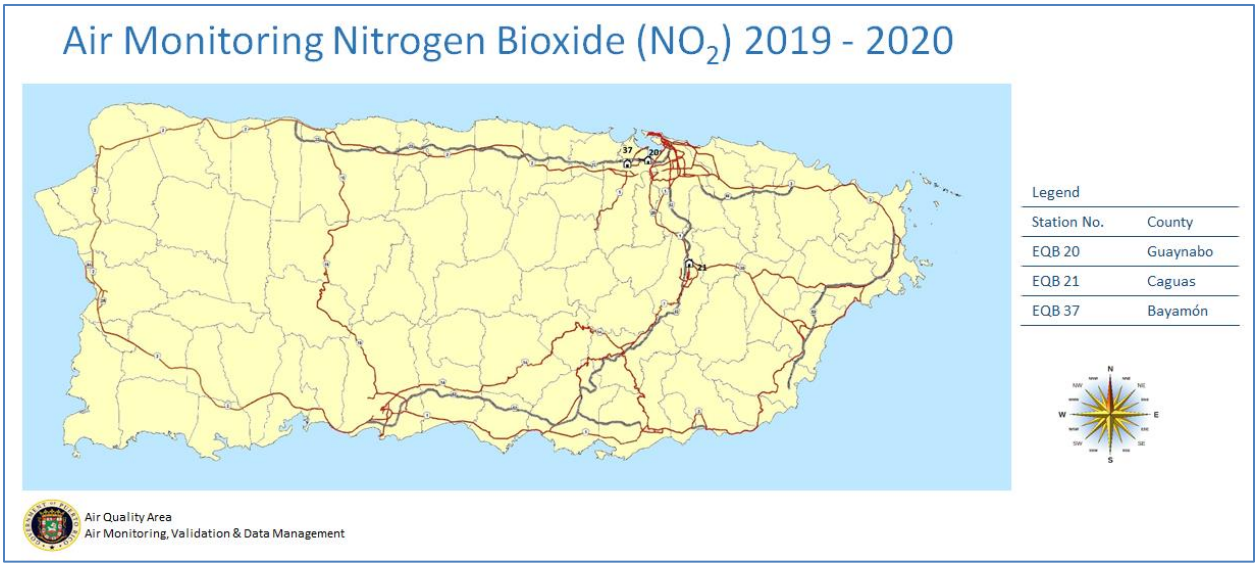
Figure 7: Lead Network



5.6 NO_2 Air-Monitoring Network

The CPR 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 NO_2 samplers are operated year-round and the measurements are sent to the EPA AQS on an hourly basis. The SLAMS NO_2 sites are used as a FRM. The details of these sites are included in Appendix 1: Site Description and Figure 8: NO_2 Network.

Figure 8: NO_2 Network



5.7 CO Air-Monitoring Network

The CPR 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 details of these sites are included in Appendix 1: Site Description and Figure 9: CO Network.

Figure 9: CO Network

5.8 PM Sulfate Air Monitoring Network

The CPR operates four (4) sulfate sites (SO_4) in the air sampling network. The sulfate particulate sampling network analyzes the PM_{10} filters by atomic absorption analysis to generate the sulfate concentrations. The sulfate monitors are operated throughout the year and the concentrations are sent in 24-hour values to EPA AQS. The details of the location of the sites are included in Appendix I: Description of the Sites.

5.9 NCore – Air Monitoring Network

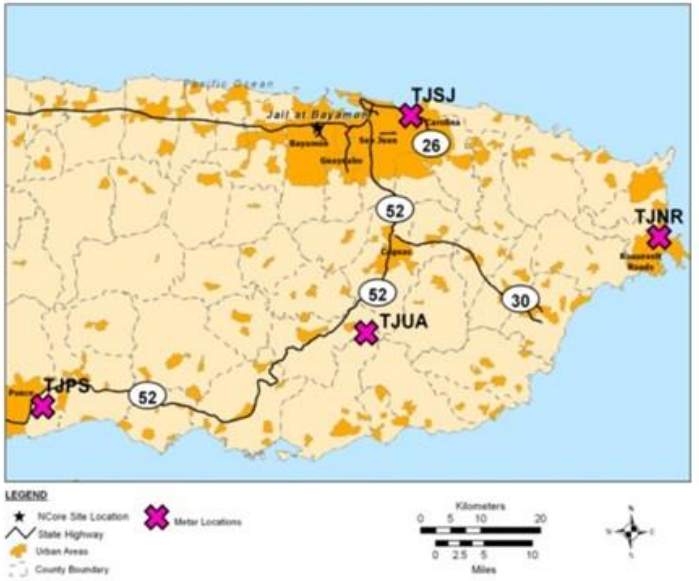
In PR an NCore site was established for March 2011. This site is part of the sampling network that uses various advanced equipment for measuring particles, gases and meteorology. The EPA requires each state at least one NCore site. The parameters sampled are: CO, O_3, NO_2, NOy, NO, SO_2, $PM_{2.5}$, PM_{10}, $PM_{10-2.5}$, $PM_{2.5}$ Speciation and basic meteorology.

Puerto Rico is required to have an NCore site. Bayamon (AQS: 72-021-0010) was established as the NCore site for Puerto Rico. After the passage of Hurricanes Irma and María, the structure did not suffer great damages but the constant interruptions of light affected the equipment, prevented to achieve their effective calibrations and that all the equipment worked in optimal conditions. It is not until early 2018 that intermittent and continuous particulate monitoring is re-established, then the monitoring of CO and SO_2 pollutants, and finally making the whole monitoring system work.

Figure 9: NCore Site

NCore Station
Bayamón- San Juan

AIRS Id: 72-021-0006
State: Puerto Rico
County: Bayamon
City: San Juan
EPA Region: 2
Latitude: 18.416667; Longitude: -66.150833
Street Address: Regional Jail Of Bayamon
Location Setting: Suburban
Land Use Type: Industrial



Parameters:

$PM_{2.5}$ (continuous & filter), $PM_{2.5}$ speciation, $PM_{10-2.5}$ particle mass, O_3, SO_2, CO, NO/NO_x, wind speed, wind direction, relative humidity, and ambient temperature. $PM_{10-2.5}$ or PM Coarse is determined by the difference between collocated PM_{10} and $PM_{2.5}$ FRM samplers.

6.0 NETWORK CHANGES

After the passage of Hurricanes Irma and María in September 2017, it has been an invaluable challenge to restore the air sampling system in P.R. Finally, in 2019 with almost 100% of the monitors operating, no changes are planned in the next eighteen (18) months (from July 1, 2019 to December 31, 2020). The Agency will concentrate its efforts and resources to reestablish the entire sampling network to continue with data capture and to complete the changes approved by the EPA and which are still pending from the 2018 Sampling Plan.

On the agenda is relocating the SO_2 monitor from Salinas to a new location in the same municipality. The proposed new location will be near areas where maximum SO_2 concentrations are expected to occur according to the results of the air modeling. The details of the proposed sites for the new location can be found in Section 5.4 SO_2 Air-Monitoring Network.

Also, select a new location to re-locate the $PM_{2.5}$ at Guayanilla. The old location was closed by the owner of the site. Establish the $PM_{2.5}$ Guayama at the new location as already approved by the EPA.

7.0 NETWORK MODIFICATIONS FORMS

Network modifications forms will be prepared for submit to EPA Region 2 to implement the network changes identified in this plan.

8.0 SUMMARY AND CONCLUSIONS

The air monitoring network of Puerto Rico 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 has been established by EPA.

The only significant network changes is re-locate the SO_2 monitor in Salinas and; established the $PM_{2.5}$ at Guayama, select a new site to $PM_{2.5}$ at Guayanilla and continue to reestablished the network to maintain over 75 % of data completeness.

APPENDIX I: Site Description

Site Name	EQB #13
Address	Road #123
City	Adjuntas
AQS Code	72-001-0002
PR County	Adjuntas
MSA/CSA	N/A
Latitude	+18.1753778
Longitude	-66.725988
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ambient Average Temperature	Instrumental	Electronic	1 in 3	Urban	Extreme Downwind	2005/01/01
Sample Average Barometric Pressure	Instrumental	Barometric Sensor	1 in 3	Urban	Extreme Downwind	2005/01/01
$PM_{2.5}$	E-Seq-FRM/VSCC	Gravimetric	1 in 3	Urban	Upwind Background	2005/01/01

Parameter	Monitor Type
$PM_{2.5}$	SLAMS

Site Purpose	Reference for Extreme downwind
Plans for the next 18 months	No Changes
Other comments	$PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 to Oct. 02, 2018 because Hurricane María and damaged. **Re start Oct./02/18**

APPENDIX I: Site Description

Site Name	EQB #74
Address	Victor Santoni Cordero Road
City	Arecibo
AQS Code	72-013-0001
PR County	Arecibo
MSA/CSA	N/A
Latitude	+18.457039
Longitude	-66.696693
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ambient Temperature Average	Instrumental	Offsite Avg. Pressure	1 in 6	Micro	Source Oriented	2010/01/02
Ambient Pressure Average	Instrumental	Offsite Avg. Pressure	1 in 6	Micro	Source Oriented	2010/01/02
Lead TSP	Hi-Vol	ICP-MS	1 in 6	Micro Scale	Source Oriented	2010/01/02

Parameter	Monitor Type
Lead	SLAMS

Site Purpose	Reference for Extreme downwind
Plans for the next 18 months	No Changes
Other comments	Reestablished services on **January 01, 2018** after Hurricane María.

APPENDIX I: Site Description

Site Name	EQB #75
Address	PR Road #2
City	Arecibo
AQS Code	72-013-0002
PR County	Arecibo
MSA/CSA	N/A
Latitude	+18.453389
Longitude	-66.694987
Suitable for Comparison to $PM_{2.5}$ NAAQS?	n/a

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ambient Temperature Average	Instrumental	Offsite Avg. Pressure	1 in 6	Micro	Source Oriented	2012/08/19
Ambient Pressure Average	Instrumental	Offsite Avg. Pressure	1 in 6	Micro	Source Oriented	2012/08/19
Lead TSP	Hi-Vol	ICP-MS	1 in 6	Micro Scale	Source Oriented	2012/08/19

Parameter	Monitor Type
Lead	SLAMS

Site Purpose	Reference for Extreme downwind
Plans for the next 18 months	No Changes
Other comments	Pb collocated. Reestablished services on **January 01, 2018** after Hurricane María.

APPENDIX I: Site Description

Site Name	EQB #21
Address	Highway 22 Caguas South Toll
City	San Juan
AQS Code	72-025-0007
PR County	San Juan
MSA/CSA	N/A
Latitude	+18.198712
Longitude	-66.052237
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
NO_2	Instrumental	T200 EU/501 Chemiluminescence	Continuous	Urban	High Concentration	2016/12/19
CO	Instrumental	T300U Gas filter Correlation CO analyzer	Continuous	Urban	High concentration	2017/02/06
$PM_{2.5}$	E-Seq-FRM/VS	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 Barometric Pressure	Instrumental	Barometric Sensor	1 in 3	Urban	High concentration	2017/06/01

Parameter	Monitor Type
NO_2	SLAMS
CO	SLAMS
$PM_{2.5}$	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Comments	Near Road Site (Caguas) $PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged, CO re-start Jun 7, 18, NO_2 re-start Aug. 01, 18

APPENDIX I: Site Description

Site Name	EQB #40
Address	11 Final St. Las Vegas
City	Cataño
AQS Code	72-033-0004
PR County	Cataño
MSA/CSA	San Juan - Bayamón
Latitude	+18.431208
Longitude	-66.14168263
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Sulfur Dioxide	Instrumental	T100U Pulsed Fluorescent	Continuous	Neighborhood	Population Exposure	1993/12/07
PM_{10}	Inst. R&P SA246B-Inlet	TEOM Gravimetric	Continuous	Urban	Population Exposure	2000/07/13
$PM_{2.5}$	TEOM $PM_{2.5}$ VSCC	FDMS Gravimetric	Continuous	Urban	Population Exposure	2015/01/01

Parameter	Monitor Type
Sulfur Dioxide	SLAMS
PM_{10}	SLAMS
$PM_{2.5}$	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Other comments	AQI (PM_{10}, $PM_{2.5}$) $PM_{2.5}$ continuous monitor; SO_2 re-start Mar. 8, 18; $PM_{2.5}$ Jan. 22, 18 & PM_{10} Oct. 31, 18

APPENDIX I: Site Description

Site Name	EQB #5
Address	PR Rd. 165
City	Cataño
AQS Code	72-033-0008
PR County	Cataño
MSA/CSA	San Juan - Bayamón
Latitude	+18.440774
Longitude	-66.126531
Suitable for Comparison to $PM_{2.5}$ NAAQS?	NO

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ozone	T-400	Instrumental Ultra Violet Abs.	Continuous	Urban	Population exposure	2004/07/22

Parameter	Monitor Type
Ozone	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Other comments	AQI (O_3); Re-start 2018/01/01

APPENDIX I: Site Description

Site Name	EQB #22
Address	Fajardo Lighthouse
City	Fajardo
AQS Code	72-053-0003
PR County	Fajardo
MSA/CSA	Humacao - Fajardo
Latitude	+18.383983
Longitude	-66.618888
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
$PM_{2.5}$	E-Seq-FRM $PM_{2.5}$/VSCC	Gravimetric	1 in 3	Regional	Regional Transport	1999/04/20
PM_{10}	Hi-Vol SA/GMW-1200	Gravimetric	1 in 1	Neighborhood	Background	1989/03/05
PM_{10} Sulfate	Hi-Vol SA/GMW-321B	Colorimetric	1 in 6	Neighborhood	Background	1998/01/05
Ambient Temperature Average	Instrumental	Electronic	1 in 3	Regional	General / Background	1999/04/20
Ambient Pressure Average	Instrumental	Barometric Sensor	1 in 3	Regional	General / Background	1999/04/20

Parameter	Monitor Type
$PM_{2.5}$	SLAMS
PM_{10}	SLAMS
PM_{10} Sulfate	SPM

Site Purpose	Reference and Background
Plans for the next 18 months	No Changes
Other comments	$PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged. Pm2.5 Re-start on Oct. 5, 2018, PM_{10} TSS

Site Name	EQB #15
Address	Barrio Jobos, Intersection Highway 3 & 707
City	N/A
AQS Code	72-057-0008
PR County	Guayama
MSA/CSA	Guayama
Latitude	+17.957894
Longitude	-66.165016
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
$PM_{2.5}$	E-Seq-FRM $PM_{2.5}$/VSCC	Gravimetric	1 in 3	Neighborhood	Population Exposure	1999/01/15
PM_{10}	Hi-Vol SA/GMW-321B	Gravimetric	1 in 6	Neighborhood	Population Exposure	1988/10/06
PM_{10} Sulfate	Hi-Vol SA/GMW-321B	Colorimetric	1 in 6	Neighborhood	Population Exposure	1998/01/05
Ambient Temperature Average	Instrumental	Electronic	1 in 3	Neighborhood	Population Exposure	1999/04/20
Ambient Pressure Average	Instrumental	Barometric Sensor	1 in 3	Neighborhood	Population Exposure	1999/04/20

Parameter	Monitor Type
$PM_{2.5}$	SLAMS
PM_{10}	SLAMS
PM_{10} Sulfate	SPM

Site Purpose	Protection for the population
Plans for the next 18 months	Establish in new location
Comments	$PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged.

Site Name	EQB #69
Address	PR Police Station, Stolen Vehicles Division
City	Guayama
AQS Code	72-057-0011
PR County	Guayama
MSA/CSA	Guayama
Latitude	+17.967309
Longitude	-66.186149
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Sulfur Dioxide	T-100	Pulsed Fluorescence	Continuous	Neighborhood	Source Oriented	2017/04/06

Parameter	Monitor Type
Sulfur Dioxide	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Comments	Re-start 018/01/10

Site Name	EQB #57
Address	Road 377 Bo. Quebrada
City	Guayanilla
AQS Code	72-059-0016
PR County	Guayanilla
MSA/CSA	Ponce
Latitude	+18.045111
Longitude	-66.802253
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ambient Average Temperature	Instrumental	Electronic	1 in 3	Neighborhood	Population Exposure	1999/01/15
Sample Average Barometric Pressure	Instrumental	Barometric Sensor	1 in 3	Neighborhood	Population Exposure	1999/01/15
$PM_{2.5}$	E-Seq-FRM $PM_{2.5}$/VSCC	Gravimetric	1 in 3	Neighborhood	Population Exposure	1999/01/15

Parameter	Monitor Type
$PM_{2.5}$	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	$PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged. The $PM_{2.5}$ sampler will be changed to an air sampler which is included in the USEPA List of Designated Reference and Equivalent Methods such as a Met One E-SEQ –FRM or equivalent. Monitor to be relocated.
Comments	

Site Name	EQB #7
Address	USGS & Water Resources Bldg.
City	Guaynabo
AQS Code	72-061-0001
PR County	Guaynabo
MSA/CSA	San Juan - Bayamón
Latitude	+18.425652
Longitude	-66.115846
Suitable for Comparison to $PM_{2.5}$ NAAQS?	No

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
PM_{10}	Hi-Vol SA/GMW-1200	Gravimetric	1 in 6	Micro Scale	Highest Concentration	1999/02/28
PM_{10} Sulfate	Hi-Vol SA/GMW-321B	Colorimetric	1 in 6	Neighborhood	Unknown	1998/01/05

Parameter	Monitor Type
PM_{10}	SLAMS
PM_{10} Sulfate	SPM

Site Purpose	Determine Highest Concentration
Plans for the next 18 months	No Changes
Comments	PM_{10} Monitor is part of PM_{10} SIP for Guaynabo LMP. PM_{10} monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged.

Site Name	EQB #24
Address	Electrical Substation
City	Guaynabo
AQS Code	72-061-0005
PR County	Guaynabo
MSA/CSA	San Juan - Bayamón
Latitude	+18.440095
Longitude	-66.114460
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
$PM_{2.5}$	E-Seq FRM/ VSCC	Gravimetric	1 in 3	Neighborhood	Population Exposure	1999/01/15
PM_{10}	Hi-Vol SA/GMW-1200	Gravimetric	1 in 3	Neighborhood	Population Exposure	1988/01/05
PM_{10} Sulfate	Hi-Vol SA GMW/321B	Colorimetric	1 in 6	Neighborhood	Population Exposure	1998/01/05
Ambient Average Temperature	Instrumental	Electronic	1 in 3	Neighborhood	Population Exposure	1999/01/15
Average Barometric Pressure	Instrumental	Barometric Sensor	1 in 3	Neighborhood	Population Exposure	1999/01/15

Parameter	Monitor Type
$PM_{2.5}$	SLAMS
PM_{10}	SLAMS
PM_{10} Sulfate	SPM

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Comments	PM_{10} Monitor is part of PM_{10} SIP for Guaynabo LMP, $PM_{2.5}$ and PM_{10} collocated monitors. The $PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 until January 5, 2018 of Hurricane María. The PM_{10} monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María and damaged. The monitoring equipment was substituted.

Site Name	EQB #20
Address	Buchanan (Metropista)
City	Guaynabo
AQS Code	72-061-0006
PR County	Guaynabo
MSA/CSA	San Juan - Bayamón
Latitude	+18.422595
Longitude	-66.120012
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Carbon Monoxide	Instrumental	Gas Filter Corr. CO Analyzer	Continuous	Urban	High concentration	2014/07/08
NO_2	Instrumental	T200 EU/501 Chemiluminescence	Continuous	Urban	High Concentration	2015/02/20

Parameter	Monitor Type
NO_2	SLAMS
Carbon Monoxide	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No changes
Comments	Near Roads Site.

Site Name	EQB #59
Address	UPR-RUM
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?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
$PM_{2.5}$	TEOM 1405	Gravimetric	continuous	Neighborhood	Population Exposure	New
Ozone	Instrumental	Ultra Violet	Continuous	Urban	Population Exposure	New

Parameter	Monitor Type
$PM_{2.5}$	SLAMS
Ozone	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	Add ozone monitor
Comments	Ozone, $PM_{2.5}$ (AQI purpose)

Site Name	EQB #8
Address	Road 183
City	Juncos
AQS Code	72-077-0001
PR County	Juncos
MSA/CSA	Juncos
Latitude	+18.177939
Longitude	-65.915482
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Ozone	Instrumental	Ultra violet	Continuous	Neighborhood	Population Exposure	2007/10/03

Parameter	Monitor Type
Ozone	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	No Changes
Comments	AQI (O_3), continue without electricity

Site Name	EQB #56
Address	Civil Defense Bldg. Urb. San Antonio
City	Ponce
AQS Code	72-113-0004
PR County	Ponce
MSA/CSA	Ponce
Latitude	+18.009558
Longitude	-66.627249
Suitable for Comparison to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
$PM_{2.5}$	E-Seq VSCC	Gravimetric	1 in 3	Neighborhood	Population Exposure	1999/01/15
PM_{10}	Hi-Vol SA/GMW-1200	Gravimetric	1 in 6	Neighborhood	High Concentration	1999/01/06
CO	Instrumental	Nondispersive Infrared	Continuous	Neighborhood	Population Exposure	2011/10/01
PM_{10} continuous	TEOM 1405 246-B Inlet	TEOM Continuous	Continuous	Neighborhood	Population Exposure	2011/10/05
Ambient Average Temperature	Instrumental	Electronic	1 in 3	Neighborhood	Source Oriented	1999/01/15
Sample Average Barometric Pressure	Instrumental	Barometric Sensor	1 in 3	Neighborhood	Source Oriented	1999/01/15
$PM_{2.5}$ continuous	TEOM $PM_{2.5}$ VSCC	FDMS-Gravimetric	Continuous	Neighborhood	Population Exposure	2017/07/05

Parameter	Monitor Type
$PM_{2.5}$, $PM_{2.5}$ continuous	SLAMS
PM_{10}, PM_{10-} continuous	SLAMS
CO	SLAMS

Site Purpose	Determine High Concentration
Plans for the next 18 months	No Changes
Comments	AQI ($PM_{2.5}$ & PM_{10}). The $PM_{2.5}$ monitor was temporary shutdown on Sept. 20, 2017 until January 5, 2018 of Hurricane María. The $PM_{2.5}$ was changed to a new air sampler. The PM_{10} monitor was temporary shutdown on Sept. 20, 2017 of Hurricane María, was substituted for a new equipment. CO re-star Jan 1. 2018

Site Name	EQB 18
Address	New
City	Salinas
AQS Code	72-123-0002
PR County	Salinas
MSA/CSA	Ponce
Latitude	
Longitude	
Suitable for Comparison to $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
SO_2	Instrumental	Pulsed Fluorescent	Continuous	Neighborhood	Source oriented	New

Site Purpose	Protection for the population
Plans for the next 18 months	Select a new location.
Comments	

Site Name	EQB #30
Address	Baldorioty de Castro Ave.
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 to $PM_{2.5}$ NAAQS?	Yes

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
Carbon Monoxide	Instrumental T- 300U	Gas Filter Corr. CO Analyzer	Continuous	Middle	High Concentration	1995/04/01

Parameter	Monitor Type
Carbon Monoxide	SLAMS

Site Purpose	Determine High Concentration and protection of population
Plans for the next 18 months	No Changes
Comments	Re-Start on March 13, 2019

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 $PM_{2.5}$ NAAQS?	N/A

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
SO_2	Instrumental	Ultraviolet Fluorescent	Continuous	Neighborhood	Population Exposure	2011/03/16
CO	Instrumental	Gas Filter Corr. CO Analyzer	Continuous	Neighborhood	Population Exposure	2011/03/16
NO	Instrumental 699	Chemiliminescence Teledyne API T200	Continuous	Neighborhood	Population Exposure	2014/05/21
NOy	Instrumental 699	Chemiliminescence Teledyne API T200	Continuous	Neighborhood	Population Exposure	2014/05/21
NOy-NO	Instrumental 699	Chemiliminescence Teledyne API T200	Continuous	Neighborhood	Population Exposure	2014/05/21
PM_{10}	E-FRM PM_{10}	Gravimetric	1-3	Neighborhood	Population Exposure	2015/05/09
$PM_{2.5}$	E-Seq FRM $PM_{2.5}$/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

Parameter	Sampling Method	Analysis Method	Schedule	Spatial Scale	Monitoring Objective	Begin Date
O_3	T – 400	Instrumental Ultra violet	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
$PM_{2.5}/PM_{10}$	Beta 602 Plus Monitor	Beta Paired Difference	Continuous	Neighborhood	Population Exposure	2017/05/18
$PM_{2.5}$ Speciation	MetOne 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
PM_{10}	SLAMS
$PM_{2.5}/PM_{10}$	SLAMS
$PM_{2.5}$ Speciation	SLAMS

Site Purpose	Protection for the population
Plans for the next 18 months	Re-establish NOy & O_3
Comments	AQI (O_3, PM_{10} & $PM_{2.5}$) The $PM_{2.5}$ & PM_{10} monitors were temporary shutdown on Sept. 20, 2017 until January 5, 2018 of Hurricane María. The $PM_{2.5}$ & PM_{10} samplers was changed to MetOne E-SEQ –FRM. $PM_{2.5}$ & PM_{10} (FRM) re-start with new sampler on Jan. 11, 2018