

Quality Assurance Project Plan for a Community Science Project: *Air Quality Supplementary Network Monitoring Study*

Low-cost air sensors can be used to supplement network monitoring by focusing on an area outside the range of the network. You may use the data to confirm whether or not local pollutant levels are similar to those at the nearest state-operated monitor.

Section 1: Title and Approval Page

Using _____ *Air Sensors to Supplement the New Jersey Air*
(Name of sensor)
Monitoring Network in _____
(Project area)

Effective Date of Plan: _____

Author(s): _____

This is a “blank” copy of a Quality Assurance Project Plan (QAPP) that can be used for a Community Science air monitoring project. Blank lines with guiding topics in parentheses are meant for you to fill in. Guidance for filling out this document is in blue boxes, like this one, and can be deleted in your final copy. This is a template and should be altered to accommodate the quality assurance (QA) needs for your specific project. Your QAPP should be approved by the Technical Support, Project Leader, or other designated party before beginning any data collection.

Approvals:

Technical Support: _____
Signature

Project Manager: _____
Signature

This is a general outline to follow for your table of contents. Feel free to add any additional notable sections here.

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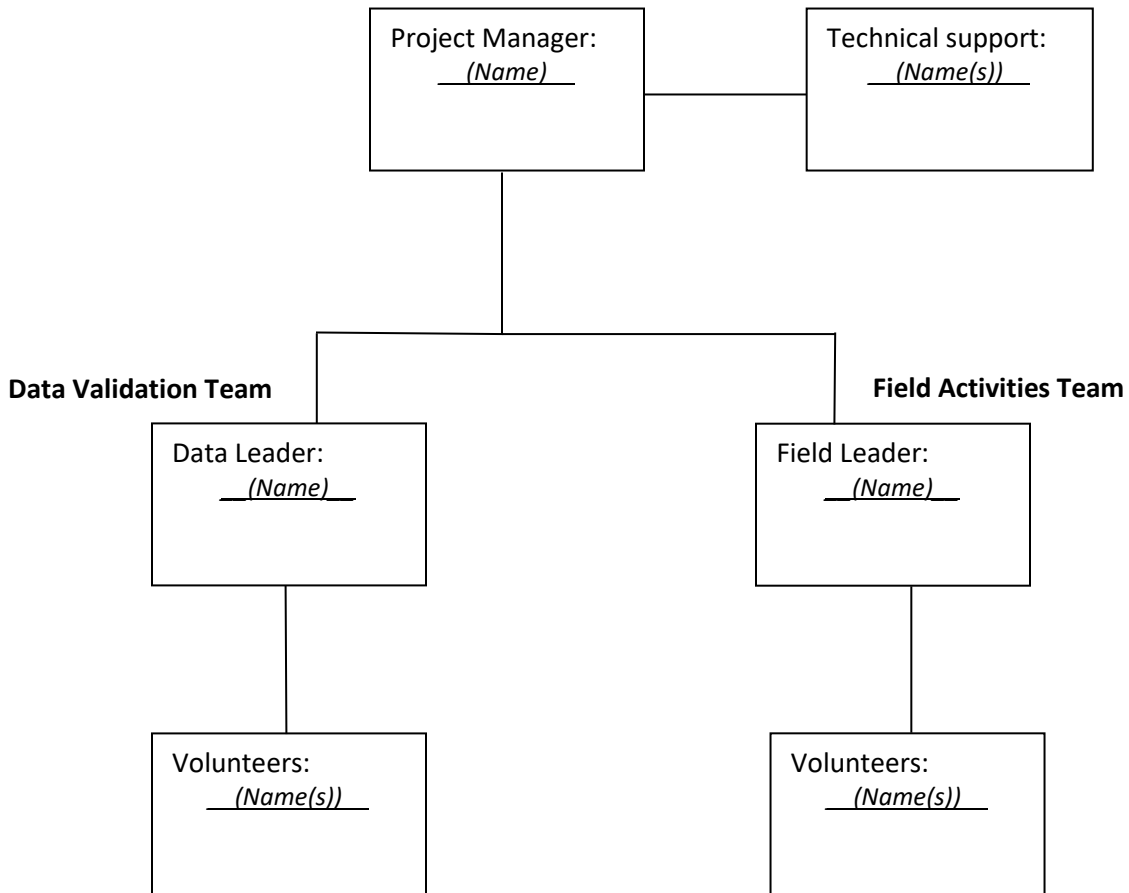
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Section 2A: Project Organization Chart

Fill in the organization chart and contact list table, below which shows the lines of communication and reporting for the project.



Section 2B: Project Contact List

Name/Title	Contact Information
<u>(Name)</u> Project Manager	Email: Phone:
<u>(Name(s))</u> Technical Support	Email: Phone:
<u>(Name(s))</u> Data & Field Leaders	Email: Phone:
<u>(Name(s))</u> Volunteers	Email: Phone:

Section 3: Project/Task Organization

Listed below are the possible roles needed for a supplementary network monitoring project. Project Manager and Technical Support are critical for this type of project.

Name	Title	Organizational Affiliation	Responsibilities (specific to this project)
<u>(Name)</u>	Project Manager	<u>(Organization/Group)</u>	Coordinates between technical support and the interested community group. Oversees project structure, monitor siting, training, technical assistance.
<u>(Name(s))</u>	Technical Support*	<u>(Organization/Group)</u>	Supports Project Manager, advises field lead, trains group on proper use of air sensors, advises Project Manager on any data and quality assurance questions.
<u>(Name(s))</u>	Data & Field Leaders	<u>(Organization/Group)</u>	Data: Train and oversee students and volunteers; assist in technical issues, quality assurance, and data analysis Field: Train and oversee student volunteers, assure accuracy of field sampling
<u>(Name(s))</u>	Volunteers	<u>(Organization/Group)</u>	Data and Field: Collect data, record results, perform data analysis under supervision

*The technical support team could be from government agencies such as the NJDEP Bureau of Air Monitoring or U.S. Environmental Protection Agency (USEPA); professors or experienced students from local universities; or technical professionals. **The technical support team advises the project but is not responsible for its outcome or success.**

Section 4: Problem Definition and Project Objectives

Problem Definition

Describe an area in your community where you would like to supplement the current air monitoring network, and how you would like to do it. Is there too much distance between state-operated monitors, so that they don't capture the air pollution conditions in your area? Are there potential pollution sources in your town that you believe aren't covered by state-operated monitors? The following are examples of a project definition:

In (location/town), there are several sources of air pollution that may not be detected by the closest state-operated monitor. For the purpose of this project, the pollutant of concern is (pollutant). (Pollutant) can have negative health impacts such as (examples & cite source) and the closest NJDEP air monitoring site is located (location), (# of miles) miles away from where the area of concern (or town) is. This study will collect environmental data using (air sensor) to measure (pollutant) concentrations in (location/town) and will be used to answer the following questions:

- “Is there a significant difference between (pollutant) concentrations between here and (name nearby monitoring site(s))? If so, why?”
- “Are (pollutant) emissions from (potential pollution source) detectable by the closest state-operated monitor?”
- “Does this area experience particularly high (pollutant) concentrations that may not be detected by the closest state-operated monitor?”

BLANK TYPE 3

Project Objectives

Describe how the project objectives will provide answers to the problem. Include the tasks that will collect information to address the problem. Below are some examples.

- Determine if we should use (name of sensor) sensor to measure (pollutant) in the project area. (This is what we'll call the area of interest, where there is no current state-operated monitor.)
- Use (name of sensor) sensors to collect (pollutant) data in the project area to compare to the nearest state-operated monitor(s).
- Determine if there are locally high concentrations of (pollutant) in the project area that were previously unknown.

Data Users

List all the groups/organizations that could potentially use the data collected from this project. For example, local schools/universities, community groups, government organizations (NJDEP), etc. Explain how the data could be used and some potential next steps or future projects.

The data users may include:

- Residents of (town)
- Students at (local university)
- Local (town) government

The data and presentation may suggest the following next steps:

- More air quality data may be necessary in order to make confident conclusions.
- Town officials may need to analyze the results and understand the impacts.

Section 5: Background

State why this project needs to be done, identifying the reasons for conducting the work and/or the current lack of information relating to the project. Cite sources used here.

(Town) is located in (specific area of NJ) with a population of (town population). (specific neighborhood) is located in a(n) (rural, residential, commercial, or industrial) part of (town) where there the nearest state-operated monitor(s) is/are (distance) away. This is of concern because there may be a local air quality problem that is not being detected by state-operated monitors. Ambient air quality data can be collected by the general public using low-cost air sensors and, with the proper oversight, could be used to supplement the current New Jersey air monitoring network in (town). With the use of (name of sensor), we hope to supplement the current air monitoring network and determine whether there is a local air quality problem in (town).

Section 6: Project Location

Select **at least 3** sampling locations: two in the project area, and one next to an NJDEP air monitor. Provide a description of the sampling locations, and sample dates and times. Provide a map showing the locations and any other relevant information about the area. Tie this information back to the goals and objectives of the project.

(Number, at least 3) sampling locations were chosen in (town). The first two sampling sites are located (describe location) and are situated in the “project area”. The third sampling site is located (describe location) and is collocated with the NJDEP air sensor that also monitors (pollutant). Here is a map showing all the sampling locations [insert a map image here with labeled sites and a caption].

Section 7: Project Schedule

In the table below, list all major tasks and activities that will be performed during the course of the project. For a supplementary network monitoring project, it’s best to perform air quality data collection for about 1 year, but the minimum amount of time for a data collection period is 3 months, during the time of year when pollution is highest. Organize this information in any way that best fits you and your project.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
Grant writing, project plan/outline, organize group	X						
Grant approval, gather materials, finalize project plans, begin data collection	X	X					
Collect data		X	X	X			
Data analysis		X	X	X	X		
Quality Assurance checks			X	X	X	X	
Report writing				X	X	X	
Presentations						X	X

Section 8: Existing Data

Do some research to find any existing data or previous studies done in your area; or find a similar research topic that could be useful for this current study. Use only data and information from a reliable primary source and cite sources. Explain why this data is relevant to the study and if/how it can be used in the project. Below is an example of how you can describe any existing data.

Existing Data or Study	Data Source	How Data Will Be Used	Acceptance Criteria
<u>(Pollutant)</u> Concentration data in <u>(units)</u>	<u>(Abbreviate source citation here, full citation will be in References section)</u>	This data will be used to <u>(briefly state how it will be used, i.e., supplement measured data, compare measured data, show how concentrations have changed)</u>	This data is acceptable because it is the same pollutant measured in the same area from <u>(time/year)</u> and has a reliable, peer-reviewed source.

Section 9: Measurement Quality Indicators

Provide information needed to measure and establish goals for the data quality indicators (DQIs). The goals ensure that the data is accurate, well-managed, and are appropriate for meeting the project objectives. If you need additional resources to help you determine your DQIs or to learn more about what DQIs are and how they are measured, please refer to the [Air Sensors Guidebook](#).

Precision – the ability of a measurement to consistently be reproduced. The goal is a slope of 1.0 ± 0.2 , and a correlation coefficient (R^2) > 0.8 . There are 2 ways to measure precision:

- 1) repeated measurement by the sensor of a known concentration such as a standard.
- 2) repeated measurements of side-by-side sensors.

Precision will be measured by (describe how you determined precision) and the goal for percent difference is (% difference) .

Bias – any influence in the project that might sway or skew the data in a particular direction. The goal is a mean absolute percent difference of ≤ 20 . There are 2 ways to measure for bias:

- 1) challenging the sensor with a known amount of a pollutant that is traceable to a standard.
- 2) collocating the sensor to a monitor that is traceable to a standard such as state operated monitor.

Bias will be measured by (describe how you determined bias) and the goal for percent difference is (% difference) .

Representativeness – how well the collected data reflects the typical pollutant levels throughout the project area. This goal can be addressed by describing the 3 sampling locations and their distribution.

The sampling locations accurately monitor the project area by having sampling locations located (describe the 2 project area sampling locations) and one next to the nearest state-operated monitor.

Comparability – the extent to which data from one data set can be compared directly to another data set. State if the data is intended to be compared to other data sets and how this will be achieved.

Data from this study will be compared with (describe data from a previous study to be compared to, if applicable) and will also be compared with itself using data from NJDEP monitors. Therefore, this data could be used for comparison in future studies using (name of sensor) .

Completeness – the amount of data that must be collected in order to achieve the goals and objectives of the project. This can be stated as a total number of samples or a percentage of data collected. The goal is $\geq 75\%$ of valid data. Data is considered valid when collected according to the sensor instruction manual and when it meets the goals of precision, bias, and comparability as explained above.

The data collection period is (describe sample collection time) and 75% valid data is the goal.

Sensitivity – the lowest detection limit of a method, instrument, or process for each of the measurement parameters of interest. State the sensitivity needed for the sensor, as stated in the sensor instructions.

The lowest detection limit of the (name of sensor) is (indicate lowest detection limit with units) .

Section 10A: Data Collection Methods

Sampling Design

Describe and justify the data collection activities. Provide information about the frequency of sampling and the collection of quality control (QC) samples. Attach all air sensor instructions as an appendix or provide the web address if they are accessible online.

Sampling Location	Sampling Schedule	Parameter	Field QC Samples	Total Number of Samples	Sampling Location Objective
<i>(Name of location)</i> – Use 1 row for each sampling location	Frequency and duration of sampling.	<i>(Pollutant)</i>	<i>(Describe the method & frequency of measuring precision & bias at this location)</i>	<i>(# of samples taken in this location)</i>	<i>(Define objective for sampling at this location)</i>

Section 10B: Equipment List and Instrument Calibration

Equipment List

Generate a list of all necessary field equipment that will be used for the project. Include specific details when listing instrumentation (model and serial number). Make sure the type of air sensor you choose makes sense for a Type 3 project. Refer to “Resources to Help You Select the Appropriate Low-Cost Sensors” page in the [Helpful Links](#).

Materials

(Type of air sensor & serial #)

(Type of air sensor & serial #)

(Type of air sensor & serial #)

Pens

Data sheets

Instrument Calibration and Maintenance

In the table below, fill in any calibration or maintenance requirements for the equipment used during the project. State how the calibration information will be documented.

Instrument	Dates & times	Were calibrations within acceptance criteria?	Maintenance Requirements
<i>(Name of sensor and serial #)</i>	<i>(Dates & times of how often this was done)</i>	<i>(Yes or no)</i>	As per sensor instructions.

All calibrations will be completed as needed/recommended by the instrument instruction manual.

Section 11: Field Data Table

Below is an example of a field data table. If the data is being collected and recorded electronically, provide an example of the format of the data, in a spreadsheet or text table.

Using <u>(name of sensor)</u> to Supplement the NJ Air Monitoring Network in <u>(town)</u>				
Group:				Sensor Serial Number:
Date	Sampling Location	Start Time	Stop Time	Additional Observations (i.e. area description, weather, what's nearby, anything physically sensed like smell or visible smog)

Section 12: Training and Specialized Experience

Training

Describe any training needed by an individual involved with the project. Also include any refresher training that may be conducted during the project. An example is below.

Personnel/Group to be Trained	Description of Training	Frequency of Training
- Project Manager - Data & Field Leads - Volunteers	Training session will be led by Technical Support on how to properly use air sensors, collect data, analyze data, and complete QAPP.	One large group-setting training, and then as needed throughout the duration of the project.

Specialized Experience

Identify who is providing training to the community science group for the low-cost sensors, data analysis, quality assurance, etc. This will typically be the same person/people who are considered the Technical Support. Also state their relevant experience and years of experience. Below is an example table you can fill in.

Person	Specialized Experience	# of Years of Experience
<u>(Names of people providing technical support)</u>	They have experience in air monitoring including <u>(pollutants)</u> .	<u>(# of years)</u> years

Section 13: Assessments and Oversight

In order to identify shortcomings and deviations from the QAPP, plan out some assessments of the sensors and the field & data work performed by the Field Operations and Data Validation Teams. For each type of assessment, describe procedures for handling QAPP and project deviations encountered during the project assessment. Below is an example of a table showing some general assessments. Feel free to use this example and fill it in with your more specific oversight & assessment plans.

Assessment Type	Frequency of Assessments	What Will be Assessed	Who Will Conduct the Assessment	How Issues or Deviations will be Addressed
On-site field inspection	During each sample	Air sensor operation, field data sheet completeness and correctness, data analysis, quality assurance	Data & Field Leads, Project Manager, Technical Support	Retrain if necessary
Performance	Once at start of project	Accuracy of air sensors	Technical Support or 3 rd party	Determine validity of data

Section 14: Data Management

Describe the data management processes used throughout the project, including recording and transcribing field notes, logging and retrieval of instrument data, and data analysis. Describe the way data handling errors will be managed (e.g., spot checks for transcription and calculation errors). If the data is recorded electronically, describe how it is stored, and if additional calculations are performed on the data.

Field Data and Air Sensor Data:

All data from the field will be recorded on pre-printed data sheets (Section 11). The recorded data will be checked for accuracy and transcription errors by the Data and Field Leads and/or Project Manager. If there are any discrepancies in data entries, Data and Field Leads and/or Project Manager will discuss them with the Volunteers. Original datasheets will be kept until after the final project reporting is completed. Data from air sensors will be downloaded and manipulated using (data analysis program used) and original raw data will be kept on file in case of discrepancies or errors. The data will be electronically stored in (location of data) .

Section 15: Data Review for Usability

List the types of checks that will be performed at the end of the project to determine if the data collected is usable for achieving the goals of the project. Below is an example of some Field/Lab and Data checks you may complete.

Field/Lab	Data Management
<ul style="list-style-type: none"> • Monitoring performed per sensor instructions or QAPP • Field QC samples performed correctly • Measurements performed correctly • Calibrations performed correctly • Data meets acceptance criteria • Holding times • Evaluate any deviations from QAPP or sensor instructions to determine the impact to the data and project objectives 	<ul style="list-style-type: none"> • Data entry and transcription errors • Calculation/reduction errors • Proper data and document storage • Missing data documented • <u>(Explain how data meets acceptance criteria)</u> • <u>(How long raw data is kept)</u> • <u>(Explain any deviations from QAPP or sensor instructions)</u>

Explain the usability of your project data. If your data review meets all QC criteria, then your data will be assumed to be usable for the intended project objective. If that is not the case, explain which data can be used if not all criteria have been met. The paragraph below is an example.

All data issues identified will be discussed with the Project Manager or Technical Support to determine data usability on a case-by-case basis. All decisions to allow data that did not fully comply with QC criteria or QAPP requirements will be explained, and any resulting limitations on data use will be fully discussed in the final project presentation.

Section 16: Reporting

Specify the frequency of all project reports, the names of the originators and to whom they will be issued. This may include but is not limited to the following: sample collection records, quality control sample records, equipment calibration records, assessment reports, data downloading reports, final report of results, etc. Below is an example.

During the sampling period, the Project Manager will email weekly project reports to Technical Support in order to provide a status update for the project and will include a summary of the quality assurance data checks conducted and the results of those checks. (Also include any final presentations done with the data for school projects, local meetings, etc.).

Section 17: References

List any references that were used in any previous sections. This can be added as an Appendix if it's long.