

Considerations for designing an ambient air monitoring study

I: Goals of the study

Determine the goals of the study. These goals will provide the framework of the study during development and execution. Include information such as what pollutant(s) the study is focusing on, why the study is being conducted, and who does the user want to reach?

II: Environmental description and location

List a detailed description of the study's location and terrain. Add maps, plats or charts to visually show the location and any other pertinent and relevant information.

III: Sampling program

For the purpose of the study, determine what criteria the data collection should meet.

- Parameters
 - What parameters will be measured (PM2.5, SO2, Ozone, Toxics, etc.)?
- Spatial scale (see 40 CFR Part 58 Appendix E)
 - How many data collection sites will be included?
 - What is the scale and objective of locations being sited?
 - Are there specific areas of impact that are intended to be examined (schools, elder care facilities, hospitals, etc.)?
 - Has meteorology data or modeling evaluations been considered to determine areas of predicted highest concentration?
- Duration of the study
 - Are there changes over time or seasonality of measurements that should be accounted for?
 - Is there a before/after condition being evaluated?
- Granularity of measurements
 - What time intervals of data should be collected (sub-hourly, hourly, daily, etc.)?

IV: Monitoring site description

Determine what equipment and methods will be used to collect data.

- Does the equipment and method(s) fit the criteria needs for the study?
- Will the equipment and methods meet the logistical constraints of the study?
 - Are there power requirements (electrical circuits, battery, generator, etc.)?
 - Are there climatological restraints (precipitation, temperature, solar radiation, etc.)?
 - Are there security needs (fencing, locked enclosures, etc.)?
- Are there siting limitations?
 - Do samples need to be collected at a certain height?
 - Are there obstructions that need to be avoided?
 - Are the sites free of interfering sources (burn piles, parking lots, building exhausts, etc.)?

V: Data acquisition / reporting

Determine how the data will be collected.

- Samples collected for laboratory analysis:
 - What laboratories will be involved in analysis?
 - What are the hold times between sampling and collection, collection and analysis?
 - Are there temperature requirements for sample storage?
 - Do the laboratory analytical methods meet the criteria needs for the study?
- Onsite analysis data records
 - What type of data logging will be used?
 - How is the data retrieved and backed up?
 - How often must the data be collected to prevent data loss (overwriting memory buffer)?

VI: Data quality

1. Determine how complete the data is.
 - How frequently does a valid data point need to be collected to be representative of the conditions being studied?
2. Ensure data quality objectives are met.
 - Are the questions of the study qualitative or quantitative?
 - What detection limits will be useful for the determination of whether a parameter is present or absent?
 - How accurate does the data need to be?
 - How well does the method need to compare to a regulatory method?
 - How precise does the data need to be?
 - How well do different sensors of the same method need to compare with each other?
3. Include all needed ancillary data.
 - Will the study utilize outside data sets such as meteorological data?
 - Will metadata need to be collected regarding operations or events (production schedules, precipitation events, traffic counts, etc.)?
4. Include the quality control measures that will support the defensibility of the data.
 - Calibration checks – verify the accuracy of the sensor/monitor by challenging with a known standard, ideally a known concentration of the target pollutant and perhaps with a zero source where the pollutant does not exist
 - Collocation with a higher standard – Compare measurements of the sensor/monitor with a higher quality standard to relate accuracy to the higher standard
 - Collocation with an identical method – compare measurement of a sensor/monitor to determine how repeatable the measurement is
 - Audits – checks of the instrument/procedures by an oversight agency or expert

Resources:

For more assistance for air sensor studies, visit:

- [NACAA air sensor summary](#) page for general assistance
- [South Coast – Air Quality Sensor Performance Evaluation Center for more](#) specific collocation studies and results