

## Appendix 7a. Detailed Discussion of Monitor Selection

---

OAQPS applied several screening techniques in the effort to select monitors within the NO<sub>2</sub> monitoring network that would be appropriate to scale-up to simulate what a near-road monitor might record. OAQPS used monitor site characteristics and visual inspection by using Google Earth geospatial software to determine which of the monitor sites were appropriate to scale-up to simulate near-road monitors. We then screened that list of monitors so that only those located in Core Based Statistical Areas (CBSAs) with populations of 350,000 or greater, which corresponds to the proposed population threshold in the NO<sub>2</sub> NAAQS and monitoring proposal package, would be scaled-up.

All NO<sub>2</sub> monitoring sites that are used for comparison to the NAAQS report their data to the Air Quality System (AQS). Each monitoring site has a profile in AQS containing metadata pertaining to the monitor, including where the monitor is located, the monitoring objective, the scale of representativeness, and whether it is thought to be influenced by a particular type of emission source, among other data metrics. Although, the metadata in AQS are informative, we must note that AQS metadata should be used with caution as there are no formal requirements for the responsible state and local air monitoring agencies that operate the monitoring network to quality assure or update metadata at any frequency.

In conjunction with the language in the NO<sub>2</sub> NAAQS and monitoring proposal package, this exercise was intended to only use “area-wide” monitors to scale-up to simulate near-road concentrations. Area-wide monitors are monitors that are not significantly influenced by point, area, or mobile sources, meaning they typically do not represent the maximum concentration that may be attributable to a source or sources. Further, area-wide sites are sited to represent neighborhood, urban, and regional spatially representative scales. To identify which sites in the NO<sub>2</sub> network were suitable to classify as “area-wide” site, we screened sites utilizing three particular AQS metadata metrics: 1) monitor objective, 2) spatial (measurement) scale, and 3) dominant source.

The monitor objective meta-data field describes what the data from the monitor are intended to characterize. The focus of the data presented is to show the nature of the network in terms of its attempt to generally characterize health effects, photochemical activity, transport, or welfare effects. There are 11 categories of monitor objective for a NO<sub>2</sub> monitor within AQS. The first six categories listed below stem directly from categorizations of site types within the Code of Federal Regulations (CFR). In 40 CFR Part 58 Appendix D, there are six examples of NO<sub>2</sub> site types:

1. Sites located to determine the highest concentration expected to occur in the area covered by the network (Highest Concentration).
2. Sites located to measure typical concentrations in areas of high population (Population Exposure).
3. Sites located to determine the impact of significant sources or source categories on air quality (Source Oriented).
4. Sites located to determine general background concentration levels (General Background).
5. Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards (Regional Transport).
6. Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts (Welfare Related Impacts).
7. Sites with unspecified or non-routine monitor objectives (Other).

The remaining four categories available are a result of updating the AQS database. In the more recent upgrade to AQS, the data handlers inserted the available site types for the Photochemical Assessment Monitoring Stations (PAMS) network. These PAMS site types are spelled out in 40 CFR Part 58 Appendix D:

1. Type 1 sites are established to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to transport (Upwind Background).
2. Type 2 sites are established to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions are expected to impact and are suited for the monitoring of urban air toxic pollutants (Max. Precursor Impact).
3. Type 3 sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions (Max. Ozone Concentration).
4. Type 4 sites are established to characterize the downwind transported ozone and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming transport in other areas (Extreme Downwind).

It should be noted that any particular monitor can have multiple monitor objectives. For this screening exercise, we selected one reported monitor objective based on a hierarchy to represent an individual monitor. The hierarchy used was to select, in order of priority: 1) source

oriented, 2) high concentration, 3) population exposure, or 4) general background, if they existed at a site with multiple monitoring objectives.

The spatial (measurement) scales are also defined in 40 CFR Part 58, Appendix D. This regulation language spells out what data from a monitor can represent in terms of air volumes associated with area dimensions where:

Microscale – Defines the concentration in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

Middle scale – Defines the concentration typical of areas up to several city blocks in size, with dimensions ranging from about 100 meters to 0.5 kilometers.

Neighborhood scale – Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.

Urban scale – Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale. The neighborhood and urban scales have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.

Regional scale – Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.

Therefore the meta-data records for the NO<sub>x</sub> network in AQS indicate what the measurement scale of a particular monitor represents. It is important to note that a monitor can only have one measurement scale, as opposed to the possibility of a single monitor having multiple monitor objectives.

The “dominant source” metric in AQS allows responsible state and local air monitoring agencies to identify, if applicable, what type of emission source may be the dominant source influencing the measurements at a particular site. There are three choices for the dominant source category: 1) Point, 2) Area, and 3) Mobile. It should be noted that not all NO<sub>2</sub> monitor records have a value in the dominant source field, either because the responsible state and local monitoring agency does not believe any particular type of source is influencing a particular site, or because the information was simply not entered into the database.

For the first screening to identify area-wide NO<sub>2</sub> monitoring sites, we chose to exclude all sites that met one or more of the following criteria based on AQS metadata:

- Any microscale site (measurement scale)
- Any middle scale site (measurement scale)
- Any source oriented site (monitor objective)
- Any site with the following combination of metadata: Highest Concentration, Neighborhood scale, and Point source dominated  
(monitor objective/measurement scale/dominant source)
- Any site identified as being operated by industry, as these sites are usually micro or middle scale, source oriented sites.

As a result of the first screening, of the original 255 sites used in the RIA, 225 remained for use in the second screening process.

The second screening process was by visual inspection and geospatial analysis using Google Earth of the top eleven NO<sub>2</sub> sites, ranked by estimated ppb/ton and two other monitor sites located in counties with multiple monitoring sites that had higher estimated ppb/ton values. The analysis reviewed where the site was physically located in an urban area, checked its proximity to major roads (such as interstates, freeways, and major arterial roads), and its proximity to identifiable sources such as industrial complexes and facilities, commercial facilities (such as trucking depots), or proximity to other area sources (such as airports or shipping ports). As a result, three more sites were excluded from the pool of NO<sub>2</sub> sites that were to be allowed to be scaled-up to simulate near-road monitoring sites.

The final screening was to remove any sites that were not in CBSAs with a population of 350,000 or greater. This was done to match the proposed population based thresholds that trigger minimum required near-road monitors in the NO<sub>2</sub> NAAQS and monitoring proposal package. This screening removed 41 monitors, leaving 181 monitors to use in the scale-up simulation.