EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) completed a comprehensive assessment of the National Air Toxics Trends Station (NATTS) Network. The NATTS Network was created to generate long-term ambient air toxics concentration data to identify trends in air toxic concentrations and evaluate the effectiveness of efforts to reduce air toxics across the nation. Some of the policy-relevant questions addressed in this assessment include the following:

- Are the data collected adequate to meet the program-level data quality objective and program goals?
- Are the NATTS goals and objectives still relevant?
- Is the network design appropriate/optimal to achieve the goals and objectives?
- What changes to the current network design would be appropriate to improve the NATTS regarding sites, pollutants, reporting, and measurements?

EPA conducted this NATTS Network Assessment as part of the Air Toxics Component of its overall National Monitoring Strategy, which requires that the NATTS Network be evaluated, and modified every 6 years.[1] EPA's assessment, as summarized here, can be divided into two portions: quantitative and qualitative. The quantitative portion examined the pollutant datasets collected by the monitoring stations and evaluates the quality of those datasets in terms of suitability for assessing trends. EPA used the suitable datasets to identify trends of air toxic concentrations over the 6-year period 2005-2010, as well as to identify national trends of air toxics at individual sites. The qualitative portion examined issues such as whether the network design is appropriate to achieve the network's goals and objectives and whether changes to the sites, pollutants, or means of measurement are needed to refine the network.

BACKGROUND

NATTS Network. The NATTS Network collects ambient air monitoring data on air toxics as part of the Urban Air Toxic Strategy, which addresses air toxics in urban areas.[2] Air toxics include hazardous air pollutants or HAPs, which are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

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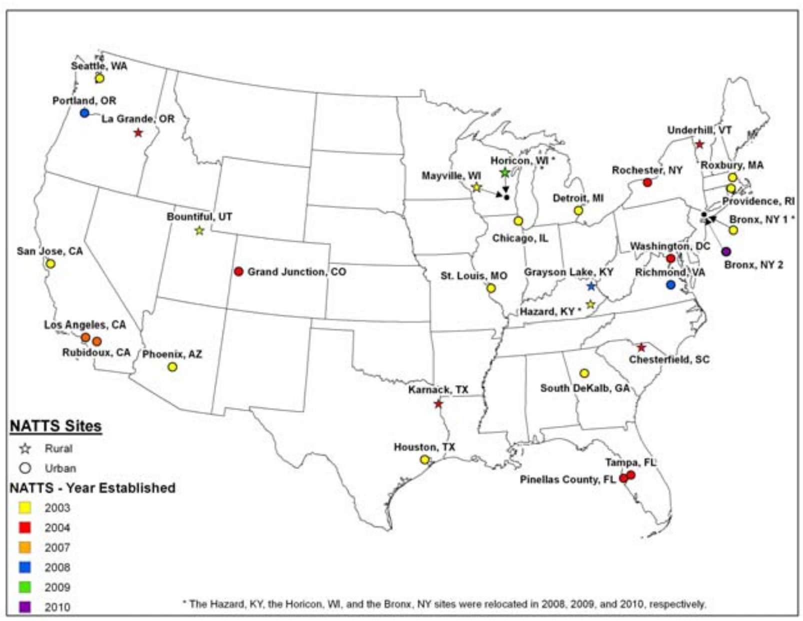
[1] U.S. EPA, 2004. National Monitoring Strategy—Air Toxics Component, Final Strategy, July 2004.
[2] U.S. EPA, 1999. National Air Toxics Program: The Integrated Urban Strategy; Federal Register Notice, 64 FR 38706, July 19, 1999.

Data generated by each NATTS site are quality assured and submitted to the national Air Quality System (AQS), EPA's repository of ambient air data. These quality-assured data can then be used for purposes such as:

- Identifying trends in ambient air toxic concentrations to facilitate tracking progress toward emission and risk reduction goals.
- Directly evaluating public exposure and environmental impacts in the vicinity of monitoring sites.
- Assessing the effects of specific emission reduction activities both locally and nationally.
- Providing quality assured air toxics data for risk characterization.
- Evaluating and subsequently improving air toxics emission inventories and model performance.
- Identifying additional monitoring needs (e.g., new sites or additional methods).

The design of the NATTS Network is the result of concerted efforts between the EPA Office of Air Quality Planning and Standards (OAQPS) and the National Association of Clean Air Agencies. Their efforts led to the monitoring locations, the list of air toxics to sample, and corresponding data quality requirements. In 2005, 23 original NATTS sites began to fully sample the initial 16 core HAPs (i.e., eight volatile organic compounds (VOCs), two carbonyls, and six speciated PM_{10} metals). Hexavalent chromium was also added at 22 of the 23 original sites in 2005. Polycyclic aromatic hydrocarbons (PAHs) were added in 2007/2008. Two new sites were added in both in 2007 and 2008, leading to the current network of 27 sites, sampling 19 air toxics.

Site locations. The current network of 27 NATTS monitoring sites is distributed across the country and encompasses 20 urban/suburban sites and seven rural sites. Note that for logistical reasons, three sites moved: In 2008, the Hazard, KY site relocated 67 miles to Grayson Lake, KY; in 2009, the Mayville, WI site relocated 5.1 miles to Horicon, WI; and in 2010, the Bronx 1, NY site relocated 5 miles to Bronx 2, NY.



NATTS Sites and Year Established

Administration. The NATTS Network is administered by the EPA Office of Air Quality Planning and Standards through an annual competitive grant. Each year, EPA awards non-matching grants of approximately $155,000 to state and local agencies to operate each NATTS monitoring station. The money is designated under CAA Section 103 as State and Tribal Assistance Grants. Awarded agencies are expected to meet administrative requirements, such as developing a work plan and quality assurance project plan, as well as participate in the OAQPS quality assurance program. NATTS operating agencies are also expected to meet specific data quality requirements to ensure that the respective monitoring sites generate data of adequate quality to meet the network goals and objectives. A key requirement is that sites generate data that meet the NATTS Network data quality objective.

QUANTITATIVE ASSESSMENT

A quantitative assessment was completed through the data reported to AQS and through other directly relevant reported information, such as Proficiency Testing samples. EPA extracted data from AQS as of December 2011, which provided at least 6 years of consecutive data for most of the 19 NATTS pollutants. Note that acrolein data were not included in this assessment because of data quality issues.[3]

The assessment examined whether data collected under the program are complete enough and are of adequate quality to meet the program-level data quality objective. The program-level data quality objective (DQO) of the NATTS Network is the following:

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.[4]

Data Quality. To determine whether this data quality objective is being met, EPA examined the performance of NATTS monitoring sites/operating agencies in terms of whether the pollutant datasets they generated met specific method quality objectives (MQOs). A "pollutant dataset" means the set of pollutant concentrations submitted to AQS by a monitoring site for an individual pollutant for a specific year.

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[3] In 2010, EPA/OAQPS completed a study that determined acrolein monitoring results could be affected by factors such as how canisters are cleaned in preparation for sample collection and the gas standards used to calibrate analytical equipment. This means that while it is probable that monitors are detecting acrolein in the air, the results of the current sampling and analysis methods are suspect. For more information, see http://www.epa.gov/schoolair/pdfs/acroleinupdate.pdf.

[4] U.S. EPA, 2002. Draft Report On Development Of Data Quality Objectives (DQOs) For The National Ambient Air Toxics Trends Monitoring Network, Contract No. 68-D-98-030, Work Assignment 5-12. Prepared by Battelle, Columbus, OH, U.S. EPA, Office of Air Quality Planning and Standards; Emissions, Monitoring, and Analysis Division. September 27, 2002.

Pollutant datasets are expected to meet the following MQOs, in order to be suitable for assessing trends:

- **Completeness:** ≥85%, measured as percent of samples actually collected versus samples scheduled to be collected.
- **Sensitivity:** Quantification at the target method detection limits (MDLs), as demonstrated by experimentally-determined MDL on an annual basis.
- **Bias:** Percent difference of ≤25 percent, as demonstrated through periodic proficiency tests.
- **Precision:** Coefficient of variation (CV) of ≤15%, as demonstrated through duplicate or collocated sampling. [Landis: May be useful to add explanation of Overall Method Precision and Analytical Precision]

Initial examination of the datasets showed two important factors when comparing the pollutant datasets to the MQOs: 1) Some pollutant datasets were *just outside* of the MQO and 2) not all pollutant datasets could be evaluated versus each MQO because the MQOs did not apply consistently for the period of the assessment. For example, a dataset may have completeness of 80% or have bias of 28%—values just outside of the MQO. Also, precision measurements were not required for the assessment period and there was variability in the frequency of proficiency testing for measuring bias.

Thus, EPA developed scoring criteria to account for these two factors. The scoring criteria weights the MQOs as follows: Completeness (40%), Sensitivity (30%), Bias (20%), and Precision (10%). In addition, if a pollutant dataset could not be scored for an MQO because the data were not required (precision measurements) or because the data were not available (proficiency test for measuring bias was not requested by EPA), then the dataset was not scored for that MQO. This means a pollutant dataset was not "penalized" for not having data to compare to the precision or bias MQO. The benefits of the scoring criteria are that the evaluation of pollutant datasets reflects how the respective MQOs were applied during the period of the assessment, which results in more datasets being included in assessing trends.

Based on the scoring criteria, EPA found that 78% of the 2,827 pollutant datasets are complete enough and are of adequate quality to meet the program-level data quality objective of identifying pollutant-specific trends in average air toxics concentrations over two successive 3-year periods. The breakdown by individual MQO follows:

- 90% of the pollutant datasets met the Completeness MQO
- 85% of the pollutant datasets met the Sensitivity MQO
- 97% of the pollutant datasets met the Bias MQO
- 81% of the pollutant datasets met the Overall Method Precision MQO

- 95% of the pollutant datasets met the Analytical Precision MQO (Note that overall method precision estimates precision for the total data collection system, i.e., the estimate includes imprecision related to field, preparation, handling and laboratory operations. Analytical precision estimates only values generated by laboratory analysis (i.e., reweighing a filter or GC/MS analysis).

Regarding data quality versus the DQO, EPA made the following observations and recommendations:

- The data generated by NATTS monitoring sites were, in general, consistent, high-quality datasets that met the DQO. Many sites employed the same sampling and analytical procedures, which helps ensure data consistency needed for trends analysis.
- The number of sites having sufficient quality and quantity to calculate the across-site trends for the NATTS core HAPs ranged from eight (arsenic) to 15 (chloroform and trichloroethylene). The reasons for this small number of sites were deficiencies in sensitivity (discussed below) and completeness. Although 95% of the pollutant datasets met the Completeness MQO, not all NATTS operating agencies sampled for the particular pollutant groups they were supposed to sample, which meant fewer pollutant datasets could be included in trends calculations.

Method Detection Limits. The most common reason a pollutant dataset did not meet the MQOs was because it did not meet the Sensitivity MQO. Method sensitivity is measured using method detection limits (MDLs). The inability to meet the target MDLs or the lack of reporting MDLs accounted for the majority of the datasets that did not meet the overall MQOs. The qualitative portion of the assessment may help identify underlying reasons pollutant dataset(s) did not meet the MQOs, such as inadequate or dated equipment.

EPA evaluated the performance of the laboratories supporting the NATTS sites by comparing the laboratory-derived MDL to the target MDL. Each year, laboratories must experimentally determine MDLs in accordance with 40 CFR, part 136, Appendix B. It has been EPA's desire that the responsible NATTS AQS reporting entities submit these MDLs to AQS in conjunction with their concentration data. However, in some cases, laboratories did not report their MDLs to AQS. Thus, for this assessment, EPA obtained each site's MDL from one of three sources: AQS, the Quality Assurance Annual Reports, or directly from the laboratory. Often, laboratory MDLs change or fluctuate through a sampling year. Thus, for this analysis, EPA used the minimum reported value for each site's experimentally-determined MDL by pollutant and by year as an indicator of MDL sensitivity. MDLs were available for over 96% of the concentration data.

For the assessment period, meeting the target MDLs varied by pollutant and by laboratory:

- Target MDLs were consistently met for acetaldehyde, benzo(a)pyrene, cadmium, hexavalent chromium, lead, manganese, nickel, naphthalene, and nickel.
- Target MDLs were not consistently met for: arsenic, benzene, 1,3-butadiene, carbon tetrachloride, formaldehyde, tetrachloroethylene, and vinyl chloride.
- 12 sites/laboratories consistently met the target MDLs for all or nearly all pollutants.
- Six sites/laboratories tended to account for the majority of pollutant datasets with MDLs above the target MDLs.

EPA closely examined the sites' experimentally-determined MDLs for the year 2010, comparing them to the target MDLs that EPA publishes in the NATTS Workplan Template (U.S. EPA, 2011c).[5] EPA found the following:

For 2010, for these pollutants, all sites/laboratories met the target MDL:

- Benzo(a)pyrene
- Hexavalent chromium
- Lead
- Manganese
- Naphthalene
- Nickel

For 2010, for these pollutants, all sites/laboratories did not meet the target MDL:

- Acetaldehyde (1 site did not meet the target MDL in 2010)
- Arsenic (6 sites did not meet the target MDL in 2010)
- Benzene (8 sites did not meet the target MDL in 2010)
- Beryllium (2 sites did not meet the target MDL in 2010)
- 1,3-butadiene (10 sites did not meet the target MDL in 2010)
- Cadmium (1 site did not meet the target MDL in 2010)
- Carbon tetrachloride (9 sites did not meet the target MDL in 2010)
- Chloroform (3 sites did not meet the target MDL in 2010)
- Formaldehyde (7 sites did not meet the target MDL in 2010)
- Tetrachloroethylene (10 sites did not meet the target MDL in 2010).
- Trichloroethylene (6 sites did not meet the target MDL in 2010; 5 sites did not meet the target MDL for 2012).

[5] U.S. EPA, 2012b. National Air Toxics Trends Station Work Plan Template, April 17, 2012. http://www.epa.gov/ttnamti1/files/ambient/airtox/nattsworkplantemplate.pdf. Last accessed 4/17/2012.

Trends. Using only the pollutant datasets that were determined to be acceptable for assessing trends, EPA calculated trends in two ways:

- Consecutive 3-year block averages *across multiple sites*, consistent with the program-level data quality objective, for the years 2005-2010
- Rolling 3-year averages *for individual sites* to identify trends at the site level for the years for which the site had suitable data.

Table ES-1 presents the 3-year block averages and percent difference for each pollutant:

- Results use *zero* as the surrogate for non-detects in calculating the annual averages, which is consistent with the historical NATTS approach (see Section 7 for further discussion regarding the use of zeros for non-detects).
- The number of sites used in the averaging ranged from eight to 14, because not all sites had pollutant datasets for the *consecutive* years 2005-2010.
- PAH sampling did not begin until 2007/2008, thus, no trends were calculated for benzo(a)pyrene and naphthalene.

Table ES-1. Results of DQO Trends Analysis—3-year Block Averages, Ranked by Percent Difference

Pollutant	Pollutant Group	Units of Measure	Cancer Risk 10^{-6} (µg/m^3)	Noncancer at HQ=0.1 (µg/m^3)	# Sites Used in Averaging	2005-2007	2008-2010	%Diff
Tetrachloroethylene	VOC	µg/m^3	0.17000	27.0	12	0.39	0.22	-42.6%
Hexavalent Chromium	Hexavalent Chromium	ng/m^3	0.00008	0.0081	12	0.026	0.016	-37.4%
Lead (PM_{10})	PM_{10} Metal	ng/m^3	--	0.15	12	4.63	3.02	-34.6%
Trichloroethylene	VOC	µg/m^3	0.50000	60.0	15	0.057	0.037	-33.5%
Nickel (PM_{10})	PM_{10} Metal	ng/m^3	0.00210	0.009	11	1.85	1.25	-32.4%
Cadmium (PM_{10})	PM_{10} Metal	ng/m^3	0.00056	0.002	14	0.27	0.19	-28.6%
Butadiene, 1,3-	VOC	µg/m^3	0.03000	0.200	12	0.119	0.086	-28.3%
Beryllium (PM_{10})	PM_{10} Metal	ng/m^3	0.00042	0.002	12	0.056	0.043	-22.2%
Formaldehyde	Carbonyl	µg/m^3	180.00000	0.980	12	2.87	2.34	-18.6%
Benzene	VOC	µg/m^3	0.13000	3.000	14	1.07	0.87	-18.2%
Acetaldehyde	Carbonyl	µg/m^3	0.45000	0.900	13	1.93	1.62	-15.9%
Manganese (PM_{10})	PM_{10} Metal	ng/m^3	--	0.005	13	6.20	5.30	-14.6%
Arsenic (PM_{10})	PM_{10} Metal	ng/m^3	0.00023	0.003	8	0.89	0.80	-12.2%
Carbon tetrachloride	VOC	µg/m^3	0.06700	19.0	10	0.57	0.62	8.7%
Vinyl chloride	VOC	µg/m^3	0.11000	10.0	13	0.0029	0.0034	15.9%
Chloroform	VOC	µg/m^3	--	9.8	15	0.21	0.24	16.5%

Observations: Consecutive 3-year block averages *across sites*:

- 13 pollutants decreased, ranging from -42.6% (tetrachloroethylene) to -12.2% (arsenic)
- 3 pollutants increased (carbon tetrachloride +8.7%, vinyl chloride +15.9%, chloroform +16.5%)

Observations: Rolling 3-year averages *for individual sites:*

Sites were generally consistent with the 6-year trend across sites, with the following exceptions:

- Arsenic - Decreasing across sites, but increasing at Providence RI and Chesterfield, SC
- Acetaldehyde - Decreasing across sites, but increasing at Pinellas, FL; Hazard, KY; Bronx#1, NY; and Underhill, VT
- Benzene- Decreasing across sites, but increasing at Washington, DC
- Beryllium- Decreasing across sites, but increasing at Pinellas, FL; Tampa, FL; South DeKalb, GA; Rochester, NY; Providence, RI; and Chesterfield, SC
- 1,3-Butadiene- Decreasing across sites, but increasing at Chicago, IL; St. Louis, MO; and Bountiful, UT
- Cadmium- Decreasing across sites, but increasing at South DeKalb, GA
- Carbon tetrachloride- Increasing across sites, but decreasing at Tampa, FL and South DeKalb, GA
- Chloroform- Increasing across sites, but decreasing at Roxbury, MA and Underhill, VT
- Formaldehyde - Decreasing across sites, but increasing at Phoenix, AZ; Grand Junction, CO; Tampa, FL; Hazard, KY; Bronx#1, NY; Providence, RI; Karnack, TX; and Underhill, VT
- Hexavalent chromium- Decreasing across sites, as well as for individual sites.
- Lead- Decreasing across sites, but increasing at Hazard, KY
- Manganese - Decreasing across sites, but increasing at Washington, DC; Pinellas County, FL; and Underhill, VT
- Nickel - Decreasing across sites, but increasing at Grand Junction; Tampa, FL; and Chesterfield, SC
- Tetrachloroethylene - Decreasing across sites, but increasing at Grand Junction, CO
- Trichloroethylene - Decreasing across sites, but increasing at Grand Junction, CO; Bountiful, UT; and Mayville, WI
- Vinyl chloride - Increasing across sites, but decreasing at Seattle, WA.

QUALITATIVE ASSESSMENT

The qualitative portion examined issues such as whether the network design is appropriate to achieve the network's goals and objectives, whether the data collected are adequate to meet the program goals, and whether changes to the monitoring sites, NATTS core pollutants, or sampling and analytical methods are needed to refine the network.

Monitoring Sites. The number, location, and geographic distribution of monitoring sites were assessed to determine whether or not the current network configuration is optimal to achieve the network and program goals and objectives. The assessment evaluated sites for redundancy and considered the possibility of new sites based upon factors such as risk, population, exposure, and distinctive airshed characteristics that are not reflected by any of the existing sites. In addition, EPA examined the list of current NATTS core HAPs to determine if they were adequate to meet the program goals and objectives.

Regarding site locations, EPA made the following observations and recommendation:

- The current number of 27 sites in the NATTS Network has remained the same since 2008. The Program Office may find it beneficial to add one urban and one rural site using the following criteria:
  - Recent National-Scale Air Toxics Assessment (NATA) results (e.g., Are there geographic areas not represented by high risk NATA areas?)
  - Spatial geographic coverage (e.g., Are there geographic "holes" across the United States not represented?)
  - Areas of interest (e.g., increased areas of energy production)
  - Logistics (e.g., Is there an NCore site that can be used?)
  - Potential redundancy of sites that are close together (e.g., Are the concentrations between two sites consistently similar?).
- A preliminary review of the NATTS sites geographically would suggest adding one site in a rural area in an EPA Region 7 state (Iowa, Nebraska, Missouri, or Kansas).
- Additionally, the eastern Ohio/western Pennsylvania area was a recent priority focus during the School Air Toxics Monitoring Program and was an area of interest for naphthalene risk based on NATA 2005 results.
- A site near the Gulf of Mexico (specifically along the Louisiana coast) was identified as an area of interest during the BP Oil Spill based on a lack of air toxics monitoring data in this region.
- Based on the inter-comparison of concentrations at four pairs of sites that are close to one another (Los Angeles, CA-Rubidoux, CA; Pinellas County, FL-Tampa, FL; Providence, RI-Roxbury, MA; and Richmond, VA-Washington, D.C.), there were statistically significant differences in concentrations for some pollutants, but no statistically significant difference for other pollutants.

NATTS Core HAPs. Regarding the current list of 19 NATTS core HAPs, preliminary work has begun on reviewing the entire suite of pollutants that are available for the five method groups. Of primary importance to adding or removing pollutants are the following criteria: 1) associated chronic health benchmark level, 2) frequency of detection, 3) MDL achievability, 4) AQS reporting, and 5) other information, such as the pollutant being a NATA risk driver or of interest to EPA. An initial list of 59 pollutants has been identified using the above criteria.

Sampling and Analytical Methods. Some of the sampling and analysis methods approved for the NATTS program may be in need of refinement, and possibly be made more prescriptive.

- Some EPA Compendium Methods have not been revised in as many as 10 years. Because the compendium methods are structured as guideline methods as opposed to reference methods, they are performance based and not prescriptive.

ADDITIONAL INFORMATION

Additional information can be found in the full draft of the NATTS Network Assessment.

1.0 INTRODUCTION AND OVERVIEW

This report documents U.S. EPA's first 6-year assessment of the National Air Toxics Trends Station Network. The network was created to gather data that are suitable for identifying trends in the concentration levels of air toxics in ambient air. This report presents trends in air toxics concentrations at the site level and across sites.

Ambient air monitoring networks are a critical part of the U.S. Environmental Protection Agency's (EPA's) national air quality program. Data from these networks are used to characterize air quality and associated health and ecosystem impacts, develop emission strategies to reduce adverse impacts, and account for progress over time. EPA's national air quality program encompasses ambient monitoring networks that address two pollutant categories:

- *Criteria pollutants* (pollutants for which National Ambient Air Quality Standards or NAAQS have been established): carbon monoxide, ozone, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.
- *Non-criteria pollutants* (pollutants for which NAAQS have not been established), which include:
  - Ozone precursors (pollutants that specifically contribute to ozone formation) as measured by the Photochemical Assessment Monitoring Station (PAMS) Network.
  - Air toxics, which include hazardous air pollutants or HAPs (pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects), as measured by the National Air Toxics Trends Station (NATTS) Network.

The NATTS Network was created to generate long-term ambient air toxics concentration data across the country in order to identify national trends in air toxic concentrations and evaluate the effectiveness of national HAP reduction efforts. To achieve this objective, the NATTS monitoring sites are, to the degree practicable, fixed sites that remain active over an extended period of time. Data generated by each NATTS site are quality assured and submitted to the national Air Quality System (AQS), EPA's repository of ambient air data. These quality-assured data can then be used for purposes such as:

- Identifying trends in ambient air toxic concentrations to facilitate tracking progress toward emission and risk reduction goals.
- Directly evaluating public exposure and environmental impacts in the vicinity of monitoring sites.
- Assessing the effects of specific emission reduction activities both locally and nationally.
- Providing quality-assured air toxics data for risk characterization.

- Evaluating and subsequently improving air toxics emission inventories and model performance.
- Identifying additional monitoring needs (e.g., new sites or additional methods).

1.1 Basis of the Assessment

The NATTS Network is a component of EPA's National Ambient Air Monitoring Strategy. In 2004, EPA published the final draft of the *National Monitoring Strategy, Air Toxics Component* (U.S. EPA, 2004), which requires that the NATTS Network be evaluated, and modified as needed, every 6 years:

> *Although the longevity of trends sites typically extends over a decade or more, the NATTS must be evaluated, and modified as needed, on 6-year intervals to assure continued relevancy, consistent with the procedures established under the National Strategy.*

Six years of data are needed to meet the NATTS data quality objective of identifying pollutant-specific trends in average concentrations over two successive 3-year periods. Although the program itself is older than 6 years at the time of this assessment, many of the original sites did not begin to fully sample for the initial 16 core HAPs (i.e., volatile organic compounds (VOCs), carbonyls, and speciated PM_{10} metals) consistently until the 2005 sampling year. Thus, the assessment is being conducted after the 2010 sampling year to ensure a full 6 years of VOCs, carbonyls, and PM_{10} metals data at all of the original NATTS sites. Based on their sampling schedule, 20 of the original 23 NATTS sites *potentially* have the minimum amount of VOCs, carbonyls, and PM_{10} metals data to assess trends over two successive 3-year periods. Sites in Kentucky, Wisconsin, and New York moved mid-year in 2008, 2009, and 2010, respectively, thus preventing a full calendar year of data, which is necessary for assessing trends. (See Section 3 for more details.)

Hexavalent chromium was anticipated at 22 of the 23 original sites beginning with the first quarter of 2005. However, only 15 of these 22 sites actually began sampling during the first quarter of 2005; therefore, only 15 sites *potentially* have the minimum amount of data to assess trends in hexavalent chromium concentrations over two successive 3-year periods. Polycyclic aromatic hydrocarbons (PAHs) were not formally added to the NATTS analyte list until 2007 and 2008, and not enough data are available to assess trends over two successive 3-year periods. Note that four new sites were added after 2005 (two each in 2007 and 2008) to increase the current network to 27 sites, and likewise the data generated by these sites will not be used to assess trends over two successive 3-year periods.

Appendix A shows which sites were *scheduled* to collect which pollutants for the period of this assessment. Section 5 of this assessment discusses which pollutant groups were *actually sampled* during the assessment period.

1.2 Scope of the Assessment

The overarching purpose of this assessment is to determine the degree to which the NATTS Network objectives are being met. Some of the policy-relevant questions addressed in this assessment include the following:

- Is the network design appropriate/optimal to achieve the goals and objectives?
- Are the NATTS goals and objectives still relevant?
- Are the data collected adequate to meet the program goals?
- What changes to the current network design would be appropriate to improve the NATTS regarding:
  - sites?
  - pollutants?
  - measurements?

The objectives of the assessment are both quantitative and qualitative: A quantitative assessment is completed through the data reported to AQS and other directly relevant reported information, such as Proficiency Testing (PT) samples. A qualitative assessment was completed through other means such as interviews with the operating agencies and discussions with EPA regional offices. The objectives include:

- *Trends*. The assessment examines whether data collected under the program are complete enough and are of adequate quality to meet the program-level data quality objective of identifying pollutant-specific trends in average air toxics concentrations over two successive 3-year periods.
  - Using the data that are adequate for assessing trends, the assessment presents trends in national air toxics concentrations over two successive 3-year periods.
  - Using the adequate data, the assessment presents 3-year rolling-average concentrations of air toxics at the site level.
  - The assessment also presents annual concentrations of air toxics at the site level.
- *Data quality*. Data must meet certain quality criteria in order to assess trends and meet the needs of decision makers and data users. Therefore, the assessment examines whether the data meet criteria for the following data characteristics:
  - Representativeness
  - Completeness

- Bias
- Sensitivity
- Precision
- Comparability

- *Method Detection Limits (MDL).* The assessment compares the reported site- and pollutant-specific MDLs with the corresponding NATTS target MDLs.
- *Monitoring sites and laboratories*. Each monitoring site and laboratory is assessed based its performance versus the NATTS Network requirements. Each site assessment is based on information from various sources, including interviews with each site operator and the laboratory providing analytical services for that particular site. Interview topics include, for example, which pollutants are being sampled, analyzed, and reported to AQS; whether meteorological data are being collected; what sampling and analytical equipment are being used; how standards are prepared; sampling schedules; performance evaluations; and MDLs.
- *Meteorological Measurements.* The assessment examines which meteorological parameters are being collected at each site and whether minimum meteorological parameters should be required for the program.
- *Network Design*. The number, location, and geographic distribution of sites are assessed to determine whether or not the current network configuration is optimal to achieve the network and program goals and objectives. The assessment includes an evaluation of each existing site for redundancy as well as considering the possibility of new sites based upon factors such as risk, population, exposure, and distinctive airshed characteristics that are not reflected by any of the existing sites. In addition, EPA examined the list of current NATTS core HAPs to determine if they were adequate to meet the program goals and objectives.
- *Program goals and objectives.* The NATTS Network goals and objectives are stated in the Air Toxics Component of the National Ambient Air Monitoring Strategy (NMS, Air Toxics Component). An important aspect of this network assessment is to evaluate the degree to which the currently configured network is meeting the goals and objectives, and whether the goals and objectives should be refined to better support the Urban Air Toxics Strategy (U.S. EPA, 2003).
- *Air Quality Model Evaluation*. NATTS data can be used to validate and improve modeling efforts, such as for EPA's National-Scale Air Toxics Assessment (NATA). Ambient measurements provide basic "ground-truthing" of models, which in turn are used for exposure assessments, development of emission control strategies, and related assessments of program effectiveness.

Note that this assessment identifies issues and makes recommendations at both the network and site levels. Findings and recommendations are discussed in Section 10 of this assessment.

1.3 Organization of the NATTS Network Assessment

This assessment is divided into 11 sections and six appendices.

Section 1 introduces the NATTS Network and describes the basis and scope of this assessment.

Section 2 chronicles EPA's efforts to reduce human and environmental exposure to hazardous air pollutants through its national air toxics program. These efforts led to the current NATTS Network.

Section 3 identifies the location of NATTS Network sites, lists the years of participation, and identifies sources of emissions that could affect air quality near the monitoring sites.

Section 4 describes the requirements that each NATTS monitoring site are expected to meet to ensure that the site and laboratory generate high quality and consistent data that can be used for trends analysis.

Section 5 provides a comprehensive assessment of NATTS data reported to EPA's Air Quality System.

Section 6 documents interviews conducted with the NATTS operating sites, and includes information on sampling and analytical equipment, analytical laboratory, and feedback on the NATTS Network.

Section 7 provides a statistical overview of the NATTS data at both the national level and the site level and describes the data treatments that were necessary for data consistency. Statistics include detection rates, average concentrations, and data distribution. This section also compares urban versus rural sites and makes inter-comparisons of sites that are in close proximity to one another.

Section 8 identifies which datasets are of sufficient quantity and quality to meet the program-level data quality objective of assessing trends in ambient air concentrations of the NATTS core HAPs over two consecutive 3-year periods.

Section 9 presents trends in ambient air concentrations of the NATTS core HAPs over two consecutive 3-year periods, thus satisfying the program-level data quality objective. This section also presents results of rolling averages on a site-specific basis.

Section 10 presents observations and recommendations of this assessment.

Section 11 lists references that were used in developing this assessment.

Six appendices provide supporting data used in this assessment.

Appendix A shows which sites were *scheduled* to collect which pollutants for the period of this assessment.

Appendix B supports Section 3 and uses satellite images to show the location of emission sources within 2 miles of the NATTS monitoring sites. It also contains tables that list specific sources of the 18 NATTS core HAPs that were evaluated.

Appendix C supports Section 6 and presents the survey forms as completed by site operators. Survey information describes sampling and analytical equipment, sampling/analytical/reporting entities, and NATTS/criteria pollutant/meteorological data in AQS.

Appendix D supports Section 7. Appendix D-1 presents the raw concentration data for all sites and all NATTS core HAPs. Appendix D-2 presents overview statistics (percent detection, average concentration, standard deviation, maximum concentration, and data distribution) of NATTS core HAPs at the site level.

Appendix E supports Section 8 and shows the results of EPA's analysis to determine which pollutant datasets are of sufficient quantity and quality to be used to assess trends in concentrations of the NATTS core HAPs.

Appendix F supports Section 9 and presents the site-level trends in NATTS core HAP concentrations as 1-year averages and 3-year rolling averages. The rolling averages by site are presented in figures and tables.

2.0 AIR TOXICS AND THE NATTS PROGRAM

This section chronicles EPA's efforts to reduce human and environmental exposure to hazardous air pollutants through its national air toxics program. These efforts led to the current NATTS Network.

Section 112(b) of the Clean Air Act (CAA) lists 188 hazardous air pollutants (HAPs) to be regulated because of their potential adverse effects on human health and the environment. People exposed to certain HAPs at sufficient concentrations and durations may have an increased chance of developing cancer or experiencing other serious health effects. These health effects can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory, and other health problems (U.S. EPA, 2012). In addition, toxic air pollutants such as mercury can have adverse environmental impacts because they can deposit onto soils or surface waters, where they are taken up by plants, ingested by animals, and eventually magnified up through the food chain. Note that such pollutants (i.e., with an ingestion pathway) are not a part of the NATTS protocol; only HAPs with an inhalation pathway are monitored as part of the NATTS Network.

Note that "air toxics" include "hazardous air pollutants" or "HAPs." Thus, this assessment uses the term "air toxics" in a broader sense than HAPs. This assessment uses the term "HAPs" when discussing HAP as defined in Section 112(b) of the CAA, or as a subset of those HAPs.

2.1 Evolution of the Air Toxics Program

EPA's national air toxics program has evolved over the past two decades—while retaining the objective of reducing human and environmental exposure to air toxics. Prior to 1990, the CAA established a risk-based air toxics program under which EPA was required to list air toxics it deemed hazardous and promulgate regulations for them. However, by 1990, EPA had regulated only seven such pollutants. To address the lack of progress and the difficulty in setting standards based on risk, the CAA amendments of 1990 established a new approach for addressing HAP emissions from stationary sources. Instead of requiring EPA to develop ambient standards for HAPs as it does for the six criteria pollutants, the CAA amendments of 1990 listed 189 HAPs to be controlled (later modified to 187, see U.S. EPA, 2008a). The CAA amendments directed EPA to control these pollutants by:

- Developing technology-based emissions limits (maximum achievable control technology or MACT standards) for major stationary sources, such as incinerators and chemical plants.
- Regulating emissions from smaller (area) sources, such as dry cleaners and gas stations.

- Evaluating the need for and feasibility of regulations for mobile sources, such as motor vehicles, and regulating these sources based on this evaluation.

Since 1990, EPA has issued MACT standards that are expected to reduce air toxics emissions from stationary sources. To date, the MACT standards have affected over 96 categories of major industrial sources, such as incinerators, chemical plants, oil refineries, aerospace manufacturers, steel mills, and some smaller (area source) operations such as dry cleaners and commercial sterilizers. For mobile sources, many motor vehicle and fuel emission control programs have reduced air toxics and will continue to provide significant emission reductions in the future through technology improvements and fleet turnover. By 2008, major source emissions were about 80 percent lower than in 1990. Mobile-source reductions are realized over time as the vehicle fleet turns over and by 2008, were about 50 percent lower than in 1990. In addition, for mobile sources with the regulations already in place as well as fleet turnover, emissions are expected to continue to fall, resulting in even lower emissions levels by 2030. Area source emissions are estimated to be more than 65 percent lower in 2008 than in 1990 U.S. EPA, 2000a; U.S. EPA, 2012a).

National-Scale Air Toxics Assessment (NATA). NATA began in 1996 as one of the main activities of the Air Toxics Program and is an ongoing EPA program evaluating air toxics and their potential health impacts. As part of NATA, EPA completes an assessment to characterize the nationwide chronic cancer risk estimates and non-cancer hazards from inhaling air toxics. EPA has completed four assessments—simulating emissions for the years 1996, 1999, 2002, and 2005. The 1996 NATA was released in May 2002. (See the assessments at: www.epa.gov/nata.) These assessments provide general air toxics information, emissions data, and risk estimates of various health effects from the inhalation of air toxics, all of which are intended to aid state, local, and tribal agencies in prioritizing resources in high-risk areas or populations. Each assessment follows the following four steps:

- Compiling a national emissions inventory of air toxics emissions from outdoor sources.
- Estimating ambient and exposure concentrations of air toxics across the United States.
- Estimating population exposures across the United States.
- Characterizing potential public health risk due to inhalation of air toxics including both cancer and non-cancer effects.

NATA assessments are primarily based on emissions inventory data and not ambient air data. NATA uses air toxics emissions inventory data to model predicted ambient monitoring concentrations at the census-tract level across the nation. NATA emissions inventory data are compiled from numerous sources, such as state and local air emissions inventories, EPA's Toxic Release Inventory (TRI) database, and emission estimates generated from emission factors and activity data. Ambient air toxics data are used in NATA for the development of background concentrations and for model evaluation (U.S. EPA, 2010).

Urban Air Toxics Strategy. In 1999, EPA finalized the Urban Air Toxics Strategy (Strategy). Congress instructed EPA to develop a strategy for air toxics in urban areas that includes specific actions to address the large number of smaller, area sources, and that contains broader risk reduction goals that encompass all stationary sources. The health risks from exposure to air toxics are greater in urban areas due to the concentration of air pollution sources, including mobile and stationary sources, and population density. Health effects from exposure to HAPs might be more severe to more susceptible or sensitive populations such as children or individuals with compromised health status and disproportionately impacted communities.

The 1990 CAA amendments required EPA to identify at least 30 HAPs emitted from area sources that present the greatest threat to public health in the largest number of urban areas and the source categories emitting such pollutants. EPA identified 33 air toxics that present the greatest threat to public health in the largest number of urban areas (U.S. EPA, 2003). These 33 analytes, known as "urban air toxics," reflect a variety of possible exposure periods (acute/chronic), pathways (inhalation, dermal, ingestion), and types of adverse health effects (cancer/non-cancer).

The Strategy states that emissions data are needed to quantify the sources of air toxics impacts and aid in the development of control strategies, while ambient monitoring data are needed to understand the behavior of air toxics in the atmosphere after they are emitted (U.S. EPA, 1999a). Part of the Strategy included the development of the NATTS Network to collect ambient monitoring data (see Section 2.2). The Strategy includes three goals—two mandated by the CAA and the third being a programmatic goal to address populations and areas disproportionately affected by air toxics. The goals of the Strategy are as follows:

1. Reduce by 75 percent the incidence of cancer attributable to exposure to air toxics emitted by large and small stationary sources nationwide.
2. Attain a substantial reduction in public health risks (such as birth defects and reproduction effects) posed by HAP emissions from small industrial/commercial sources known as area sources.
3. Address disproportionate impacts from air toxics across urban areas, such as geographic "hot spots," highly exposed population groups, and predominately minority and low-income communities.

The Strategy presents a framework for addressing air toxics in urban areas. Under the national Air Toxics Program, EPA has developed a number of national standards for stationary and mobile sources to improve air quality in urban and rural areas. The Strategy complements the existing national efforts to improve air quality by focusing on achieving further reductions in air toxics emissions in urban areas. The Strategy outlines actions to reduce emissions of air toxics and to improve EPA's understanding of the health risks posed by air toxics in urban areas. The four key components of the Strategy include the following:

1. Source-specific and sector-based standards.
2. National, regional, and community-based initiatives focusing on multimedia and cumulative risks.
3. National-level air toxics assessments.
4. Education and outreach.

2.2 NATTS Component of the Urban Air Toxics Strategy

Part of the Urban Air Toxics Strategy included the development of the NATTS Network to assess air toxics through the collection of air toxics data using ambient air monitors. In 1999, the STAPPA/ALAPCO/U.S. EPA Air Toxics Monitoring Steering Committee (Steering Committee) was established for the purpose of overseeing the development of a national air toxics monitoring network. STAPPA/ALAPCO stands for State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officers—the organization is now known as National Association of Clean Air Agencies or NACAA. Thus, the Steering Committee is now known as the NACAA Monitoring Steering Committee. Steering Committee members include representatives from several states and local agencies (California, New Jersey, Oregon, Vermont, Washington-Puget Sound), multi-state organizations (Lake Michigan Air Directors Consortium (LADCO)), and U.S. EPA Office of Air Quality Planning and Standards (OAQPS) and some U.S. EPA Regional Offices. The Steering Committee completed work that led to the NATTS Network, including initiating data collection and analysis through a pilot monitoring project. The NACAA Monitoring Steering Committee continues to provide input regarding implementation and refinement of the NATTS Network.

In 2001, the Pilot Monitoring Project was initiated to help determine data quality objectives for what would become the NATTS Network—based on the state of the methods at the time, the level of trending that EPA desired, and the funds available for an air toxics monitoring program. The Pilot Monitoring Project began in January 2001 and ended in July 2002 and gathered information and data on the spatial and temporal variability of air toxics concentrations in 10 locations around the United States: four urban/large cities (Detroit, MI; Providence, RI; Seattle, WA; and Tampa Bay, FL) and six rural/small cities (Barceloneta-San Juan, PR; Cedar Rapids, IA; Grand Junction, CO; Charleston, WV; Rio Rancho, NM; and San Jacinto, CA). The Pilot Monitoring Project was used to determine the monitoring locations, pollutants to be collected, and data quality requirements of the initial network.

Pollutants to be Measured. The Pilot Monitoring Project focused on 18 of the 33 urban air toxics because the availability and cost of measurement methods, along with the known problems that existed with some of the methods, limited the utility of measuring all 33 urban air toxics on a routine basis. In addition, sampling and analysis required to monitor for every component of air pollution would be prohibitively expensive. Thus, the Pilot Monitoring Project focused on 18 “core” HAPs, which were chosen for their representativeness, risk, and methods availability.

Six HAPs were found to be especially crucial in the air toxics program based on 1996 NATA modeling estimates as national or regional risk drivers: benzene, acrolein, formaldehyde, 1,3-butadiene, arsenic, and hexavalent chromium. These six HAPs represent three of the four classes of air toxics sampled under the NATTS Network: VOCs, metals, and carbonyl compounds (SVOCs were added to the program later). A Steering Committee technical sub-workgroup, which was involved in sampling and analysis of air toxic compounds, identified the “core” target list of 18 HAPs, which represent the six highest risk drivers (U.S. EPA, 2004).

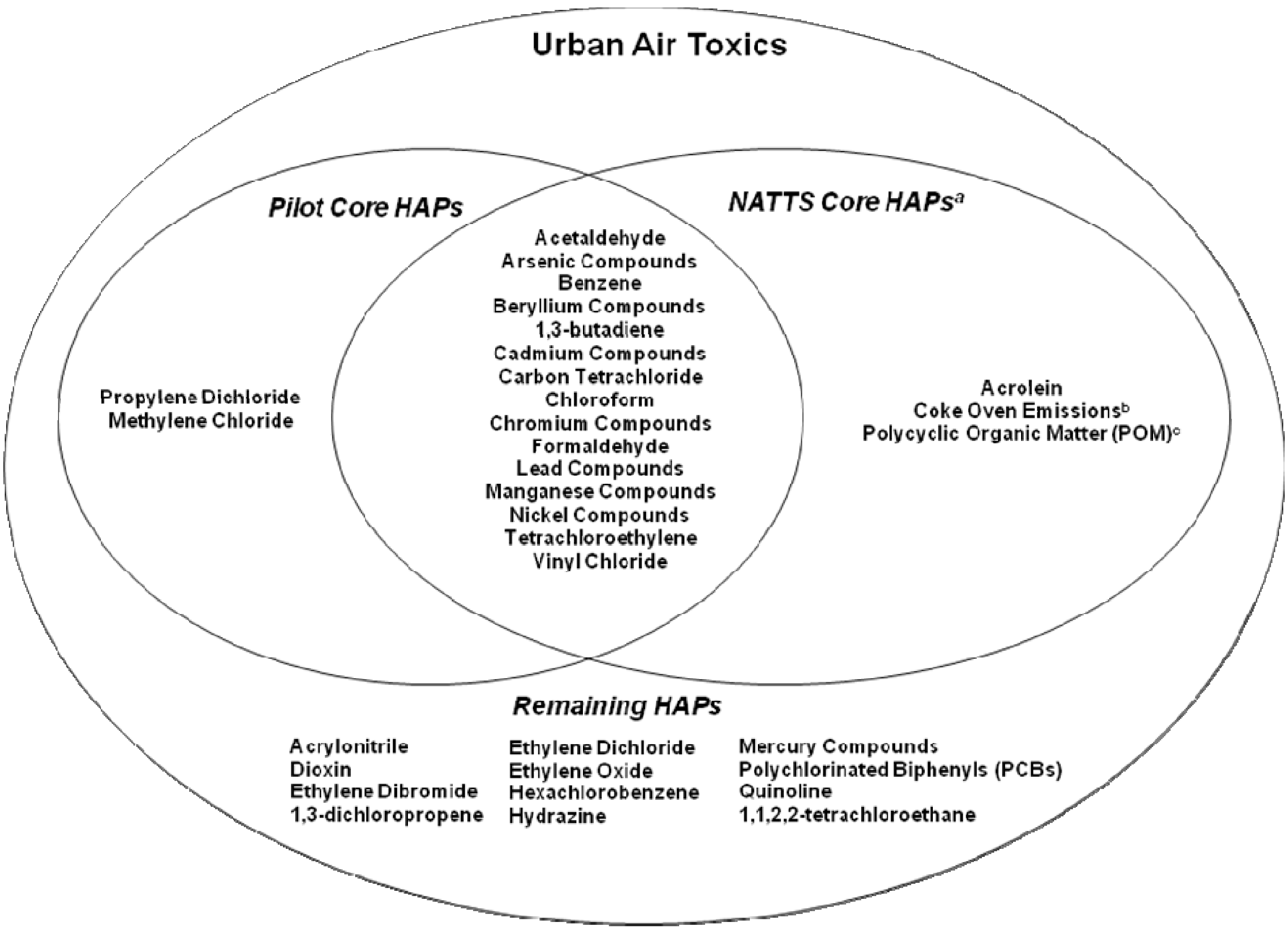
Figure 2-1 shows the intersection of the Pilot Monitoring Project pollutants and the NATTS core HAPs. The NATTS core HAPs, which are sometimes referred to as the “MQO core HAPs” because they served as the basis for developing the Method Quality Objectives (MQOs), are analyzed using specific methods described in Section 4 of this assessment.

Following the Pilot Monitoring Project, several adjustments were made to the NATTS core HAP list:

- Propylene dichloride and methylene chloride were not included as NATTS core HAPs.
- In 2005, hexavalent chromium replaced total chromium on the NATTS core HAP list because it is more representative of risk than chromium compounds.
- In 2008, PAHs were formally added as NATTS core HAPs because of their potential health risk and due to their prevalence in ambient air. By measuring two polycyclic aromatic hydrocarbons (PAHs)—benzo(a)pyrene and naphthalene, EPA is addressing the polycyclic organic matter (POM) component of the 33 urban air toxics. Polycyclic organic matter defines a broad class of compounds that includes the PAH compounds, of which benzo(a)pyrene and

naphthalene are members. EPA health risk assessment staff were consulted and concurred with the addition of these two PAHs as NATTS core HAPs. Naphthalene is emitted by both stationary and mobile sources. Benzo(a)pyrene is a surrogate for coke oven emissions, which is one of the 33 urban air toxics.

- Through other studies, measurement of black carbon was added to the core HAP list to ascertain its viability as a diesel surrogate (primarily relevant at urban sites), but was later removed from the core HAP list.



[a] NATTS samples hexavalent chromium because it is more representative of risk than chromium compounds.
[b] NATTS samples arsenic, benzene, and benzo(a)pyrene as surrogates for coke oven emissions.
[c] NATTS samples the two PAHs benzo(a)pyrene and naphthalene as surrogates for POM. POM includes PAHs.

Sites and Siting Criteria. The goal of siting efforts was to establish an urban site in each of the 10 EPA Regions and, as resources permit, a few rural sites. To determine the location of the trends sites, data analyses were conducted to support stratifying the nation by EPA Regions and by urban versus rural areas. Statistical analysis considered elevated risk per NATA and/or actual ambient monitoring data and population in the immediate vicinity, the metropolitan statistical area (MSA), and the region. Also considered was whether state and local agencies had sufficient expertise and capability to establish, operate, and maintain a NATTS site, as well as the adequacy of each site's current infrastructure. Some of the statistical analyses included environmental, seasonal, and diurnal variability, precision and sampling frequency, sampling uncertainty, and risk levels for areas of the country, as outlined in NATA (U.S. EPA, 2004; LADCO, 2001). Both urban and rural sites were necessary to quantify differences in typical ambient HAP concentrations and to assess the range of population exposures in the respective area.

The initial NATTS Network sites were to rely on existing infrastructure and thus were established at existing ambient air monitoring sites (e.g., $PM_{2.5}$ speciation, PAMS, lead). Using existing monitoring sites and corresponding infrastructure (e.g., monitoring platform, fencing, power) saves time and money not only in terms of capital costs, but also operations and maintenance costs (e.g., less infrastructure to maintain, more efficient use of monitoring agency staff time and resources that results from visiting fewer sites). In addition, collocating NATTS monitoring with other ambient air monitoring allows for examining interrelationships between NATTS pollutants and those ambient air pollutants (typically criteria) already monitored at each site.

The NATTS locations were ultimately sited to meet the following criteria (U.S. EPA, 2004):

- Reflect neighborhood-oriented and general population exposure.
- Comply with established physical siting protocols.
- Provide good geographic coverage and represent different climatological regimes.
- Include appropriate numbers of sites with influences by specific emission sources (mobile and stationary).
- Represent regional background and transport concentrations (rural areas).
- Include common sets of HAPs at sufficient numbers of sites.
- Monitor throughout the year and on common days/sampling schedule (e.g., 24-hours every sixth day).
- Ensure sufficient data capture.
- Use consistent sampling, analytical methods, laboratory procedures, and quality assurance protocols.

Data Quality Objective. Under the direction of the Steering Committee, a workgroup organized by EPA/OAQPS (DQO workgroup) guided DQO development for the NATTS Network. The workgroup represented data users, decision makers, state and local agencies, and monitoring and laboratory personnel (U.S. EPA, 2002).

EPA's *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4* (U.S. EPA, 2006a) describes the DQO process and provides a general framework for ensuring that the data collected by EPA meet the needs of decision makers and data users. The process establishes the link between the specific end use(s) of the data with the data collection process and the data quality (and quantity) needed to meet the program's goals. The DQO process may be applied to all programs involving the collection of environmental data and apply to programs with objectives that cover decision making, estimation, and modeling in support of research studies, monitoring programs, regulation development, and compliance support activities. When the goal of the study is to support decision making, the DQO process applies systematic planning and statistical hypothesis testing methodology to decide between alternatives. When the goal of the study is to support estimation, modeling, or research, the DQO process develops an analytic approach and data collection strategy that is effective and efficient (U.S. EPA, 2006a).

Using data collected and analyzed by the 10-city Pilot Monitoring Project, as well as EPA's Air Toxics Data Archive, EPA and its contractor applied the QA/G-4 DQO process to the trends objective of the NATTS program: *To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.* Results of the DQO process as applied to the NATTS Network are documented in *Development Of Data Quality Objectives (DQOs) for the National Ambient Air Toxics Trends Monitoring Network* (U.S. EPA, 2002).

Based on the DQO process and the data analysis completed by the EPA contractor, the DQO workgroup concluded that the trends data quality objective will be met for monitoring sites that meet the following requirements (U.S. EPA, 2002):

- A 1-in-6-day monitoring frequency with at least an 85% quarterly completeness.
- Precision controlled to a coefficient of variance (CV) of no more than 15%.

It was determined that the monitoring approach must show a combination of precision, accuracy, and sensitivity appropriate for the concentration ranges at a set of fixed monitoring sites—each selected with consistent siting criteria. Under these conditions, true decreasing trends of 30 percent or more can be detected at least 90 percent of the time between successive 3-year periods. Moreover, the error rate for when there is no true change between successive 3-year periods is controlled to be at most 10 percent. Sampling frequency and natural or environmental day-to-day variation are the primary factors affecting these error rates (U.S. EPA, 2002).

2.3 2010 NATTS Network

The groundwork completed by the Steering Committee, coupled with implementation of the NATTS Network by EPA and operating agencies, led to the current network of NATTS sites and corresponding requirements. Section 3 of this assessment describes the NATTS monitoring sites and the sites' years of participation. Appendix A shows which sites were *scheduled* to monitor which pollutants during each site's participation (note that Appendix A does not reflect *actual* sampling, which is presented in Sections 5 and 8). Section 4 outlines the program's requirements, to which pollutant datasets are compared in Section 8.

3.0 NATTS NETWORK SITES

This section identifies the location of NATTS Network sites, lists the years of participation, and identifies sources of emissions that could affect air quality near the monitoring stations.

NATTS monitors are sited to assess population exposure and background-level concentrations. To address the geographic diversity of population centers, information on air toxics compounds must be collected in both urban and rural areas. Data arising from urban NATTS are used to characterize and assess the range of population exposures across and within urban areas; rural data are needed to characterize exposures of non-urban populations, and establish background concentrations to better assess environmental impacts in both urban and rural areas.

3.1 Site Locations

Site locations. The current network of 27 NATTS monitoring sites is distributed across the country and encompasses 20 urban/suburban sites and seven rural sites. For example, some monitors are located in urban areas near the centers of heavily populated cities (e.g., Phoenix, AZ and Chicago, IL), while others are located in moderately to sparsely populated rural areas (e.g., Chesterfield, SC and Underhill, VT). Figure 3-1 shows the locations and starting years of the 27 active monitoring sites under the NATTS Network, plus the original locations of three that relocated.

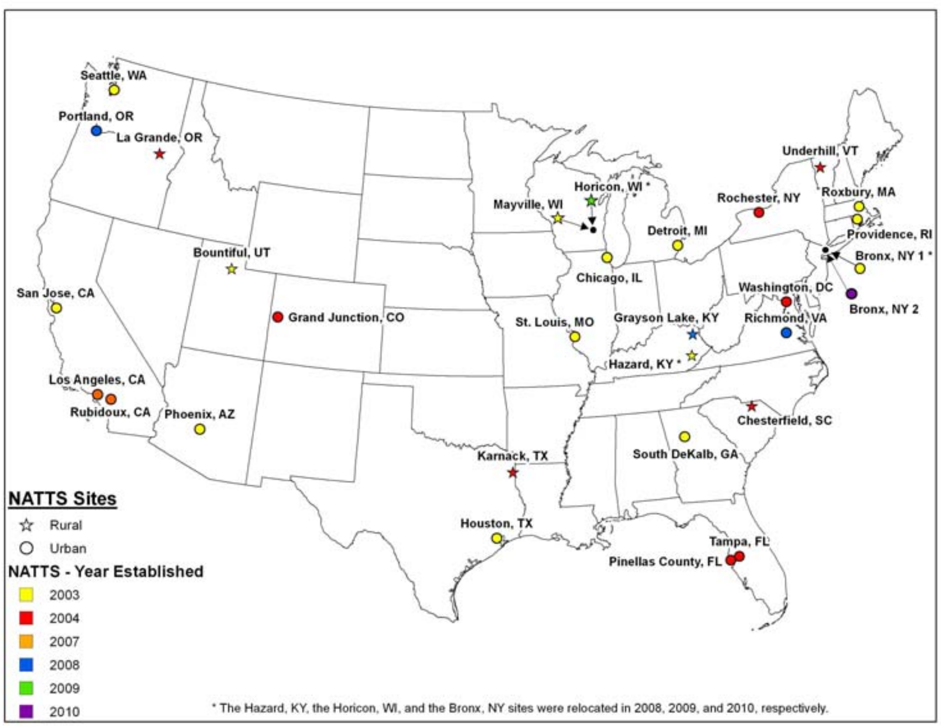


Figure 3-1. NATTS Sites and Year Established

Because the NATTS Network objectives are premised upon long-term ambient air measurements, the sites must be considered and treated as permanent. Therefore, NATTS sites must be established and maintained in the same location (to the degree practicable) over many years, and NATTS operating agencies must sustain year-round sampling and analysis operations for as many years as the program deems appropriate, following the guidelines specified in the NATTS *Technical Assistance Document for the National Air Toxics Trends Stations Program* (U.S. EPA, 2009) and described in Section 4 of this assessment. Although permanent sites are preferred, three sites had to change locations for various reasons.

- In 2008, the Hazard, KY site relocated 67 miles north to Grayson Lake, KY because the site operator retired and there were no state employees available in the Hazard area who could manage the NATTS site. The site moved to the Grayson Lake monitoring site, which was already a rural (background) monitoring site for $PM_{2.5}$ and had two experienced site operators available.
- In 2009, the Mayville, WI site relocated 5.1 miles southwest to Horicon, WI because the Mayville site was located on private property that was potentially for sale. Wisconsin Department of Natural Resources (DNR) relocated the site to land owned and controlled by Wisconsin DNR.
- In 2010, the Bronx #1, NY site relocated 5 miles southwest to Bronx #2, NY because the rooftop on which the monitor was located was being replaced and other building repairs were being made such that a new site was needed. It is anticipated that NATTS monitoring will return to Bronx #1 in 2013.

Additionally, new sites were added since the inception of the NATTS Network to reflect new geographic areas of interest based on the NATA 1999 and 2002, which estimated the risk of cancer and other serious health effects from inhaling air toxics was higher for these areas:

- In 2007, NATTS monitoring sites were added in Los Angeles, CA and Rubidoux, CA.
- In 2008, NATTS monitoring sites were added in Portland, OR and Richmond, VA.

Site participation. Table 3-1 lists the years of program participation for the NATTS monitoring sites, including the three that relocated. Appendix A expands the information in Table 3-1 by showing the pollutant groups that each site was scheduled to collect since 2003. Twenty-one of the 27 sites began collecting data by 2005 and *potentially* have the minimum amount of VOCs, carbonyls, and PM_{10} metals data to assess trends over two successive 3-year periods. Section 5 of this assessment discusses which pollutant groups were *actually sampled* during the assessment period.

Table 3-1. NATTS Sites and Year Participated

State	Monitoring Location	Setting	Year Participated							
			2003	2004	2005	2006	2007	2008	2009	2010
AZ	Phoenix	Urban	✓	✓	✓	✓	✓	✓	✓	✓
CA	Los Angeles	Urban					✓	✓	✓	✓
CA	Rubidoux	Urban					✓	✓	✓	✓
CA	San Jose	Urban	✓	✓	✓	✓	✓	✓	✓	✓
CO	Grand Junction	Urban		✓	✓	✓	✓	✓	✓	✓
DC	Washington	Urban		✓	✓	✓	✓	✓	✓	✓
FL	Pinellas County	Urban		✓	✓	✓	✓	✓	✓	✓
FL	Tampa	Urban		✓	✓	✓	✓	✓	✓	✓
GA	South DeKalb	Urban	✓	✓	✓	✓	✓	✓	✓	✓
IL	Chicago (Northbrook)	Urban	✓	✓	✓	✓	✓	✓	✓	✓
KY	Hazard (moved to Grayson Lake)	Rural	✓	✓	✓	✓	✓	✓		
KY	Grayson Lake	Rural						✓	✓	✓
MA	Roxbury (Boston)	Urban	✓	✓	✓	✓	✓	✓	✓	✓
MI	Detroit (Dearborn)	Urban	✓	✓	✓	✓	✓	✓	✓	✓
MO	St. Louis	Urban	✓	✓	✓	✓	✓	✓	✓	✓
NY	Bronx #1 (moved to Bronx #2)	Urban	✓	✓	✓	✓	✓	✓	✓	✓
NY	Bronx #2	Urban								✓
NY	Rochester	Urban		✓	✓	✓	✓	✓	✓	✓
OR	La Grande	Rural		✓	✓	✓	✓	✓	✓	✓
OR	Portland	Urban						✓	✓	✓
RI	Providence	Urban	✓	✓	✓	✓	✓	✓	✓	✓
SC	Chesterfield	Rural		✓	✓	✓	✓	✓	✓	✓
TX	Houston (Deer Park)	Urban	✓	✓	✓	✓	✓	✓	✓	✓
TX	Karnack (Harrison County)	Rural		✓	✓	✓	✓	✓	✓	✓
UT	Bountiful	Rural	✓	✓	✓	✓	✓	✓	✓	✓
VT	Underhill	Rural		✓	✓	✓	✓	✓	✓	✓
VA	Richmond	Urban						✓	✓	✓
WA	Seattle	Urban	✓	✓	✓	✓	✓	✓	✓	✓
WI	Mayville (moved to Horicon)	Rural	✓	✓	✓	✓	✓	✓	✓	
WI	Horicon	Rural							✓	✓

Gray = Site was not scheduled to collect NATTS pollutants because it was not yet a NATTS site, or because sampling began or ended to change locations.

3.2 Proximity to Emission Sources

The proximity of the monitoring locations to different emissions sources, especially industrial facilities and heavily traveled roadways, often explains the observed spatial variations in ambient air quality. The following maps and tables identify sources of emissions, including potential mobile source emissions, near the monitoring sites.

Stationary Sources

(1) *Satellite images: Emission sources within 2 miles*. Satellite images in Appendix B identify the locations of stationary emission sources of the NATTS core HAPs that are within 2 miles of the respective monitoring site. The scale of these emission sources is quantified as follows: white: <0.01 tons per year (tpy); yellow: 0.01-10.0 tpy; and blue: ≥10.0 tpy. A 2-mile boundary was chosen to give an indication of which pollutant-specific emissions sources or emissions source categories could potentially have an immediate impact on the air quality at the monitoring site. These site-specific figures also identify heavily traveled roadways and railroads, which are potential sources of onroad mobile source pollutants such as benzene, naphthalene, and formaldehyde.

(2) *Tables: Emission sources within 5 miles.* Tables in Appendix B list the major and area source emitters of the NATTS core HAPs that are located within 2 miles of the respective monitoring site and the major sources that are located within 5 miles of the respective monitoring site. (Major sources emit 10 tpy of any single hazardous air pollutant or 25 tpy of any combination of hazardous air pollutants. Area sources emit less than the major source thresholds of hazardous air pollutants.) Each table lists the emission source's distance from the monitoring site and quantifies emissions of the core HAPs in tons per year. Each table also lists the county-level nonpoint, onroad, and nonroad emissions where available. Data for these tables and the corresponding satellite images were obtained from the following sources:

- National Emissions Inventory (NEI) data for 2002, 2005, and 2008 were obtained from: http://www.epa.gov/ttn/chief/eiinformation.html
- Toxic Release Inventory (TRI) data from 2002 to 2010 were obtained from http://www.epa.gov/tri/tridata/index.html
- Risk and Technology Review (RTR) data for 2002, 2005 and 2008 were obtained from: http://www.epa.gov/ttn/atw/rrisk/rtrpg.html

(3) *Tables: Emission sources within 2 miles.* Table B3-1 in Appendix B shows the number of emission sources within 2 miles of each monitoring site. This table generally corresponds with the satellite images showing emission sources within 2 miles. However, note that the counts in Table B3-1 may not match up exactly with the number of emission points in the satellite images. This is because a single emission point on the satellite image may represent more than one source of emissions. For example, DC General Hospital and Howard University share the same geographic latitude and longitude coordinates and appear as a single emission point on the satellite images.

Mobile Sources

Ambient air can be significantly affected by mobile sources. Mobile source refers to an air-pollutant emitter that moves, or can be moved, from place to place and includes both on-road and non-road sources of emissions (U.S. EPA, 2011a). Pollutants found in motor vehicle exhaust generally result from incomplete combustion of vehicle fuels. Although modern vehicles and, more recently, vehicle fuels have been engineered to minimize air emissions, all motor vehicles with internal combustion engines emit a wide range of pollutants. The magnitude of these emissions primarily depends on the volume of traffic, while the chemical profile of these emissions depends more on vehicle design and fuel formulation.

Several parameters are used to identify potential mobile source emissions that could contribute to the air quality near the NATTS monitoring sites: vehicle registration within the county, traffic volume on a segment of roadway near the monitoring site, and the number of vehicle miles traveled within the respective metropolitan statistical area.

(1) Vehicle registration. Vehicle ownership includes passenger vehicles, trucks, and commercial vehicles, as well as vehicles that can be regional in use such as boats or snowmobiles. County-level vehicle registration data were obtained from the applicable state or local agency, where possible. If data were not available, vehicle registration data were obtained at the state-level (FHWA, 2008; FHWA, 2009a). The county proportion of the state population was then applied to the state vehicle registration count to estimate the average number of vehicles registered per person in the county. The ratio of vehicle registration to population appears in the footnotes to the Population, Motor Vehicle, and Traffic Information table in Sections 3.3 through 3.31.

(2) Average Annual Daily Traffic. Traffic volume can be estimated using the average annual daily traffic or AADT, which is the total volume of traffic on a highway segment for 1 year, divided by the number of days in the year, and incorporates both directions of traffic (FL DOT, 2007). Most AADT counts obtained for this assessment are based on data from 2002 to 2009. AADT statistics are developed

for roadways, such as interstates, state highways, or local roadways, which are managed by different municipalities or government agencies. AADT data are not always available in rural areas or for secondary roadways. For monitoring sites located near interstates, the AADT for the interstate segment closest to the site is provided in this assessment. For other monitoring sites, the highway or secondary road closest to the monitoring site is provided. Only one AADT value was obtained for each monitoring site. The intersection or roadway chosen for each monitoring site is identified in each individual monitoring site section.

(3) Vehicle Miles Traveled. VMT is the sum of distances traveled by all motor vehicles in a specified system of highways for a given period of time (OR DOT, 2011). Thus, VMT values are typically measured in the millions. County-level data are not available for all states; however, daily VMT data for 2008 are available from the Federal Highway Administration (FHWA) by urban area (FHWA, 2009b). Metropolitan statistical area (MSA) designations were used to designate in which urban area each monitoring site resides and the corresponding VMT is reported for that monitoring site. For example, the Houston (Deer Park), Texas NATTS site is located in the City of Deer Park near Houston, which is part of the Houston-Sugarland-Baytown, TX MSA. Therefore, the VMT value for the Houston-Sugarland-Baytown, TX MSA is reported for Deer Park, TX.

Table 3-2 presents the number of vehicles passing the nearest roadway to the monitoring site (expressed as AADT) and the distances traveled by all motor vehicles in a specified system of highways within the metropolitan statistical area (expressed as VMT).

Table 3-2. NATTS Site Characteristics, Population, and Mobile Source Data

State	Location	AQS Code	Land Use	Location Setting	Population Residing Within 10 Miles of the Monitoring Site[a]	Average Annual Daily Traffic[b] (year)	VMT[c] (thousands)
AZ	Phoenix	04-013-9997	Residential	Urban/City Center	1,511,946	206,000 (2007)	78,147
CA	Los Angeles	06-037-1103	Residential	Urban/City Center	3,739,626	238,000 (2005)	275,665
CA	Rubidoux	06-065-8001	Residential	Suburban	1,000,923	18,365 (2005)	42,835
CA	San Jose	06-085-0005	Commercial	Urban/City Center	1,435,158	6,000 (2005)	36,859
CO	Grand Junction[c]	08-077-0017 08-077-0018	Commercial	Urban/City Center	108,432	11,800 (2009)	2,000
DC	Washington	11-001-0043	Commercial	Urban/City Center	1,860,974	7,600 (2008)	98,704

Table 3-2. NATTS Site Characteristics

State	Location	AQS Code	Land Use	Location Setting	Population Residing Within 10 Miles of the Monitoring Site[a]	Average Annual Daily Traffic[b] (year)	VMT[c] (thousands)
FL	Pinellas County	12-103-0026	Residential	Suburban	672,839	51,000 (2009)	62,865
FL	Tampa	12-057-3002	Residential	Rural	311,528	10,400 (2009)	62,865
GA	South DeKalb	13-089-0002	Residential	Suburban	776,511	9,200 (2008)	127,008
IL	Chicago (Northbrook)	17-031-4201	Residential	Suburban	870,561	34,100 (2009)	172,794
KY	Grayson Lake	21-043-0050	Residential	Rural	14,815	428 (2009)	NA
KY	Hazard	21-193-0003	Residential	Suburban	31,861	21,359 (2008)	NA
MA	Roxbury (Boston)	25-025-0042	Commercial	Urban/City Center	1,585,962	31,400 (2007)	92,756
MI	Detroit (Dearborn)	26-163-0033	Industrial	Suburban	1,138,740	104,100 (2009)	99,633
MO	St. Louis	29-510-0085	Residential	Urban/City Center	816,098	81,174 (2009)	66,114
NY	Bronx #1 Bronx #2	36-005-0110 36-005-0080	Residential	Urban/City Center	6,531,354	100,230 (2008)	299,125
NY	Rochester	36-055-1007	Residential	Urban/City Center	636,955	105,038 (2008)	16,267
OR	La Grande	41-061-0119	Residential	Urban/City Center	17,003	9,200 (2010)	251,300
OR	Portland	41-051-0246	Residential	Urban/City Center	1,008,125	5,457 (2005)	34,294
RI	Providence	44-007-0022	Residential	Urban/City Center	670,441	136,800 (2009)	26,006
SC	Chesterfield	45-025-0001	Forest	Rural	5,432	650 (2009)	NA
TX	Houston (Deer Park)	48-201-1039	Residential	Suburban	741,262	31,043 (2004)	NA
TX	Karnack (Harrison County)	48-203-0002	Agricultural	Rural	3,034	1,400 (2009)	1,544
UT	Bountiful	49-011-0004	Residential	Suburban	251,597	111,065 (2009)	10,791
VA	Richmond	51-087-0014	Residential	Suburban	477,486	74,000 (2009)	26,709
VT	Underhill	50-007-0007	Forest	Rural	14,408	1,200 (2005)	3,236
WA	Seattle	53-033-0080	Industrial	Suburban	912,020	236,000 (2009)	69,801
WI	Horicon	55-027-0001	Agricultural	Rural	21,539	5,000 (2008)	NA
WI	Mayville	55-027-0007	Agricultural	Rural	24,804	3,500 (2004)	NA

[a] Reference: http://xionetic.com/zipfinddeluxe.aspx.

[b] The source of average annual daily traffic (AADT) data varies by site and is specified in Sections 3.3 through 3.31.
[c] Grand Junction, CO's hexavalent chromium monitor is at a separate, but adjacent, location; thus, this site has two AQS codes.
[d] Vehicle Miles Traveled reflects 2008 data for the respective metropolitan statistical area (MSA) from the Federal Highway Administration (FHWA, 2009b).
NA = VMT data are not available because the site is not located in an MSA.

Sections 3.3 through 3.31 characterize the NATTS monitoring sites by providing geographical and physical information about the location of the site and the surrounding area. This information is provided to give insight regarding factors that may influence the air quality near the site and assist in the interpretation of the ambient air toxics measurements.

3.3 Phoenix, AZ NATTS Monitoring Site

The Phoenix, AZ NATTS monitoring site is located in central Phoenix. Figure 3-2 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

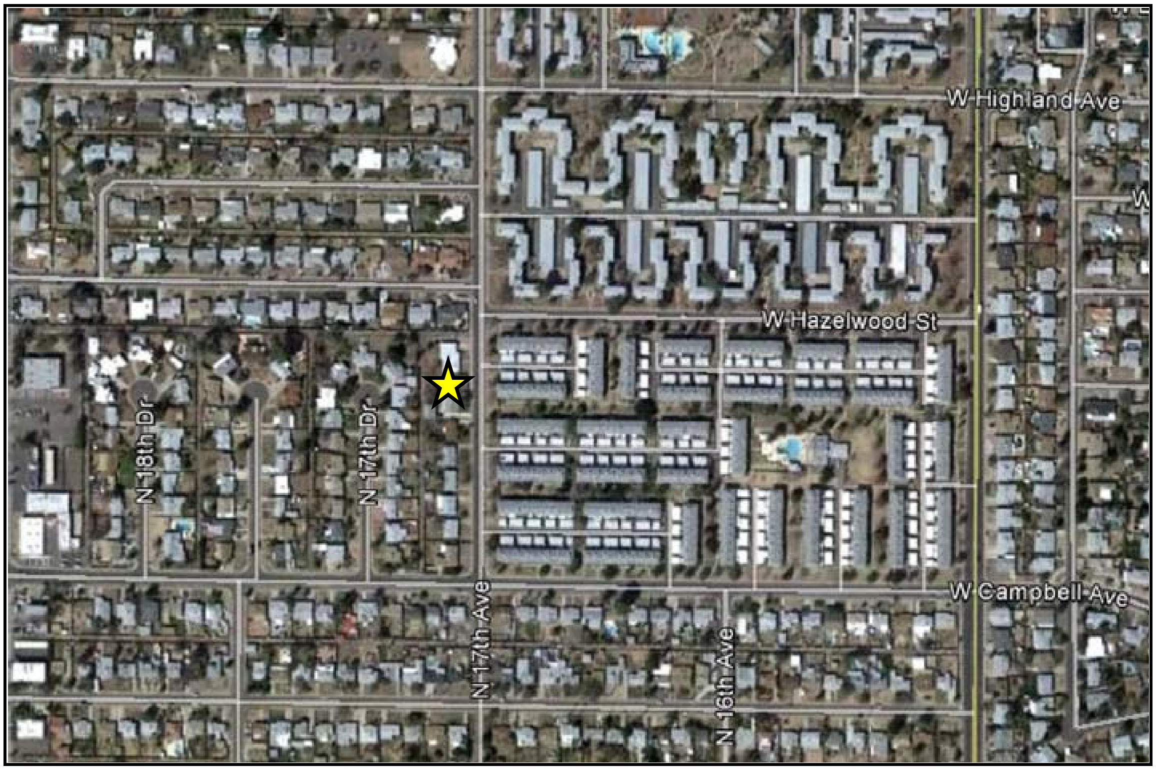


Figure 3-2. Phoenix, AZ NATTS Monitoring Site

Figure 3-2 shows that the Phoenix site is located in a highly residential area on North 17th Avenue in central Phoenix. The Grand Canal is just off the bottom of Figure 3-2. The monitoring site is approximately three-fourths of a mile east of I-17 and 2 miles north of I-10. Figure B1-1 in Appendix B shows several stationary emission point sources within 2 miles of the monitoring site. A single emissions point source for VOCs is located less than 1 mile west of the Phoenix NATTS site. Approximately 2 miles to the southeast are two emissions point sources of the NATTS core pollutants benzene, 1,3 butadiene, lead (as PM_{10}), and constituents of the carbonyl and PAH pollutant groups. Finally, an emissions point source for all PM_{10} metal compounds is shown 2 miles to the southwest of the monitoring site. Figure B1-1 also shows historical wind speed and wind direction based on data from the Phoenix Sky Harbor International Airport National Weather Service Station (WBAN 23183). Winds are predominantly from the east to southeast, and west. Table B2-1 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Phoenix monitoring site.

Table 3-3 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-3. Geographical Information for the Phoenix, AZ NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Phoenix, AZ	04-013-9997	Phoenix	Maricopa	Phoenix-Mesa-Scottsdale, AZ	33.503731, -112.095809	Residential	Urban/City Center

Table 3-4 presents information related to mobile source activity, such as population, traffic, and VMT in the area surrounding the Phoenix NATTS monitoring site.

Table 3-4. Population, Motor Vehicle, and Traffic Information for the Phoenix, AZ NATTS Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Phoenix, AZ	4,023,132	3,753,941	1,511,946	206,000	78,147

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2009 data from the Arizona DOT (AZ DOT, 2009). The ratio of vehicle registration to population for Maricopa County, AZ is 0.93 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx
4 Annual Average Daily Traffic reflects 2007 data from the Arizona DOT. The traffic data count is based on data for a location on I-17 (AZ DOT, 2007).
5 VMT reflects 2008 data for the Phoenix-Mesa-Scottsdale, AZ MSA from the Federal Highway Administration (FHWA, 2009b).

3.4 Los Angeles, CA NATTS Monitoring Site

The Los Angeles, CA NATTS monitoring site is located in downtown Los Angeles, CA. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

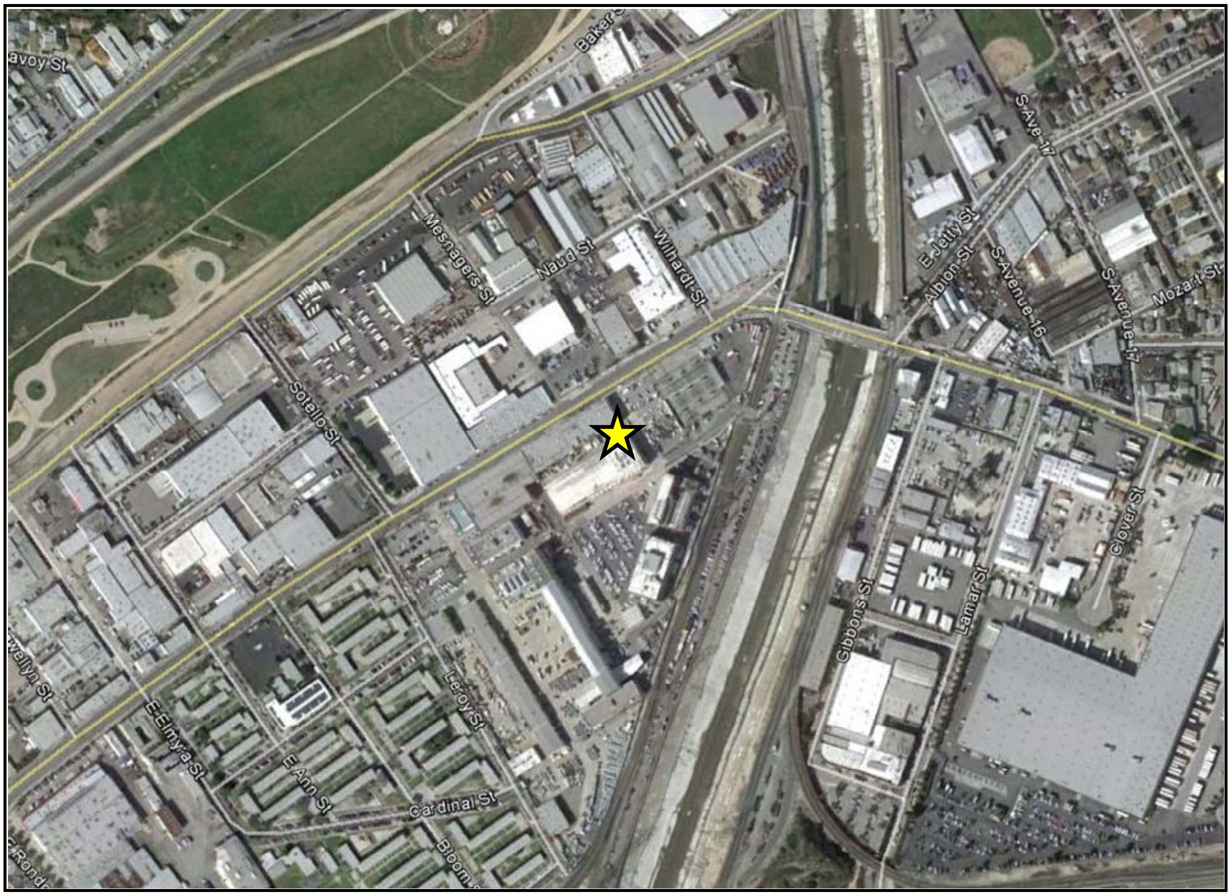


Figure 3-3. Los Angeles, CA NATTS Monitoring Site

Figure 3-3 shows the location of the Los Angeles monitoring site on the rooftop of a two-story building just northeast of downtown Los Angeles, near Dodgers' Stadium. A freight yard is located to the south of the site and the Los Angeles River runs north to south just east of the site. Figure B1-2 in Appendix B shows large clusters of stationary emission point sources less that 2 miles west-southwest of the monitoring site for carbonyls, PAHs, benzene, 1,3-butadiene and lead (PM_{10}). Additionally, emission point sources for PM_{10} metals arsenic, cadmium and nickel, and hexavalent chromium are shown scattered east to southeast with smaller clusters in west-northwest region. Finally, emission point sources for benzene, naphthalene, and formaldehyde are shown less than 2 miles east of the monitoring site. Figure B1-2 also shows historical wind speed and wind direction measurements based on data from the Los Angeles Downtown Campus National Weather Service Station (WBAN 93134). Winds are predominantly from the west. Table B2-2 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Los Angeles monitoring site.

Table 3-5 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-5. Geographical Information for Los Angeles, CA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Los Angeles, CA	06-037-1103	Los Angeles	Los Angeles	Los Angeles-Long Beach-Santa Ana, CA	34.06659, -118.22688	Residential	Urban/City Center

Table 3-6 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Los Angeles NATTS site.

Table 3-6. Population, Motor Vehicle, and Traffic Information for Los Angeles, CA Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Los Angeles, TX	9,848,011	7,498,722	3,739,626	238,000	275,665

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the California Division of Motor Vehicles (CA-DMV, 2008). The ratio of vehicle registration to population for Los Angeles County, CA is 0.76 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2005 data from the LA Almanac. The traffic estimate is based on data for Exit 136 off I-5 at Main Street (LA Almanac, 2005).
[5] VMT reflects 2008 data for the Los Angeles-Long Beach-Santa Ana, CA MSA from the Federal Highway Administration (FHWA, 2009b).

3.5 Rubidoux, CA NATTS Monitoring Site

The Rubidoux, CA NATTS monitoring site is located just outside Riverside, CA in the suburban town of Rubidoux, CA. Figure 3-4 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

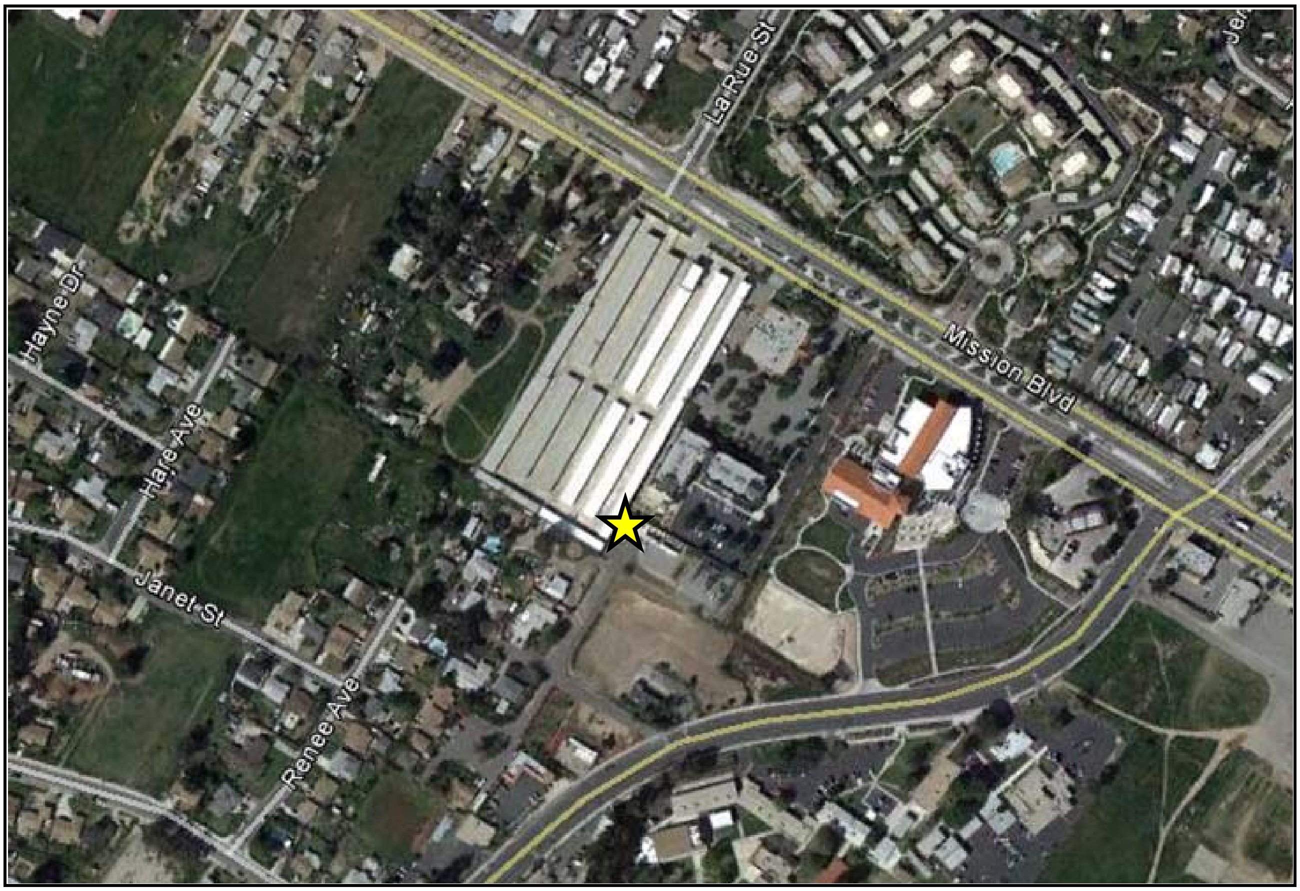


Figure 3-4. Rubidoux, CA NATTS Monitoring Site

Figure 3-4 shows that the Rubidoux monitoring site is adjacent to a power substation near the intersection of Mission Boulevard and Riverview Drive. Highway 60 runs east-west to the north and the Flabob Airport is located about three-fourths of a mile to the southeast of the site. Figure B1-3 in Appendix B shows most of the stationary emissions point sources are located approximately 2 miles northeast of the monitoring site with reported emissions for all NATTS core pollutants with the exception of benzo(a)pyrene. Additionally, a single emissions source located 1 mile south to southeast of the NATTS site reports emissions for 1,3-butadiene, benzene, lead, carbonyls and PAHs. Figure B1-3 also shows historical wind speed and wind direction measurements based on data from the Riverside

Municipal Airport National Weather Service Station (WBAN 03171). Winds are predominantly from the west to west-northwest. Table B2-3 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Rubidoux monitoring site.

Table 3-7 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-7. Geographical Information for the Rubidoux, CA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Rubidoux, CA	06-065-8001	Rubidoux	Riverside	Riverside-San Bernardino-Ontario, CA	33.99958, -117.41601	Residential	Suburban

Table 3-8 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the California NATTS site.

Table 3-8. Population, Motor Vehicle, and Traffic Information for the Rubidoux, CA Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Rubidoux, CA	2,125,440	1,685,246	1,000,923	18,365	42,835

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2008 data from the California DMV (CA DMV, 2008). The ratio of vehicle registration to population for Riverside County, CA is 0.79 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx
[4] Annual Average Daily Traffic reflects 2005 data from the Riverside County Transportation Department. The traffic estimate is based on data for Mission Boulevard, west of Riverview Drive (Riverside, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Riverside-San Bernardino-Ontario, CA MSA (FHWA, 2009b).

3.6 San José, CA NATTS Monitoring Site

The San José, CA NATTS monitoring site is located in central San José. Figure 3-5 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

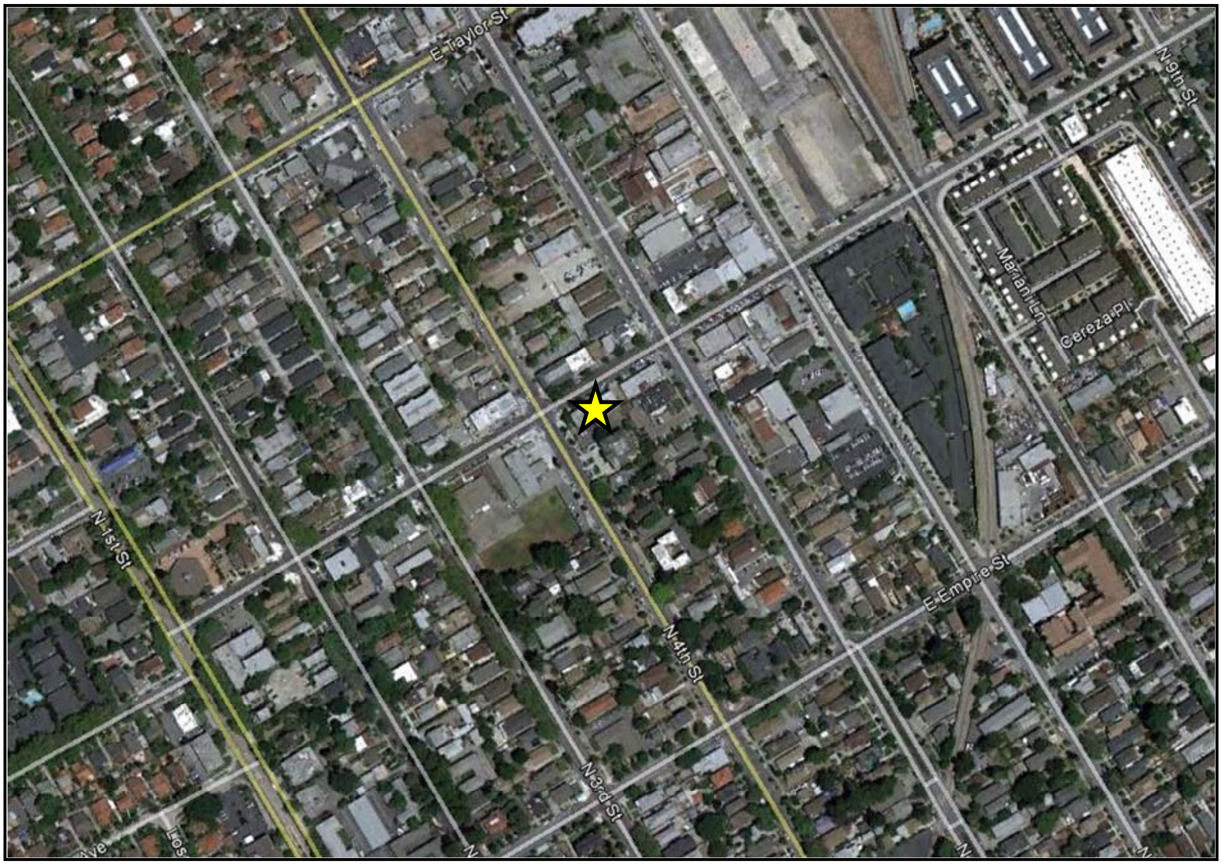


Figure 3-5. San José, CA NATTS Monitoring Site

Figure 3-5 shows that the San José site is located in a commercial area surrounded by residential areas. A railroad track is runs north to south two blocks east of the monitoring site. The Guadalupe Parkway-I-880 intersection and the San José International Airport are located approximately 1 mile to the northwest of the monitoring site. Figure B1-4 in Appendix B shows multiple stationary emissions point sources within a 2-mile radius of the NATTS monitoring site. Sources within 0.5 miles east of the site report benzene, tetrachloroethylene, and formaldehyde emissions, while emissions sources less than 1 mile west report emissions of benzene, formaldehyde and PM_{10} metals. Additionally, emissions sources of benzene, formaldehyde, and PM_{10} metals are somewhat clustered 1-2 miles southeast to south and northwest of the site. Figure B1-4 also shows historical wind speed and wind direction measurements, based on data from the San José International Airport National Weather Service Station (WBAN 23293). Winds are predominantly from the northwest to north-northwest. Table B2-4 in Appendix B lists sources of NATTS core HAPs within 5 miles of the San Jose monitoring site.

Table 3-9 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-9. Geographical Information for the San José, CA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
San José, CA	06-085-0005	San José	Santa Clara	San José-Sunnyvale-Santa Clara, CA	37.3485, -121.895	Commercial	Urban/City Center

Table 3-10 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the San José, CA NATTS site.

Table 3-10. Population, Motor Vehicle, and Traffic Information for the San José, CA NATTS Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
San José, CA	1,784,642	1,508,850	1,435,158	6,000	36,859

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2008 data from the California DMV (CA DMV, 2008). The ratio of vehicle registration to population for Santa Clara County, CA is 0.85 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx
[4] Annual Average Daily Traffic reflects 2005 data from the San José DOT. The traffic estimate is based on data for the intersection of North 4th Street and Jackson Street (San José, 2006).
[5] VMT reflects 2008 data from the Federal Highway Administration for the San José-Sunnyvale-Santa Clara, CA MSA (FHWA, 2009b).

3.7 Grand Junction, CO NATTS Monitoring Site

The Grand Junction, CO NATTS monitoring site is located at two adjacent sites in Grand Junction. Figure 3-6 is a composite satellite image retrieved from Google™ Earth showing the monitoring sites in their urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

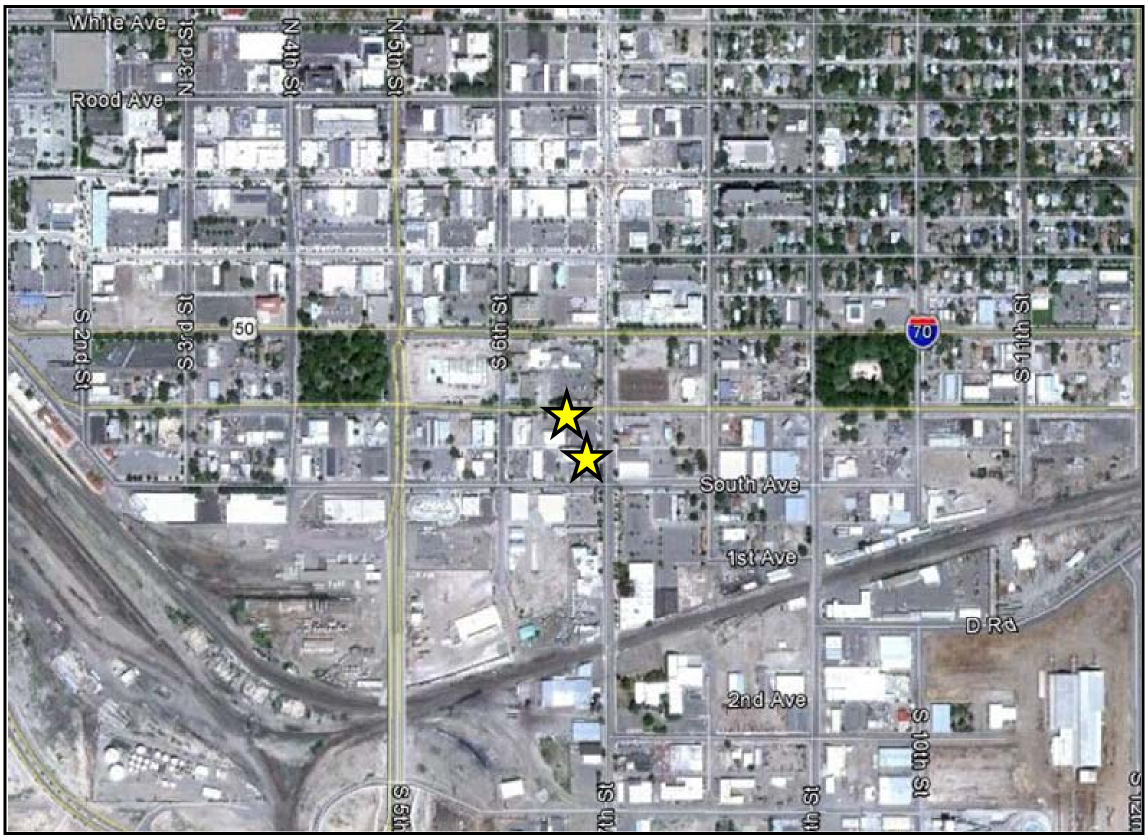


Figure 3-6. Grand Junction, CO NATTS Monitoring Site

Figure 3-6 shows that the area surrounding the Grand Junction monitoring site is of mixed usage, with commercial businesses to the west, northwest and north, residential areas to the northeast and east, and industrial areas to the southeast, south and southwest. The site location is next to one of the major east-west roads in Grand Junction (I-70 Business). A railroad runs east-west to the south of the Grand Junction monitoring site, and merges with another railroad to the southwest of the site. Figure B1-5 in Appendix B shows the stationary point emissions sources within 2 miles of the NATTS monitoring site. Emissions sources for benzene appear along the interstate highways near the monitoring site location. Additionally, emissions sources north of the monitoring site report mainly VOCs, while emissions sources to the south report mainly carbonyls, PM_{10} metals, and PAHs. Figure B1-5 also shows the historical wind speed and wind direction measurements based on data from the Grand Junction Walker Field Airport National Weather Service Station (WBAN 23066). Winds are predominantly from the east to southeast. Table B2-5 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Grand Junction monitoring site.

Table 3-11 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-11. Geographical Information for Grand Junction, CO NATTS Site

Site	AQS Code	Location	County	Core-based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Grand Junction, CO	08-77-0017	Grand Junction	Mesa	Grand Junction, CO	39.064289, -108.56155	Commercial	Urban/City Center
	08-77-0018				39.06429, 108.56155		

Table 3-12 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Grand Junction monitoring site.

Table 3-12. Population, Motor Vehicle, and Traffic Information for the Grand Junction, CO Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Grand Junction, CO	146,093	182,518	108,432	11,800	2,000

1 Reference: Census Bureau, 2010.

2 County-level vehicle registration reflects 2008 data from the Colorado Department of Revenue (CO DOR, 2009). The ratio of vehicle registration to population for Mesa County, CO is 1.25 vehicles per person.

3 Reference: http://xionetic.com/zipfinddeluxe.aspx

4 Annual Average Daily Traffic reflects 2009 data from the Colorado Department of Transportation. The traffic estimate is based on data for Business-70 between 5th and 7th Streets (CO DOT, 2009).

5 VMT reflects 2008 data from the Federal Highway Administration for the Grand Junction MSA (FHWA, 2009b).

3.8 Washington, DC NATTS Monitoring Site

The Washington, DC NATTS monitoring site is located in central Washington, DC. Figure 3-7 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

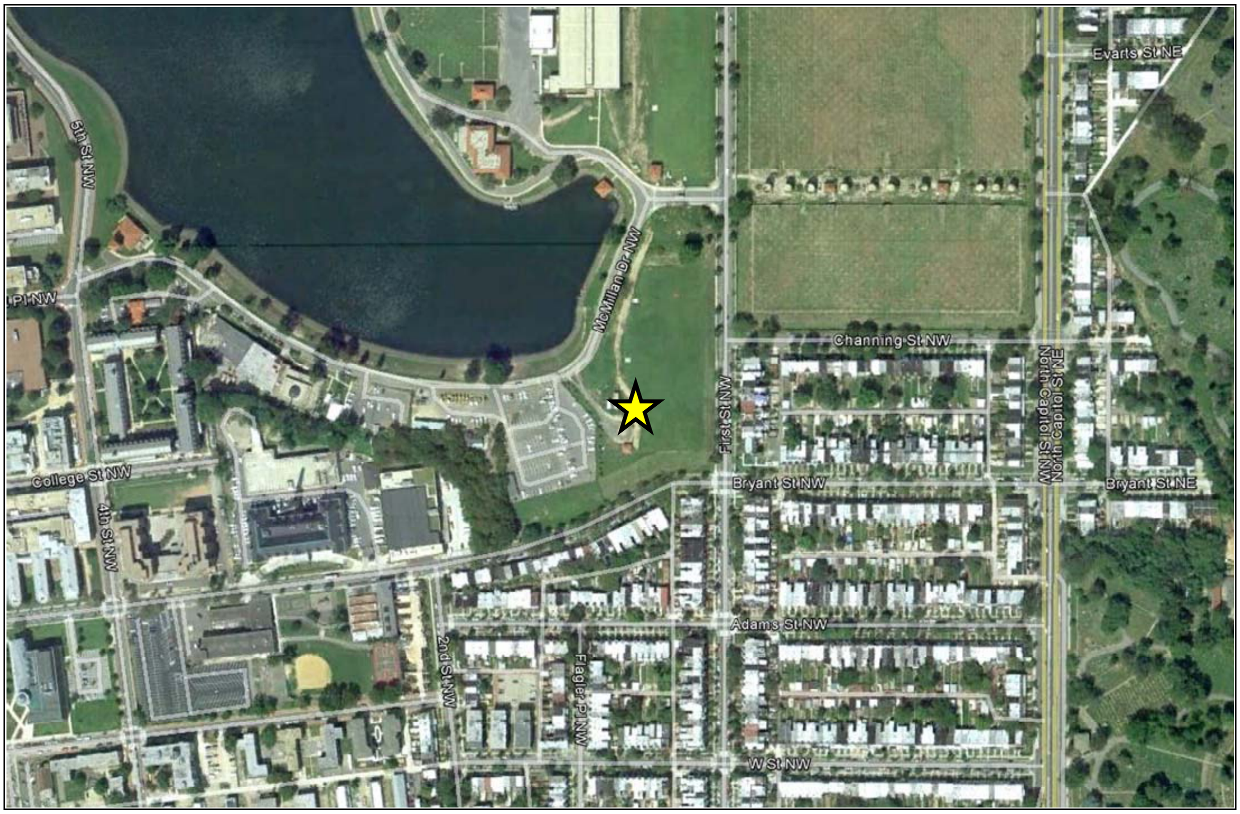


Figure 3-7. Washington, DC NATTS Monitoring Site

Figure 3-7 shows that the Washington, DC monitoring site is located in a primarily commercial area on an open field near a water reservoir. The monitoring site is surrounded by a hospital, a cemetery, and a university. It is also located near several heavily traveled roadways. Figure B1-6 in Appendix B shows multiple stationary emissions point sources surrounding the Washington, DC monitoring site with a single emissions point source for benzene, carbonyls, PM_{10} metals, and PAHs located less than one-fourth mile southwest. Additionally, less than 1 mile north to north-northeast and 1 mile southeast of the monitoring site are point sources for benzene, 1,3-butadiene, and lead (PM_{10}). An additional source 1 mile to the northeast reports emissions for carbonyls, and PAHs. Finally, facilities less than 2 miles southwest to west of the monitoring site report abundant emissions for lead (PM_{10}) followed by benzene, carbonyls, and PAHs. No stationary hexavalent chromium emission point sources are within the 2-mile boundary. Figure B1-6 also shows historical wind speed and wind direction measurements based on data from the Washington Reagan Airport National Weather Service Station (WBAN 13743). Winds are predominantly from the north, south to south-southwest, and north to north-northwest. Table B2-6 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Washington, D.C. monitoring site.

Table 3-13 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-13. Geographical Information for the Washington, DC NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Washington, DC	11-001-0043	Washington, D.C.	District of Columbia	Washington-Arlington-Alexandria, DC-VA-MD-WV	38.921847, -77.013178	Commercial	Urban/City Center

Table 3-14 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Washington, DC monitoring site.

Table 3-14. Population, Motor Vehicle, and Traffic Information for the Washington, DC Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Washington, DC	599,657	171,255	1,860,974	7,600	98,704

[1] Reference: Census Bureau, 2010.

[2] County-level vehicle registration reflects 2008 data from the Federal Highway Administration (FHWA, 2009a). The ratio of vehicle registration to population for the District of Columbia is 0.29 vehicles per person.

[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.

[4] Annual Average Daily Traffic reflects 2008 data from the District DOT. The traffic estimate is based on data for the intersection of Bryant Street and First Street (DC DOT, 2008).

[5] VMT reflects 2008 data from the Federal Highway Administration for the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA (FHWA, 2009b).

3.9 Pinellas County, FL NATTS Monitoring Site

The Pinellas County, FL NATTS monitoring site is located in Pinellas Park, north of St. Petersburg. Figure 3-8 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its suburban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

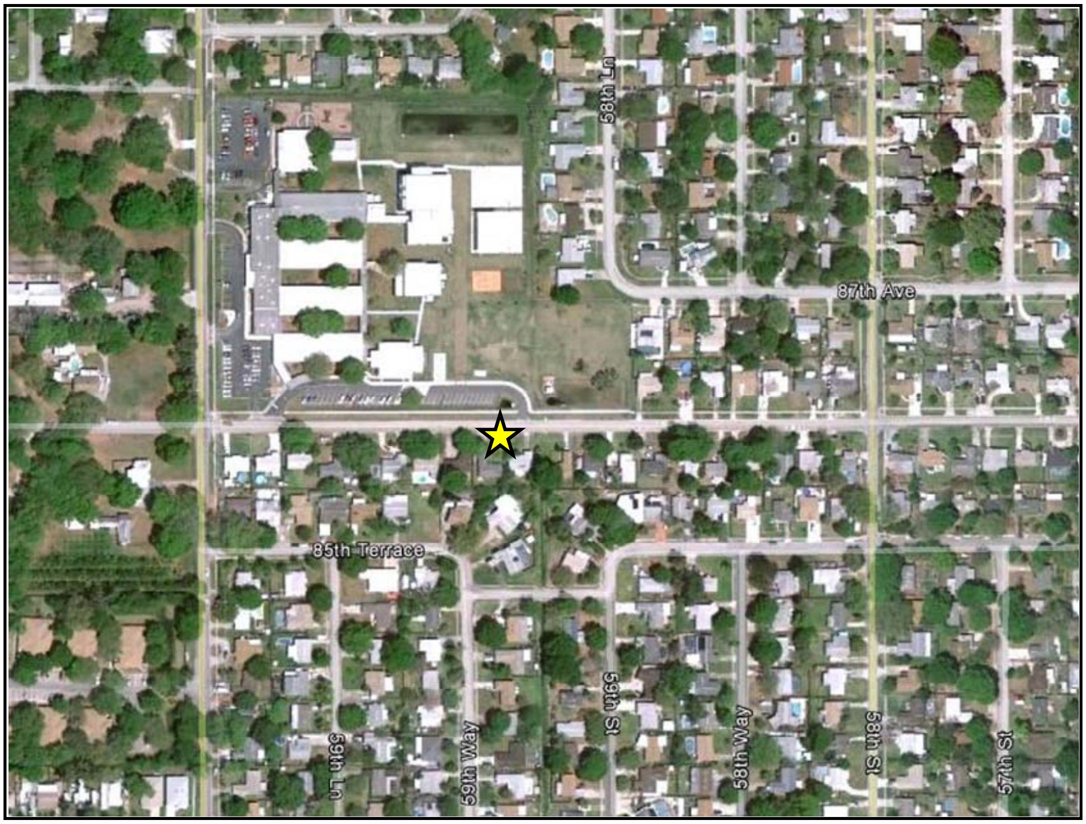


Figure 3-8. Pinellas County, FL NATTS Monitoring Site

Figure 3-8 shows that the Pinellas County, FL monitoring site is located in a residential area next to a school near 86th Avenue North. Figure B1-7 in Appendix B shows stationary emissions point sources. Three emissions sources are located within 1 mile of the monitoring site. First, emissions sources of benzene and formaldehyde are located about 1 mile west-northwest of the monitoring. Next, a stationary emissions point source for naphthalene is located over a mile south-southwest; and an emissions source for tetrachloroethylene is located more than a mile north of the monitoring site. Additionally, emissions sources located slightly more than 2 miles northeast report emissions for benzene, 1,3-butadiene, carbonyls and PAHs, and sources located north-northwest to north report emissions for lead and other PM_{10} metals, benzene, trichloroethylene, vinyl chloride, naphthalene, and carbonyls. Figure B1-7 also shows historical wind speed and wind direction measurements based on data from the St. Petersburg International Airport National Weather Service Station (WBAN 12873) Winds are predominantly from the north to south-southeast, south, and west to north-northwest. Table B2-7 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Pinellas County monitoring site.

Table 3-15 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-15. Geographical Information for the Pinellas County, FL NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Pinellas County, FL	12-103-0026	Pinellas Park	Pinellas	Tampa-St. Petersburg-Clearwater, FL	27.850041, -82.714590	Residential	Suburban

Table 3-16 presents information related to population and mobile source activity, such as population, traffic, and VMT for the Pinellas County, FL area.

Table 3-16. Population, Motor Vehicle, and Traffic Information for the Pinellas County, FL NATTS Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Pinellas County, FL	909,013	896,957	672,839	51,000	62,865

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2009 data from the Florida DHSMV (FL DHSMV, 2009). The ratio of vehicle registration to population for Pinellas County, FL is 0.99 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx
4 Annual Average Daily Traffic reflects 2009 data from the Florida DOT. Traffic estimate is based on data for Park Boulevard, east of 66th Street North (FL DOT, 2009).
5 VMT reflects 2008 data from the Federal Highway Administration for the Tampa-St. Petersburg-Clearwater, FL MSA (FHWA, 2009b).

3.10 Tampa, FL NATTS Monitoring Site

The Tampa, FL monitoring site is located in Plant City, FL. Figure 3-9 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-9. Tampa, FL NATTS Monitoring Site

Figure 3-9 shows the Tampa, FL monitoring site is situated in a rural area east of a residential community. This Tampa, FL site serves as a background site, although the impact of increased development in the area is likely being captured by the monitor. Figure B1-8 in Appendix B shows there are no stationary emissions point sources within a 2-mile radius of the monitoring site. Figure B1-8 also shows historical wind speed and wind direction measurements based on data from the Tampa International Airport National Weather Service Station (WBAN 12842). Winds are predominantly from the north to east, south, southwest to west-southwest, and northwest to north-northwest. Table B2-8 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Tampa monitoring site.

Table 3-17 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-17. Geographical Information for the Tampa, FL NATTS Site

Site	AQS Code	Location	County	Core-based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Tampa, FL	12-057-3002	Plant City	Hillsborough	Tampa-St. Petersburg-Clearwater, FL	27.96565, -82.2304	Residential	Rural

Table 3-18 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Tampa, FL NATTS site.

Table 3-18. Population, Motor Vehicle, and Traffic Information for the Tampa, FL NATTS Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Tampa, FL	1,195,317	1,137,069	311,528	10,400	62,865

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2009 data from the Florida DHSMV (FL DHSMV, 2009). The ratio of vehicle registration to population for Hillsborough County, FL is 0.95 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data from the Florida DOT. Traffic estimate is based on data the intersection of MLK Jr. Boulevard (574) east of McIntosh Road (FL DOT, 2009).
5 VMT reflects 2008 data from the Federal Highway Administration for the Tampa-St. Petersburg-Clearwater MSA (FHWA, 2009b).

3.11 South DeKalb, GA NATTS Monitoring Site

The South DeKalb NATTS monitoring site is located in Decatur, Georgia, southeast of Atlanta. Figure 3-10 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its suburban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

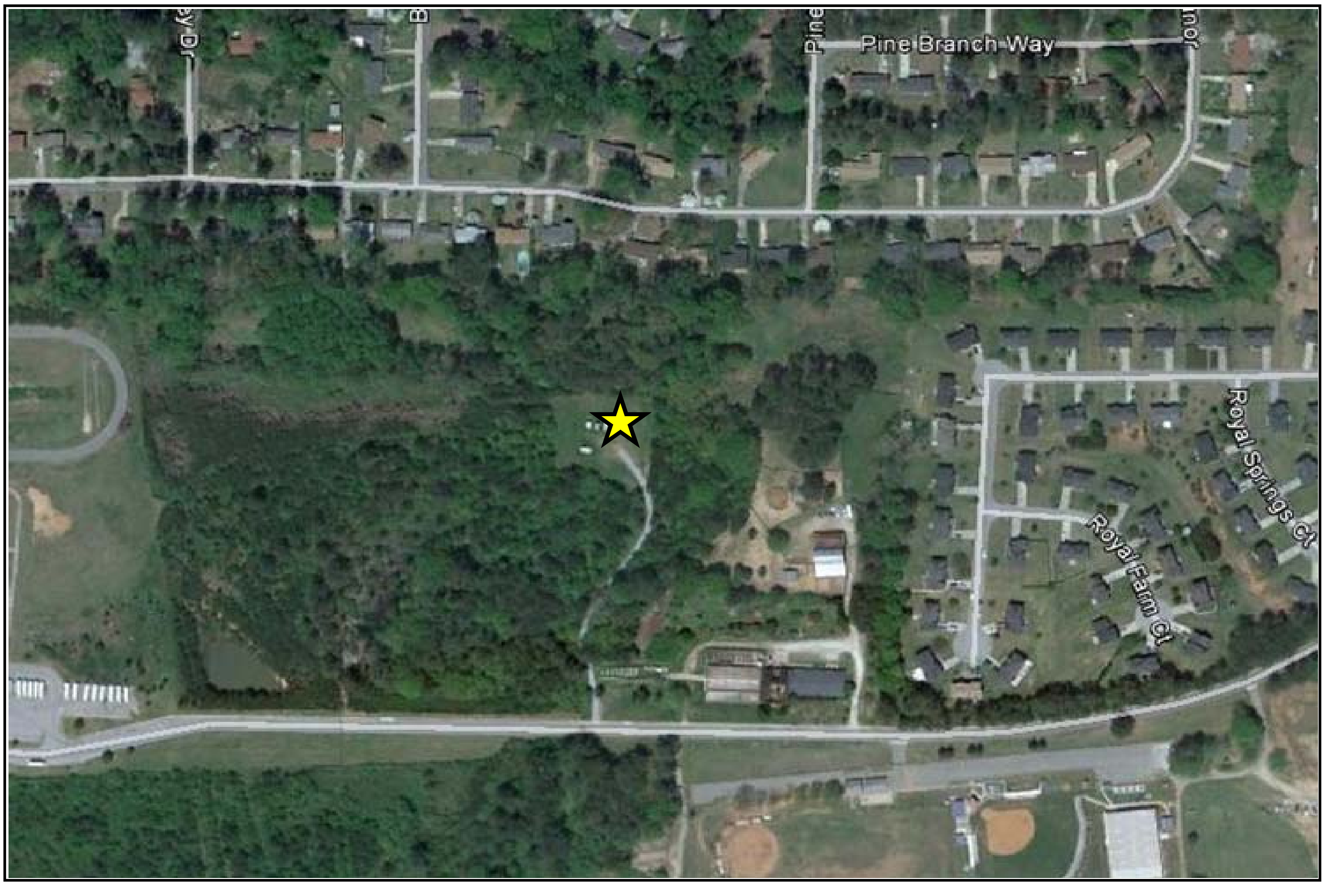


Figure 3-10. South DeKalb, GA NATTS Monitoring Site

Figure 3-10 shows that the South DeKalb, GA monitoring site is located in a suburban/residential area. The South DeKalb site is situated on DeKalb County Schools Environmental Education property off Wildcat Road. Residential subdivisions, a greenhouse and horse barn, an athletic field, and a high school surround the monitoring site. A golf course is adjacent to the school property. Interstate 285 is located less than 1 mile north of the site. Figure B1-9 in Appendix B shows that a single stationary emission point source is located less than 1 mile east of the monitoring site. The pollutant emissions for this point source include benzene, arsenic, beryllium, cadmium, manganese, nickel, carbonyls and PAHs. Figure B1-9 also shows historical wind speed and wind direction measurements based on data from the Atlanta Hartsfield

International Airport National Weather Service Station (WBAN 13874). Winds are predominantly from the east and west to north-northwest. Table B2-9 in Appendix B lists sources of NATTS core HAPs within 5 miles of the South DeKalb monitoring site.

Table 3-19 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-19. Geographical Information for the South DeKalb, GA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
South DeKalb, GA	13-089-0002	Decatur	DeKalb	Atlanta-Sandy Springs-Marietta, GA	33.688007, -84.290325	Residential	Suburban

Table 3-20 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the South DeKalb monitoring site.

Table 3-20. Population, Motor Vehicle, and Traffic Information for the South DeKalb Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
DeKalb, GA	747,274	467,962	776,511	9,200	127,008

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2009 data from the Georgia DOR (GA DOR, 2009). The ratio of vehicle registration to population for South DeKalb County, GA is 0.63 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2008 data from the Georgia DOT. The traffic estimate is based on data for Clifton Spring Road, between Wildcat Road and Clifton Church Road (GA DOT, 2008).
5 VMT reflects 2008 data from the Federal Highway Administration for the Atlanta-Sandy Springs-Marietta, GA MSA (FHWA, 2009b).

3.12 Chicago (Northbrook), IL NATTS Monitoring Site

The Chicago, IL NATTS monitoring site is located in the northwestern suburb of Northbrook. Figure 3-11 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-11. Chicago, IL NATTS Monitoring Site

Figure 3-11 shows that the Chicago, IL monitoring site is in a suburban and residential area with commercial, residential, and forested areas nearby. Figure B1-10 in Appendix B shows only a few stationary emission point sources within a 2-mile radius of the site. A single emissions point source located less than 0.5 miles to the east report emissions for benzene, carbonyls, PM_{10} metals, PAHs, and hexavalent chromium. The same pollutant emissions are also reported for stationary emission point sources less than 2 miles southwest and slightly more than 2 miles west of the Chicago, IL monitoring site. Finally, source emissions for benzene, 1,3-butadiene, carbonyls, PM_{10} metals and hexavalent chromium were found about 1 mile north of the site. Figure B1-10 also shows historical wind speed and wind direction measurements based on data from the Chicago Palwaukee Airport National Weather Service Station (WBAN 04838). Winds are predominant from the northeastern, southwestern, and northwestern quadrants. Table B2-10 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Chicago monitoring site.

Table 3-21 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-21. Geographical Information for Chicago, IL NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Chicago, IL	17-031-4201	Northbrook	Cook County	Chicago-Naperville-Joliet, IL-IN-WI	42.139996, -87.799227	Residential	Suburban

Table 3-22 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Chicago monitoring site.

Table 3-22. Population, Motor Vehicle, and Traffic Information for the Chicago, IL Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Chicago, IL	5,287,037	2,128,822	870,561	34,100	172,794

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2008 data from the Illinois Secretary of State (IL SOS, 2008). The ratio of vehicle registration to population for Cook County, IL is 0.40 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data from the Illinois DOT. The traffic estimate is based on data from Dundee Road near the monitoring site (IL DOT, 2009).
5 VMT reflects 2008 data from the Federal Highway Administration for the Chicago-Naperville-Joliet, IL-IN-WI MSA (FHWA, 2009b).

3.13 Grayson Lake, KY NATTS Monitoring Site

The Grayson Lake, KY monitoring site replaced the Hazard, KY NATTS monitoring site in mid-year 2008. It is located in northeast Kentucky, 67 miles north of Hazard, KY. Figure 3-12 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-12. Grayson Lake, KY NATTS Monitoring Site

Figure 3-12 shows that the site is located in a rural area. The closest road to the monitoring site is a service road feeding into Camp Grayson. Figure B1-11 in Appendix B shows there are no point sources within the 2-mile radius of the Grayson Lake monitoring site. Figure B1-11 also shows historical wind speed and wind direction measurements based on data from the Huntington Tri State Airport National Weather Service Station (WBAN 03860). Winds are predominantly from the southwestern quadrant. Table B2-11 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Grayson Lake monitoring site.

Table 3-23 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-23. Geographical Information for Grayson Lake, KY NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Grayson Lake, KY	21-043-0050	Grayson	Carter	Not in a CBSA	38.238333, -82-988333	Residential	Rural

Table 3-24 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Grayson Lake, KY monitoring site.

Table 3-24. Population, Motor Vehicle, and Traffic Information for the Grayson Lake, KY Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT (thousands)
Grayson Lake, KY	26,771	28,371	14,815	428	NA

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2008 data from the Kentucky Transportation Cabinet (KYTC, 2009a). The ratio of vehicle registration to population for Carter County, KY is 1.06 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Kentucky Transportation Cabinet. The traffic estimate is based on data for the intersection of State Road 1496 with Camp Webb Road (KYTC, 2009b).
NA = Data are unavailable because the site is not within an MSA.

3.14 Hazard, KY NATTS Monitoring Site

The Hazard, KY NATTS monitoring site is located in southeastern Kentucky. Figure 3-13 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. In 2008, the site was moved 67 miles north to a new location near Grayson, KY. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-13. Hazard, KY NATTS Monitoring Site

The Hazard, KY monitoring site is located between the towns of Hazard and Bonnyman on the property of the Perry County Horse Park. The Hal Rogers Parkway and State Highways 15 and 80 merge just to the north of the monitoring site. Figure B1-12 in Appendix B shows a single stationary emissions point source located less than 2 miles east of the monitoring site. The pollutant emissions reported for this point source include all VOCs with the exception of 1,3-butadiene. Figure B1-12 also shows historical wind speed and wind direction measurements based on data from the Jackson Airport National Weather Service Station (WBAN 03889). Winds are predominantly from the south to southeast and west. Table B2-12 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Hazard monitoring site.

Table 3-25 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-25. Geographical Information for Hazard, KY NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Hazard, KY	21-193-0003	Hazard	Perry	Not in a CBSA	37.283056, -83.220278	Residential	Suburban

Table 3-26 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Hazard monitoring site.

Table 3-26. Population, Motor Vehicle, and Traffic Information for the Hazard, KY Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT (thousands)
Hazard, KY	29,241	25,654	31,861	21,359	NA

[1] Reference: Census Bureau, 2009.
[2] County-level vehicle registration reflects 2008 data from the Kentucky Transportation Cabinet (KYTC, 2009a). The ratio of vehicle registration to population for Perry County, KY is 0.88 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2008 data from the Kentucky Transportation Cabinet. The traffic estimate is based on data for the Daniel Boone Parkway (KYTC, 2008).
NA = Data are unavailable because the site is not within an MSA.

3.15 Roxbury (Boston), MA NATTS Monitoring Site

The Roxbury, MA monitoring site is located at Dudley Square in Roxbury, a neighborhood of southwest Boston. Figure 3-14 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

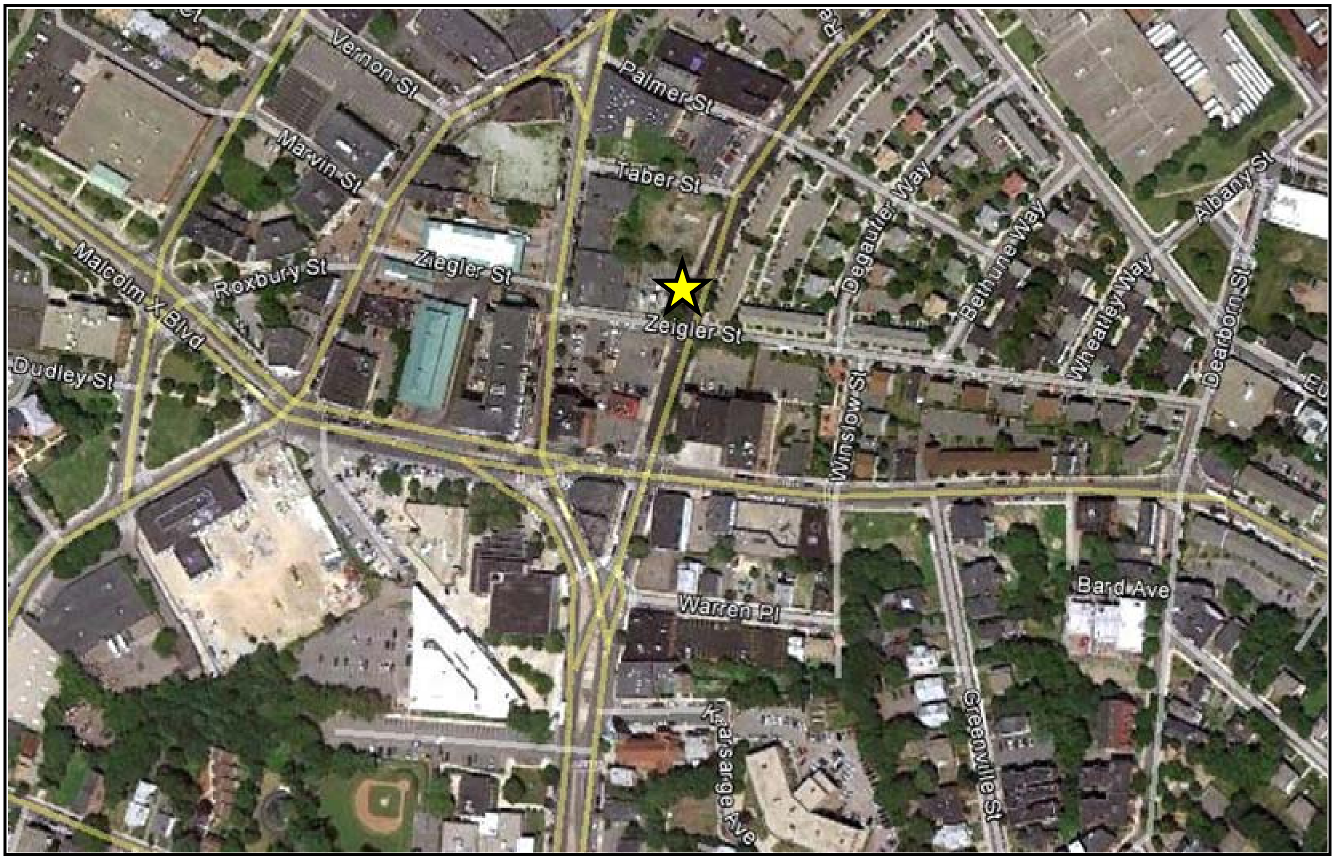


Figure 3-14. Roxbury, MA NATTS Monitoring Site

Figure 3-14 shows the surrounding area is commercial as well as residential. The monitoring site is approximately 1.25 miles south of I-90 and 1 mile west of I-93. The original purpose for the location of this site was to measure population exposure to a city bus terminal located across the street from the monitoring site. In recent years, the buses servicing the area were converted to compressed natural gas. Figure B1-13 in Appendix B shows numerous stationary emissions point sources within 2 miles of the NATTS monitoring site. Source emissions located less than 0.5 miles south and 1 mile west of the monitoring site include benzene, hexavalent chromium, carbonyls, PAHs, and PM_{10} metals. Additionally, the same pollutant emissions, with the exception of beryllium and benzo(a)pyrene, are reported for facilities located 1 mile to the east. Many stationary emissions point sources for NATTS core pollutants benzene, carbonyls, PAHs, PM_{10} metals and, to a lesser extent, hexavalent chromium are shown 1 to 2 miles west to north-northwest of the monitoring site near Route 9 and Route 20.These same pollutant emissions are also reported for facilities north-northeast to southeast near I-95. Figure B1-13 also shows historical wind speed and wind direction measurements based on data from the Boston Logan International Airport National Weather Service Station (WBAN 14739). Winds are predominantly from the north, east, and south-southwest to northwest. Table B2-13 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Roxbury monitoring site.

Table 3-27 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-27. Geographical Information for the Roxbury, MA NATTS Site

Site	AQS Code	Location	County	Core-based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Roxbury, MA	25-025-0042	Boston	Suffolk	Boston-Cambridge-Quincy, MA-NH	42.32944, -71.0825	Commercial	Urban/City Center

Table 3-28 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Roxbury NATTS site.

Table 3-28. Population, Motor Vehicle, and Traffic Information for the Roxbury, KY Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Roxbury, MA	753,580	489,937	1,585,962	31,400	92,756

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2008 data from the Massachusetts RMV (MA RMV, 2009). The ratio of vehicle registration to population for Suffolk County, MA is 0.65 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2007 data from the Massachusetts DOT. The traffic estimate is based on data for Melnea Cass Boulevard between Washington Street and Harrison Avenue (MA DOT, 2007).
5 VMT reflects 2008 data from the Federal Highway Administration for the Boston-Cambridge-Quincy, MA-NH MSA (FHWA, 2009b).

3.16 Detroit (Dearborn), MI NATTS Monitoring Site

The Detroit NATTS monitoring site is located southwest of Dearborn, MI. Figure 3-15 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

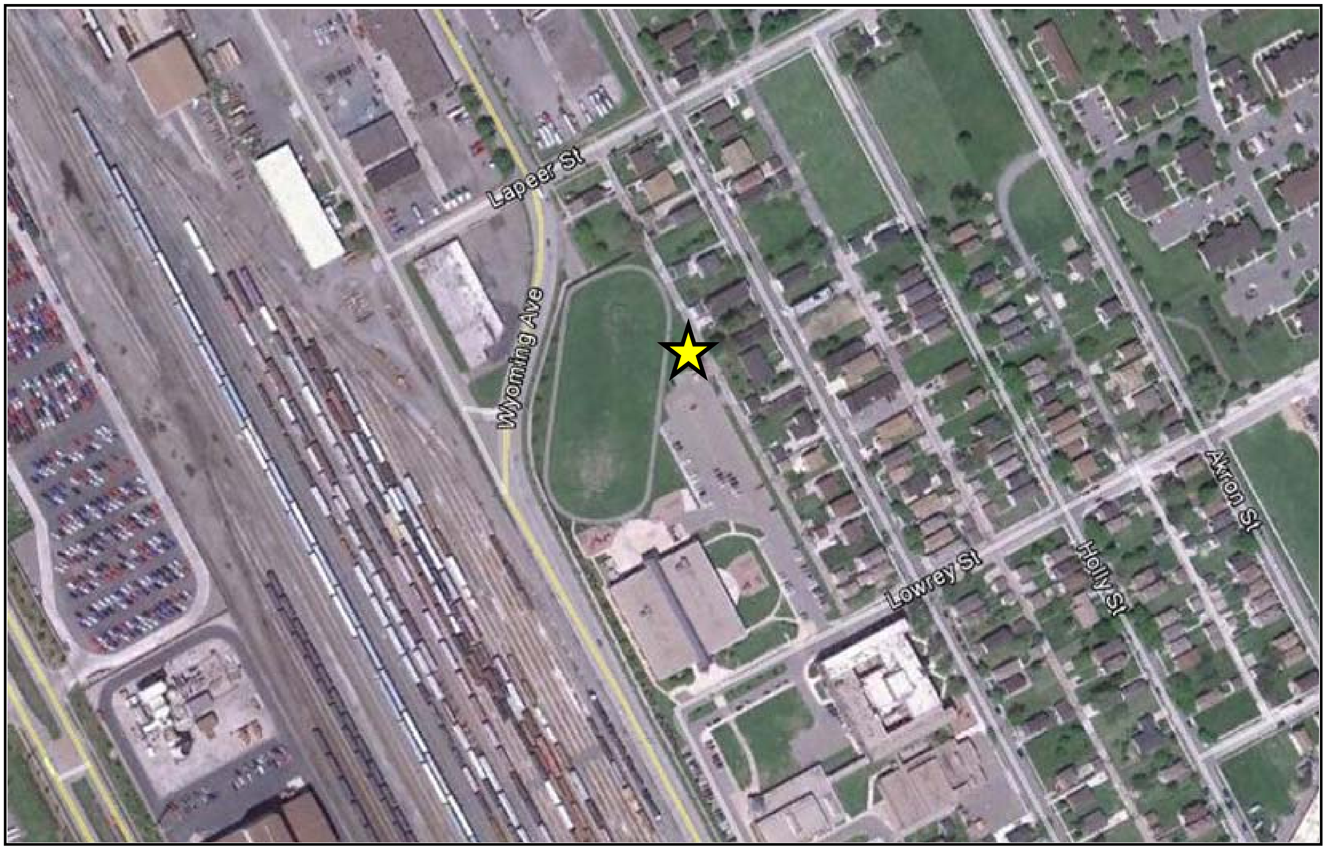


Figure 3-15. Detroit, MI NATTS Monitoring Site

Figure 3-15 shows that the site is located in a suburban and industrialized area. A freight yard is shown to the west of the monitoring site and a residential neighborhood is located to the east. Heavily traveled roadways surround the monitoring site, as the site lies between I-75 and I-94. Figure B1-14 in Appendix B shows multiple stationary emissions point sources within a 2-mile radius of the Detroit monitoring site. Of particular interest is the stationary source located directly next to the monitoring site, which reports emissions that include benzene, formaldehyde, PM_{10} metals, PAHs, and hexavalent chromium. Less than 2 miles south to southwest of the site are emissions sources for benzene, 1,3 butadiene, carbonyls, PM_{10} metals, and hexavalent chromium. Additionally, less than 2 miles south-southeast along the Detroit River and north near I-94 are stationary source emissions of benzene, benzo(a)pyrene, carbonyls, PM_{10} metal compounds, and hexavalent chromium. Finally, emissions sources west near I-94 include trichloroethylene, tetrachloroethylene, and vinyl chloride. Figure B1-14 also shows historical wind speed and wind direction measurements from the Detroit Metro Airport National Weather Service Station (WBAN 94847). Winds are predominantly from the north to north-northeast, east, and south to north-northwest. Table B2-14 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Detroit monitoring site.

Table 3-29 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-29. Geographical Information for Detroit, MI NATTS Site

Site	AQS Code	Location	County	Core-based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Detroit, MI	26-163-0033	Dearborn	Wayne	Detroit-Warren-Livonia, MI	42.30754, -83.14961	Industrial	Suburban

Table 3-30 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Detroit monitoring site.

Table 3-30. Population, Motor Vehicle, and Traffic Information for the Detroit, MI Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Detroit, MI	1,925,848	1,341,276	1,138,740	104,100	99,633

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the Michigan Department of State (MDS, 2009 and 2010). The ratio of vehicle registration to population for Wayne County, MI is 0.70 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Michigan DOT. The traffic estimate is based on data for I-94, from Ford Plant Road to Rotunda Drive (MI DOT, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Detroit-Warren-Livonia, MI MSA (FHWA, 2009b).

3.17 St. Louis, MO NATTS Monitoring Site

The St. Louis, MO monitoring site is located in central St. Louis, MO. Figure 3-16 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-16. St. Louis, MO NATTS Monitoring Site

Figure 3-16 shows that the monitoring site is located less than one-fourth mile west of I-70. The Mississippi River, which separates Missouri from Illinois, is less than 1 mile east of the site. Although the area directly around the monitoring site is residential, industrial facilities are located just on the other side of I-70. Figure B1-15 in Appendix B shows numerous stationary emissions point sources within 2 miles of the St. Louis, MO monitoring site. Numerous emission point sources for all NATTS core pollutants are shown running north to south along I-70. Additionally, these same pollutant emissions with the exception of carbon tetrachloride, trichloroethylene, and vinyl chloride, are reported southwest of the monitoring site. Finally, stationary point sources located near the Mississippi River report emissions for benzene, 1,3-butadiene, carbonyls, PM_{10} metals, PAHs, and hexavalent chromium. Figure B1-15 also shows historical wind speed and wind direction measurements based on data from the Cahokia St. Louis Airport National Weather Service Station (WBAN 03960). Winds are predominantly from the north, southeast to south, and west to north-northwest. Table B2-15 in Appendix B lists sources of NATTS core HAPs within 5 miles of the St. Louis monitoring site.

Table 3-31 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-31. Geographical Information for the St. Louis, MO NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
St. Louis, MO	29-510-0085	St. Louis	St. Louis	St. Louis, MO-IL	38.656436, -90.198661	Residential	Urban/City Center

Table 3-32 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the St. Louis monitoring site.

Table 3-32. Population, Motor Vehicle, and Traffic Information for the St. Louis, MO Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
St. Louis, MO	992,408	1,132,283	816,098	81,174	66,114

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2009 data from the Missouri DOR (MO DOR, 2009). The ratio of vehicle registration to population for St. Louis County, MO is 1.14 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data from the Missouri DOT (MO DOT, 2009). The traffic estimate is based on data for I-70 near Exit 250.
5 VMT reflects 2008 data from the Federal Highway Administration for the St. Louis, MO-IL MSA (FHWA, 2009b).

3.18 Bronx (#1 and #2), NY

The Bronx NATTS monitoring sites are located in the Bronx Borough of New York City, northeast of Manhattan. In 2010, the building housing Bronx #1 was closed for repairs. To continue NATTS monitoring, the Bronx-1 site was relocated approximately 2 miles southwest to a temporary location (Bronx #2). Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-17. Bronx #1, NY NATTS Monitoring Site

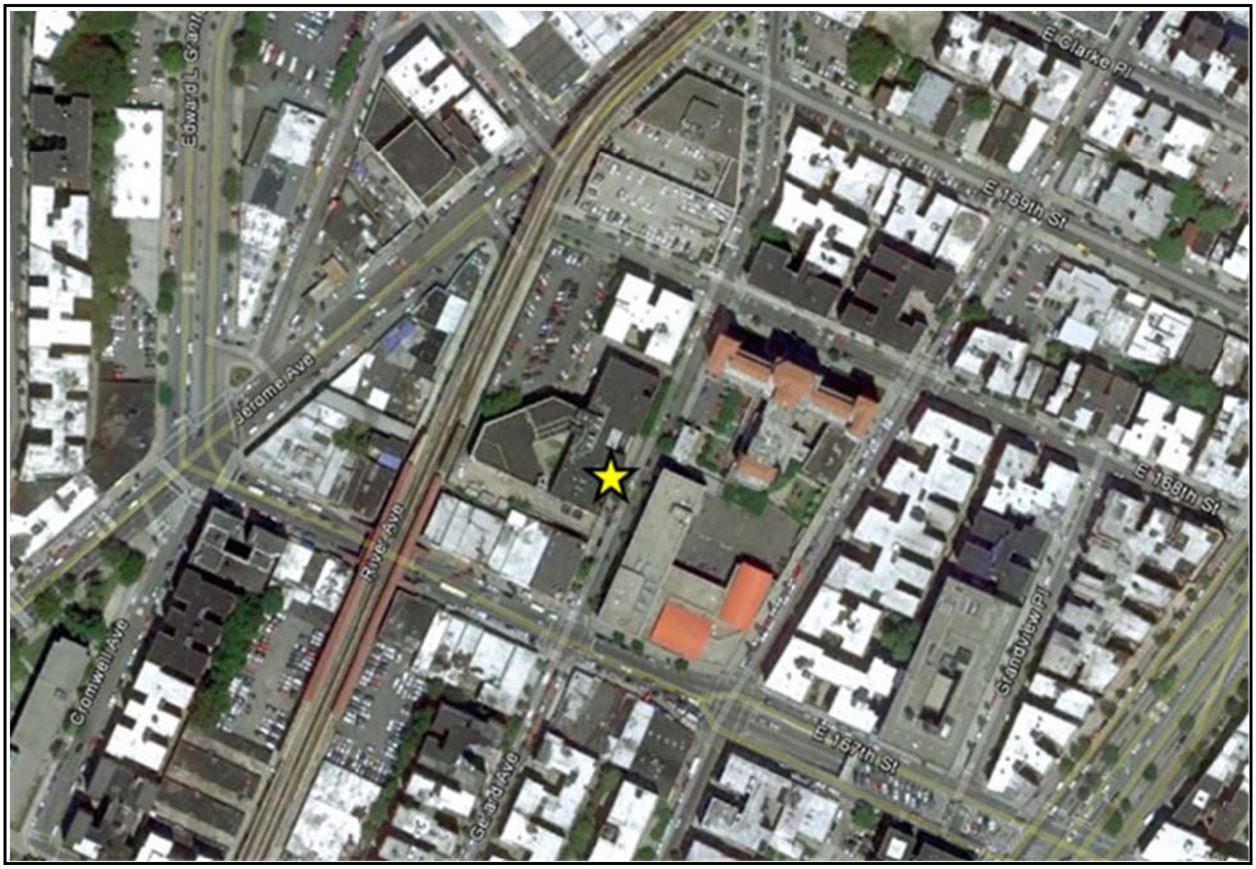


Figure 3-18. Bronx #2, NY NATTS Monitoring Site

Figure 3-17 shows that the Bronx #1 site is located in an urban and residential area. The Bruckner Expressway (I-278) is located a few blocks east of the monitoring site and other heavily traveled roadways are located within a few miles. The monitoring site sits less than 0.5 miles east of the East River. Figure 3-18 shows that the Bronx #2 site is located in an area similar to Bronx #1. The Bronx #2 monitoring site is located approximately 0.5 miles west of the New York State Thruway (I-87) and less than 1 mile south of the Cross-Bronx Expressway (US-1). Figures B1-16 and B1-17 in Appendix B show there are multiple stationary emissions point sources within 2 miles of both monitoring sites. Point source located to the southeast of the sites report emissions for benzene, formaldehyde, PAHs, and PM_{10} metals. In addition, several emissions point sources are located along US Route 9 less than 2 miles west of the monitoring sites. The emissions for these facilities include all NATTS core pollutants. The figures also show historical wind speed and wind direction measurements based on data from the New York La Guardia Airport National Weather Service Station (WBAN14732). Winds are predominantly from the northeast to east-northeast, south, southwest, and west to north-northwest. Tables B2-16 and B2-17 in Appendix B list sources of NATTS core HAPs within 5 miles of the Bronx monitoring sites.

Table 3-33 describes the area surrounding the monitoring sites by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-33. Geographical Information for the Bronx, NY NATTS Sites

Site Code	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Bronx #1, NY	36-005-0110	New York	Bronx	New York-Northern New Jersey-Long Island, NY-NJ-PA	40.81616, -73.90207	Residential	Urban/City Center
Bronx #2, NY	36-055-0080				40.83606, -73.92009		

Table 3-34 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Bronx, NY monitoring sites.

Table 3-34. Population, Motor Vehicle, and Traffic Information for the Bronx, NY NATTS Monitoring Sites

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Bronx-1 & Bronx-2, NY	1,397,287	246,190	6,531,354	100,230	299,125

[1] Reference: Census Bureau, 2010.

[2] County-level vehicle registration reflects 2008 data from the New York State DMV (NYS DMV, 2008). The ratio of vehicle registration to population for Bronx County, NY is 0.18 vehicles per person.

[3] Reference: Data from http://xionetic.com/zipfinddeluxe.aspx and applies to only Bronx #1.

[4] Annual Average Daily Traffic reflects 2008 data from the New York State DOT (NYS DOT, 2008) and applies to only Bronx #1. The traffic estimate is based on data for I-278 between I-87 and I-895 .

[5] VMT reflects 2008 data from the Federal Highway Administration for the New York-Northern New Jersey-Long Island, NY-NJ-PA MSA (FHWA, 2009b).

3.19 Rochester, NY NATTS Monitoring Site

The Rochester, NY NATTS monitoring site is located on the east side of Rochester in western New York State. Figure 3-19 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

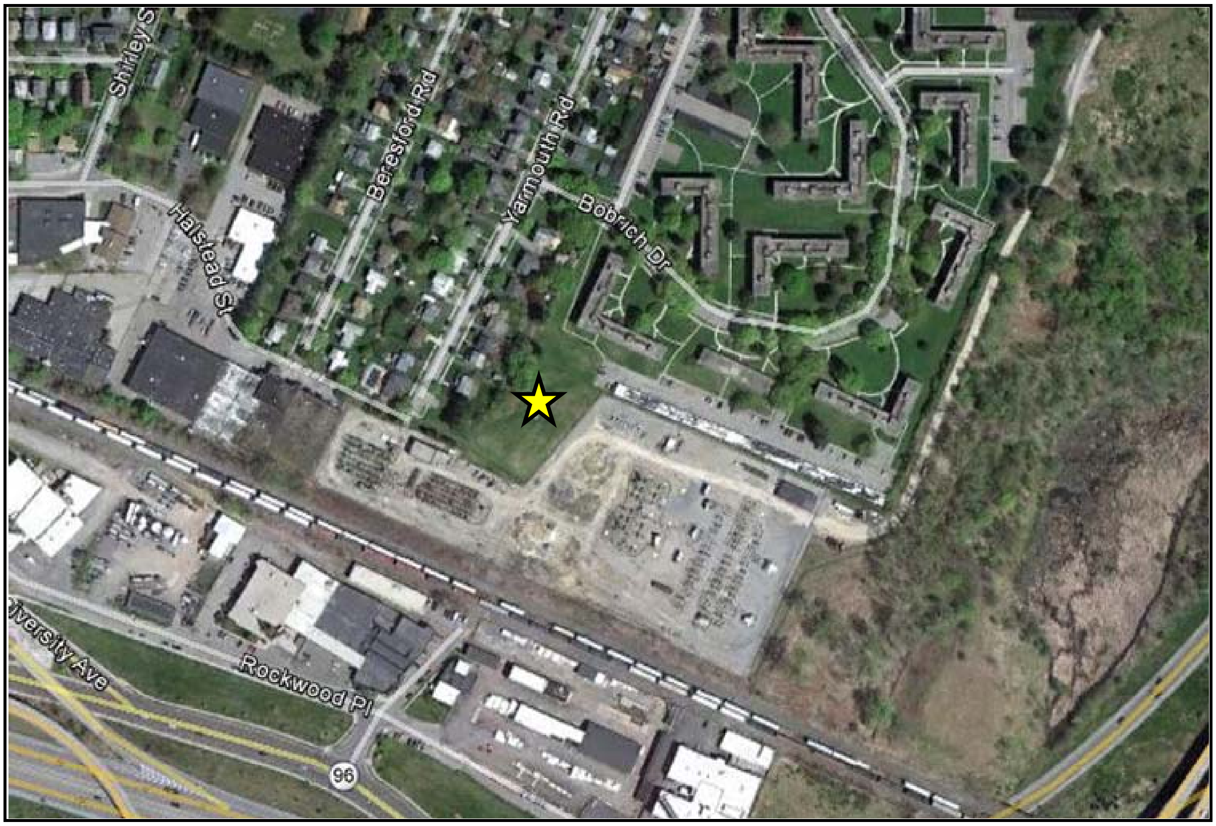


Figure 3-19. Rochester, NY NATTS Monitoring Site

Figure 3-19 shows that the Rochester, NY monitoring site is located at a power station in a primarily residential area. A railroad traverses the area just to the south of the site and interstate highways I-590 and I-490 intersect less than 0.25 miles farther south. Figure B1-18 in Appendix B shows a single stationary emissions point source for all VOCs, with the exception of 1,3-butadiene, located 1.5 miles north-northeast of the monitoring site. Additionally, three sources of lead (PM_{10}) emissions are located less than 1 mile south-southwest, 1 mile northwest, and less than 2 miles north of the NATTS monitoring site. Figure B1-18 also shows historical wind speed and wind direction measurements based on data from the Greater Rochester International Airport National Weather Service Station (WBAN 14768). Winds are predominantly from the south to west-northwest. Table B2-18 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Rochester monitoring site.

Table 3-35 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-35. Geographical Information for the Rochester, NY NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Rochester, NY	36-055-1007	Rochester	Monroe	Rochester, NY	43.146198, -77.54813	Residential	Urban/City Center

Table 3-36 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Rochester, NY monitoring site.

Table 3-36. Population, Motor Vehicle, and Traffic Information for the Rochester, NY Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Rochester, NY	733,703	552,964	636,955	105,038	16,267

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2008 data from the New York State DMV (NYS DMV, 2008). The ratio of vehicle registration to population for Monroe County, NY is 0.75 vehicles per person.[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2008 data from the New York State DOT. The traffic estimate is based on data for I-490 between Winston Road and I-590 (NYS DOT, 2008).
5 VMT reflects 2008 data from the Federal Highway Administration for the Rochester, NY MSA (FHWA, 2009b).

3.20 La Grande, OR NATTS Monitoring Site

The La Grande, OR NATTS monitoring site is in a rural location in La Grande, OR. Figure 3-20 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

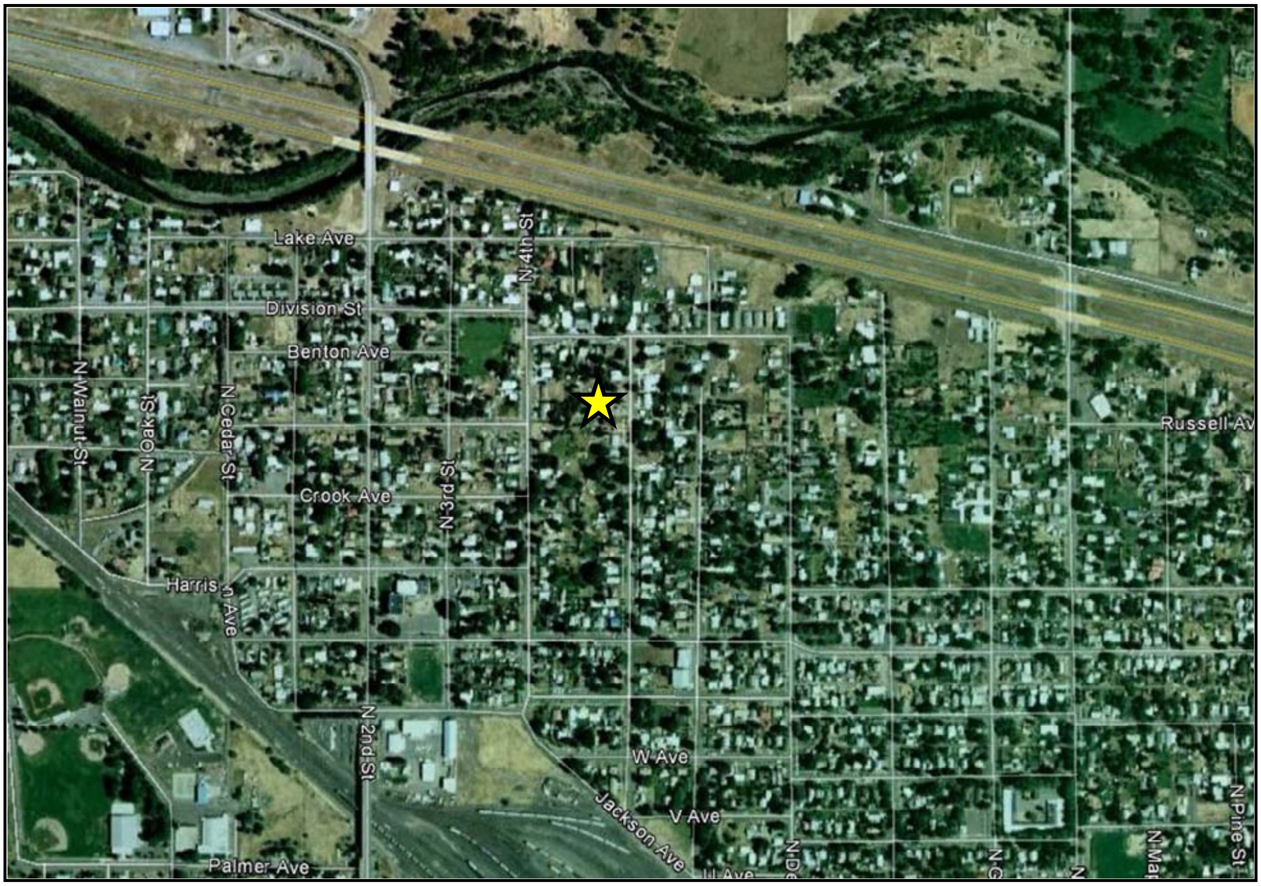


Figure 3-20. La Grande, OR NATTS Monitoring Site

The La Grande monitoring site is located in a rural setting surrounded by residential areas less than 1 mile west of the Old Oregon Trail Highway (I-84). Figure B1-19 in Appendix B shows there are only a few stationary emissions point sources located within 2 miles of the monitoring site. The first stationary emission source is located less than 1 mile southeast of the La Grande site. The pollutant emissions reported for this point source include benzene, PM_{10} metals, carbonyls, and PAHs. A second emissions source located about 1 mile south reports emissions for all VOCs with the exception of 1,3-butadiene. Figure B1-19 also shows historical wind speed and wind direction measurements based on data from the La Grande Airport National Weather Service Station (WBAN 24148). Winds are predominantly from the north, south-southeast to south and west-northwest to north-northwest. Table B2-19 in Appendix B lists sources of NATTS core HAPs near the La Grande site.

Table 3-37 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-37. Geographical Information for the La Grande, OR NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
La Grande, OR	41-061-0119	La Grande, OR	Union	La Grande, OR	45.33897 -118.0945	Residential	Urban/City Center

Table 3-38 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the La Grande, OR monitoring site.

Table 3-38. Population, Motor Vehicle, and Traffic Information for the La Grande, OR Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
La Grande, OR	25,748	25,138	17,003	9,200	NA

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2008 data from the Oregon State DMV(OR DMV, 2009). The ratio of vehicle registration to population for Union County, OR is 1.49 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data. The traffic estimate is based on data for North 2nd Street exit off I-84 (OR DOT 2010).
5 VMT reflects 2009 data from the Oregon Department of Transportation for the La Grande, OR CBSA (OR DOT, 2009b).

3.21 Portland, OR NATTS Monitoring Site

The Portland, OR NATTS monitoring site is located in north-central Portland. Figure 3-21 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

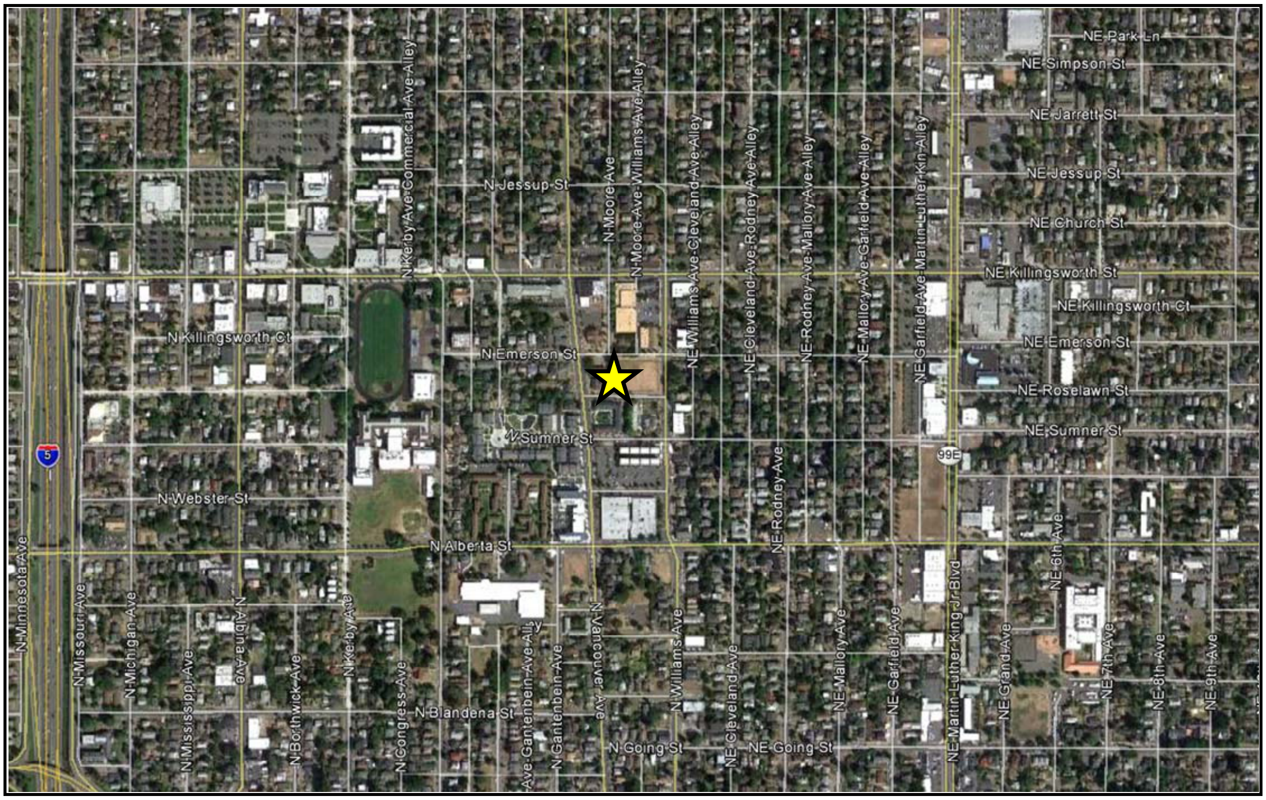


Figure 3-21. Portland, OR NATTS Monitoring Site

Figure 3-21 shows that the Portland, OR monitoring site is located in a primarily residential area. The Jefferson High School track and athletic fields lie to the west of the site, and an apartment complex and Humboldt Primary are located to the southwest. Interstate-5 runs north-south approximately one-half mile to the west, a few blocks from the high school, and Highway 99 parallels I-5 to the east of the monitoring site. Figure B1-20 in Appendix B shows multiple stationary emissions point sources within 2 miles of the Portland, OR monitoring site. Several sources of tetrachloroethylene emissions are located within 1 mile northeast, southeast, southwest and north-northwest of the site. All remaining stationary emissions point sources are located more than 1 mile north-northwest to northeast and south to west-northwest of the monitoring site. To the north-northwest to northeast, emissions sources appear near a railway with reported emissions for all NATTS core pollutants. Southeast of the monitoring site near Highway 99, numerous stationary sources report emissions for tetrachloroethylene while to the south near Highway 30, there are several emissions sources for lead (PM_{10}), VOCs (with the exception of chloroform and vinyl chloride), carbonyls and PAHs. Finally, numerous point sources are located south-southwest to west-northwest of the NATTS site. All NATTS core pollutants with the exception of carbon tetrachloride, trichloroethylene, and vinyl chloride are reported for this area. Figure B1-20 also shows historical wind speed and wind direction measurements, based on data from the Portland Airport National Weather Service Station (WBAN 24229). Winds are predominantly from the east to east-southeast, south to south-southwest, and west to north-northwest. Table B2-20 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Portland monitoring site.

Table 3-39 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-39. Geographical Information for the Portland, OR NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Portland, OR	41-051-0246	Portland	Multnomah	Portland, OR	45.561301, -122.678784	Residential	Urban/City Center

Table 3-40 presents information related to mobile source activity, such as population, traffic, and VMT for the area surrounding the monitoring site.

Table 3-40. Population, Motor Vehicle, and Traffic Information for the Portland, OR Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Vehicles per Person (Registration: Population)	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Portland, OR	714,567	748,648	1.05	1,008,125	5,457	34,294

1 Reference: Census Bureau, 2009.
2 County-level vehicle registration reflects 2007 data from Oregon DMV (OR DMV, 2007). The ratio of vehicle registration to population for Multnomah, OR is 1.05 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2005 data from the Portland BOT. The traffic estimate is based on data for Northeast Killingsworth Street at North Williams Avenue (Portland BOT, 2005).
5 VMT reflects 2008 data from the Federal Highway Administration for the Portland, OR MSA (FHWA, 2009b).

3.22 Providence, RI NATTS Monitoring Site

The Providence, RI NATTS monitoring site is located in South Providence. Figure 3-22 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban/city center location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-22. Providence, RI NATTS Monitoring Site

Figure 3-22 shows the Providence, RI monitoring site in its residential location. The site is located in South Providence between residential areas to the west and south commercial areas to the north and east. A hospital lies to the northeast of the site, just north of Dudley Street. About one-half mile to the east, I-95 runs north-south, then turns northwestward, entering downtown Providence. Narragansett Bay and the Port of Providence are a few tenths of a mile farther to the east, just on the other side of I-95. Figure B1-21 in Appendix B shows multiple emission sources for the pollutants benzene, hexavalent chromium, carbonyls, and PM_{10} metals. Within a 2-mile radius of the monitoring site, the emission sources appear scattered near Highways 1, 6 and 246 and are somewhat clusters to the north, southeast, southwest, and northwest. Figure B1-21 also shows historical wind speed and wind direction measurements, based on data from the Providence T. F. Green Airport National Weather Service Station (WBAN 14765). Winds are predominantly from the north, south to south-southwest, and west to northwest. Table B2-21 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Providence monitoring site.

Table 3-41 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-41. Geographical Information for the Providence, RI NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Providence, RI	44-007-0022	Providence	Providence	Providence-New Bedford-Fall River, RI-MA	41.807949, -71.415	Residential	Urban/City Center

Table 3-42 presents information related to population and mobile source activity, such as population, traffic, and VMT for the area surrounding the Providence monitoring site.

Table 3-42. Population, Motor Vehicle, and Traffic Information for the Providence, RI Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Providence, RI	627,690	142,334	670,441	136,800	26,006

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2006 data from Rhode Island Data Control (RI DC, 2006). The ratio of vehicle registration to population for Providence County, RI is vehicles per person 0.23.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data from the Rhode Island DOT. The traffic estimate is based on data for I-95 near the I-195 interchange (RI DOT, 2009).
5 VMT reflects 2008 data from the Federal Highway Administration for the Providence-New Bedford-Fall River, RI-MA MSA (FHWA, 2009b).

3.23 Chesterfield, SC

The Chesterfield, SC NATTS monitoring site is located about 15 miles south of the North Carolina/South Carolina border, between the towns of McBee and Chesterfield. Figure 3-23 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-23. Chesterfield, SC NATTS Monitoring Site

Figure 3-23 shows that the site is located in a rural area surrounded by forest that is part of the Carolina Sandhills Wildlife Refuge. Figure B1-22 in Appendix B show there are no stationary emission sources within a 2-mile radius of the monitoring site. Figure B1-22 also shows historical wind speed and wind direction measurements based on data from the Monroe Airport National Weather Service Station (WBAN 53872). Winds are predominantly from the north to northeast and the south-southwest to west-southwest. Table B2-22 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Chesterfield monitoring site.

Table 3-43 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-43. Geographical Information for the Chesterfield, SC NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Chesterfield, SC	45-025-0001	Not in a city	Chester-field	Not in a CBSA	34.615367 -80.198789	Forest	Rural

Table 3-44 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Chesterfield monitoring site.

Table 3-44. Population, Motor Vehicle, and Traffic Information for the Chesterfield, SC Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT (thousands)
Chesterfield, SC	43,037	40,133	5,432	650	NA

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2007 data from South Carolina DPS (SC DPS, 2007). The ratio of vehicle registration to population for Chesterfield County, SC is 0.93 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2009 data from the South Carolina DOT. The traffic estimate is based on data for State Road 145 between State Road 109 and US-1 (SC DOT, 2010).
NA = Data are unavailable because the site is not located in a CBSA.

3.24 Houston, TX NATTS Monitoring Site

The Houston, TX NATTS monitoring site is located in Deer Park, southeast of Houston, in east Texas. Figure 3-24 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

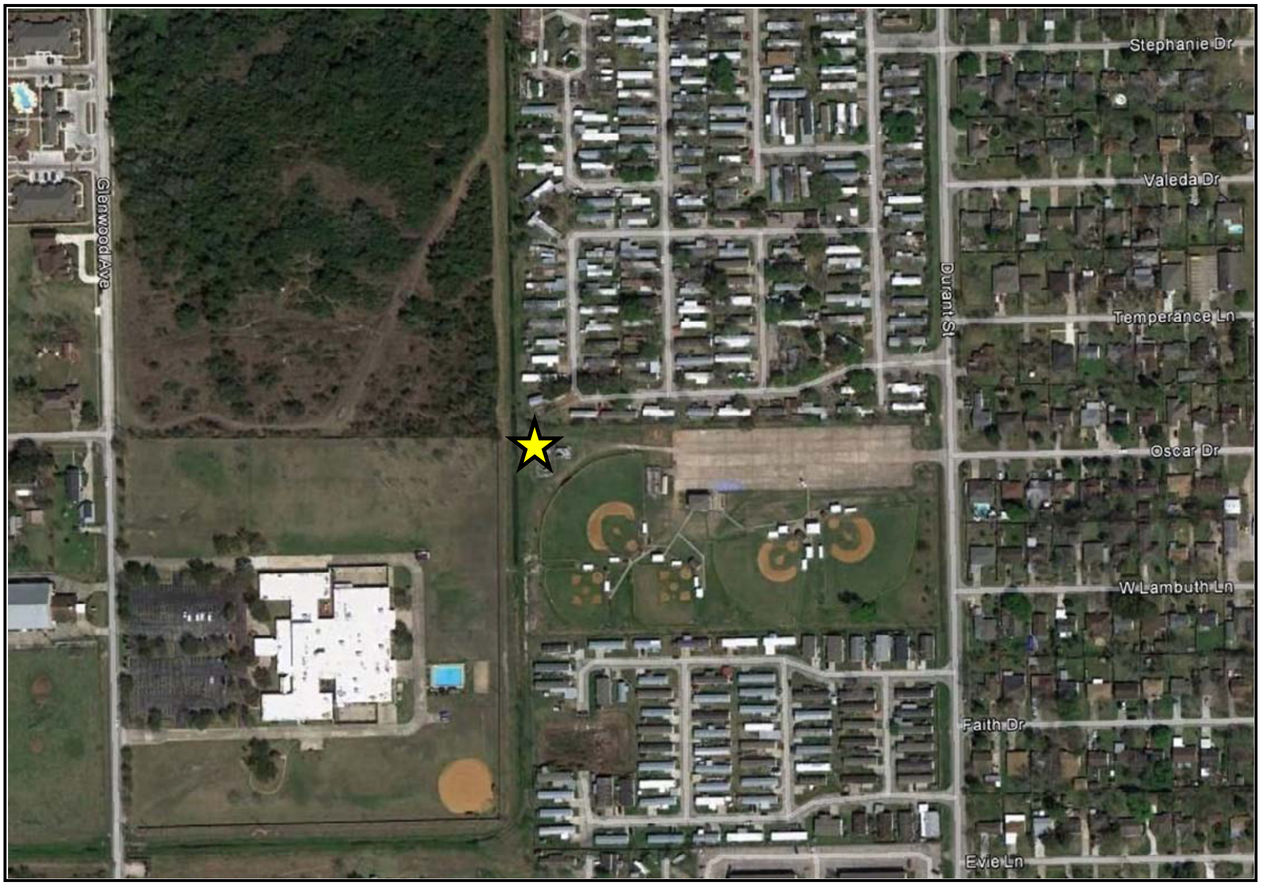


Figure 3-24. Houston, TX NATTS Monitoring Site

Figure 3-24 shows that the Houston monitoring site is in a primarily residential area. The area is near two major thoroughfares: Beltway 8 (1.5 miles) and Highway 225 (nearly 3 miles). Galveston Bay is located to the east and southeast and the Houston Ship Channel, which runs from the Bay westward towards downtown Houston, is located to the north on the other side of Highway 225. Figure B1-23 in Appendix B shows one stationary emission source less than 2 miles southeast of the monitoring site. The NATTS core pollutants reported for this source are: benzene, 1,3-butadiene, lead (PM_{10}), carbonyls, and PAHs. Additionally, an emissions source located slightly more than 2 miles northwest of the monitoring site reports emissions of benzene, 1,3-butadiene, all PM_{10} metals, and hexavalent chromium. Figure B1-23 also shows historical wind speed and wind direction measurements based on data from the Houston Hobby Airport National Weather Service Station (WBAN 12918). Winds are predominantly from the north and southeast to south. Table B2-23 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Houston monitoring site.

Table 3-45 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-45. Geographical Information for Houston, TX NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Houston, TX	48-201-1039	Deer Park	Harris	Houston-Sugarland-Baytown, TX	29.670046, -95.128485	Residential	Suburban

Table 3-46 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Houston monitoring site.

Table 3-46. Population, Motor Vehicle, and Traffic Information for the Houston, TX Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Houston, TX	4,070,989	2,982,632	741,262	31,043	106,872

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the Texas Department of Transportation (TX-DOT, 2009). The ratio of vehicle registration to population for Harris County, TX is 0.73 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2004 data from the Harris County Public Infrastructure Department. The traffic estimate is based on data for Spencer Highway between Red Bluff Road and Underwood Road (HCPID, 2004).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Houston-Sugarland-Baytown, TX MSA (FHWA, 2009b).

3.25 Karnack, TX NATTS Monitoring Site

The Karnack, TX NATTS monitoring site is located in northeastern Harrison County, Texas near Caddo Lake. Figure 3-25 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-25. Karnack, TX NATTS Monitoring Site

Figure 3-25 shows that the monitoring site is in a rural forested area. Figure B1-24 in Appendix B show there are no stationary emission sources within a 2-mile radius of the monitoring site. Figure B1-24 also shows historical wind speed and wind direction measurements based on data from the Shreveport Airport National Weather Service Station (WBAN 13957). Winds are predominantly from the north and southeast to south. Table B2-24 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Karnack monitoring site.

Table 3-47 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-47. Geographical Information for Karnack, TX NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Karnack, TX	48-203-0002	Karnack	Harrison	Longview-Marshall, TX	32.669004, 94.16744	Agricultural	Rural

Table 3-48 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Karnack monitoring site.

Table 3-48. Population, Motor Vehicle, and Traffic Information for the Karnack, TX Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Karnack, TX	65,260	69,883	3,034	1,400	1,544

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2010 data from the Texas State Department of Transportation (TX DOT, 2010). The ratio of vehicle registration to population for Harrison County, TX is 1.07 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Texas DOT. The traffic estimate is based on data for Highway 43 (TX DOT, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Longview-Marshall, TX MSA (FHWA, 2009b).

3.26 Bountiful, UT NATTS Monitoring Site

The Bountiful, UT NATTS site is located north of Salt Lake City, UT situated in a valley between the Great Salt Lake to the west and the Wasatch Mountains to the east. Figure 3-26 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its urban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-26. Bountiful, UT Monitoring Site

Figure 3-26 shows that the site is located in a primarily residential area. The site is located about one-third of a mile from I-15, which runs north-south through most of the surrounding urban area including Salt Lake City, Clearfield, and Ogden. Figure B1-25 in Appendix B shows only a few stationary emission point sources located approximately 2 miles south to southwest of the Bountiful, UT monitoring site. Figure B1-25 also shows historical wind speed and wind direction measurements based on data from the Salt Lake City International Airport National Weather Service Station (WBAN 24127). Winds are predominantly from the southeast to south and north. Table B2-25 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Bountiful monitoring site.

Table 3-49 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-49. Geographical Information for the Bountiful, UT Monitoring Site

Site Code	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Bountiful, UT	49-011-0004	Bountiful	Davis	Ogden-Clearfield, UT	40.902967, -111.884467	Residential	Suburban

Table 3-50 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Bountiful monitoring site.

Table 3-50. Population, Motor Vehicle, and Traffic Information for the Bountiful, UT Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Bountiful, UT	300,827	241,541	251,597	111,065	10,791

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the Utah Tax Commission (UT TC, 2009). The ratio of vehicle registration to population for Davis County, UT is 0.80 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Utah DOT. The traffic estimate is based on data for the intersection of I-15 with US-89, just west of the site (UT DOT, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Ogden-Clearfield, UT MSA (FHWA, 2009b).

3.27 Richmond VA NATTS Monitoring Site

The Richmond, VA NATTS monitoring site is located at the MathScience Innovation Center northeast of the capital city of Richmond, in east-central Virginia. Figure 3-27 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its suburban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

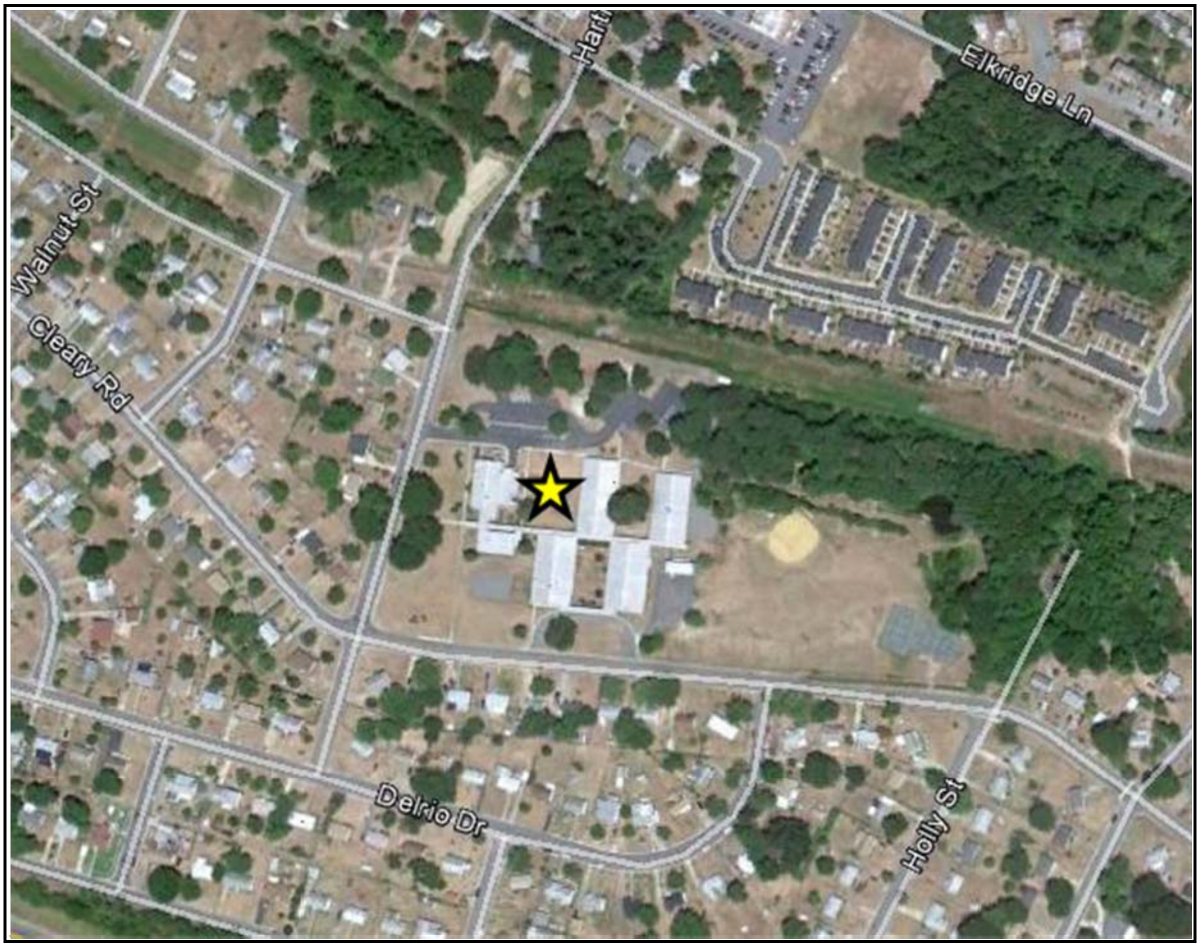


Figure 3-27. Richmond VA NATTS Monitoring Site

Figure 3-27 shows that the Richmond VA monitoring is located in a residential area less than one-fourth mile from I-64. The I-64 interchange with Mechanicsville Turnpike (360) is less than one-half mile southwest of the site. Beyond the residential areas surrounding the site are a golf course to the southeast, a high school to the south, and commercial areas to the west. Figure B1-26 in Appendix B show there are no stationary emission point sources within a 1-mile radius, but shows several less than 2 miles from the NATTS monitoring site. Several stationary VOC emission point sources are scattered from the southeast to southwest along Highway 33. Multiple emissions point sources are reported for manganese, nickel and other PM_{10} metals, naphthalene, and hexavalent chromium approximately 2 miles to the southwest of the site. In addition, a few stationary emissions point sources are reported west-southwest of the site along I-95. Figure B1-26 also shows historical wind speed and wind direction measurements from the Richmond International Airport National Weather Service Station (WBAN 13740). Winds are predominantly from the north to northeast, south to southwest. Table B2-26 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Richmond monitoring site.

Table 3-51 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-51. Geographical Information for the Richmond VA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Richmond, VA	51-087-0014	Not in a City	Henrico	Richmond-Petersburg, VA	37.558333, -77.400278	Residential	Suburban

Table 3-52 presents information related to population and mobile source activity, such as population, traffic, and VMT for the area surrounding the Richmond VA monitoring site.

Table 3-52. Population, Motor Vehicle, and Traffic Information for the Richmond VA Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Richmond, VA	296,415	347,913	477,486	74,000	26,709

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the Henrico County Revenue Department (Henrico County, 2010). The ratio of vehicle registration to population for Henrico County, VA is 1.17 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Virginia DOT. The traffic estimate is based on data for I-64 interchange for US-360 (VA DOT, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Richmond-Petersburg, VA MSA (FHWA, 2009b).

3.28 Underhill, VT NATTS Monitoring Site

The Underhill, VT NATTS monitoring site is located in northern Vermont east of Burlington, VT. Figure 3-28 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

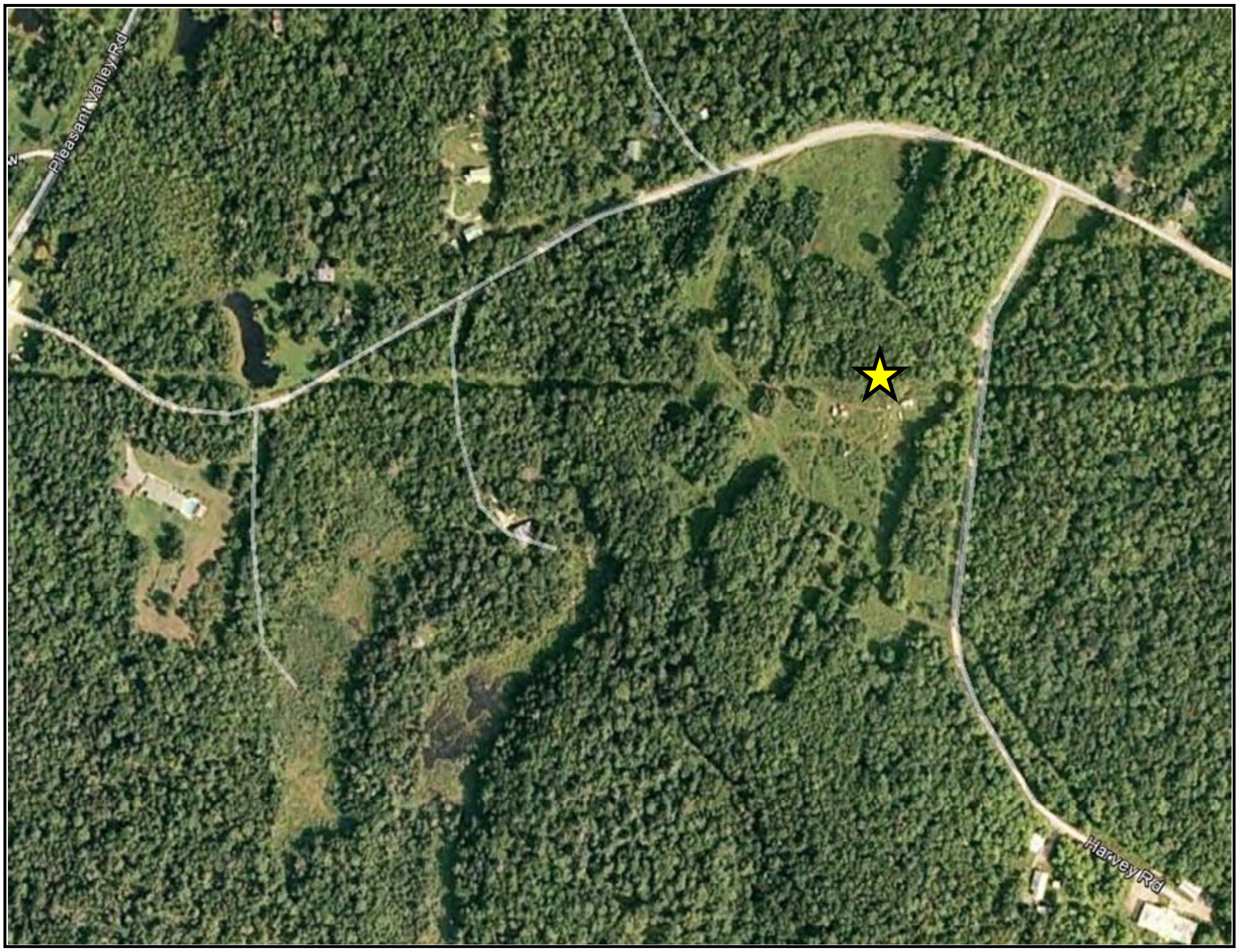


Figure 3-28. Underhill, VT NATTS Monitoring Site

Figure 3-28 shows that the area surrounding the monitoring site is rural in nature and heavily forested. The site is situated on the Proctor Maple Research Farm. Mount Mansfield in Underhill State Park lies less than 3 miles east of the site and the Underhill Artillery Range a few miles to the south. This site is intended to serve as a background site for the region for trends assessment, standards compliance, and long-range transport assessment. Figure B1-27 in Appendix B shows there are no stationary emissions point sources within a 2-mile radius of the site. Figure B1-27 also shows historical wind speed and wind direction measurements based on data from the Morrisville Stowe State Airport National Weather Service Station (WBAN 54771) Winds are predominantly from the north, south to south-southwest, and northwest to north-northwest. Table B2-27 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Underhill monitoring site.

Table 3-53 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-53. Geographical Information for the Underhill, VT NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Underhill, VT	50-007-0007	Underhill	Chittenden	Burlington-South Burlington, VT	44.52839, -72.86884	Forest	Rural

Table 3-54 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Vermont NATTS site.

Table 3-54. Population, Motor Vehicle, and Traffic Information for the Underhill, VT Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Underhill, VT	152,313	223,316	14,408	1,200	3,236

1 Reference: Census Bureau, 2010.

2 County-level vehicle registration reflects 2010 data from the Vermont DMV (VT DMV, 2010). The ratio of vehicle registration to population for Chittenden County, VT is 1.47 vehicles per person.

3 Reference: http://xionetic.com/zipfinddeluxe.aspx.

4 Annual Average Daily Traffic reflects 2005 data from Chittenden County Regional Planning Commission. The traffic estimate is based on data for Pleasant Valley Road, north of Harvey Road (CCRPC, 2005).

5 VMT reflects 2008 data from the Federal Highway Administration for the Burlington-South Burlington, VT MSA (FHWA, 2009b).

3.29 Seattle, WA NATTS Monitoring Site

The Seattle, WA NATTS monitoring site is located in Seattle, WA. Figure 3-29 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its suburban location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-29. Seattle, WA NATTS Monitoring Site

Figure 3-29 shows that the monitoring site is located in a suburban area with a residential community to the west and a golf course to the east to southeast. Interstate 5 is less than 1 mile to the west and intersects with I-90 farther north. Interstate 90 runs east-west across Seattle, and is located less than 2 miles to the northwest of the site. The area to the west of I-5 is industrial while the area to the east is primarily residential. Figure B1-28 in Appendix B shows several stationary emissions sources within 2 miles of the monitoring site. Emissions from these sources include VOCs, carbonyls, PAHs, and several PM10 metals, including five sources of lead emissions. Figure B1-28 also shows historical wind speed and wind direction measurements based on data from Seattle Boeing Field (WBAN 24234). Winds are predominantly from the south to southeast. Table B2-28 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Seattle monitoring site.

Table 3-55 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-55. Geographical Information for the Seattle, WA NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Seattle, WA	53-033-0080	Seattle	King	Seattle-Tacoma-Bellevue, WA	47.568333, -122.308056	Industrial	Suburban

Table 3-56 presents information related to mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Vermont NATTS site.

Table 3-56. Population, Motor Vehicle, and Traffic Information for the Seattle, WA Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Seattle, WA	1,916,441	1,772,343	912,020	236,000	69,801

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2009 data from the Washington DOL (WA DOL, 2009). The ratio of vehicle registration to population for King County, WA is 0.92 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2009 data from the Washington DOT. The traffic estimate is based on data for I-5 near Spokane Street (WA DOT, 2009).
[5] VMT reflects 2008 data from the Federal Highway Administration for the Seattle-Tacoma-Bellevue, WA MSA (FHWA, 2009b).

3.30 Horicon, WI NATTS Monitoring Site

The Horicon monitoring site is located in Horicon, WI. In 2009, the Wisconsin Department of Natural Resources (DNR) relocated the Mayville, WI site 5.1 miles west-northwest to Horicon because the Horicon site was state owned and controlled by Wisconsin DNR. Figure 3-30 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-30. Horicon, WI NATTS Monitoring Site

Figure 3-30 shows that the Horicon NATTS monitoring site is located in a rural area. Highway 28 runs less than 1 mile east to southeast of the site. Figure B1-29 in Appendix B shows there are two stationary emission point sources within 2 miles of the monitoring site. One emissions point source is located 1 mile to the southwest. The NATTS core pollutants reported for the source include all pollutants except 1,3-butadiene. A second stationary emissions point source is located less than 2 miles southeast of the monitoring site and reports emissions of benzene, naphthalene, PM_{10} metals, and carbonyls. Figure B1-29 also shows historical wind speed and wind direction measurements from the West Bend Municipal

Airport National Weather Service Station (WBAN 04875). Winds are predominantly from the west to northwest. Table B2-29 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Horicon monitoring site.

Table 3-57 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-57. Geographical Information for Horicon, WI NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Horicon, WI	55-027-0001	Horicon	Dodge	Beaver Dam, WI	43.466111, -88.621111	Agricultural	Rural

Table 3-58 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Horicon, WI monitoring site.

Table 3-58. Population, Motor Vehicle, and Traffic Information for the Horicon, WI Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT (thousands)
Horicon, WI	87,253	98,211	21,539	5,000	NA

1 Reference: Census Bureau, 2010.
2 County-level vehicle registration reflects 2010 data from the Wisconsin Department of Transportation/DMV (WI DOT/ DMV, 2008). The ratio of vehicle registration to population for Dodge County, WI is 1.13 vehicles per person.
3 Reference: http://xionetic.com/zipfinddeluxe.aspx.
4 Annual Average Daily Traffic reflects 2008 data from the WI Department of Transportation. The traffic estimate is based on data for intersection of Highway 33 and Highway 28 (WI DOT).
NA=Data unavailable.

3.31 Mayville, WI NATTS Monitoring Site

The Mayville, WI NATTS monitoring site is located in Mayville, WI. In 2009, the site was moved because it was located on private property that was potentially for sale. The new site, Horicon, WI is situated on state-owned property 5.1 miles west-northwest of Mayville. Figure 3-31 is a composite satellite image retrieved from Google™ Earth showing the monitoring site in its rural location. Maps and tables in Appendix B identify sources of emissions, including potential mobile source emissions, near the monitoring site. The content of these maps and figures is described in Section 3.2.

Figure 3-31. Mayville, WI NATTS Monitoring Site

Figure 3-30 shows that the Mayville monitoring site is located in a rural and agricultural area. The Mayville site served as a rural background site but may have been impacted by nearby urban areas. Highway 33 to the north and Highway 67 to the west intersect less than 1 mile northwest of the site. Figure B1-30 in Appendix B shows a single stationary emissions point source located less than 1 mile north of the monitoring site. The reported NATTS core pollutants for this source are benzene, hexavalent chromium, and all PM_{10} metals, carbonyls and PAHs pollutant groups. Figure B1-30 also shows predominant historical wind speed and wind direction measurements from the West Bend Municipal Airport National Weather Service Station (WBAN 04875). The predominant winds are from the west. Table B2-30 in Appendix B lists sources of NATTS core HAPs within 5 miles of the Mayville monitoring site.

Table 3-59 describes the area surrounding the monitoring site by providing supplemental geographical information such as land use, location setting, and locational coordinates.

Table 3-59. Geographical Information for Mayville, WI NATTS Site

Site	AQS Code	Location	County	Core-Based Statistical Area (CBSA)	Latitude and Longitude	Land Use	Location Setting
Mayville, WI	55-027-0007	Mayville	Dodge	Beaver Dam, WI	43.435, -88.527778	Agricultural	Rural

Table 3-60 presents information related to population and mobile source activity, such as population, traffic, VMT, and estimated vehicle ownership information for the area surrounding the Mayville monitoring site.

Table 3-60. Population, Motor Vehicle, and Traffic Information for the Mayville, WI Monitoring Site

Site	Estimated County Population[1]	Number of Vehicles Registered[2]	Population Within 10 Miles[3]	Annual Average Daily Traffic[4]	VMT[5] (thousands)
Mayville, WI	87,335	93,219	24,804	3,500	NA

[1] Reference: Census Bureau, 2010.
[2] County-level vehicle registration reflects 2008 data from the Wisconsin Department of Transportation (WI-DOT, 2008). The ratio of vehicle registration to population for Dodge County, WI is 1.07 vehicles per person.
[3] Reference: http://xionetic.com/zipfinddeluxe.aspx.
[4] Annual Average Daily Traffic reflects 2004 data from the Wisconsin Department of Transportation. The traffic estimate is based on data for the intersection of Highway 33 and Highway 67 (WI DOT, 2004).
NA= Data unavailable because the site is not within an MSA.

4.0 NATTS NETWORK REQUIREMENTS

This section describes the requirements that each NATTS monitoring site is expected to meet to ensure that the site generates high quality and consistent data that can be used for trends analysis.

The NATTS Network was created to generate long-term ambient air toxics concentration data at specific fixed sites across the country so that EPA can track trends in ambient air toxics levels. In order for the program to track trends and meet the needs of decision makers and data users, EPA developed a program-level data quality objective (DQO), as discussed in Section 2.2 of this assessment. The trends data quality objective of the NATTS monitoring network is the following:

> *To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.*

To evaluate air toxics trends, data must be generated consistently across all sites in the monitoring network. Monitoring sites must measure the same pollutants, use the same sampling and analytical methods in the same way, meet the same quality specifications, and report data in the same way. Thus, data collection under the NATTS Network is based upon the following key requirements, described in greater detail throughout this section:

- Target analytes that pose the greatest risk to the public and have the greatest impact on the environment (Section 4.1).
- Stable monitoring sites that are operated consistently over time (Section 4.2).
- Strict and specific data quality objectives across the Network (Section 4.3).
- Strict and specific measurement quality objectives (MQOs) and corresponding data quality indicators for the measurement methods (Section 4.4).
- Specified measurement methods performed in a standardized manner across the network (Section 4.5).
- Technical Systems Audits, Instrument Performance Audits, and Proficiency Tests to ensure data quality (Section 4.6).
- Workplans, Quality Assurance Project Plans, and reporting to EPA's Air Quality System Database (Section 4.7).
- Location information and details on the closest off-site meteorological monitoring station (Section 4.8).

The *Technical Assistance Document for the National Air Toxics Trends Stations Program (Technical Assistance Document*) (U.S. EPA, 2009a) provides guidelines for standardization of the sampling, analytical, quality assurance, and reporting methodology. This section presents the key requirements of the NATTS Network and incorporates material from the *Technical Assistance Document*.

Sections 5, 6, and 8 of this assessment present results of the NATTS Network's performance versus these requirements.

4.1 NATTS Network Pollutants

The NATTS Network mandates sampling and analysis for 19 air toxics. Rather than developing measurement quality objectives (MQOs) for each of the 19 analytes, EPA selected the highest risk drivers, per NATA modeling results, for the development of the MQOs. These six analytes are acrolein, arsenic, benzene, 1,3-butadiene, chromium, and formaldehyde. In addition, these six analytes represent three of the four classes of air toxics sampled under the NATTS Network: VOCs, metals, and carbonyl compounds. SVOCs (represented by PAHs) were added to the NATTS Network in 2007/2008, after the initial MQOs were developed.

Table 4-1 identifies the six highest risk drivers, the corresponding 19 NATTS core HAPs, and the remaining HAP analytes that are resolved by the respective sampling and analysis methods for VOCs, PM_{10} metals, carbonyl compounds, and SVOCs. EPA prefers, but does not require, that the full suite of target analytes, including non-HAPs, be analyzed and reported under the NATTS Network. The full suite of target analytes, including non-HAPs, are listed in Tables 4-7 through 4-10 of this section.

Table 4-1. Core HAPs and Additional HAPs Resolved by the Required Test Methods

NATTS Core HAPs (19)	Additional HAPs Resolved by the Required Test Methods (54)	
Highest risk drivers:	acenaphthene	dichloropropylene, *cis-1,3-*
acrolein	acenaphthylene	dichloropropylene, *trans-1,3-*
arsenic	acetonitrile	ethyl acrylate
benzene	acrylonitrile	ethylbenzene
1,3-butadiene	anthracene	ethylene dibromide
formaldehyde	antimony	ethylene dichloride
hexavalent chromium	benz(a)anthracene	fluoranthene
	benzo(b)fluoranthene	fluorene
acetaldehyde	benzo(e)pyrene	hexachlorobenzene
benzo(a)pyrene	benzo(k)fluoranthene	hexachloro-1,3-butadiene
beryllium	benzyl chloride	indeno(1,2,3-cd)pyrene
cadmium	bromoform	mercury
carbon tetrachloride	bromomethane	methyl chloroform
chloroform	carbon disulfide	methyl isobutyl ketone
lead	chlorobenzene	methyl methacrylate
manganese	chloroethane	methyl *tert*-butyl ether
naphthalene	chloromethane	phenanthrene
nickel	chloroprene	propionaldehyde
tetrachloroethylene	chrysene	pyrene
trichloroethylene	cobalt	selenium
vinyl chloride	dibenz(a,h)anthracene	styrene
	dibenzo(g,h,i)perylene	tetrachloroethane, 1,1,2,2-
	dichlorobenzene, *p-*	toluene
	dichloroethane, 1,1-	trichlorobenzene, 1,2,4-
	dichloroethylene, 1,1-	trichloroethane, 1,1,2-
	dichloromethane	xylene, *m-,p-*
	dichloropropane, 1,2-	xylene, *o-*

4.2 Stability of Monitoring Sites

As discussed in Sections 2 and 3 of this assessment, NATTS sample collection systems are sited to assess population exposure and background-level concentrations. To address the geographic diversity of population centers, information on air toxics compounds must be collected in both urban and rural areas. Data arising from urban NATTS sites are used to characterize and assess the range of population exposures across and within urban areas; data arising from rural sites are needed to characterize exposures of non-urban populations, as well as establish background concentrations in order to better assess environmental impacts in both urban and rural areas.

Because the NATTS Network objectives are premised upon long term ambient air measurements, the sites must treated as permanent. Therefore, NATTS sites must be established and maintained in the same location (to the degree practicable) over many years, and NATTS operating agencies must sustain year-round sampling and analysis operations for as many years as the program deems appropriate, following the guidelines specified in the *Technical Assistance Document*. Section 3 of this assessment provides details on the location, participation, and other characteristics of the NATTS monitoring sites.

4.3 NATTS Data Quality Objectives

As described in Section 2.2 of this assessment, EPA applied the DQO process from EPA's *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4* (U.S. EPA, 2006a) to the trends data quality objective of the NATTS Network: *To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error*. EPA applied the DQO process using data collected and analyzed by the 10-city Pilot Monitoring Project as well as EPA's Air Toxics Data Archive. EPA concluded that the trends data quality objective will be met for monitoring sites that meet the following requirements (U.S. EPA, 2002):

- A 1-in-6-day monitoring frequency with at least an 85 percent quarterly completeness.
- Precision controlled to a coefficient of variation (CV) of no more than 15 percent.

Figure 4-1 shows the relationship between the trends data quality objective and the corresponding MQOs and data quality indicators (DQIs) in the NATTS Network. The DQO defines the criteria that a data collection design should satisfy; MQOs control and evaluate various elements of data collection; and DQIs are the metrics that measure the performance of both DQOs and MQOs.

Figure 4-2. NATTS DQO Process

Define the Data Quality Objective	Identify the Method Quality Objective	Measure using the Data Quality Indicator
Define the data quality needed to make correct decision an acceptable percentage of the time.	*Identify the number and type of QC samples with the acceptance criteria for those samples so that the user can control and assess the quality of the data.*	*Measure and statistically assess if the DQO and MQOs are met and provide descriptions of data uncertainty.*
To be able to detect a 15% difference between the annual mean concentrations of two successive 3-year periods within acceptable levels of decision error.	1) Completeness Completeness ≥85% 1- in-6 day sampling	1) Completeness Completeness ≥85% 1-in-6 day sampling
	2) Sensitivity Annually determine NATTS MDL.	4) Sensitivity Ratio of average NATTS MDL to NATTS target MDL ≤1.0
	3) Bias Proficiency tests (PTs) ≤ +/-25% difference from the true concentration	2) Bias Proficiency tests (PTs) ≤ +/-25% difference from the true concentration
	4) Precision Collocated samples +/-15% CV	3) Precision Collocated samples +/-15% CV

Data Quality Indicators (DQIs). The DQIs measure and statistically assess if the MQOs, and accordingly the DQO, are met and provide descriptions of data uncertainty. The DQIs and their application to the NATTS Network are the following (U.S. EPA, 2009a):

- **Completeness** refers to the number of valid samples collected and analyzed as compared to the total number of samples scheduled to be collected. Completeness is considered a quantitative measure of the reliability of air sampling and laboratory analytical equipment and is a measurement of program management efficiency. The NATTS Network requires a completeness of 85 percent or more.
- **Sensitivity** assesses whether the management activities allow quantification, with the appropriate level of certainty, of an acceptable number of values from a monitoring site. Sensitivity is determined by the minimum method detection limits (MDL) in accordance with 40 CFR, Part 136, Appendix B with a 99 percent confidence level and a standard deviation of n-1 degrees of freedom. The NATTS Network requires each site to experimentally determine its MDL on an annual basis.

- **Bias** assesses whether there is a systematic deviation from the true concentration being reported. Bias is measured by conducting performance evaluations based on proficiency testing standards certifications. The NATTS criteria sets the bias to a percent difference of $\leq$25 percent.
- **Precision** assesses whether the data collection approach is repeatable. The estimate of precision (and bias) must be inclusive of the total data collection system, i.e., the estimate should include imprecision related to field, preparation, handling, and laboratory operations. Precision is assessed by using duplicate or collocated sampling. The NATTS criteria sets the precision to a coefficient of variation (CV) of $\leq$15 percent.
- **Representativeness** is a measure of the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. NATTS sites were established at existing ambient air monitoring sites (e.g., $PM_{2.5}$ speciation, PAMS, lead, etc.) as described in Section 3, and are intended to be representative of ambient air quality conditions in both urban and rural settings.
- **Comparability** assesses whether the data from one site compares to the data from another site/sites across the nation. This comparability is achieved by consistently performing specified methods, and by setting the method-specific DQO(s) and establishing the correct MQOs for the DQIs. Periodic assessments of the NATTS Network (such as this network assessment) show comparability between site data. Section 7 allows for comparison of the concentrations of NATTS core HAPs between sites. Section 8 compares the quality of the data among the NATTS monitoring sites in terms of meeting the MQOs.

4.4 NATTS Measurement Quality Objectives

Measurement quality objectives identify the controls and assess various elements of a data collection activity. Through the implementation of the MQOs for the specified methods, and by achieving the acceptance limits for those MQOs, the assumption can be made that the method-specific DQO(s) will be met. As discussed in Section 4.1, the DQOs and corresponding MQOs were developed with regard to the six highest risk drivers: acrolein, arsenic, benzene, 1,3-butadiene, chromium, and formaldehyde. The resulting MQOs are summarized in Tables 4-2 through 4-6 (U.S. EPA, 2009a).

Table 4-2. VOC MQOs

MQO Parameter	Requirement	Acceptance Criteria for Core HAPs
1. Completeness	Valid samples collected compared to samples planned.	>85%
2. Precision	Duplicate samples or collocated samples. Duplicate samples are taken simultaneously through the same collection system. Collocated samples are taken simultaneously through two separate collection systems at the same location. 10 % of total samples - Six per year for 1-in-6 day sampling.	<15% CV
3. Bias	Proficiency Test samples. Two per calendar year.	+/- 25% for each analyte/sample
4. Sensitivity	Experimentally determined MDL conducted per the specifications of 40 CFR Part 136, Appendix B. Determined annually, or after any major instrument change. Minimum of seven low-level canister standards analyzed over a 2-day period (minimum).	Acrolein: ≤ 0.100 $\mu g/m^3$ Benzene: ≤ 0.130 $\mu g/m^3$ 1,3-Butadine: ≤ 0.100 $\mu g/m^3$ Carbon tetrachloride: ≤ 0.170 $\mu g/m^3$ Chloroform: ≤ 0.500 $\mu g/m^3$ Trichloroethylene: ≤ 0.200 $\mu g/m^3$ Tetrachloroethylene: ≤ 0.170 $\mu g/m^3$ Vinyl chloride: ≤ 0.110 $\mu g/m^3$

* The MDL for trichloroethylene has been updated to this concentration since the last update of the *Technical Assistance Document* (April 1, 2009).

Table 4-3. Carbonyl Compounds MQOs

MQO Parameter	Requirement	Acceptance Criteria for Core HAPs
1. Completeness	Valid samples collected compared to samples planned.	>85%
2. Precision	Duplicate samples or collocated samples. Duplicate samples are taken simultaneously through the same collection system. Collocated samples are taken simultaneously through two separate collection systems at the same location. 10% of total samples - Six per year for 1-in-6 day sampling.	<15% CV
3. Bias	Proficiency Test samples. Two per calendar year.	+/- 25% for each analyte/sample
4. Sensitivity	Experimentally determined MDL conducted per the specifications of 40 CFR Part 136, Appendix B. Determined annually, or after any major instrument change. Minimum of seven low-level cartridge standards analyzed over a 2-day period (minimum).	Acetaldehyde: ≤ 0.450* $\mu g/m^3$ Formaldehyde: ≤ 0.080* $\mu g/m^3$
5. Sample Flow Rate Accuracy	Sampler indicated sample flow rate compared to measured sample flow rate determined using a primary standard flow measurement device.	+/- 10%

* The MDLs for acetaldehyde and formaldehyde have been updated to these concentrations since the last update of the *Technical Assistance Document* (April 1, 2009).

Table 4-4. PM_{10} Metals MQOs

MQO Parameter	Requirement	Acceptance Criteria for Core HAPs
1. Completeness	Valid samples collected compared to samples planned.	>85%
2. Precision	Collocated samples. Collocated samples are taken simultaneously through two separate collection systems at the same location. 10% of total samples - 6 per year for 1-in-6 day sampling.	<15% CV
3. Bias	Proficiency Test samples. Two per calendar year.	+/- 25% for each analyte/sample
4. Sensitivity	Experimentally determined MDL conducted per the specifications of 40 CFR Part 136, Appendix B. Determined annually, or after any major instrument change. Minimum of seven low level filters analyzed over a 2-day period (minimum).	Arsenic: ≤ 0.230* ng/m^3 Beryllium: ≤ 0.420 ng/m^3 Cadmium: ≤ 0.560 ng/m^3 Lead: ≤ 15.000* ng/m^3 Manganese: ≤ 5.000* ng/m^3 Nickel: ≤ 2.100 ng/m^3

* The MDL for arsenic, lead, and manganese have been updated to these concentrations since the last update of the *Technical Assistance Document* (April 1, 2009).

Table 4-5. Hexavalent Chromium MQOs

MQO Parameter	Requirement	Acceptance Criteria for Core HAPs
1. Completeness	Valid samples collected compared to samples planned.	>85%
2. Precision	Collocated samples. Collocated samples are taken simultaneously through two separate collection systems at the same location. 10 % of total samples - Six per year for 1-in-6 day sampling.	<15% CV
3. Bias	Proficiency Test samples. Two per calendar year.	+/- 25% for each analyte/sample
4. Sensitivity	Experimentally determined MDL conducted per the specifications of 40 CFR Part 136, Appendix B. Determined annually, or after any major instrument change. Minimum of seven low level filters analyzed over a 2-day period (minimum).	Hexavalent chromium: ≤ 0.00008 $\mu g/m^3$
5. Sample Flow Rate Accuracy	Sampler indicated sample flow rate compared to measured sample flow rate using a primary standard flow measurement device.	+/- 10%

Table 4-6. PAH MQOs

MQO Parameter	Requirement	Acceptance Criteria for Core HAPs
1. Completeness	Valid samples collected compared to samples planned.	>85%
2. Precision	Collocated samples. Collocated samples are taken simultaneously through two separate collection systems at the same location. 10 % of total samples - Six per year for 1-in-6 day sampling.	<15% CV
3. Bias	Proficiency Test samples. Two per calendar year.	+/- 25% for each analyte/sample
4. Sensitivity	Experimentally determined MDL conducted per the specifications of 40 CFR Part 136, Appendix B. Determined annually, or after any major instrument change. Minimum of seven low-level cartridge standards analyzed over a 2-day period (minimum).	Benzo(a)pyrene: ≤ 0.910 ng/m^3 Naphthalene: ≤ 29.000 ng/m^3

4.5 Measurement Methods and Target Method Detection Limits (Sensitivity)

To accomplish the consistency needed to meet the MQOs for the NATTS core HAPs, EPA mandates pollutant-specific sample collection and analysis methods. The *Technical Assistance Document* presents the approach, configurations, and procedures conducted by the EPA National Monitoring Program's (NMP) contract laboratory. The following methods are summarized in the *Technical Assistance Document* and in this section.

- Method TO-15 for sampling and analysis of VOCs
- Method TO-11A for sampling and analysis of carbonyl compounds
- Method IO-3.5 for sampling and analysis of metals (PM_{10})
- EPA approved method for sampling and analysis of hexavalent chromium
- Method TO-13A for sampling and analysis of PAHs.

NATTS agencies wishing to use alternate approaches, configurations, and procedures can apply for Regional EPA approval provided the approaches, configurations, and procedures meet the MQOs (U.S. EPA, 2009a).

To ensure consistency across the NATTS Network, laboratories contracted by NATTS must experimentally determine and report MDLs in accordance with 40 CFR, Part 136, Appendix B. The EPA defines MDL in 40 CFR Part 136, Appendix B as "the minimum concentration of a substance that can be reported with 99 percent confidence that the analyte concentration is greater than zero." This statistical assessment is used to compare different laboratories' performance using the same methods, or the performance of different methods within the same laboratory. MDLs can be operator, method, laboratory, and matrix-specific.

Method for Sampling and Analysis of Volatile Organic Compounds. VOC sampling and analysis are performed in accordance with EPA Compendium Method TO-15 (U.S. EPA, 1999b) adjusted to the procedures presented in EPA's *Technical Assistance Document*. The preferred sampling approach entails collecting ambient air by passing it through specially prepared stainless steel canisters that have been pre-evacuated and passivated for subatmospheric pressure. Prior to field sampling, the passivated canisters are prepared with internal pressures much lower than atmospheric pressure. Using this pressure differential, ambient air flows into the canisters automatically once an associated system solenoid valve is actuated. A mass flow controller on the sampling device inlet ensures that ambient air enters the canister at an integrated constant rate across the collection period. At the end of the 24-hour sampling period, the solenoid valve automatically stops ambient air from flowing into the canister. Subsequently, the VOCs are analyzed by gas chromatography/mass spectrometry (GC/MS).

VOC MDLs are experimentally determined in accordance with 40 CFR Part 136, Appendix B with 99 percent confidence level and a standard deviation estimate having n-1 degrees of freedom. The VOC analyzed by EPA Compendium Method TO-15 generally have detection limits at or below 0.20 ppbv. Therefore, the MDL study standard must be prepared at a concentration of 0.25 ppbv or lower. The maximum acceptable MDLs allowable to ensure consistency across the NATTS Network specified in EPA's *Technical Assistance Document* are presented in Table 4-7.

Method for Sampling and Analysis of Carbonyls. Carbonyl compounds (aldehydes and ketones) are sampled and analyzed following the specifications of EPA Compendium Method TO-11A (U.S. EPA, 1999c), adjusted to the procedures presented in the *Technical Assistance Document*. Ambient air samples for carbonyl analysis are collected by passing ambient air through cartridges containing silica gel coated with *2,4*-dinitrophenylhydrazine (DNPH), a compound known to react selectively and reversibly with many aldehydes and ketones. Carbonyl compounds in ambient air are retained in the sampling cartridge, while other compounds pass through the cartridge without reacting with the DNPH-coated matrix. To eliminate the interference of ozone, removal or scrubbing of ozone from the sample air stream in the field is mandatory. Subsequently, the carbonyls are eluted from the exposed DNPH cartridges using high purity grade solvent and analyzed using a high-performance liquid chromatography (HPLC) with ultraviolet detection.

Table 4-7. Target Method Detection Limits for GC/MS Analysis of VOCs

Pollutant	Target MDL (µg/m^3)	Pollutant	Target MDL (µg/m^3)
NATTS Core VOC HAPs[a]			
Acrolein	≤ 0.100	Chloroform	≤ 0.500
Benzene	≤ 0.130	Tetrachloroethylene	≤ 0.170
1,3-Butadiene	≤ 0.100	Trichloroethylene	≤ 0.500
Carbon Tetrachloride	≤ 0.170[b]	Vinyl Chloride	≤ 0.110
Other VOC HAPs[c]			
Acetonitrile	≤ 0.100	Ethyl Acrylate	≤ 0.071
Acrylonitrile	≤ 0.100	Ethylbenzene	≤ 0.500
Benzyl Chloride	≤ 0.050	Ethylene dibromide	≤ 0.060
Bromoform	≤ 0.910	Ethylene dichloride	≤ 0.040
Bromomethane	≤ 0.010	Hexachloro-1,3-butadiene	≤ 0.500
Carbon Disulfide	≤ 0.500	Methyl Chloroform	≤ 0.030
Chlorobenzene	≤ 0.500	Methyl isobutyl ketone	≤ 0.500
Chloroethane	≤ 0.010	Methyl Methacrylate	≤ 0.500
Chloromethane	≤ 0.020	Methyl *tert*-Butyl Ether	≤ 0.500
Chloroprene	≤ 0.500	Styrene	≤ 0.500
Dichlorobenzene, *p*-	≤ 0.091	Tetrachloroethane, 1,1,2,2-	≤ 0.200
Dichloroethane, 1,1-	≤ 0.030	Toluene	≤ 0.500
Dichloroethylene, 1,1-	≤ 0.020	Trichlorobenzene, 1,2,4-	≤ 0.500
Dichloromethane	≤ 0.500	Trichloroethane, 1,1,2-	≤ 0.150
Dichloropropane, 1,2-	≤ 0.050	Xylene, *m/p*-	≤ 0.500
Dichloropropylene, *cis*-1,3-	≤ 0.300	Xylene, *o*-	≤ 0.500
Dichloropropylene, *trans*-1,3-	≤ 0.300		
Non-HAP VOCs[d]			
Acetylene		Dichloroethylene, *trans*-1,2-	
tert-Amyl methyl ether		Dichlorotetrafluoroethane	
Bromochloromethane		Methyl ethyl ketone	
Bromodichloromethane		Octane, *n*-	
tert-Butyl ethyl ether		Propylene	
Dibromochloromethane		Trichlorofluoromethane	
Dichlorobenzene, 1,3-		Trichlorotrifluoroethane	
Dichlorobenzene, *o*-		Trimethylbenzene, 1,2,4-	
Dichlorodifluoromethane		Trimethylbenzene, 1,3,5-	
Dichloroethylene, *cis*-1,2-			

[a] Target MDLs were published in the April 11, 2012 NATTS Workplan Template at: http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsworkplantemplate.pdf (U.S. EPA, 2012b).
[b] The target MDL was revised from 0.067 µg/m^3 to 0.170 µg/m^3 in Spring 2010, and is not reflected in the NATTS Workplan Template (See Section II.C.1.1 at: http://www.epa.gov/iris/subst/0020.htm).
[c] The MDLs presented here are from the April 2009 version of the *Technical Assistance Document*.
[d] The non-HAP VOCs were published in the April 2009 version of *Technical Assistance Document*.

Carbonyl MDLs are experimentally determined in accordance with 40 CFR Part 136, Appendix B with 99 percent confidence level and a standard deviation estimate having n-1 degrees of freedom. A low-level standard of the carbonyl derivatives is prepared at a concentration within two to five times the estimated MDL. Minimum MDLs that must be achieved for the NATTS Network according to EPA's *Technical Assistance Document* are presented in Table 4-8. For a list of carbonyl compounds measured using Method TO-11A and the respective method-specific MDL, see the *Technical Assistance Document*.

Table 4-8. Target Method Detection Limits for Carbonyl Compounds for the NATTS Network

Pollutant	Target MDL ($\mu g/m^3$)
NATTS Core Carbonyl HAPs[a]	
Acetaldehyde	≤ 0.450
Formaldehyde[b]	≤ 0.080
Other Carbonyl HAPs[c]	
Propionaldehyde	≤ 0.007
Non-HAP Carbonyls[d]	
Acetone	Hexaldehyde
Butyr/Isobutyraldehyde	Isovaleraldehyde
Benzaldehyde	Tolualdehyde
Crotonaldehyde	Valeraldehyde
Dimethylbenzaldehyde, 2,5	

[a] Target MDLs were published in the April 11, 2012 NATTS Workplan Template at: http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsworkplantemplate.pdf (U.S. EPA, 2012b).
[b] The target MDL was revised from 0.98 $\mu g/m^3$ to 0.080 $\mu g/m^3$ in June 2010, and is not reflected in the NATTS Workplan Template (See Section II.C.1.1 at: http://www.epa.gov/iris/subst/0419.htm).
[c] The MDL presented here is from the April 2009 version of the EPA *Technical Assistance Document*.
[d] The non-HAP carbonyls were published in the April 2009 version of the EPA *Technical Assistance Document*.

Method for the Sampling and Analysis of Trace Metals. Sampling and analysis of metals in or on particulate matter is performed in accordance with EPA Compendium Method IO-3.5 (U.S. EPA, 1999d), adjusted to the procedures presented in the EPA *Technical Assistance Document*. Ambient air is pulled through an 8 inch x 10 inch quartz fiber filter for high-volume air sampling, or though a 47 millimeter Teflon® filter for low-volume sampling. The collected particulates are analyzed for metal compounds using an inductively coupled plasma/mass spectrometry (ICP/MS).

Method detection limits are determined according to the procedures of 40 CFR Part 136 Appendix B with the following exceptions (U.S. EPA, 2009a):

- Metals that are measured in the filter blanks at concentrations greater than three times the estimated MDL. Seven to 10 replicate blank filter strips should be analyzed to determine the MDL values (from FACA on 40 CFR Part 136, Appendix B found at http://www.epa.gov/waterscience/methods/det/). The samples should be prepared following the entire analytical method.
- Metal concentrations in the blank filter strips that are below the estimated MDL. In this instance, the filter strips should be spiked and the digested filters should be fortified at a concentration of two to five times the estimated MDL. The samples should be prepared following the entire analytical method.

Table 4-9 presents the target MDLs (U.S. EPA, 2009a).

Table 4-9. Target Method Detection Limits for EPA Compendium Method IO-3.5 for the NATTS Network

Pollutant	Target MDLs (ng/m^3)
NATTS Core Metal HAPs[a]	
Arsenic (PM_{10})	≤ 0.230
Beryllium (PM_{10})	≤ 0.420
Cadmium (PM_{10})	≤ 0.560
Lead (PM_{10})[b]	≤ 15.000
Manganese (PM_{10})	≤ 5.000
Nickel (PM_{10})	≤ 2.100
Non-Core Metal HAPs[c]	
Antimony (PM_{10})	≤ 0.080
Chromium (PM_{10})	≤ 0.850
Cobalt (PM_{10})	≤ 0.020
Mercury (PM_{10})	≤ 0.130
Selenium (PM_{10})	≤ 0.060

[a] Target MDLs were published in the April 11, 2012 NATTS Workplan Template at: http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsworkplantemplate.pdf (U.S. EPA, 2012b).

[b] The required MDL for lead was lowered in 2012 due to a decrease in the health benchmark value for noncancer risk. In addition, the lead MDL (≤ 15 ng/m^3) is equal to the National Ambient Air Quality Standard for lead, which was established in November 2008 (U.S. EPA, 2008b)

[c] The MDL presented here is from the April 2009 version of the EPA *Technical Assistance Document*.

Method for Sampling and Analysis of Hexavalent Chromium. Unlike other trace metals, hexavalent chromium cannot be detected by EPA Compendium Method IO-3.5. The EPA approved method presents details on sample preparation and analysis approved for NATTS use. The EPA-approved method determines the hexavalent chromium ion (Cr^{6+}) from ashless cellulose filters that are acid washed and then impregnated with bicarbonate before exposure to ambient air. After extraction from the filter media, the sample is analyzed for hexavalent chromium using ion chromatography with a post column deriviatization module and ultraviolet-visible detection at 530 nanometers (nm).

The target MDL for hexavalent chromium is 0.08 nanograms per cubic meter (ng/m^3), however, concentrations have been determined below 0.0043 ng/m^3 following this method (U.S. EPA, 2009a).

Method for Sampling and Analysis of Polycyclic Aromatic Hydrocarbons. Sampling and determination of PAH is performed in accordance with EPA Compendium Method TO-13A (U.S. EPA, 1999e) and ASTM 6209-98 (ASTM, 2004) adjusted to the procedures presented in the EPA *Technical Assistance Document*. Ambient air samples for PAH analysis are prepared by passing approximately 200 to 300 m^3 of ambient air through a quartz filter and a pre-cleaned cartridge containing the sorbent PUF/XAD-2®. A high volume flow rate of ambient air and a 24-hour exposure period are needed in order to obtain detectable levels of PAHs. Prior to analysis, the air-exposed filters and sorbent cartridges are extracted together because of post-collection volatilization distributes PAHs between the particulate phase (collected on the filter) and the gaseous phase (collected on the PUF/XAD-2®). The extracted samples are analyzed for PAHs using GC/MS.

MDLs must be determined using the procedure described in the EPA *Technical Assistance Document* using 40 CFR Part 136, Appendix B as a guideline. To follow the guidelines of 40 CFR Part 136, Appendix B, the following steps are required:

- Estimate the MDLs using the lowest calibration standard.
- Determine the spiking level for the sorbent mix using seven to 10 sorbent media spiked with PAH levels two to five times the estimated MDL.
- Prepare and analyze the spiked sorbent media.

Table 4-10 presents the target MDLs found in the EPA *Technical Assistance Document*.

Table 4-10. Target Method Detection Limits for EPA Compendium Method TO-13A Analytes for the NATTS Network: Extraction from Spiked PUF

Pollutant	Target MDL (ng/m^3)
NATTS Core PAH HAPs[a]	
Benzo(a)pyrene	0.910
Naphthalene	29.000
Other PAH HAPs[b]	
Acenaphthene	0.04
Acenaphthylene	0.05
Anthracene	0.05
Benz(a)anthracene	0.06
Benzo(e)pyrene	0.05
Dibenzo(g,h,i)perylene	0.03
Benzo(b)fluoranthene	0.06
Benzo(k)fluoranthene	0.06
Chrysene	0.04
Dibenz(a,h)anthracene	0.05
Fluoranthene	0.05
Fluorene	0.04
Indeno(1,2,3-cd)pyrene	0.04
Phenanthrene	0.06
Pyrene	0.06
Non-HAP PAHs[c]	
Coronene	Perylene
Cyclopenta(c,d)pyrene	Retene
Fluorenone, 9-	

[a] Target MDLs were published in the April 11, 2012 NATTS Workplan Template at: http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsworkplantemplate.pdf (U.S. EPA, 2012b).

[b] The MDLs presented here are from the April 2009 version of the EPA *Technical Assistance Document*.

[c] The non-HAP PAHs are published in the April 2009 version of the EPA *Technical Assistance Document*.

4.6 NATTS QA Program Requirements

To ensure the quality of the data collected under the NATTS network, the EPA Office of Air Quality Planning and Standards (OAQPS) has implemented a Quality System that comprises three primary components: (1) Technical Systems Audits (TSAs), (2) Instrument Performance Audits (IPAs) for both the network sites and the associated sample analysis laboratories, and (3) Proficiency Tests (PTs). EPA requires that NATTS sites participate in these quality system activities.

Technical Systems Audits. A TSA is a thorough and systematic on-site qualitative audit, where facilities, equipment, personnel, training, procedures, and record keeping are examined for conformance to the Quality Assurance Project Plan (QAPP), activities that can be categorized as follows:

- Field: media handling, sampling, and shipping.
- Laboratory: media preparation and shipping, sample receipt, preparation, analysis, associated QA/QC, and data archiving.
- Data management: data flagging, editing, security, and uploading.

Each NATTS site and corresponding laboratory is typically audited every 3 years, the detailed schedule for which is determined annually by EPA's NATTS QA Manager (QAM). While most TSAs are conducted by the NATTS QA Contractor, in some instances the affiliated EPA Regional Office volunteers to perform the audit. The NATTS QAM allows for these audits to supplant the contractor audits as long as the Regional Office follows the established NATTS audit protocol.

Key personnel that are interviewed during the audits are those individuals with responsibilities for planning, field operations, laboratory operations, quality assurance/quality control (QA/QC), data management, and reporting. To increase uniformity of the TSA, an audit checklist, developed by the contractor and approved by the EPA NATTS QAM, is used. This checklist is based on the *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5) guidance (U.S. EPA, 2001). Following the audit, the audit team prepares a brief written summary of findings, organized into the following areas: planning, field operations, laboratory operations, QA/QC, data management, and reporting. Problems with specific areas are discussed and ranked in order of their potential impact on data quality.

The major post-audit activity is preparation of the systems audit report. To prepare the report, the audit team compares observations with collected documents and results of interviews and discussions with key personnel. Expected QAPP implementation is compared with observed accomplishments and deficiencies and the audit findings are reviewed in detail. The TSA report is then prepared and submitted to the EPA QAM within 30 calendar days of completing the audit. The QAM distributes the draft audit report to the NATTS agency's monitoring and laboratory principal contacts, as well as the affiliated Regional Office. The NATTS agency has 2 weeks to respond to comments. Upon receipt of comments, a contractor under the direction of the EPA QAM incorporates the response to comments. The final report is distributed to the NATTS agency and EPA Regional Office.

Instrument Performance Audits. An IPA is a field operations audit that ascertains whether the samplers are operating within the specified limits as stated in the standard operating procedures (SOPs) and QAPP. The performance audit is completed in conjunction with the field TSA. The audit consists of challenging the samplers to operate using independent NIST-traceable orifices or other flow devices. Once the audit has been performed, the flow rate is calculated and compared against the flow rates as specified in the QAPP or SOPs. If the flow rates are not within these ranges, then the field operations technician is notified and corrective action ensues. Once the field technicians have remedied the situation, a post audit confirms the adjustment or maintenance. The audit results are then written in a detailed report and are included in the Quality Assurance Annual Report (QAAR).

Proficiency Tests. An additional and integral aspect of the NATTS Quality System is periodic Proficiency Testing (PT) of VOC, carbonyl, metals, and PAH samples. The PT program is intended to provide quantitative assessment of laboratory performance and to ensure that sampling and analysis techniques are consistent with precision, bias, and MDLs specified by the NATTS MQOs.

In addition to the TSA and PT program components, EPA requires that each NATTS agency participate in the following activities, as specified in the NATTS Workplan template (U.S. EPA, 2012b):

- Review and update the prior year's QAPPs.
- Comply with the requirements of ANSI/ASQC E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs."
- Submit air toxics collocated, duplicate and replicate data, as applicable, to the EPA Air Quality System (AQS) database within 120 days after the end of the calendar quarter.
- Participate in NATTS teleconference calls that are initiated by OAQPS.
- Participate in EPA Regional air toxics monitoring teleconferences.
- Provide OAQPS and/or its QA contractor with updated (not less than annually) MDLs upon request.

NATTS Quality Assurance Annual Report. Each calendar year, EPA prepares a report that describes and summarizes the QA data generated by the NATTS Network during that calendar year. The EPA QAARs are available at www.epa.gov/ttnamti1/airtoxqa.html. The following general categories of information are presented (U.S. EPA, 2009b):

- Descriptive background information on the AQS site identities, compounds of interest, and MQOs.
- Assessment of the completeness of the data available in the AQS database.
- Precision estimates, independently, for analytical and overall sampling error computed for as many of the applicable compounds and for as many of the 27 NATTS sites as available for the calendar year.
- Evaluation of an analytical laboratory's accuracy (or bias), based on analysis of blind audit PT samples.
- Field bias data, which are expressed as the differences between actual and measured sampler flow readings for each of the four different sampler types associated with VOCs, carbonyls, PAHs, and PM_{10} metals, for primary and collocated samplers (where available) at the sites visited during the IPAs conducted during the calendar year.
- MDL data for each site and/or analytical laboratory.

4.7 Other NATTS Network Requirements

The NATTS Network contains other administrative requirements, which taken collectively, help ensure success of the NATTS Network. The following are descriptions of these individual requirements.

Workplans. Each NATTS site must prepare a site-specific workplan at the outset of each funding period of the project. It describes the overall goals and vision of the project and includes the elements that the site will utilize to meet those goals. EPA prepared a Workplan Template for the NATTS Network that outlines the content of the workplans (U.S. EPA, 2012b). For a full description of these requirements, see the NATTS Workplan Template at www.epa.gov/ttnamti1/files/ambient/airtox/nattsworkplantemplate.pdf:

- Project description/objectives
  - Project outputs and outcomes
  - Linkage to the U.S. EPA's Strategic Goals
- Project network design plan
  - Site selection
  - Meteorological measurements
  - Measured pollutants
- Monitoring protocols
  - Sampling methods and MDLs
  - Sampling frequency, duration, and quantity
- Quality Assurance Project Plan (see below for details)

- Reporting (see below for details)
- Budget
- Measures of Success

Quality Assurance Project Plans. Each NATTS site must prepare a site-specific Quality Assurance Project Plan (QAPP). The preparation and implementation of a QAPP is critical to the success of the NATTS Network. Each site-specific QAPP details how environmental operations are planned, implemented, documented, and assessed.

For all EPA-funded programs, QAPPs must be composed of standardized recognizable elements encompassing the entire project from planning to implementation to assessment. The QAPP integrates the contributions and requirements of everyone involved into a clear, concise statement of what needs to be accomplished, how it will be done, and by whom. It must contain understandable instructions to those who implement the QAPP, including the field sampling team, the analytical laboratory, and the data reviewers.

In general, the QAPP must provide sufficient detail to demonstrate that:

- Technical DQOs are identified.
- Measurement and method quality objectives (MQOs) are appropriate to achieve the DQOs.
- Assessment procedures (DQIs) are sufficient to confirm that data and quality needed to achieve the DQO(s) are obtained.
- Any limitations on the use of the data can be identified and documented (U.S. EPA, 2000b).

For the NATTS Network, each site-specific QAPP must be prepared according to the EPA Requirements for Quality Assurance Project Plans (U.S. EPA, 2000b). EPA prepared a model QAPP to be used for the Air Toxics Monitoring Program (U.S. EPA, 2007). NATTS sites are required to provide a copy of the QAPP to all personnel involved with the monitoring program. The QAPP is reviewed, revised as necessary, and approved by the EPA Regional Office in which that NATTS site is located to ensure consistency with achieving the DQO of the NATTS Network. The document should be reviewed annually and, if revisions are necessary, submitted for approval.

Reporting Requirements. Reporting data is another element essential to the success of the NATTS Network. The integrity of the data collected and compiled in an acceptable management system is critical.

In the NATTS workplan described above, each site must provide a detailed narrative about data management and reporting.

The following are required for each NATTS site:

- Report all quality assured ambient monitoring data to the AQS database on a quarterly schedule within 120 days of completing a data collection quarter.
- Follow all guidelines and procedures as detailed in Chapter 5 of the EPA *Technical Assistance Document*, which include, but are not limited to, the following:
  - Include values below MDL; data value substitutions (e.g., one-half MDL) are not acceptable.
  - Include MDLs with data reported to AQS.
  - Specify the reporting units for all data, to include MDLs, as specified in Section 5.3.1.4 of the NATTS TAD (i.e., ppbv, ppbc, $\mu g/m^3$, ng/m^3) specific to each target pollutant. Units of mass per cartridge or filter are not acceptable.
  - Report the "Collecting" and "Analyzing" agencies for each monitor, in addition to the AQS required "Reporting" agency and "PQAO." Thereafter, only subsequent changes need be entered.
  - Submit quality assurance data (collocated, duplicate and replicate), as applicable, to the AQS database within 120 days after the end of the quarter.
    - Definitions for collocated, duplicate, and replicate data (as well as associated requisite reporting procedures) are provided in Section 5.3.1.5 of the EPA *Technical Assistance Document*.

4.8 Beneficial Supplemental Data

Meteorological Measurements. Although the measurement of site-specific meteorological parameters is not a requirement of the NATTS Network, it is highly desirable, especially in instances where the closest meteorological monitoring stations may be too far away to be representative. If site-specific meteorological monitoring data are not conducted, NATTS requires that each site provide location information and details on the closest off-site meteorological monitoring station.

In all cases, specific site characteristics should be well-documented, especially where surface characteristics and/or terrain are not uniform and when standard exposure and siting criteria cannot be met. Site-specific placement of measuring devices is dependent upon the type of terrain and the measurement techniques of each parameter. As a general rule, meteorological sensors should be sited at a distance beyond the influence of obstructions and the measurements should be representative of the type of meteorological conditions in the area of interest. Guidance and concerns regarding the measurement in complex terrains are addressed in *A Meteorological Monitoring Guidance for Regulatory Modeling Applications* (U.S. EPA, 2000c).

NATTS recommends that meteorological data be processed using hourly averages. The data acquisition clock should have an accuracy of ±1 minute per week. The recommended procedures for quality assurance and audit activities for the meteorological monitoring system are found in *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, Version 1.0 (Draft)* (U.S. EPA. 2006b).

System specifications for meteorological measurements are presented in Table 4-11.

Table 4-11. System Specifications for Meteorological Measurements

Parameter	Method	Reporting Units	Operating Range	Resolution
Wind speed	cup, propeller, or sonic anemometer	meters per second (m/s)	0.5 to 50 m/s	0.1 m/s
Wind direction	vane or sonic anemometer	degrees	0 to 360° (540°)	1
Temperature	thermistor	degrees Celsius (°C)	-30 to 50 °C	0.1 °C
Dew point	psychrometer or hygrometer	°C	-30 to +30 °C	0.1 °C
Solar radiation	pyranometer	watts/m^2 (W/m^2)	0 to 1100 W/m^2	10 W/m^2
Barometric pressure	aneroid barometer	millibar (mb)	600 to 1,100 hectopascals (hPa)	0.5 hPa
Precipitation	tipping bucket	millimeters per hour (mm/hour)	0 to 250 mm/hour	0.25 mm

5.0 AQS DATA REPORTING

This section provides a comprehensive assessment of NATTS data reported to EPA's Air Quality System (AQS). More information on AQS can be found at: http://www.epa.gov/ttn/airs/airsaqs/

An important component of this assessment is to evaluate how NATTS data were reported to EPA's Air Quality System (AQS). EPA's AQS is a computer-based system for handling storage and retrieval of information pertaining to airborne pollutants. AQS contains data from state and local agencies, tribes, and federal organizations, including descriptions of air monitoring sites and monitoring equipment, measurement concentrations of air pollutants and related parameters, and calculated summary and statistical information. Reporting agencies submit air quality data as formatted transactions using EPA's Central Data Exchange (CDX). Users of AQS can upload and download data using standard or ad-hoc queries. Although not required for most air toxic programs, state and local agencies are encouraged to upload their ambient monitoring data to AQS. From an external viewpoint, the level of confidence in the quality of the generated NATTS data in AQS is related to the amount and quality of metadata surrounding the actual data concentrations. "Metadata," in the case of AQS, is the surrounding detailed information—information such as explanations of voided samples or flags to mark data that are in need of special attention (e.g., out of expected data ranges, nearby wildfire event, cleanup after weather event, etc.).

Since the inception of the NATTS Network in 2003, there has been a requirement for NATTS operating agencies to report the data into AQS. Beginning July 2011, EPA mandated that NATTS operating agencies also report lab-specific method detection limits (MDLs) for each concentration data point. Also beginning in July 2011, EPA mandated reporting of analytical precision data.

Table 5-1 provides an overview of the data fields in AQS pertaining to the submittal of concentration data using the "Raw Data" or RD format. Required data elements are denoted with an asterisk (*).

Table 5-1. Data Elements for Submittal into AQS

Data Element	Data Element Description
RD*	Indicates the dataset is in the "Raw Data" format.
Action Code*	Indicates the action (input, delete, etc.) for the data file.
State Code*	Unique 2-digit Federal Information Processing System (FIPS) code for the state in which the monitoring site is located.
County Code*	Unique 3-digit FIPS code for the county in which the monitoring site is located.
Site ID*	Unique 4-digit identifier for the monitoring site.
Parameter*	Unique 5-digit code indicating the variable being

Table 5-1. Data Elements for Submittal into AQS

Data Element	Data Element Description
	measured.
POC*	Parameter Occurrence Code. Identifies the monitor in which the variable is being measured.
Sample Duration*	Unique AQS code that defines the time length of the sample.
Unit*	Unique AQS code that defines the engineering units of the measurement variable.
Method*	Unique AQS code that defines the sampling and analysis protocols for the measurement variable.
Date*	Date of the measurement variable in YYYYMMDD format.
Start Time*	Start time of the measurement in HH:MM format.
Sample Value*	Value of the measurement variable.
Null Data Code	Unique AQS code that explains the missing or voided measurement.
Sampling Frequency	Unique AQS code that defines the sampling schedule of the measurement variable.
Monitor Protocol (MP) ID	AQS protocol identifier for associated precision and accuracy records.
Qualifier 1-10	Unique data qualifier code that defines information that qualifies the measurement variable sample value (up to 10 codes).
Alternate Method Detectable Limit	Instrument method detection limit for the measurement variable applicable to the analyzing entity.
Uncertainty	Estimate of uncertainty bounding the measurement variable.

* = Mandatory reporting field

When data are generated under the NATTS Program, these data should have been uploaded into AQS in a timely manner, typically 120 days after the calendar year of measurements (i.e., 2010 data should have been in AQS by April 30, 2011). Given the importance of this assessment, data were not extracted from AQS until December 2011 to ensure that NATTS operating agencies had sufficient opportunity to upload data.

This assessment explores the AQS data reporting in several ways, including the following:

- Missing datasets
- Missing pollutants within a reported dataset
- Missing concentration records within a reported dataset
- Confirming if samples were taken on a consistent 1-in-6 day schedule nationally
- Reported engineering units
- Appropriate reporting of non-detects
- Miscoding of data elements

- Reported Alternate Method Detectable Limit data.

Other metrics (which are not required) explored in this assessment include the following:

- Use of data qualifiers and null codes
- Under-MDL reporting of data
- Reporting of collocated/replicate/duplicate data
- Reporting of non-NATTS Core HAPs
- Reporting of non-HAPs
- Reporting of meteorological measurements.

5.1 Data Retrieval

In December 2011, EPA retrieved over 27 million data records from AQS for all NATTS sites from 2003 through 2010. As described in Section 3 of this assessment, NATTS monitoring sites are typically collocated with other air monitoring programs, such as the Speciation Trends Network (STN), Photochemical assessment Monitoring Stations (PAMS), or with criteria air pollutant monitoring data (e.g., ozone). Of the total number of records retrieved, nearly 30% were meteorological records and approximately 22% were criteria air pollutant records. Hazardous air pollutant (HAP) data represented 8% of the data pulled for initial screening. Included in this dataset are any precision records coded in the AQS Raw Precision (RP) format.

Just as other air monitoring parameters are measured at NATTS sites, concurrent monitoring of similar pollutants often takes place, such as for hourly benzene measurements. Because of this, much time was invested in identifying and selecting the data generated exclusively for the NATTS Program. EPA primarily used its Quality Assurance Annual Reports (QAARs) to help identify the relevant parameter occurrence code (POC) specific to each NATTS site-pollutant dataset by year. In situations where those data were not readily available, EPA contacted the various NATTS operating agencies for the correct POC. As part of this assessment, all POCs by site, year, and pollutant group are presented in Table 5-2. The POC merely identifies the monitor in which the variable is being measured. In general, most of the NATTS sites began sampling in 2003 or 2004, with some exceptions noted at end of Table 5-2. Additionally, hexavalent chromium was added to the NATTS core HAP list beginning in 2005 and PAHs were added in 2008.

Table 5-2. POCs for Primary NATTS Data

Method Group	2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ (AQS Site Code = 04-013-9997)								
VOCs	6	6, 20	20	20	20, 6	6	6	6
Carbonyls	1	1	1	1	1, 30	30	30	30
PM_{10} Metals	[a]	[a]	[a]	1	1	1	1	1
Hexavalent Chromium			[a]	6	6	6	6	6
PAHs					3[b]	3	3	3
Los Angeles, CA (AQS Site Code = 06-037-1103)								
VOCs	[c]				4	4	4	4
Carbonyls	[c]				4	4	4	4
PM_{10} Metals	[c]				2	2	2	2
Hexavalent Chromium			[c]		4	4	4	4
PAHs					6[b]	6	6	6
Rubidoux, CA (AQS Site Code = 06-065-8001)								
VOCs	[c]				4	4	4	4
Carbonyls	[c]				4	4	4	4
PM_{10} Metals	[c]				2	2	2	2
Hexavalent Chromium			[c]		4	4	4	4
PAHs					6[b]	6	6	6
San Jose, CA (AQS Site Code = 06-085-0005)								
VOCs	3	3	3	3	3	3	3	3
Carbonyls	1	1	1	3	3	3	3	3
PM_{10} Metals	[a]	[a]	[a]	[a]	[a]	1	1	1
Hexavalent Chromium			[a]	[a]	[a]	[a]	[a]	[a]
PAHs						1	1	1
Grand Junction, CO (AQS Site Code = 08-077-0017/-0018)[d]								
VOCs	--	6	6	6	6	6	6	6
Carbonyls	--	6	6	6	6	6	6	6
PM_{10} Metals	--	1	3	3	3	3	3	3
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Washington, D.C. (AQS Site Code = 11-001-0043)								
VOCs	--	2	1	2	1	4	4	4
Carbonyls	--	3	3	3	1	2	2	2
PM_{10} Metals	--	1	1	1	1	1	1	1
Hexavalent Chromium			1	1	1	1	1	1
PAHs						1	1	1
Pinellas County, FL (AQS Site Code = 12-103-0026)								
VOCs	--	1	1	1	1	1	1	1
Carbonyls	--	6	6	6	6	6	6	6
PM_{10} Metals	--	5	5	5	5	5	5	5
Hexavalent Chromium				[e]		6	6	6
PAHs						6	6	6
Tampa, FL (AQS Site Code =12-057-3002)								
VOCs	--	1	1	1	1	1	1	1
Carbonyls	--	6	6	6	6	6	6	6
PM_{10} Metals	--	5	5	5	5	5	5	5
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6

Table 5-2. POCs for Primary NATTS Data

Method Group	2003	2004	2005	2006	2007	2008	2009	2010
South DeKalb, GA (AQS Site Code =13-089-0002)								
VOCs	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3
Carbonyls	2	2	2	2	2	2	2	2
PM$_{10}$ Metals	1	1	1	1	1	1	1	1
Hexavalent Chromium			6	6	6	6	6	6
PAHs					6[b]	6	6	6
Chicago, IL (AQS Site Code =17-031-4201)								
VOCs	6	6	6	6	6	6	6	6
Carbonyls	2	2	2,6	6	6	6	6	6
PM$_{10}$ Metals	--	[a]	6	6	6	6	6	6
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Grayson Lake, KY (AQS Site Code =21-043-0500								
VOCs			[f]			1	1	1,6
Carbonyls			[f]			1	1	1
PM$_{10}$ Metals			[f]			1	1	1
Hexavalent Chromium				[f]		6	6	6
PAHs						6	6	6
Hazard, KY (AQS Site Code =21-193-0003								
VOCs	1	1	1	1	1	1	[f]	
Carbonyls	1	1	1	1	1	1	[f]	
PM$_{10}$ Metals	1	1	1	1	1	1	[f]	
Hexavalent Chromium			6	6	6	6	[f]	
PAHs						6	[f]	
Roxbury, MA (AQS Site Code =25-025-0042)								
VOCs	10	10	10	10	10	10	10	10
Carbonyls	3	3	3	3	3	3	3	3
PM$_{10}$ Metals	6	6	6	6	6	6	6	6
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Detroit, MI (AQS Site Code =26-163-0033)								
VOCs	1,6	1	1	1	1	1	1	1
Carbonyls	1,6	1	1	2	1	1	1	1
PM$_{10}$ Metals	1	1	1	1	1	1	1	1
Hexavalent Chromium			1	1	1	1	1	1
PAHs						1	1	1
St. Louis, MO (AQS Site Code =29-510-0085)								
VOCs	6	6	6	6	6	6	6	6
Carbonyls	6	6	6	6	6	6	6	6
PM$_{10}$ Metals	6	6	6	6	6	6	6	6
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Bronx (#1), NY (AQS Site Code =36-005-0110)								
VOCs	1	1	1	1	1	1	1	1
Carbonyls	[a]	2	2	2	2	2	2	2
PM$_{10}$ Metals	[a]	[a]	[a]	[a]	1	1	1	1
Hexavalent Chromium			[a]	[a]	6	6	6	6
PAHs						6	6	6

Table 5-2. POCs for Primary NATTS Data

Method Group	2003	2004	2005	2006	2007	2008	2009	2010
Bronx (#2), NY (AQS Site Code =36-005-0080)								
VOCs	[g]							2
Carbonyls	[g]							2
PM_{10} Metals	[g]							1
Hexavalent Chromium			[g]					6
PAHs						[g]		6
Rochester, NY (AQS Site Code = 36-055-1007)								
VOCs	--	2	2	2	2	2	2	2
Carbonyls	--	2	2	2	2	2	2	2
PM_{10} Metals	--	[a]	[a]	[a]	1	1	1	1
Hexavalent Chromium			[a]	[a]	6	6	6	6
PAHs						6	6	6
La Grande, OR (AQS Site Code =41-061-0119)								
VOCs	--	7	7	7	7	7	7	7
Carbonyls	--	7	7	7	7	7	7	7
PM_{10} Metals	--	7	7	7	7	7	7	7
Hexavalent Chromium			6	6,7	7	7	7	7
PAHs					7[b]	7	7	7
Portland, OR (AQS Site Code =41-051-0246)								
VOCs	[h]					7	7	7
Carbonyls	[h]					7	7	7
PM_{10} Metals	[h]					7	7	7
Hexavalent Chromium			[h]			7	7	7
PAHs						6	7	7
Providence, RI (AQS Site Code =44-007-0022)								
VOC	6	6	2	2	2	2	2	2
Carbonyl	5	5	5	5	5	5	5	5
PM_{10} Metals	1	1	1	1	1	1	1	1
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Chesterfield, SC (AQS Site Code =45-025-0001)								
VOC	--	1	1	1	1	1	1	1
Carbonyl	--	1	1	1	1	1	1	1
PM_{10} Metals	--	1	1	1	1	1	1	1
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Houston, TX (AQS Site Code =48-201-1039)								
VOCs	2	2	2	2	2	2	2	2
Carbonyls	3	3	3	3	3	3	3	3
PM_{10} Metals	1	1	1	1	1	1	1	1
Hexavalent Chromium			[a]	1	1	1	1	1,6
PAHs					1[b]	1	1	1
Karnack, TX (AQS Site Code =48-203-0002)								
VOCs	--	1	1	1	1	1	1	1
Carbonyls	--	1	1	1	1	1	1	1
PM_{10} Metals	--	1	1	1	1	1	1	1
Hexavalent Chromium			[a]	1	1	1	1	1,6
PAHs						1	1	1

Table 5-2. POCs for Primary NATTS Data

Method Group	2003	2004	2005	2006	2007	2008	2009	2010
Bountiful, UT (AQS Site Code =49-011-0004)								
VOCs	6	6	6	6	6	6	6	6
Carbonyls	6	6	6	6	6	6	6	6
PM_{10} Metals	1	1	1	1	1	1	1	1
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Underhill, VT (AQS Site Code =50-007-0007)								
VOCs	--	1	1	1	1	1	1	1
Carbonyls	--	1	1	1	1	1	1	1
PM_{10} Metals	--	1	1	1	1	1	1	3
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Richmond, VA (AQS Site Code =51-087-0014)								
VOCs	[h]					4	4	4
Carbonyls	[h]					2	2	2
PM_{10} Metals	[h]					1	1	1
Hexavalent Chromium			[h]			6	6	6
PAHs						6	6	6
Seattle, WA (AQS Site Code =53-033-0080)								
VOCs	1	1	1	1	6	6	6	6
Carbonyls	1	1	1	1	6	6	6	6
PM_{10} Metals	1	1	1	1	6	6	6	6
Hexavalent Chromium			6	6	6	6	6	6
PAHs						6	6	6
Horicon, WI (AQS Site Code =55-027-0001)								
VOCs	[i]						1	1
Carbonyls	[i]						1	1
PM_{10} Metals	[i]						1	1
Hexavalent Chromium			[i]				6	6
PAHs						[i]	6	6,1
Mayville, WI (AQS Site Code =55-027-0007)								
VOCs	1	1	1	1	1	1	1	[i]
Carbonyls	1	1	1	1	1	1	1	[i]
PM_{10} Metals	--	--	1	1	1	1	1	[i]
Hexavalent Chromium			6	6	6	6	6	[i]
PAHs						6	6	[i]

-- No data were expected because the pollutant group was not scheduled for sampling.

[a] Pollutant group was expected, but not sampled at this site for this year. See Table 5-4 for specific details.

[b] Although PAH sampling officially began in 2008, this site participated in a Pilot Study for PAHs in 2007.

[c] This site was added to the NATTS Network in 2007.

[d] Due to site logistical issues, VOC and carbonyl samplers were placed at 08-077-0018, while the PM_{10} metals, hexavalent chromium, and PAHs samplers were placed at 08-077-0017, which is located within 0.25 miles.

[e] Due to the close proximity of the Tampa, FL site to the Pinellas County, FL site, hexavalent chromium was not initially sampled at Pinellas County, FL. However, a decision was made by EPA to add hexavalent chromium sampling at Pinellas County, FL beginning 2008.

[f] Due to site logistical issues, the Hazard, KY site was moved to the Grayson Lake, KY site in 2008 and was given a new AQS site code.

[g] Due to site logistical issues, the Bronx (#1), NY site was moved approximately 5 miles away in Summer 2010 and was given a new AQS site code.
[h] The Richmond, VA site was added to the NATTS Program in 2008.
[i] Due to site logistical issues, the Mayville, WI site was moved to the Horicon, WI site in 2009 and was given a new AQS site code.

5.2 Method-Specific Datasets in AQS

Table 5-3 summarizes the method-specific datasets for the NATTS sites, as reported in the December 2011 AQS retrieval. Because all the NATTS sites did not begin at the same time and certain methods were added after the inception of the program, the expected number of method-specific datasets varies by site and year. It is important to note that although a method-specific dataset may have been reported to AQS, it is possible that specific pollutants within the dataset may not have been reported. More discussion on these situations are presented in Table 5-5.

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
Phoenix, AZ: AQS Site Code = 04-013-9997							
2003	2	**2**	✓	✓	--	--	--
2004	3	**2**	✓	✓	M[a]	--	--
2005	4	**2**	✓	✓	M[a]	M[a]	--
2006	4	**4**	✓	✓	✓	✓	--
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103							
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001							
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
San Jose, CA: AQS Site Code = 06-085-0005							
2003	3	**2**	✓	✓	M[a]	--	--
2004	3	**2**	✓	✓	M[a]	--	--
2005	4	**2**	✓	✓	M[a]	M[a]	--
2006	4	**2**	✓	✓	M[a]	M[a]	--
2007	4	**2**	✓	✓	M[a]	M[a]	--
2008	5	**4**	✓	✓	✓	M[a]	✓

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
2009	5	**4**	✓	✓	✓	M[a]	✓
2010	5	**4**	✓	✓	✓	M[a]	✓
Grand Junction, CO: AQS Site Code = 08-077-0017/-0018							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**4**	✓	✓	M[a]	✓	✓
Washington, D.C.: AQS Site Code = 11-001-0043							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026							
2004	3	**3**	✓	✓	✓	--	--
2005	3	**3**	✓	✓	✓	--	--
2006	3	**3**	✓	✓	✓	--	--
2007	3	**3**	✓	✓	✓	--	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	5	**4**	✓	✓	✓	✓	--
2006	5	**4**	✓	✓	✓	✓	--
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
Chicago, IL: AQS Site Code = 17-031-4201							
2003	2	**2**	✓	✓	--	--	--
2004	3	**2**	✓	✓	M[a]	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500							
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
Roxbury, MA: AQS Site Code = 25-025-0042							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
St. Louis, MO: AQS Site Code = 29-510-0085							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110							
2003	3	**1**	✓	M[a]	M[a]	--	--
2004	3	**2**	✓	✓	M[a]	--	--
2005	4	**2**	✓	✓	[a,c]	M[a]	--
2006	4	**2**	✓	✓	M[a]	M[a]	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Bronx (#2), NY: AQS Site Code = 36-005-0080							
2010	5	**5**	✓	✓	✓	✓	✓
Rochester, NY: AQS Site Code = 36-055-1007							
2004	3	**2**	✓	✓	M[a]	--	--
2005	4	**2**	✓	✓	M[a]	M[a]	--
2006	4	**2**	✓	✓	M[a]	M[a]	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Portland, OR: AQS Site Code = 41-051-0246							
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Providence, RI: AQS Site Code = 44-007-0022							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
Chesterfield, SC: AQS Site Code = 45-025-0001							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**4**	✓	✓	M[a]	✓	✓
Houston, TX: AQS Site Code = 48-201-1039							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**3**	✓	✓	✓	M[a]	--
2006	4	**4**	✓	✓	✓	✓	--
2007	5	**5**	✓	✓	✓	✓	✓[b]
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Karnack, TX: AQS Site Code = 48-203-0002							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**3**	✓	✓	✓	M[a]	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Bountiful, UT: AQS Site Code = 49-011-0004							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Underhill, VT: AQS Site Code = 50-007-0007							
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓

Table 5-3. AQS Reported NATTS Core HAP Data, December 2011 Data Pull

Year	Expected # of Method-Specific Datasets	Total # of Reported Method-Specific Datasets	VOC Data Reported to AQS	Carbonyls Data Reported to AQS	PM_{10} Metals Data Reported to AQS	Hexavalent Chromium Data Reported to AQS	PAH Data Reported to AQS
Richmond, VA: AQS Site Code = 51-087-0014							
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Seattle, WA: AQS Site Code = 53-033-0080							
2003	3	**3**	✓	✓	✓	--	--
2004	3	**3**	✓	✓	✓	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Horicon, WI: AQS Site Code = 55-027-0001							
2009	5	**5**	✓	✓	✓	✓	✓
2010	5	**5**	✓	✓	✓	✓	✓
Mayville, WI: AQS Site Code = 55-027-0007							
2003	2	**2**	✓	✓	--	--	--
2004	2	**2**	✓	✓	--	--	--
2005	4	**4**	✓	✓	✓	✓	--
2006	4	**4**	✓	✓	✓	✓	--
2007	4	**4**	✓	✓	✓	✓	--
2008	5	**5**	✓	✓	✓	✓	✓
2009	5	**5**	✓	✓	✓	✓	✓
Total							
2003	39	36	14	13	9	NA	NA
2004	68	63	23	23	17	NA	NA
2005	91	81	23	23	19	16	NA
2006	91	85	23	23	20	19	NA
2007	110	103	25	25	24	23	6
2008	140	139	28	28	28	27	28
2009	140	139	28	28	28	27	28
2010	140	137	28	28	26	27	28
ALL	**814**	**783**	**192**	**191**	**171**	**139**	**90**

✓ Reported dataset

-- No data are expected

M Missing dataset

NA Not applicable

[a] Explanation of missing datasets, where available, are presented in Table 5-4

[b] Selected sites were chosen to be part of a pilot study on PAH sampling in 2007.

[c] Although there are data records for this method type and year in AQS, the data were qualified as missing.

Since the inception of the NATTS program, over 95% (783/820) of the expected method-specific datasets from 2003 to 2010 were reported to AQS, as of December 2011. All NATTS sites reported 100% of the expected VOC and PAH datasets to AQS, while nearly 100% (191/192) of the expected carbonyl datasets were reported to AQS. Approximately 91% (171/188 and 139/152, respectively) of the expected PM_{10} metals and hexavalent chromium datasets were reported to AQS.

Table 5-4 summarizes method-specific datasets that were expected, but were not reported to AQS per the December 2011 data retrieval. In many situations, the particular method-specific dataset was not measured for a particular year, so no dataset exists. In other situations, the data exists, but were not uploaded into AQS as of the December 2011 data retrieval. In those situations, the NATTS operating agency may have provided the data directly to EPA for use in this assessment, and this is denoted in Table 5-4.

Table 5-4. Missing Method-Specific Datasets

NATTS Site	Missing Method-Specific Dataset	Comment/Follow-up
Phoenix, AZ	2004-2005 PM_{10} metals 2005 hexavalent chromium	No reason was provided for the missing PM_{10} datasets. Site chose not to sample for hexavalent chromium in 2005.
San Jose, CA	2003-2007 PM_{10} metals 2005-2010 hexavalent chromium	TSP sampling was conducted. Site chose not to sample for hexavalent chromium
Grand Junction, CO	2010 PM_{10} metals	2010 PM_{10} metals dataset sent to EPA directly in January 2012.
Chicago, IL	2004 PM_{10} metals	Entire suite of method PM_{10} metals not sampled in 2004.
Bronx (#1), NY	2003 carbonyls 2003-2006 PM_{10} metals 2005-2006 hexavalent chromium	- Entire suite of method carbonyls not sampled in 2003. - $PM_{2.5}$ sampling was conducted in 2003-2006. - Hexavalent chromium was not sampled in 2005-2006.
Rochester, NY	2004-2006 PM_{10} metals 2005-2006 hexavalent chromium	- $PM_{2.5}$ metals sampling was conducted in 2004-2006 - Hexavalent chromium was not sampled in 2005-2006.
Chesterfield, SC	2010 PM_{10} metals	2010 PM_{10} metals dataset sent to EPA directly in January 2012.
Houston, TX	2005 hexavalent chromium	No reason was provided for the missing datasets.
Karnack, TX	2005 hexavalent chromium	No reason was provided for the missing datasets.

5.3 Pollutant Coverage in AQS

This section summarizes the NATTS core HAPs reported to AQS for each site and year. As mentioned above, although method-specific data may have been reported to AQS, it is possible that not all the NATTS core HAPs within the method were reported. Table 5-5 summarizes the NATTS core HAPs that were reported to AQS from the December 2011 data retrieval.

Special Note on Acrolein. Although acrolein is identified as a NATTS core HAP, the data were not considered for this assessment in terms of data presentations (values, averages, etc). In 2010, OAQPS completed a study that determined acrolein monitoring results could be affected by factors that include how canisters are cleaned in preparation for sample collection and the gas standards used to calibrate analytical equipment.[1] This means that while it is probable that monitors are detecting acrolein in the air, the results of the current sampling and analysis methods are suspect. Because acrolein is a highly reactive pollutant, it can react with other compounds in a sample matrix and form other compounds that complicate the analysis. Also, because other compounds can react to form acrolein, supplemental acrolein levels are potentially present within the canister.[2]

Because of the uncertainty of acrolein measurements, OAQPS has changed the name of the existing acrolein parameter code in AQS (43505) to “Acrolein – unverified” to indicate the current level of uncertainty that exists with the data already reported to AQS. Correspondingly, a new parameter code (43509) has been created in AQS for “Acrolein – verified.” Each owning agency has complete discretion over whether all or a subset of existing data remain in the unverified parameter code, or are re-categorized as verified and moved/reported to this new “verified” parameter code. EPA recommends that already-reported data remain in the unverified method code until agencies evaluate their acrolein monitoring procedures and the quality of reported data.

[1] http://www.epa.gov/ttn/amtic/files/ambient/airtox/20101217acroleindataqualityeval.pdf
[2] http://www.epa.gov/schoolair/pdfs/acroleinupdate.pdf

For verified acrolein, EPA recommends the canister cleanliness testing be performed over a period of time (~2-3 weeks) to ensure that supplemental acrolein is not being formed. This will result in a more representative value of ambient acrolein from the canister. EPA also recommends testing each canister for the stability of acrolein within the canister. This is accomplished by placing a low concentration standard of acrolein into a canister and testing it over a 2 to 3 week period to ensure good stability. The stability of acrolein working standards for calibration purposes is also an issue. EPA recommends purchasing reference stock VOC standard, which includes acrolein at a concentration of 1 ppmv or higher. More accurate acrolein concentrations can be achieved by using higher concentration stock standards and diluting down to working concentration levels. The stability of a VOC standard at 1 ppmv or higher concentration is 6 to 12 months. A VOC standard below 1 ppmv concentration is stable for a much shorter timeframe, which can affect the final concentrations of working standards when diluted.

For verified acrolein, EPA recommends the canister cleanliness testing be performed over a period of time (~2-3 weeks) to ensure that supplemental acrolein is not being formed. This will result in a more representative value of ambient acrolein from the canister. EPA also recommends testing each canister for the stability of acrolein within the canister. This is accomplished by placing a low concentration standard of acrolein into a canister and testing it over a 2 to 3 week period to ensure good stability. The stability of acrolein working standards for calibration purposes is also an issue. EPA recommends purchasing reference stock VOC standard, which includes acrolein at a concentration of 1 ppmv or higher. More accurate acrolein concentrations can be achieved by using higher concentration stock standards and diluting down to working concentration levels. The stability of a VOC standard at 1 ppmv or higher concentration is 6 to 12 months. A VOC standard below 1 ppmv concentration is stable for a much shorter timeframe, which can affect the final concentrations of working standards when diluted.

AQS Parameter Codes of Interest. The following parameter codes were used for December 2011 AQS data retrieval of the 19 NATTS core HAPs:

- Acetaldehyde: 43503
- Acrolein: 43505 and 43509
- Arsenic (PM_{10}): 82103 and 85103
- Benzene: 45201
- Benzo(a)pyrene: 17242
- Beryllium (PM_{10}): 82105 and 85105
- 1,3-Butadiene: 43218
- Cadmium (PM_{10}): 82110 and 85110
- Carbon Tetrachloride: 43804

- Chloroform: 43803
- Formaldehyde: 43502
- Hexavalent Chromium: 12115 and 14115
- Lead (PM_{10}): 82128 and 85128
- Manganese (PM_{10}): 82132 and 85132
- Naphthalene: 17141
- Nickel (PM_{10}): 82136 and 85136
- Tetrachloroethylene: 43817
- Trichloroethylene: 43824
- Vinyl Chloride: 43860

Table 5-5 summarizes the NATTS core HAPs that were reported to AQS from the December 2011 data retrieval.

Since the inception of the NATTS program, over 94% (3,159/3,356) of the expected pollutant-specific datasets from 2003 to 2010 were reported to AQS, as of December 2011. The following pollutant datasets were 100% reported to AQS for all expected sites and years: benzo(a)pyrene (90 datasets out of 90 expected datasets); 1,3-butadiene (192/192); carbon tetrachloride (192/192); chloroform (192/192); naphthalene (90/90); trichloroethylene (192/192); and tetrachloroethylene (192/192). Conversely, the following pollutant datasets were less than 90% reported to AQS for all expected sites and years: acrolein

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Phoenix, AZ: AQS Site Code = 04-013-9997																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103																			
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001																			
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
San Jose, CA: AQS Site Code = 06-085-0005																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	✓	✓
Grand Junction, CO: AQS Site Code = 08-077-0017/-0018																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	✓	✓	✓
Washington, DC: AQS Site Code = 11-001-0043																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
2007	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	✓
2008	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	✓
2009	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chicago, IL: AQS Site Code = 17-031-4201																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	M	M	M	M	M	M	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500																			
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Roxbury, MA: AQS Site Code = 25-025-0042																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033																			
2003	--	✓	✓	✓	✓	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
St. Louis, MO: AQS Site Code = 29-510-0085																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110																			
2003	--	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	M	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	M	--	--
2006	M	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓	✓	M	M	M	M	M	M	M	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#2), NY: AQS Site Code = 36-005-0080																			
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Rochester, NY: AQS Site Code = 36-055-1007																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	M	M	M	M	M	M	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	M	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]
2008	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]
2009	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]
Portland, OR: AQS Site Code = 41-051-0246																			
2008	M	✓	✓	✓[a]	✓	✓	✓	✓	✓[a]	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]	✓[a]
2009	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Providence, RI: AQS Site Code = 44-007-0022																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	✓	✓	M	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chesterfield, SC: AQS Site Code = 45-025-0001																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2005		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	✓[a]	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓	M	M	M	M	M	M	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Houston, TX: AQS Site Code = 48-201-1039																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Karnack, TX: AQS Site Code = 48-203-0002																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	M	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	M	M	M	M	M	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Bountiful, UT: AQS Site Code = 49-011-0004																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓[a]
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underhill, VT: AQS Site Code = 50-007-0007																			
2004	--	✓	✓	✓	✓	✓	✓	✓	✓[a]	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Richmond, VA: AQS Site Code = 51-087-0014																			
2008	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Seattle, WA: AQS Site Code = 53-033-0080																			
2003	--	✓	✓	✓	✓	✓	✓	M	✓	M	✓	✓[a]	✓	✓	✓	✓	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--
2005	M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	M	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	✓[a]	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Horicon, WI: AQS Site Code = 55-027-0001																			
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mayville, WI: AQS Site Code = 55-027-0007																			
2003	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--	--	--	--
2004	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--	--	--	--	--	--	--	--
2005	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2006	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2007	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	--
2008	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-5. AQS Pollutant Reporting for the NATTS Core HAPs

Year	Acrolein	Benzene	Butadiene, 1,3-	Carbon Tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM_{10})	Beryllium (PM_{10})	Cadmium (PM_{10})	Lead (PM_{10})	Manganese (PM_{10})	Nickel (PM_{10})	Hexavalent Chromium	Benzo(a)pyrene	Naphthalene
Total																			
2003	--	14	14	14	14	14	14	13	13	12	9	8	9	9	8	9	--	--	--
2004	--	23	23	23	23	23	23	23	23	23	17	16	16	16	16	16	--	--	--
2005	13	22	23	23	23	23	23	23	23	23	19	18	18	18	18	18	16	--	--
2006	14	23	23	23	23	23	23	23	23	23	20	19	19	19	19	19	19	--	--
2007	22	25	25	25	25	25	25	25	25	25	24	23	23	23	23	23	23	6	6
2008[b]	24	28	28	28	28	28	28	28	28	28	28	27	27	27	27	27	27	28	28
2009[c]	25	28	28	28	28	28	28	28	28	28	28	27	27	27	27	27	27	28	28
2010[d]	25	28	28	28	28	28	28	28	28	28	26	26	26	26	26	26	27	28	28
Total	**123**	**191**	**192**	**192**	**192**	**192**	**192**	**191**	**191**	**190**	**171**	**164**	**165**	**165**	**164**	**165**	**139**	**90**	**90**
Expected	**155**	**192**	**192**	**192**	**192**	**192**	**192**	**192**	**192**	**192**	**188**	**188**	**188**	**188**	**188**	**188**	**155**	**90**	**90**
% Reported	**79**	**99**	**100**	**100**	**100**	**100**	**100**	**99**	**99**	**99**	**91**	**87**	**88**	**88**	**87**	**88**	**90**	**100**	**100**

-- Pollutant was not expected at this site for this year.
✓ Reported pollutant within the method-specific dataset.
M Pollutant missing from the method-specific dataset. Explanation of missing pollutant datasets, where available, are presented in Table 5-6.
[a] Although AQS records are reported for this pollutant, a significant number of records were missing or voided.
[b] Although there were 27 NATTS sites in 2008, for reporting purposes, there were a maximum potential of 28 sites due to the relocation of the Hazard, KY site to the Grayson Lake, KY site mid-year.
[c] Although there were 27 NATTS sites in 2009, for reporting purposes, there were a maximum potential of 28 sites due to the relocation of the Mayville, WI site to the Horicon, WI site in December.
[d] Although there were 27 NATTS sites in 2010, for reporting purposes, there were a maximum potential of 28 sites due to the relocation of the Bronx, NY site mid-year.

(123/155); beryllium (165/188); cadmium (166/188); hexavalent chromium (139/155); lead (166/188); manganese (165/188); and nickel (166/188).

Table 5-6 summarizes pollutant-specific datasets that were expected, but were not reported to AQS per the December 2011 data retrieval. The missing datasets include the ones already identified in Table 5-4, but also Table 5-6 identifies the specific pollutants within the method.

Table 5-6. Missing Pollutant-Specific Datasets

NATTS Site	Missing Pollutant-Specific Dataset	Comment/Follow-up
Phoenix, AZ	- 2004-2005 arsenic, beryllium, cadmium, lead, manganese, and nickel - 2005 hexavalent chromium	- Entire suite of method PM_{10} metals not sampled in 2004-2005. - Hexavalent chromium not sampled in 2005.
San Jose, CA	- 2003-2007 arsenic, beryllium, cadmium, lead, manganese, and nickel - 2005-2010 hexavalent chromium	- TSP sampling was conducted in 2003-2007. - Hexavalent chromium was not sampled in any years.
Grand Junction, CO	2010 arsenic, beryllium, cadmium, lead, manganese, and nickel	Entire suite of method PM_{10} metals dataset for 2010 sent to EPA directly in January 2012.
Washington, D.C.	2005 benzene	Per the NATTS operating agency, 2005 benzene data were miscoded under a different AQS site code. Data were sent to EPA in January 2012.
Chicago, IL	2004 arsenic, beryllium, cadmium, lead, manganese, and nickel	Entire suite of method PM_{10} metals not sampled in 2004.
Bronx (#1), NY	- 2003 acetaldehyde and formaldehyde - 2003-2006 arsenic, beryllium, cadmium, lead, manganese, and nickel - 2005-2006 hexavalent chromium	- Entire suite of method carbonyls not sampled in 2003. - $PM_{2.5}$ sampling was conducted in 2003-2006 instead of PM_{10} sampling. - Hexavalent chromium was not sampled in 2005-2006.
Rochester, NY	- 2004-2006 arsenic, beryllium, cadmium, lead, manganese, and nickel - 2005-2006 hexavalent chromium	- $PM_{2.5}$ metals sampling was conducted in 2004-2006 instead of PM_{10} sampling. - Hexavalent chromium was not sampled in 2005-2006.
Providence, RI	2003 beryllium and 2003 manganese	No reason was provided for the missing datasets.
Chesterfield, SC	2010 arsenic, beryllium, cadmium, lead, manganese, and nickel	Entire suite of method PM_{10} metals dataset for 2010 sent to EPA directly in January 2012.
Houston, TX	2005 hexavalent chromium	Hexavalent chromium was not sampled in 2005.

Table 5-6. Missing Pollutant-Specific Datasets (Continued)

NATTS Site	Missing Pollutant-Specific Dataset	Comment/Follow-up
Karnack, TX	- 2004-2009 beryllium, cadmium, lead, manganese, and nickel - 2005 hexavalent chromium	- Per the NATTS operating agency, these metals were not analyzed from 2004-2009. - Hexavalent chromium was not sampled in 2005.
Seattle, WA	2003 vinyl chloride and 2003 formaldehyde	No reason was provided for the missing datasets.

5.4 Sampling Days Consistent with National Calendar

In order to conduct spatial data variability analysis between the NATTS sites, it is preferred that all sites conduct sampling on the same day and are consistent with a national calendar. EPA prepares a national calendar annually for sampling conducted under its national contract. Table 5-7 presents the number of sampling days by site and year that match the national calendar out of the expected number of sampling days from the national calendar.

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997								
Carbonyls	61/61	61/61	61/61	61/61	60/60	60/61	58/61	57/61
Hexavalent Chromium	--	--	--	58/61	57/60	60/61	57/61	58/61
PAH	--	--	--	--	27/30	59/61	58/61	58/61
PM_{10} Metals	--	--	--	57/61	58/60	58/61	58/61	58/61
VOC	58/61	60/61	61/61	61/61	55/60	54/61	58/61	57/61
Los Angeles, CA: AQS Site Code = 06-037-1103								
Carbonyls	--	--	--	--	60/60	61/61	61/61	60/61
Hexavalent Chromium	--	--	--	--	51/60	60/61	61/61	61/61
PAH	--	--	--	--	38/41	59/61	61/61	60/61
PM_{10} Metals	--	--	--	--	54/60	61/61	60/61	61/61
VOC	--	--	--	--	55/60	60/61	60/61	55/61
Rubidoux, CA: AQS Site Code = 06-065-8001								
Carbonyls	--	--	--	--	60/60	61/61	61/61	58/61
Hexavalent Chromium	--	--	--	--	49/51	57/61	61/61	61/61
PAH	--	--	--	--	32/40	60/61	59/61	61/61
PM_{10} Metals	--	--	--	--	55/60	61/61	60/61	60/61
VOC	--	--	--	--	55/60	59/61	60/61	57/61
San Jose, CA: AQS Site Code = 06-085-0005								
Carbonyls	31/31	30/30	31/31	37/30	60/60	61/61	60/61	61/61

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
Hexavalent Chromium	--	--	--	--	--	--	--	--
PAH	--	--	--	--	--	40/40	60/61	60/61
PM_{10} Metals	--	--	--	--	--	60/61	59/61	60/61
VOC	31/31	30/30	31/31	31/31	51/60	60/61	55/61	61/61
Grand Junction, CO: AQS Site Code = 08-077-0018								
Carbonyls	--	58/61	56/61	59/61	59/60	61/61	61/61	61/61
Hexavalent Chromium	--	--	54/61	60/61	57/60	60/61	61/61	61/61
PAH	--	--	--	--	--	43/45	59/61	61/61
PM_{10} Metals	--	61/61	56/61	60/61	57/60	61/61	60/61	54/61
VOC	--	58/61	56/61	59/61	59/60	60/61	57/61	61/61
Washington, DC: AQS Site Code = 11-001-0043								
Carbonyls	--	60/61	61/61	61/61	59/60	61/61	60/61	61/61
Hexavalent Chromium	--	--	49/49	61/61	60/60	61/61	61/61	61/61
PAH	--	--	--	--	--	31/31	61/61	61/61
PM_{10} Metals	--	42/42	61/61	60/61	59/60	56/61	60/61	60/61
VOC	--	59/61	60/61	61/61	59/60	61/61	60/61	61/61
Pinellas County, FL: AQS Site Code = 12-103-0026								
Carbonyls	--	28/28	60/61	60/61	60/60	61/61	61/61	61/61
Hexavalent Chromium	--	--	--	--	--	32/32	60/61	60/61
PAH	--	--	--	--	--	49/51	60/61	58/61
PM_{10} Metals	--	28/28	61/61	57/61	58/60	60/61	61/61	59/61
VOC	--	28/28	61/61	61/61	59/60	60/61	61/61	61/61
Tampa, FL: AQS Site Code = 12-057-3002								
Carbonyls	--	58/61	60/61	60/61	59/60	61/61	60/61	61/61
Hexavalent Chromium	--	--	59/61	59/61	58/60	61/61	61/61	61/61
PAH	--	--	--	--	--	45/45	60/61	61/61
PM_{10} Metals	--	60/61	59/61	61/61	60/60	61/61	61/61	61/61
VOC	--	61/61	60/61	60/61	60/60	61/61	61/61	61/61
South DeKalb, GA: AQS Site Code = 13-089-0002								
Carbonyls	60/61	60/61	61/61	59/61	59/60	59/61	61/61	61/61
Hexavalent Chromium	--	--	50/52	60/61	43/60	38/61	59/61	60/61
PAH	--	--	--	--	41/42	61/61	60/61	59/61
PM_{10} Metals	61/61	61/61	61/61	61/61	60/60	61/61	61/61	61/61
VOC	60/61	61/61	61/61	61/61	60/60	61/61	61/61	61/61
Chicago, IL: AQS Site Code = 17-031-4201								
Carbonyls	60/61	46/61	54/61	61/61	60/60	61/61	60/61	60/61
Hexavalent Chromium	--	--	57/61	57/61	60/60	61/61	60/61	61/61
PAH	--	--	--	--	--	35/35	60/61	61/61

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
PM_{10} Metals	--	--	59/61	60/61	58/60	61/61	60/61	61/61
VOC	40/40	49/61	58/61	60/61	59/60	61/61	60/61	60/61
Grayson Lake, KY: AQS Site Code = 21-043-0500								
Carbonyls	--	--	--	--	--	26/30	53/61	60/61
Hexavalent Chromium	--	--	--	--	--	30/30	58/61	61/61
PAH	--	--	--	--	--	30/30	57/61	61/61
PM_{10} Metals	--	--	--	--	--	30/30	59/61	61/61
VOC	--	--	--	--	--	28/30	58/61	60/61
Hazard, KY: AQS Site Code = 21-193-0003								
Carbonyls	54/61	61/61	61/61	61/61	60/60	25/26	--	--
Hexavalent Chromium	--	--	56/61	61/61	60/60	26/26	--	--
PAH	--	--	--	--	--	8/8	--	--
PM_{10} Metals	55/61	61/61	59/61	61/61	60/60	25/26	--	--
VOC	61/61	61/61	61/61	61/61	59/60	61/61	--	--
Roxbury, MA: AQS Site Code = 25-025-0042								
Carbonyls	39/61	56/61	61/61	61/61	59/60	61/61	61/61	59/61
Hexavalent Chromium	--	--	59/61	59/61	60/60	61/61	60/61	61/61
PAH	--	--	--	--	--	39/40	59/61	60/61
PM_{10} Metals	8/13	43/61	58/61	56/61	57/60	56/61	59/61	61/61
VOC	59/61	58/61	58/61	58/61	55/60	57/61	57/61	60/61
Detroit, MI: AQS Site Code = 26-163-0033								
Carbonyls	57/61	59/61	58/61	61/61	54/60	58/61	60/61	61/61
Hexavalent Chromium	--	--	60/61	60/61	58/60	59/61	61/61	61/61
PAH	--	--	--	--	--	43/45	61/61	61/61
PM_{10} Metals	61/61	58/61	58/61	60/61	60/60	60/61	61/61	60/61
VOC	57/61	56/61	59/61	61/61	58/60	60/61	59/61	59/61
St. Louis, MO: AQS Site Code = 29-510-0085								
Carbonyls	61/61	60/61	60/61	58/61	60/60	60/61	60/61	58/61
Hexavalent Chromium	--	--	53/61	57/61	58/60	61/61	59/61	57/61
PAH	--	--	--	--	--	45/45	58/61	60/61
PM_{10} Metals	30/30	60/61	61/61	52/61	59/60	61/61	61/61	60/61
VOC	61/61	58/61	59/61	58/61	60/60	58/61	60/61	58/61
Bronx (#1), NY: AQS Site Code = 36-005-0110								
Carbonyls	--	61/61	61/61	61/61	60/60	61/61	61/61	30/30
Hexavalent Chromium	--	--	--	--	13/15	59/61	59/61	28/30
PAH	--	--	--	--	--	30/30	59/61	28/30
PM_{10} Metals	--	--	--	--	60/60	60/61	61/61	28/30
VOC	61/61	61/61	61/61	61/61	60/60	61/61	61/61	28/30

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
Bronx (#2), NY: AQS Site Code = 36-005-0080								
Carbonyls	--	--	--	--	--	--	--	31/31
Hexavalent Chromium	--	--	--	--	--	--	--	29/31
PAH	--	--	--	--	--	--	--	29/31
PM_{10} Metals	--	--	--	--	--	--	--	31/31
VOC	--	--	--	--	--	--	--	31/31
Rochester, NY: AQS Site Code = 36-055-1007								
Carbonyls	--	23/44	61/61	61/61	60/60	61/61	61/61	61/61
Hexavalent Chromium	--	--	--	--	15/15	61/61	61/61	60/61
PAH	--	--	--	--	--	30/30	61/61	61/61
PM_{10} Metals	--	--	--	--	53/60	60/61	61/61	61/61
VOC	--	45/45	61/61	56/61	60/60	61/61	61/61	61/61
La Grande, OR: AQS Site Code = 41-061-0119								
Carbonyls	--	48/52	56/61	53/61	52/60	51/61	56/61	49/61
Hexavalent Chromium	--	--	59/61	56/61	57/60	48/61	53/61	56/61
PAH	--	--	--	--	21/60	26/61	57/61	45/61
PM_{10} Metals	--	46/53	60/61	58/61	56/60	51/61	51/61	53/61
VOC	--	49/53	54/61	58/61	53/60	54/61	54/61	52/61
Portland, OR: AQS Site Code = 41-051-0246								
Carbonyls	--	--	--	--	--	51/61	61/61	58/61
Hexavalent Chromium	--	--	--	--	--	38/61	60/61	59/61
PAH	--	--	--	--	--	39/61	57/61	53/61
PM_{10} Metals	--	--	--	--	--	54/61	59/61	56/61
VOC	--	--	--	--	--	52/61	58/61	60/61
Providence, RI: AQS Site Code = 44-007-0022								
Carbonyls	61/61	59/61	61/61	61/61	60/60	61/61	61/61	61/61
Hexavalent Chromium	--	--	57/61	61/61	60/60	60/61	61/61	60/61
PAH	--	--	--	--	--	30/30	59/61	60/61
PM_{10} Metals	60/61	61/61	61/61	61/61	60/60	60/61	60/61	61/61
VOC	61/61	61/61	61/61	61/61	59/60	60/61	61/61	61/61
Chesterfield, SC: AQS Site Code = 45-025-0001								
Carbonyls	--	60/61	61/61	61/61	60/60	61/61	61/61	61/61
Hexavalent Chromium	--	--	58/61	61/61	60/60	60/61	61/61	61/61
PAH	--	--	--	--	--	46/47	61/61	61/61
PM_{10} Metals	--	61/61	61/61	61/61	60/60	61/61	61/61	51/61
VOC	--	31/31	61/61	61/61	60/60	61/61	61/61	59/61
Houston, TX: AQS Site Code = 48-201-1039								
Carbonyls	56/61	58/61	58/61	53/61	56/60	58/61	59/61	59/61

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
Hexavalent Chromium	--	--	--	18/19	60/60	57/61	60/61	61/61
PAH	--	--	--	--	42/42	59/61	61/61	61/61
PM_{10} Metals	54/61	59/61	54/61	61/61	59/60	61/61	61/61	61/61
VOC	54/61	52/61	58/61	51/61	60/60	58/61	61/61	60/61
Karnack, TX: AQS Site Code = 48-203-0002								
Carbonyls	--	51/61	56/61	59/61	55/60	58/61	58/61	59/61
Hexavalent Chromium	--	--	--	19/19	59/60	60/61	59/61	58/61
PAH	--	--	--	--	--	54/61	57/61	54/61
PM_{10} Metals	--	47/55	57/61	61/61	60/60	61/61	61/61	61/61
VOC	--	52/61	54/61	60/61	56/60	60/61	59/61	58/61
Bountiful, UT: AQS Site Code = 49-011-0004								
Carbonyls	26/26	58/61	56/61	59/61	58/60	58/61	61/61	60/61
Hexavalent Chromium	--	--	56/61	60/61	60/60	60/61	60/61	61/61
PAH	--	--	--	--	--	16/44	61/61	61/61
PM_{10} Metals	25/25	60/61	55/61	56/61	56/60	58/61	57/61	59/61
VOC	26/26	58/61	56/61	59/61	59/60	57/61	61/61	59/61
Underhill, VT: AQS Site Code = 50-007-0007								
Carbonyls	--	61/61	61/61	61/61	58/60	61/61	60/61	61/61
Hexavalent Chromium	--	--	60/61	60/61	59/60	61/61	60/61	61/61
PAH	--	--	--	--	--	32/32	60/61	61/61
PM_{10} Metals	--	61/61	61/61	61/61	60/60	61/61	61/61	60/61
VOC	--	60/61	61/61	61/61	60/60	61/61	60/61	61/61
Richmond, VA: AQS Site Code = 51-087-0014								
Carbonyls	--	--	--	--	--	29/30	61/61	61/61
Hexavalent Chromium	--	--	--	--	--	14/15	60/61	61/61
PAH	--	--	--	--	--	15/15	61/61	61/61
PM_{10} Metals	--	--	--	--	--	27/30	60/61	61/61
VOC	--	--	--	--	--	30/30	60/61	61/61
Seattle, WA: AQS Site Code = 53-033-0080								
Carbonyls	61/61	61/61	61/61	28/30	60/60	60/61	60/61	61/61
Hexavalent Chromium	--	--	60/61	17/61	60/60	60/61	61/61	60/61
PAH	--	--	--	--	--	48/49	61/61	61/61
PM_{10} Metals	49/49	61/61	61/61	28/30	60/60	58/61	59/61	61/61
VOC	61/61	61/61	61/61	28/30	60/60	59/61	60/61	61/61
Horicon, WI: AQS Site Code = 55-027-0001								
Carbonyls	--	--	--	--	--	--	2/2	57/61
Hexavalent Chromium	--	--	--	--	--	--	2/2	61/61
PAH	--	--	--	--	--	--	2/2	55/61

Table 5-7. Summary of Sampling Conducted in Coordination with the National Calendar

Method	Number of Sampling Days That Were Consistent With the National Calendar vs. Expected Number of Samples							
	2003	2004	2005	2006	2007	2008	2009	2010
PM_{10} Metals	--	--	--	--	--	--	2/3	57/61
VOC	--	--	--	--	--	--	2/2	56/61
Mayville, WI: AQS Site Code = 55-027-0007								
Carbonyls	7/8	58/61	57/61	57/61	55/60	54/61	58/59	--
Hexavalent Chromium	--	--	49/49	61/61	57/60	60/61	59/59	--
PAH	--	--	--	--	--	48/49	59/59	--
PM_{10} Metals	--	--	51/61	56/61	56/60	59/61	47/59	--
VOC	6/6	55/61	57/61	56/61	52/60	55/61	55/59	--

--: Data not available in AQS or not expected

5.5 Data Quality Information Reporting

This section examines the reporting of data quality information associated with the NATTS concentration records. Although not required for reporting, many NATTS sites reported multiple variables describing the data quality of a concentration dataset. The data quality information reviewed for this assessment were:

- Under-MDL Reporting: Identifies if concentrations below the MDL were reported to AQS.
- ND Reporting: Identifies if non-detect records were reported to AQS as zero concentration values and if the qualifying code was assigned appropriately.
- Null Data Reported: Identifies if voided data records were reported to AQS.
- Pollutant-Specific MDLs Reported: Identifies if site-specific pollutant MDLs were reported to AQS. Reporting of MDLs were not required for this assessment.
- Data Qualifiers Reported: Identifies if data qualifiers (e.g., nearby fire, damaged filter, lab value above acceptable limits, etc.) were reported to AQS.
    - Per the NATTS TAD, "*there are clear and established situations when flags should be applied to ambient air toxics data for the NATTS Program.*" Flags are generally grouped as: quantification and detection flags; laboratory-generated flags; chain of custody flags; and field operations and maintenance flags.
- Precision Data Reported: Identifies if secondary concentration data, such as duplicate, replicate, or collocate data, were reported. Precision data were not required for this assessment.

- Table 5-8 summarizes the AQS reporting of the data quality information listed above. It is important to note that if a pollutant dataset does not have one of the above reported to AQS, it does not indicate the reported data is of suspect data quality. This table simply summarizes data quality information, if provided.

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
Phoenix, AZ: AQS Site Code = 04-013-9997						
2003	✓	--	✓	✓	--	✓
2004	✓	--	✓	✓	--	✓
2005	✓	--	✓	✓	--	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103						
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001						
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
San Jose, CA: AQS Site Code = 06-085-0005						
2003	✓	✓	✓	✓	✓	✓
2004	✓	✓	✓	✓	✓	✓
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	--	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Grand Junction, CO: AQS Site Code = 08-077-0017						
2004	✓	--	✓	✓	--	✓
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
Washington, DC: AQS Site Code = 11-001-0043						
2004	--	--	--	✓	--	--
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	✓	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026						
2004	✓	--	✓	✓	--	✓
2005	✓	--	✓	--	--	✓
2006	✓	--	✓	✓	--	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002						
2004	✓	--	✓	✓	--	✓
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	--	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002						
2003	✓	--	✓	✓	--	--
2004	✓	--	✓	✓	--	--
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	✓	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Chicago, IL: AQS Site Code = 17-031-4201						
2003	✓	--	✓	✓	--	✓
2004	✓	--	✓	✓	--	✓
2005	✓	✓	✓	✓	✓	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500						
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003						
2003	--	--	--	✓	✓	--
2004	--	--	--	✓	✓	✓
2005	✓	--	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
Roxbury, MA: AQS Site Code = 25-025-0042						
2003	✓	--	✓	✓	--	--
2004	✓	--	✓	✓	--	✓
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	--	✓
2007	✓	✓	✓	✓	--	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033						
2003	✓	--	✓	✓	✓	✓
2004	✓	--	✓	✓	✓	✓
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
St. Louis, MO: AQS Site Code = 29-510-0085						
2003	✓	--	✓	--	--	✓
2004	✓	--	✓	✓	--	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110						
2003	--	--	--	✓	--	--
2004	--	--	--	✓	--	--
2005	--	--	--	✓	--	--
2006	--	--	--	✓	--	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Bronx (#2), NY: AQS Site Code = 36-005-0080						
2010	✓	✓	✓	✓	✓	✓
Rochester, NY: AQS Site Code = 36-055-1007						
2004	--	--	--	✓	--	--
2005	--	--	--	✓	--	--
2006	--	--	--	✓	--	--
2007	✓	--	✓	✓	✓	--
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119						
2004	✓	--	✓	--	✓	--
2005	✓	--	✓	✓	✓	--
2006	✓	--	✓	--	✓	--
2007	✓	✓	✓	--	✓	--
2008	✓	✓	✓	--	✓	--
2009	✓	✓	✓	--	✓	--
2010	✓	✓	✓	--	✓	--
Portland, OR: AQS Site Code = 41-051-0246						
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	--	✓	✓
2010	✓	✓	✓	--	✓	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
Providence, RI: AQS Site Code = 44-007-0022						
2003	✓	--	✓	✓	--	--
2004	✓	--	✓	✓	✓	✓
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	✓	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Chesterfield, SC: AQS Site Code = 45-025-0001						
2004	--	--	--	✓	--	✓
2005	✓	--	✓	✓	✓	✓
2006	✓	--	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Houston, TX: AQS Site Code = 48-201-1039						
2003	--	--	--	--	--	--
2004	--	--	--	--	--	--
2005	--	--	--	✓	--	--
2006	--	--	--	✓	✓	✓
2007	--	--	--	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Karnack, TX: AQS Site Code = 48-203-0002						
2004	--	--	--	--	--	--
2005	--	--	--	--	--	--
2006	--	--	--	✓	✓	--
2007	--	--	--	✓	✓	--
2008	--	--	--	✓	✓	--
2009	--	--	--	✓	✓	--
2010	--	--	✓	✓	✓	--
Bountiful, UT: AQS Site Code = 49-011-0004						
2003	✓	--	✓	✓	--	✓
2004	✓	--	✓	✓	--	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Underhill, VT: AQS Site Code = 50-007-0007						
2004	✓	✓	✓	✓	✓	--
2005	✓	✓	✓	✓	✓	✓
2006	✓	✓	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Richmond, VA: AQS Site Code = 51-087-0014						
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Seattle, WA: AQS Site Code = 53-033-0080						
2003	--	--	--	✓	✓	--
2004	--	--	--	✓	✓	--
2005	✓	--	✓	✓	✓	✓
2006	✓	--	✓	✓	✓	✓
2007	✓	✓	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓
2009	✓	✓	✓	✓	✓	✓
2010	✓	✓	✓	✓	✓	✓
Horicon, WI: AQS Site Code = 55-027-0001						
2009	✓	✓	✓	--	✓	--
2010	✓	✓	✓	✓	✓	✓
Mayville, WI: AQS Site Code = 55-027-0007						
2003	✓	--	✓	--	--	--
2004	✓	--	✓	✓	--	✓
2005	✓	--	✓	✓	--	✓
2006	✓	--	✓	✓	--	✓
2007	✓	--	✓	✓	✓	✓
2008	✓	✓	✓	✓	✓	✓

Table 5-8. Data Quality Information Records Submitted to AQS

Year	Data Quality Information Records in AQS					
	Under-MDL Reporting	ND Reporting	Pollutant-Specific MDLs Reported	Null Data Reported	Data Qualifiers Reported	Precision Data Reported
2009	✓	✓	✓	✓	✓	✓

✓ Reported pollutant within the method-specific dataset.
-- Pollutant was not expected at this site for this year

The following observations were made:

- Under-MDL Reporting: In 2005, 19 of 23 sites reported Under-MDL concentrations; by 2010, 27 of 28 sites reported Under-MDL concentrations. The only site that did not report Under-MDL concentrations in 2010 was Karnack, TX.
- ND Reporting: In 2005, only 7 of 23 sites reported ND concentrations; by 2010, 27 of 28 sites reported ND concentrations. The only site that did not report ND concentrations in 2010 was Karnack, TX.
- Null Data Code Reporting: In 2005, 21 of 23 sites reported Null Data Code records; by 2010, 26 of 28 sites reported Null Data Code records. The only sites that did not report Null Data Code records in 2010 were La Grande, OR and Portland, OR.
- Pollutant-Specific MDLs: In 2005, 19 of 23 sites reported Pollutant-Specific MDL concentrations; by 2010, all 28 sites reported Pollutant-Specific MDL records.
- Data Qualifier Reporting: In 2005, 11 of 23 sites reported Data Qualifier records; by 2010, all 28 sites reported Data Qualifier records.
- Precision Data Reporting: In 2005, 18 of 23 sites reported Precision Data records; by 2010, 26 of 28 sites reported Precision Data records. The only sites that did not report Precision Data records in 2010 were La Grande, OR and Karnack, TX.

Additionally, EPA further examined two data quality indicators in greater detail. The first data quality indicator that EPA chose to examine further was the use of the miscellaneous void flag “AM” in populating the Null Data Code field in AQS. Machine malfunction (28%), miscellaneous void (15%) and lab error (13%) were the top three Null Data Codes reported for the NATTS data. This indicates that when null data records were reported, 85% of them were coded with specific information rather that given the “miscellaneous” void flag.

The second data quality indicators follow-up was related to the reporting of concentration data that appear to be one-half of the reported MDL, which some agencies may choose as a surrogate for non-detect reporting. Concentrations that are one-half MDL may be indeed valid, but need to be scrutinized for pollutants that are infrequently detected. Further discussion of this topic is addressed in the Data Treatment section of this assessment (Section 7.1).

5.6 Engineering Units

In this section, the engineering units of the reported datasets are summarized in Table 5-9 by site, method, and year. AQS offers the flexibility of entering data using multiple engineering units. Per Section 5.3.1.4 of the NATTS TAD:

> *"For the NATTS Programs, air toxics data may be reported to AQS in valid units (e.g., ppbv, parts per billion as carbon, µg/m^3, ng/m^3) specific to each target pollutant. With the exception of PM$_{10}$ metals, all data will be reported in standard conditions which, for ambient air monitoring, are defined as a pressure of 760mm Hg or one atmosphere, and a temperature of 25° Celsius or 298.15 Kelvin. PM$_{10}$ metals will be reported in local conditions, but may also be reported in both standard and local conditions at the discretion of the monitoring agency."*

Table 5-9. Engineering Units Assessment in AQS

NATTS Site (AQS Site Code)	Engineering Units[a] in AQS				
	Carbonyls	Hexavalent Chromium	PAHs	PM$_{10}$ Metals	VOCs
Phoenix, AZ (04-013-9997)	ppbv (2003-2010)	ng/m^3 SC (2006-2010)	ng/m^3 SC (2007-2010)	ng/m^3 SC (2006-2010)	ppbv (2003-2010)
Los Angeles, CA (06-037-1103)	ppbv (2007-2010)	ng/m^3 SC (2007-2010)	ng/m^3 SC (2007-2010)	µg/m^3 LC (2007-2010)	ppbv (2007-2010)
Rubidoux, CA (06-065-8001)	ppbv (2007-2010)	ng/m^3 SC (2007-2010)	ng/m^3 SC (2007-2010)	µg/m^3 LC (2007-2010)	ppbv (2007-2010)
San Jose, CA (06-085-0005)	ppbv (2003-2005) µg/m^3 SC (2006-2010)	Not collected	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ppbv (2003-2010)
Grand Junction, CO (08-077-0017/-0018)	ppbv (2004-2010)	ng/m^3 SC (2004-2010)	ng/m^3 SC (2008-2010)	µg/m^3 SC (2004-2010)	ppbv (2004-2010)
Washington, D.C. (11-001-0043)	ppbC (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2004-2010)	ppbv (2004-2010)
Pinellas County, FL (12-103-0026)	ppbv (2004-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2004-2010)	ppbv (2004-2010)
Tampa, FL (12-057-3002)	ppbv (2004-2010)	ng/m^3 SC (2004-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2004-2010)	ppbv (2004-2010)
South DeKalb, GA (13-089-0002)	µg/m^3 SC (2003) µg/m^3 0°C (2004-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2007-2010)	µg/m^3 SC (2003-2010)	ppbv (2003-2010)
Chicago, IL (17-031-4201)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2005-2010)	ppbv (2003-2010)

Table 5-9. Engineering Units Assessment in AQS

NATTS Site (AQS Site Code)	Engineering Units[a] in AQS				
	Carbonyls	Hexavalent Chromium	PAHs	PM_{10} Metals	VOCs
Grayson Lake, KY (21-043-0500)	µg/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	µg/m^3 SC (2008-2010) ppbv (2010)
Hazard, KY (21-193-0003)	ppbv (2003-2004) µg/m^3 SC (2005-2008)	ng/m^3 SC (2005-2008)	ng/m^3 SC (2008)	ng/m^3 SC (2003-2008)	ppbv (2003-2004) µg/m^3 SC (2005-2008)
Roxbury, MA (25-025-0042)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2003-2010)	ppbv (2003-2010)
Detroit, MI (26-163-0033)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2003-2010)	µg/m^3 SC (2003-2007) ppbv (2008-2010)
St. Louis, MO (29-510-0085)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2003-2010)	ppbv (2003-2010)
Bronx (#1), NY (36-005-0110)	ppbv (2003-2010)	ng/m^3 SC (2007-2010)	ng/m^3 SC (2008-2010)	µg/m^3 SC (2005) ng/m^3 LC (2007-2010)	ppbv (2003-2010)
Bronx (#2), NY (36-005-0080)	ppbv (2010)	ng/m^3 SC (2010)	ng/m^3 SC (2010)	ng/m3 LC (2010)	ppbv (2010)
Rochester, NY (36-055-1007)	ppbv (2004-2010)	ng/m^3 SC (2007-2010)	ng/m^3 SC (2008-2010)	ng/m3 LC (2007-2010)	ppbv (2004-2010)
La Grande, OR (41-061-0119)	µg/m^3 SC (2004-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2004-2010)	ppbv (2004-2010)
Portland, OR (41-051-0246)	µg/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ppbv (2008-2010)
Providence, RI (44-007-0022)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m3 SC (2003-2010)	ppbv (2003-2010)
Chesterfield, SC (45-025-0001)	µg/m^3 SC (2004-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2004-2010)	ppbv (2004-2010)
Houston, TX (48-201-1039)	ppbC (2003) ppbv (2004) ppbC (2005-2010)	ng/m^3 SC (2006-2010)	ng/m^3 SC (2007-2010)	µg/m^3 SC (2003-2010)	ppbv (2003-2010)
Karnack, TX (48-203-0002)	ppbv (2004)	ng/m^3 SC (2006-2010)	ng/m^3 SC (2008-2010)	µg/m^3 SC (2004-2010)	ppbv (2004-2010)

Table 5-9. Engineering Units Assessment in AQS

NATTS Site (AQS Site Code)	Engineering Units[a] in AQS				
	Carbonyls	**Hexavalent Chromium**	**PAHs**	**PM_{10} Metals**	**VOCs**
	ppbC (2005-2010)				
Bountiful, UT (49-011-0004)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	µg/m^3 SC (2003-2010)	ppbv (2003-2010)
Underhill, VT (50-007-0007)	µg/m^3 SC (2004-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m^3 LC (2004-2010)	µg/m^3 SC (2004-2010)
Richmond, VA (51-087-0014)	µg/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ng/m^3 SC (2008-2010)	ppbv (2008-2010)
Seattle, WA (53-033-0080)	ppbv (2003-2010)	ng/m^3 SC (2005-2010)	ng/m^3 SC (2008-2010)	ng/m3 SC (2003-2010)	ppbv (2003-2010)
Horicon, WI (55-027-0001)	µg/m^3 SC (2009-2010)	ng/m^3 SC (2009-2010)	ng/m^3 SC (2009-2010)	ng/m^3 SC (2009-2010)	ppbv (2009-2010)
Mayville, WI (55-027-0007)	µg/m^3 SC (2003-2009)	ng/m^3 SC (2005-2009)	ng/m^3 SC (2008-2009)	ng/m^3 SC (2005-2009)	ppbv (2003-2009)

[a]: ng/m^3 LC: nanograms per cubic meter, local conditions
ng/m^3 SC: nanograms per cubic meter, adjusted to standard conditions
µg/m^3 LC: micrograms per cubic meter, local conditions
µg/m^3 SC: micrograms per cubic meter, adjusted to standard conditions
µg/m^3 0°C: micrograms per cubic meter, adjusted to zero degrees Celsius
ppbC : parts per billion as carbon
ppbv: parts per billion, by volume

The following observations are made:

- Carbonyls: 60% of the carbonyl datasets (116 of 192 total) were reported in concentrations of ppbv, while 26% (49 of 192 total) reported concentrations in µg/m^3 SC.
- Hexavalent Chromium and PAHs: 100% of the hexavalent chromium datasets (139 of 139 total) and PAH datasets (90/90) reported concentrations in µg/m^3 SC.
- PM_{10} Metals: 64% of the PM_{10} metals datasets (111/174) reported concentrations in ng/m^3 SC, while 22% (38/174) reported concentrations in µg/m^3 SC. Among the PM_{10} metals, "local conditions" (LC) were reported in only 25 of 174 datasets (14%) across seven monitoring sites.
- VOCs: 91% of the VOC datasets (174/192) reported concentrations in ppbv, while 9% (18/192) reported concentrations in µg/m^3 SC.
- "µg/m^3 0°C", which was not an engineering unit listed in the NATTS TAD, was reported only at the South DeKalb, GA monitoring site for carbonyls.

5.7 Other HAP Reporting

This section examines the reporting of non-core HAPs associated with the NATTS sampling and analysis methods. Of the 110 total analytes that can be reported, 58 are non-NATTS core HAPs, also referred to as "Other HAPs associated with the NATTS methods." Although not required for reporting, many of these Other HAPs can be important in understanding individual pollutant and/or cumulative risks. For example, EPA's most recent NATA modeling for 2005 includes some of these Other HAPs, such as: acrylonitrile; *p*-dichlorobenzene; ethylbenzene; and methylene chloride.

Other HAPs may be analyzed with the methods to analyze carbonyls, PAHs, PM_{10} metals, and VOCs. Table 5-10 summarizes the reporting of Other HAPs associated with the NATTS sampling and analysis methods.

Table 5-10. AQS Reporting of Other HAPs Associated with NATTS Methods

Method	AQS Records Reported							
	2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997								
Carbonyls	--	--	--	--	✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
PM_{10} Metals	NA	--	--	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103								
Carbonyls	NA				--	--	--	--
PAHs	NA				✓	✓	✓	✓
PM_{10} Metals	NA				✓	✓	✓	✓
VOCs	NA				✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001								
Carbonyls	NA				--	--	--	--
PAHs	NA				✓	✓	✓	✓
PM_{10} Metals	NA				✓	✓	✓	✓
VOCs	NA				✓	✓	✓	✓
San Jose, CA: AQS Site Code = 06-085-0005								
Carbonyls	--	--	--	--	--	--	--	--
PAHs	NA					✓	✓	✓
PM_{10} Metals	--	--	--	--	--	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Grand Junction, CO: AQS Site Code = 08-077-0017/0018								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	--
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Washington, DC: AQS Site Code = 11-001-0043								
Carbonyls	NA	--	--	--	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	✓

Table 5-10. AQS Reporting of Other HAPs Associated with NATTS Methods

Method	AQS Records Reported							
	2003	2004	2005	2006	2007	2008	2009	2010
VOCs	NA	✓	--	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Chicago, IL: AQS Site Code = 17-031-4201								
Carbonyls	--	--	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	--	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500								
Carbonyls	NA					--	--	--
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA					✓	✓	✓
VOCs	NA					✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003								
Carbonyls	--	--	--	--	--	--	NA	
PAHs	NA					✓	NA	
PM_{10} Metals	✓	✓	✓	✓	✓	✓	NA	
VOCs	✓	✓	✓	✓	✓	✓	NA	
Roxbury, MA: AQS Site Code = 25-025-0042								
Carbonyls	--	--	--	--	--	--	--	--
PAHs	NA					✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓

Table 5-10. AQS Reporting of Other HAPs Associated with NATTS Methods

Method	AQS Records Reported							
	2003	2004	2005	2006	2007	2008	2009	2010
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
St. Louis, MO: AQS Site Code = 29-510-0085								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110								
Carbonyls	--	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	--	--	--	--	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#2), NY: AQS Site Code = 36-005-0080								
Carbonyls	NA							✓
PAHs	NA							✓
PM_{10} Metals	NA							✓
VOCs	NA							✓
Rochester, NY: AQS Site Code = 36-055-1007								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	--	--	--	✓	✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119								
Carbonyls	NA	✓	✓	✓	✓	✓	--	--
PAHs	NA					✓	--	--
PM_{10} Metals	NA	✓	✓	✓	✓	✓	--	--
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Portland, OR: AQS Site Code = 41-051-0246								
Carbonyls	NA					✓	--	--
PAHs	NA					✓	--	--
PM_{10} Metals	NA					✓	--	--
VOCs	NA					✓	✓	✓
Providence, RI: AQS Site Code = 44-007-0022								
Carbonyls	--	--	--	--	--	--	--	--
PAHs	NA					✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Chesterfield, SC: AQS Site Code = 45-025-0001								
Carbonyls	NA	--	--	--	--	--	--	--

Table 5-10. AQS Reporting of Other HAPs Associated with NATTS Methods

Method	AQS Records Reported							
	2003	2004	2005	2006	2007	2008	2009	2010
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	--
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Houston, TX: AQS Site Code = 48-201-1039								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	--
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Karnack, TX: AQS Site Code = 48-203-0002								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	--
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Bountiful, UT: AQS Site Code = 49-011-0004								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Underhill, VT: AQS Site Code = 50-007-0007								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA	✓	✓	✓	✓	✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Richmond, VA: AQS Site Code = 51-087-0014								
Carbonyls	NA					✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	NA					✓	✓	✓
VOCs	NA					✓	✓	✓
Seattle, WA: AQS Site Code = 53-033-0080								
Carbonyls	--	--	--	--	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
PM_{10} Metals	✓	✓	✓	✓	✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Horicon, WI: AQS Site Code = 55-027-0001								
Carbonyls	NA						✓	✓
PAHs	NA						✓	✓
PM_{10} Metals	NA						✓	✓
VOCs	NA						✓	✓
Mayville, WI: AQS Site Code = 55-027-0007								

Table 5-10. AQS Reporting of Other HAPs Associated with NATTS Methods

Method	AQS Records Reported							
	2003	2004	2005	2006	2007	2008	2009	2010
Carbonyls	✓	✓	✓	✓	✓	✓	✓	NA
PAHs	NA					✓	✓	NA
PM_{10} Metals	NA	--	✓	✓	✓	✓	✓	NA
VOCs	✓	✓	✓	✓	✓	✓	✓	NA

✓ Non-NATTS core HAPs associated with the NATTS methods were reported to AQS.
NA Not Applicable. Dataset was not expected.

The following observations were made:

- During the assessment period, all NATTS sites reported Other HAPs that were associated with the NATTS methods.
- By 2010, 85% (95 of 112) of potential datasets reported Other HAPs that were associated with the NATTS methods.
- By 2010, 16 sites reported Other HAPs for all four compound groups.

5.8 Non-HAP Reporting

This section examines the reporting of non-HAPs associated with the NATTS sampling and analysis methods. Of the 110 total analytes that can be reported, 29 are non-HAPs. Although not required for reporting, many of these non-HAPs can be useful in source identification. For example, *tert*-amyl methyl ether (TAME) and ethyl-*tert*-butyl ether (ETBE) are chemicals used for reformulated gasoline, while methyl ethyl ketone (MEK) is a chemical used in surface coating operations, and retene is typically a source marker for woodstove combustion.

Among the five method groups, non-HAPs may be analyzed in three of them: carbonyls, PAHs, and VOCs. Table 5-11 summarizes the reporting of non-HAPs associated with the NATTS sampling and analysis methods.

Table 5-11. AQS Reporting of Non-HAPs Associated with NATTS Sampling and Analysis Methods

Method Group	Reported Non-HAPs Associated with NATTS Sampling and Analysis Methods							
	2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103								
Carbonyls	NA				✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
VOCs	NA				✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001								
Carbonyls	NA				✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
VOCs	NA				✓	✓	✓	✓
San Jose, CA: AQS Site Code = 06-085-0005								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Grand Junction, CO: AQS Site Code = 08-077-0018								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Washington, DC: AQS Site Code = 11-001-0043								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA				✓	✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Chicago, IL: AQS Site Code = 17-031-4201								
Carbonyls	--	--	✓	✓	✓	✓	✓	✓

Table 5-11. AQS Reporting of Non-HAPs Associated with NATTS Sampling and Analysis Methods

Method Group	Reported Non-HAPs Associated with NATTS Sampling and Analysis Methods							
	2003	2004	2005	2006	2007	2008	2009	2010
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500								
Carbonyls	NA					--	--	--
PAHs	NA					✓	✓	✓
VOCs	NA					--	--	✓
Hazard, KY: AQS Site Code = 21-193-0003								
Carbonyls	--	--	--	--	--	--	NA	
PAHs	--	--	--	--	--	✓	NA	
VOCs	--	--	--	--	--	--	NA	
Roxbury, MA: AQS Site Code = 25-025-0042								
Carbonyls	✓	✓	✓	✓	✓	✓	--	--
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
St. Louis, MO: AQS Site Code = 29-510-0085								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110								
Carbonyls	--	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#2), NY: AQS Site Code = 36-005-0080								
Carbonyls	NA							✓
PAHs	NA							✓
VOCs	NA							✓
Rochester, NY: AQS Site Code = 36-055-1007								
Carbonyls	NA	✓	✓	✓	✓	✓	✓	✓
PAHs	NA					✓	✓	✓
VOCs	NA	✓	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119								
Carbonyls	NA	✓	✓	✓	✓	✓	--	--
PAHs	NA					✓	--	--
VOCs	NA	✓	✓	✓	✓	✓	--	--

Table 5-11. AQS Reporting of Non-HAPs Associated with NATTS Sampling and Analysis Methods

<table>
<tr><th rowspan="2">Method Group</th><th colspan="8">Reported Non-HAPs Associated with NATTS Sampling and Analysis Methods</th></tr>
<tr><th>2003</th><th>2004</th><th>2005</th><th>2006</th><th>2007</th><th>2008</th><th>2009</th><th>2010</th></tr>
<tr><td colspan="9">Portland, OR: AQS Site Code = 41-051-0246</td></tr>
<tr><td>Carbonyls</td><td colspan="5">NA</td><td>✓</td><td>--</td><td>--</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>--</td><td>--</td></tr>
<tr><td>VOCs</td><td colspan="5">NA</td><td>✓</td><td>--</td><td>--</td></tr>
<tr><td colspan="9">Providence, RI: AQS Site Code = 44-007-0022</td></tr>
<tr><td>Carbonyls</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Chesterfield, SC: AQS Site Code = 45-025-0001</td></tr>
<tr><td>Carbonyls</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Houston, TX: AQS Site Code = 48-201-1039</td></tr>
<tr><td>Carbonyls</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="4">NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Karnack, TX: AQS Site Code = 48-203-0002</td></tr>
<tr><td>Carbonyls</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>--</td></tr>
<tr><td>VOCs</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Bountiful, UT: AQS Site Code = 49-011-0004</td></tr>
<tr><td>Carbonyls</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Underhill, VT: AQS Site Code = 50-007-0007</td></tr>
<tr><td>Carbonyls</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>NA</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Richmond, VA: AQS Site Code = 51-087-0014</td></tr>
<tr><td>Carbonyls</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td colspan="5">NA</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Seattle, WA: AQS Site Code = 53-033-0080</td></tr>
<tr><td>Carbonyls</td><td>--</td><td>--</td><td>--</td><td>--</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>PAHs</td><td>--</td><td>--</td><td>--</td><td>--</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VOCs</td><td>--</td><td>--</td><td>--</td><td>--</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td colspan="9">Horicon, WI: AQS Site Code = 55-027-0001</td></tr>
<tr><td>Carbonyls</td><td colspan="6">NA</td><td>✓</td><td>✓</td></tr>
</table>

Table 5-11. AQS Reporting of Non-HAPs Associated with NATTS Sampling and Analysis Methods

Method Group	Reported Non-HAPs Associated with NATTS Sampling and Analysis Methods							
	2003	2004	2005	2006	2007	2008	2009	2010
PAHs	NA						✓	✓
VOCs	NA						✓	✓
Mayville, WI: AQS Site Code = 55-027-0007								
Carbonyls	✓	✓	✓	✓	✓	✓	✓	NA
PAHs	NA					✓	✓	NA
VOCs	✓	✓	✓	✓	✓	✓	✓	NA

✓ Non-HAPs associated with the NATTS methods were reported to AQS.

-- Non-HAPs associated with the NATTS methods were not reported to AQS.

NA Not Applicable. Dataset was not expected.

The following observations were made:

- All NATTS sites reported non-HAPs that were associated with the NATTS methods at some point during the assessment period.
- By 2010, 89% (75/84) of potential datasets reported non-HAPs that were associated with the NATTS methods.
- By 2010, 23 sites reported non-HAPs for all three method groups.

5.9 Criteria Air Pollutant Reporting

When the initial NATTS Network was designed, there was a need to begin sampling relatively quickly following the Pilot Study (See section 2.2 for more information). It was recommended that NATTS sites utilize the logistical framework already established for the $PM_{2.5}$ network. Thus, many of the NATTS sites are concurrently sampling criteria air pollutants (CAP) alongside hazardous air pollutants, creating a “one-atmosphere”-type dataset that can be beneficial in understanding trends and integrated accountability and reduction strategies. Table 5-12 summarizes the criteria air pollutant data submitted to AQS for the NATTS sites.

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Total Atmospheric)	88500	--	--	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓
San Jose, CA: AQS Site Code = 06-085-0005									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	--	--	--	--	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	--	--	--	--	✓	✓

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Grand Junction, CO: AQS Site Code = 08-077-0017									
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	--	--	--	✓	✓	✓	✓	✓
Carbon Monoxide	42101	--	✓	✓	✓	✓	✓	✓	✓
Washington, DC: AQS Site Code = 11-001-0043									
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	--	--	--	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002									
Carbon Monoxide	42101	--	--	--	--	✓	✓	✓	✓
Nitrogen Dioxide	42602	--	✓	✓	✓	✓	✓	--	--
Oxides Of Nitrogen	42603	--	--	--	✓	✓	✓	✓	✓
Ozone	44201	--	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	--	--	--	--	--	--	--	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	--	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	--	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	--	--	✓	✓	✓	✓
South DeKalb, GA: AQS Site Code = 13-089-0002									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	--	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	--	✓	✓	--	--	--	--	--
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	--	--	--	--	--	✓
Chicago, IL: AQS Site Code = 17-031-4201									
Carbon Monoxide	42101	--	--	--	--	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	--	--	--	--	✓	✓	✓	✓
Sulfur Dioxide	42401	--	✓	✓	✓	✓	✓	✓	✓

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Grayson Lake, KY: AQS Site Code = 21-043-0500									
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	--	--	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003									
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	--	--
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	--	--
Roxbury, MA: AQS Site Code = 25-025-0042									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓
Detroit, MI: AQS Site Code = 26-163-0033									
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	--	✓	✓	✓	✓	✓
$PM_{2.5}$ (Total Atmospheric)	88500	✓	✓	✓	✓	✓	--	--	--
St. Louis, MO: AQS Site Code = 29-510-0085									
Carbon Monoxide	42101	--	--	✓	✓	✓	✓	✓	✓
Ozone	44201	--	--	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	--	--	--	--	--	--	--	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	--	--	--	--	--	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110									
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	--	--	--	--	--
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Bronx (#2), NY: AQS Site Code = 36-005-0080									
PM_{10} (Local Conditions)	85101	--	--	--	--	--	--	--	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Rochester, NY: AQS Site Code = 36-055-1007									
Carbon Monoxide	42101	--	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	--	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	--	--	--	--	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	--	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	--	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	✓	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119									
PM_{10} (Local Conditions)	85101	--	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Portland, OR: AQS Site Code = 41-051-0246									
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Providence, RI: AQS Site Code = 44-007-0022									
PM_{10} (Local Conditions)	85101	--	--	--	--	✓	✓	✓	--
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	--	--	✓	✓	✓	✓	✓	✓
Chesterfield, SC: AQS Site Code = 45-025-0001									
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	✓	✓	✓	✓	✓	✓
Houston, TX: AQS Site Code = 48-201-1039									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	--	✓	✓	--	--	--	--	--
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	--	--	--	--	--	--
Sulfur Dioxide	42401	--	--	--	--	--	--	--	✓

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Karnack, TX: AQS Site Code = 48-203-0002									
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Raw Data)	88501	✓	✓	--	--	--	--	--	--
Bountiful, UT: AQS Site Code = 49-011-0004									
Nitrogen Dioxide	42602	✓	✓	✓	✓	✓	✓	✓	✓
Oxides Of Nitrogen	42603	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓
Underhill, VT: AQS Site Code = 50-007-0007									
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Local Conditions)	88101	--	--	--	--	✓	✓	✓	✓
$PM_{2.5}$ (Total Atmospheric)	88500	--	--	--	--	✓	✓	✓	✓
Richmond, VA: AQS Site Code = 51-087-0014									
Carbon Monoxide	42101	--	--	--	--	--	--	--	✓
Nitrogen Dioxide	42602	--	--	--	--	--	✓	✓	✓
Oxides Of Nitrogen	42603	--	--	--	--	--	✓	✓	✓
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	--	--	✓	✓	✓
$PM_{10-2.5}$ (Local Conditions)	86101	--	--	--	--	--	--	--	✓
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
$PM_{2.5}$ (Total Atmospheric)	88501	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	--	--	--	--	--	--	--	✓
Seattle, WA: AQS Site Code = 53-033-0080									
Carbon Monoxide	42101	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Dioxide	42602	✓	✓	✓	✓	--	--	--	--
Oxides Of Nitrogen	42603	✓	✓	✓	✓	--	--	--	--
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} (Local Conditions)	85101	✓	✓	✓	✓	✓	✓	✓	✓
PM_{10} Total (0-10µm STP)	81102	✓	✓	✓	✓	--	--	--	--
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	✓
Sulfur Dioxide	42401	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-12. Criteria Air Pollutant Reporting at NATTS Sites

Criteria Pollutant	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Horicon, WI: AQS Site Code = 55-027-0001									
Carbon Monoxide	42101	--	--	--	--	--	--	--	✓
Ozone	44201	--	--	--	--	--	--	--	✓
PM_{10} (Local Conditions)	85101	--	--	--	--	--	--	--	✓
PM_{10} Total (0-10µm STP)	81102	--	--	--	--	--	--	✓	✓
$PM_{10-2.5}$ (Local Conditions)	86101	--	--	--	--	--	--	--	✓
$PM_{2.5}$ (Local Conditions)	88101	--	--	--	--	--	--	✓	✓
Sulfur Dioxide	42401	--	--	--	--	--	--	--	✓
Mayville, WI: AQS Site Code = 55-027-0007									
Carbon Monoxide	42101	--	--	--	--	✓	✓	✓	--
Ozone	44201	✓	✓	✓	✓	✓	✓	✓	--
PM_{10} Total (0-10um STP)	81102	--	--	✓	✓	✓	✓	✓	--
$PM_{2.5}$ (Local Conditions)	88101	✓	✓	✓	✓	✓	✓	✓	--
$PM_{2.5}$ (Total Atmospheric)	88500	✓	✓	✓	✓	✓	✓	✓	--
Sulfur Dioxide	42401	--	--	--	--	✓	✓	✓	--

✓ Criteria air pollutant reported to AQS at the NATTS site.

-- No data reported to AQS for this criteria air pollutant at the NATTS site.

The following observations were made:

- During the assessment period, nearly all of the NATTS sites (29/30) reported criteria pollutant data to AQS. Pinellas County, FL did not report criteria pollutant data. The Pinellas County, FL site was not originally slated to be a NATTS site, and thus was not specifically located with a $PM_{2.5}$ monitoring site.
- With the exception of Pinellas County, FL, all sites reported $PM_{2.5}$ data at some time during the assessment period.
- PM_{10} and ozone were the next most commonly reported criteria air pollutants.
- Of the NATTS sites operating in 2010, multi-year continuous reporting of $PM_{2.5}$ from 2005-2010 was observed at the following 21 sites:

  - Phoenix, AZ
  - Los Angeles, CA
  - Rubidoux, CA
  - Grand Junction, CO
  - Washington, D.C.
  - Tampa, FL
  - South DeKalb, GA
  - Chicago, IL
  - Grayson Lake, KY
  - Roxbury, MA
  - Detroit, MI
  - St. Louis, MO
  - Bronx (#1 and 2), NY
  - Rochester, NY
  - La Grande, OR
  - Portland, OR
  - Providence, RI
  - Chesterfield, SC
  - Bountiful, UT
  - Richmond, VA
  - Seattle, WA

- Of the NATTS sites operating in 2010, multi-year continuous reporting of ozone from 2005-2010 was observed at the following 20 sites:

  - Phoenix, AZ
  - Los Angeles, CA
  - Rubidoux, CA
  - San Jose, CA
  - Washington, D.C.
  - Tampa, FL
  - South DeKalb, GA
  - Chicago, IL
  - Grayson Lake, KY
  - Roxbury, MA
  - St. Louis, MO
  - Bronx (#1), NY
  - Rochester, NY
  - Chesterfield, SC
  - Houston, TX
  - Karnack, TX
  - Bountiful, UT
  - Underhill, VT
  - Richmond, VA
  - Seattle, WA

5.10 Meteorological Measurements

Whenever possible, it is desirable to collect meteorological data in conjunction with the ambient monitoring data, which can be beneficial in understanding trends and identifying emission sources. Table 5-13 presents meteorological parameters collected at the NATTS sites that were reported to AQS. It is important to note that the collection and/or reporting of meteorological data were not required during the time period of this assessment.

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997									
Light Absorption Coefficient	63102	✓	✓	--	--	--	--	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity Factor	62202	✓	✓	--	--	--	--	--	--
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Los Angeles, CA: AQS Site Code = 06-037-1103									
Barometric Pressure	64101	--	--	--	--	--	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	--
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	--
Solar Radiation	63301	✓	--	--	--	--	--	--	--
Ultraviolet Radiation	63302	✓	--	--	--	--	--	--	--

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Rubidoux, CA: AQS Site Code = 06-065-8001									
Barometric Pressure	64101	--	--	--	--	--	✓	✓	✓
Light Absorption Coefficient	63102	--	✓	--	--	--	--	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity Factor	62202	--	✓	--	--	--	--	--	--
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Grand Junction, CO: AQS Site Code = 08-077-0018									
Outdoor Temperature	62101	--	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	--	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	--	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	--	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	--	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	--	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	--	✓	✓	✓	✓	✓	✓	✓
Washington, DC: AQS Site Code = 11-001-0043									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	✓	--	--	--	--	--	--	--
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Pinellas County, FL: AQS Site Code = 12-103-0026									
Barometric Pressure	64101	--	--	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	--	--	✓	✓	✓	✓	✓	✓
Wind Direction	61102	--	--	✓	✓	✓	✓	✓	✓
Wind Speed	61101	--	--	✓	✓	✓	✓	✓	✓
Tampa, FL: AQS Site Code = 12-057-3002									
Resultant Direction	61104	--	--	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	--	--	✓	✓	✓	✓	✓	✓
Wind Direction	61102	--	✓	--	--	--	--	--	--
Wind Speed	61101	--	✓	--	--	--	--	--	--
South DeKalb, GA: AQS Site Code = 13-089-0002									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Light Absorption Coefficient	63102	--	✓	--	--	--	--	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Rain/Melt Precipitation	65102	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity Factor	62202	--	✓	--	--	--	--	--	--
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Chicago, IL: AQS Site Code = 17-031-4201									
Barometric Pressure	64101	--	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	--	--	--	--	--	--	--	✓
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Grayson Lake, KY: AQS Site Code = 21-043-0500									
Barometric Pressure	64101	--	--	--	--	--	✓	✓	✓
Dew Point	62103	--	--	--	--	--	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Rain/Melt Precipitation	65102	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	--	--	--	--	--	✓	✓	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Hazard, KY: AQS Site Code = 21-193-0003									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	--	--
Dew Point	62103	✓	✓	✓	✓	✓	✓	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	--	--
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Roxbury, MA: AQS Site Code = 25-025-0042									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	--	--	--	--	--	--	--	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Detroit, MI: AQS Site Code = 26-163-0033									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	--	--	--	✓	✓	✓	✓	✓
Resultant Speed	61103	--	--	--	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	✓	✓	✓	--	--	--	--	--
Wind Speed	61101	✓	✓	✓	--	--	--	--	--
St. Louis, MO: AQS Site Code = 29-510-0085									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Bronx (#1), NY: AQS Site Code = 36-005-0110									
Light Absorption Coefficient	63102	--	✓	--	--	--	--	--	--
Relative Humidity 1	62201	--	✓	--	--	--	--	--	--
Relative Humidity Factor	62202	--	✓	--	--	--	--	--	--
Rochester, NY: AQS Site Code = 36-055-1007									
Barometric Pressure	64101	--	--	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	--	✓	✓	✓	✓	✓	✓	✓
Rain/Melt Precipitation	65102	--	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	--	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	--	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	--	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	--	✓	✓	✓	✓	✓	✓	✓
La Grande, OR: AQS Site Code = 41-061-0119									
Barometric Pressure	64101	✓	✓	✓	✓	✓	✓	✓	✓
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	--	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Providence, RI: AQS Site Code = 44-007-0022									
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Chesterfield, SC: AQS Site Code = 45-025-0001									
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Houston, TX: AQS Site Code = 48-201-1039									
Dew Point	62103	✓	✓	✓	✓	✓	✓	✓	✓
Light Absorption Coefficient	63102	--	✓	--	--	--	--	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Peak Wind Gust	61105	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity Factor	62202	--	✓	--	--	--	--	--	--
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Karnack, TX: AQS Site Code = 48-203-0002									
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Peak Wind Gust	61105	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Direction	61104	✓	✓	✓	✓	✓	✓	✓	✓
Resultant Speed	61103	✓	✓	✓	✓	✓	✓	✓	✓
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	✓
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Visibility	63101	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Bountiful, UT: AQS Site Code = 49-011-0004									
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Light Absorption Coefficient	63102	✓	✓	--	--	--	--	--	--
Relative Humidity 1	62201	✓	✓	--	--	--	--	--	--
Relative Humidity Factor	62202	✓	✓	--	--	--	--	--	--
Seattle, WA: AQS Site Code = 53-033-0080									
Barometric Pressure	64101	--	--	--	--	--	--	--	✓
Light Absorption Coefficient	63102	✓	✓	--	--	--	--	--	--
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	✓
Relative Humidity 1	62201	✓	✓	✓	✓	--	✓	✓	✓
Relative Humidity Factor	62202	✓	✓	--	--	--	--	--	--

Table 5-13. Meteorological Parameters Reported to AQS at NATTS Sites

Meteorological Parameter	AQS Parameter Code	AQS Records Reported							
		2003	2004	2005	2006	2007	2008	2009	2010
Std Dev Hz Wind Direction	61106	✓	✓	✓	✓	✓	✓	✓	✓
Temperature Difference	62106	--	--	--	--	--	--	--	✓
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	✓
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	✓
Horicon, WI: AQS Site Code = 55-027-0001									
Outdoor Temperature	62101	--	--	--	--	--	--	--	✓
Relative Humidity 1	62201	--	--	--	--	--	--	--	✓
Wind Direction	61102	--	--	--	--	--	--	--	✓
Wind Speed	61101	--	--	--	--	--	--	--	✓
Mayville, WI: AQS Site Code = 55-027-0007									
Outdoor Temperature	62101	✓	✓	✓	✓	✓	✓	✓	--
Solar Radiation	63301	✓	✓	✓	✓	✓	✓	✓	--
Wind Direction	61102	✓	✓	✓	✓	✓	✓	✓	--
Wind Speed	61101	✓	✓	✓	✓	✓	✓	✓	--

✓ On-site meteorological data reported to AQS at the NATTS site.

-- No data reported to AQS for this meteorological parameter or the data were not expected.

The following observations were made:

- During the assessment period, the majority of NATTS sites (25/30) reported on-site meteorological data to AQS.
- The following sites did not report on-site meteorological data to AQS:
    - San Jose, CA
    - Bronx (#2), NY
    - Portland, OR
    - Underhill, VT
    - Richmond, VA
- Of the 25 sites that reported to AQS, 24 reported wind information (wind speed and wind direction). The Bronx (#1), NY site did not collect wind information.
- Outdoor air temperature and relative humidity were the next most commonly reported meteorological parameters.
- Visibility, temperature difference, and ultraviolet radiation were the least commonly reported meteorological parameters.
- Of the NATTS sites operating in 2010, multi-year continuous reporting of wind information from 2005-2010 was observed at the following 21 sites:

- Phoenix, AZ
- Los Angeles, CA
- Rubidoux, CA
- Grand Junction, CO
- Washington, D.C.
- Tampa, FL
- Pinellas County, FL
- South DeKalb, GA
- Chicago, IL
- Grayson Lake, KY
- Roxbury, MA
- Detroit, MI
- St. Louis, MO
- Rochester, NY
- LaGrande, OR
- Providence, RI
- Chesterfield, SC
- Houston, TX
- Karnack, TX
- Bountiful, UT
- Seattle, WA

As part of this assessment, EPA conducted interviews with NATTS site operators to review data uploaded into AQS. The following information regarding meteorological data was gathered for the six sites that did not report wind data to AQS:

- San Jose, CA site: The platform housing the monitoring equipment did not have space for a meteorological tower. Meteorological data from a nearby NWS station within 1.5 miles west-northwest of this site (San Jose International Airport, WBAN: 23293) can be used for data analysis.
- Bronx (#1) and Bronx (#2), NY: Wind speed and wind direction data are collected at a nearby monitoring site (AQS Site Code = 36-005-0083). The Bronx (#1), NY site is approximately 3.5 miles south-southwest of this local meteorological station, while the Bronx (#2), NY site is approximately 3 miles southwest.
- Portland, OR: Wind speed and wind direction data are collected at a nearby monitoring site (AQS Site Code = 41-051-1191). The Portland, OR site is less than 0.25 miles east of this local meteorological station.
- Underhill, VT: Meteorological data have been collected since 2005, but have not been uploaded to AQS. The delay is because Vermont Air Pollution Control Division does not have an approved meteorological data QAPP.
- Richmond, VA: There is no meteorological monitoring equipment at this site. Meteorological data from a nearby NWS station within 5 miles southeast of the site (Richmond International Airport, WBAN: 13740) can be used for data analysis.

Based on the information above, all NATTS sites are either collecting on-site wind information or is located near a NWS station. At a minimum, wind speed and wind direction are being collected at or near each NATTS monitoring site.

6.0 NATTS SITE OPERATOR INTERVIEWS (QUALITATIVE ASSESSMENT)

This section documents interviews conducted with the NATTS operating sites, and includes information on sampling and analytical equipment, and feedback on the NATTS Network.

As part of this assessment, EPA conducted interviews with each of the NATTS Operating Site Agencies. In total, 22 interviews took place over a 3-week period. Each agency was asked to fill out survey information describing sampling and analytical equipment, sampling/analytical/reporting entities, and NATTS/criteria pollutant/meteorological data in AQS. Additionally, each operator had the opportunity to provide feedback on the NATTS Network, identify sampling/analytical/reporting issues, and provide input (recommendations, desires, etc.) towards the future design of the NATTS Network. Finally, each site operator was provided with the site map (as presented in Section 3) and emission inventory data and source location maps (as provided in Appendix B) to verify the data or correct any errors.

Table 6-1 presents the interview schedule conducted by EPA with the NATTS operating agencies. Agencies that were responsible for multiple sites were interviewed once. EPA Regional Office Air Toxics Leads were also invited to participate in the call.

Table 6-1. Interview Schedule with NATTS Site Operating Agencies

Date	NATTS Operating Agency	NATTS Operating Agency Primary Contact(s)	NATTS Site(s)
12/1/2011	Wisconsin Department of Natural Resources (WI DNR)	Mark Allen	Mayville, WI Horicon, WI
12/1/2011	Colorado Department of Health and Environment (CDHE)	Dale Wells	Grand Junction, CO
12/1/2011	Bay Area Air Quality Management District (BAAQMD)	Eric Stevenson	San Jose, CA
12/2/2011	South Carolina Department of Health and Environmental Control (SC DHEC)	Scott Reynolds	Chesterfield, SC
12/2/2011	Utah Department of Environmental Protection (UT DEP)	Larry Larkin	Bountiful, UT
12/7/2011	Kentucky Department of Environmental Protection (KYDEP)	Stephanie McCarthy	Hazard, KY Grayson Lake, KY
12/8/2011	New York State Department of Environmental Conservation (NYSDEC)	Dirk Felton	Bronx, NY Rochester, NY
12/8/2011	South Coast Air Quality Management District (SCAQMD)	Sumner Wilson	Los Angeles, CA Rubidoux, CA
12/9/2011	Texas Commission on Environmental Quality (TCEQ)	Sally Klein Adam Campbell	Houston, TX Karnack, TX

Table 6-1. Interview Schedule with NATTS Site Operating Agencies

Date	NATTS Operating Agency	NATTS Operating Agency Primary Contact(s)	NATTS Site(s)
12/12/2011	Michigan Department of Environmental Quality (MI DEQ)	Amy Robinson	Detroit, MI
12/12/2011	Environmental Protection Commission of Hillsborough County (EPCHC) and Pinellas County Department of Environmental Management (PCDEM)	Tom Tamanini Tom Stringfellow	Tampa, FL Pinellas County, FL
12/13/2011	Georgia Department of Natural Resources (GA DNR)	Susan Zimmer-Dauphnee	South DeKalb, GA
12/14/2011	Rhode Island Department of Environmental Management (RI DEM)	Barbara Morin	Providence, RI
12/14/2011	Washington Department of Ecology (WA DOE)	John Williamson	Seattle, WA
12/15/2011	District of Columbia Air Pollution District (DC APD)	Robert Day	Washington, D.C.
12/15/2011	Missouri Department of Natural Resources (MO DNR)	Jerry Downs	St. Louis, MO
12/15/2011	Massachusetts Department of Environmental Protection (MA DEP)	Tom McGrath	Roxbury, MA
12/16/2011	Virginia Department of Environmental Quality (VA DEQ)	Chuck Turner	Richmond, VA
12/16/2011	Vermont Department of Environmental Conservation (VT DEC)	Robert Lacaillade	Underhill, VT
12/16/2011	Arizona Department of Environmental Quality (AZ DEQ)	Bryan Paris	Phoenix, AZ
12/16/2011	Oregon Department of Environmental Quality (ODEQ)	Jeff Smith	La Grande, OR Portland, OR
12/20/2011	Illinois Environmental Protection Agency (IL EPA)	Ernest Kierbach	Chicago, IL

6.1 Equipment Survey

As part of the survey form, agencies were asked to provide information on both sampling and analytical equipment that were used for each year the site/laboratory participated in the NATTS Network. The survey form was also sent to EPA's national contract laboratory for sites that receive analytical support via that mechanism. Sampling equipment information primarily included both the model and age of the equipment. Conversely, the level of information required for the analytical equipment was dependent upon the method type. Table 6-2 summarizes the general equipment information gathered by EPA. EPA anticipates using this information to identify potential deficiencies in equipment, which could be related to concentration data quality.

Table 6-2. Equipment Information Requested by EPA from NATTS Operating Agencies

Equipment Information	VOCs	Carbonyls	PM_{10} Metals	Hexavalent Chromium	PAHs
Sampler Model and Equipment Age	✓	✓	✓	✓	✓
Analytical Instrumentation and Equipment Age	✓	✓	✓	✓	✓
Preconcentrator Unit Equipment and Equipment Age	✓				
Standards Preparation	✓				
Dilution Equipment and Equipment Age	✓				
Canister Cleaning Equipment and Equipment Age	✓				
Canister Hot or Cold Cleaning	✓				
Extraction technique used			✓		✓
Extraction Unit Equipment and Equipment Age			✓	✓	✓

<u>Sampling Equipment</u>

The full sampling equipment list by method group and year is presented in Appendix C-1. Many NATTS operating agencies had sampling equipment in-hand prior to participating in the NATTS Program, while some purchased equipment the year before NATTS operations began. During the assessment period, agencies often replaced older samplers with newer samplers, or refurbished the older samplers with newer parts.

During the interviews, the operating agencies provided information about the manufacturer and model type of the samplers, as well as the initial year of deployment, if known. More than 87% of the sampling equipment inventory’s initial year of deployment (i.e., equipment age) was known. Of those, approximately one-third had initial deployment years prior to 2001.

<u>Analytical Equipment</u>

Appendix C-2 presents the full analytical equipment list by method group and year. Table C-2 identifies the primary equipment used to analyze the sample. More than 90% of the analytical equipment inventory’s initial year of deployment (i.e., equipment age) was known. Of those, approximately 22% had initial deployment years prior to 2001. Due to the expense, analytical equipment was not often upgraded during the assessment period.

Table C-3 identifies the primary equipment used during preconcentration, which applies to the analysis of VOC canisters. More than 91% of the preconcentrator equipment inventory’s initial year of deployment (i.e., equipment age) was known. Of those, approximately 19% had initial deployment years prior to 2001.

Table C-4 identifies the primary equipment used during standards preparation, which applies to the analysis of VOC canisters. Approximately 72% of the standards preparation equipment inventory’s initial year of deployment (i.e., equipment age) was known. Of those, approximately 45% had initial deployment years prior to 2001. An important component in standards preparation is the method by which it is prepared. Standards prepared through dynamic dilution offer laboratories the most flexibility, while standards purchased from vendors offer the least, with syringe and pressure dilution rated in between dynamic and vendor-purchased. Over 74% of the standards preparation was through dynamic dilution, while 20% was through pressure or syringe dilution. Purchased from vendor was rarely reported (1%). “Unknown” was reported for 5% of the standards preparation.

Table C-5 identifies the primary equipment used during canister cleaning, which applies to analysis of VOC canisters. Approximately 83% of the canister cleaning equipment inventory’s initial year of deployment (i.e., equipment age) was known. Of those, approximately 29% had initial deployment years prior to 2001. An important component in canister cleaning is the method in which it is prepared. Over 66% of the canister cleaning equipments uses heat, while 26% does not. The remaining 8% were reported as “Unknown”.

Table C-6 identifies the extraction equipment used during PM_{10} metals analysis. Approximately 75% of the extraction equipment inventory’s initial year of deployment (i.e., equipment age) was known. Approximately 17% of the PM_{10} metals equipment had deployment years prior to 2001. An important component in PM_{10} metals analysis is the extraction technique used. Sonication accounts for nearly half of the extraction techniques, followed by hotblock (34%) and microwave (15%). The remaining 4% were reported as “Unknown.”

Table C-7 identifies the extraction equipment used for hexavalent chromium analysis. Approximately 96% of the extraction equipment inventory’s initial year of deployment (i.e., equipment age) was known. Over 88% of the hexavalent chromium analysis was at the national contract laboratory, and that equipment was deployed in 2001.

Table C-8 identifies the extraction equipment used during PAH analysis. Approximately 92% of the extraction equipment inventory’s initial year of deployment (i.e., equipment age) was known. Over 91% of the PAH analysis was at the national contract laboratory, and that equipment was deployed in

2004. The extraction technique used by the national contract laboratory was Accelerated Solvent Extraction (ASE).

6.2 Analytical Laboratories

Table 6-3 presents the analytical laboratories that supported NATTS sites and is organized by pollutant group. The choice of analytical laboratory is at the discretion of each operating agency, provided that the results are of the data quality expected of the NATTS Network. One of EPA's goals in allowing this flexibility is for operating agencies to build analytical laboratory capacity that may be applied to other monitoring applications under their jurisdiction. Conversely, operating agencies that do not have analytical laboratory capacity can use EPA's national contract laboratory to maintain continuity in sampling until capacity is built up.

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Phoenix, AZ: AQS Site Code = 04-013-9997								
VOCs	ERG	ERG/ SDAPCD	SDAPCD	SDAPCD	SDAPCD	ERG	ERG	ERG
Carbonyls	SDAPCD	SDAPCD	SDAPCD	SDAPCD	SDAPCD	ERG	ERG	ERG
PM_{10} Metals	--	--	--	ERG	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	--	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	ERG	ERG	ERG	ERG
Los Angeles, CA: AQS Site Code = 06-037-1103								
VOCs	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
Carbonyls	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
PM_{10} Metals	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
Hexavalent Chromium	--	--	--	--	CARB	CARB	CARB	CARB
PAHs	--	--	--	--	ERG	ERG	ERG	ERG
Rubidoux, CA: AQS Site Code = 06-065-8001								
VOCs	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
Carbonyls	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
PM_{10} Metals	--	--	--	--	SCAQMD	SCAQMD	SCAQMD	SCAQMD
Hexavalent Chromium	--	--	--	--	CARB	CARB	CARB	CARB
PAHs	--	--	--	--	ERG	ERG	ERG	ERG
San Jose, CA: AQS Site Code = 06-085-0005								
VOCs	CARB	CARB	BAAQMD	BAAQMD	BAAQMD	BAAQMD	BAAQMD	BAAQMD
Carbonyls	CARB	CARB	BAAQMD	BAAQMD	BAAQMD	BAAQMD	BAAQMD	BAAQMD
PM_{10} Metals	--	--	--	--	--	ERG	ERG	ERG
Hexavalent Chromium	--	--	--	--	--	--	--	--
PAHs	--	--	--	--	--	ERG	ERG	ERG

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Grand Junction, CO: AQS Site Code = 08-077-0017/-0018								
VOCs	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	--	CDHE	CDHE	CDHE	CDHE	CDHE	CDHE	CDHE
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Washington, DC: AQS Site Code = 11-001-0043								
VOCs	--	MDE	MDE	MDE	MDE	MDE	MDE	MDE
Carbonyls	--	PAMSL	PAMSL	PAMSL	PAMSL	PAMSL	PAMSL	PAMSL
PM_{10} Metals	--	WVDEP	WVDEP	WVDEP	WVDEP	WVDEP	WVDEP	WVDEP
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Pinellas County, FL: AQS Site Code = 12-103-0026								
VOCs	--	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM
Carbonyls	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	--	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC
Hexavalent Chromium	--	--	--	--	--	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Tampa, FL: AQS Site Code = 12-057-3002								
VOCs	--	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM	PCDEM
Carbonyls	--	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	--	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC	EPCHC
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
South DeKalb, GA: AQS Site Code = 13-089-0002								
VOCs	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR
Carbonyls	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR
PM_{10} Metals	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR	GA DNR
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	ERG	ERG	ERG	ERG
Chicago, IL: AQS Site Code = 17-031-4201								
VOCs	ERG	ERG	ERG/ IEPA	ERG	ERG	ERG	ERG	ERG
Carbonyls	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	--	--	ERG	ERG	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Grayson Lake, KY: AQS Site Code = 21-043-0500								
VOCs	--	--	--	--	--	KYDES	KYDES	KYDES/ ERG
Carbonyls	--	--	--	--	--	KYDES	KYDES	ERG
PM_{10} Metals	--	--	--	--	--	KYDES	KYDES	ERG
Hexavalent Chromium	--	--	--	--	--	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Hazard, KY: AQS Site Code = 21-193-0003								
VOCs	KYDES	KYDES	KYDES	KYDES	KYDES	KYDES	--	--
Carbonyls	KYDES	KYDES	KYDES	KYDES	KYDES	KYDES	--	--
PM_{10} Metals	KYDES	KYDES	KYDES	KYDES	KYDES	KYDES	--	--
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	--	--
PAHs	--	--	--	--	--	ERG	--	--

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Roxbury, MA: AQS Site Code = 25-025-0042								
VOCs	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH
Carbonyls	RIDOH	RIDOH	RIDOH	RIDOH	MADEP	MADEP	MADEP	MADEP
PM_{10} Metals	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Detroit, MI: AQS Site Code = 26-163-0033								
VOCs	MIDEQ/ ERG	ERG	MIDEQ	MIDEQ	ERG	ERG	ERG	ERG
Carbonyls	MIDEQ/ ERG	MIDEQ	MIDEQ	MIDEQ	ERG	ERG	ERG	ERG
PM_{10} Metals	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
St. Louis, MO: AQS Site Code = 29-510-0085								
VOCs	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Bronx (#1), NY: AQS Site Code = 36-005-0110								
VOCs	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC
Carbonyls	--	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC
PM_{10} Metals	--	--	NYSDEC	--	RTI	RTI	RTI	RTI
Hexavalent Chromium	--	--	--	--	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Bronx (#2), NY: AQS Site Code = 36-005-0080								
VOCs	--	--	--	--	--	--	--	NYSDEC
Carbonyls	--	--	--	--	--	--	--	NYSDEC
PM_{10} Metals	--	--	--	--	--	--	--	RTI
Hexavalent Chromium	--	--	--	--	--	--	--	ERG
PAHs	--	--	--	--	--	--	--	ERG
Rochester, NY: AQS Site Code = 36-055-1007								
VOCs	--	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC
Carbonyls	--	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC	NYSDEC
PM_{10} Metals	--	--	--	--	RTI	RTI	RTI	RTI
Hexavalent Chromium	--	--	--	--	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
La Grande, OR: AQS Site Code = 41-061-0119								
VOCs	--	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ
Carbonyls	--	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ
PM_{10} Metals	--	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ
Hexavalent Chromium	--	--	ERG/ODEQ	ODEQ	ODEQ	ODEQ	ODEQ	ODEQ
PAHs	--	--	--	--	ODEQ	ODEQ	ODEQ	ODEQ
Portland, OR: AQS Site Code = 41-051-0246								
VOCs	--	--	--	--	--	ODEQ	ODEQ	ODEQ
Carbonyls	--	--	--	--	--	ODEQ	ODEQ	ODEQ
PM_{10} Metals	--	--	--	--	--	ODEQ	ODEQ	ODEQ
Hexavalent Chromium	--	--	--	--	--	ODEQ	ODEQ	ODEQ
PAHs	--	--	--	--	--	ODEQ	ODEQ	ODEQ

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Providence, RI: AQS Site Code = 44-007-0022								
VOCs	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH
Carbonyls	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH	RIDOH
PM_{10} Metals	EPA Region 1	EPA Region 1	EPA Region 1	EPA Region 1	EPA Region 1/ RIDOH	RIDOH	RIDOH	RIDOH
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Chesterfield, SC: AQS Site Code = 45-025-0001								
VOCs	--	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC
Carbonyls	--	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC
PM_{10} Metals	--	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC	SC DHEC
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Houston, TX: AQS Site Code = 48-201-1039								
VOCs	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Carbonyls	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
PM_{10} Metals	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Hexavalent Chromium	--	--	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ/ERG
PAHs	--	--	--	--	TCEQ	TCEQ	TCEQ	TCEQ/ERG
Karnack, TX: AQS Site Code = 48-203-0002								
VOCs	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Carbonyls	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
PM_{10} Metals	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ
Hexavalent Chromium	--	--	--	TCEQ	TCEQ	TCEQ	TCEQ	TCEQ/ ERG
PAHs	--	--	--	--	--	TCEQ	TCEQ	TCEQ

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Bountiful, UT: AQS Site Code = 49-011-0004								
VOCs	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Underhill, VT: AQS Site Code = 50-007-0007								
VOCs	--	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC	ERG	ERG
Carbonyls	--	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC
PM_{10} Metals	--	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC	VTDEC
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Richmond, VA: AQS Site Code = 51-087-0014								
VOCs	--	--	--	--	--	VA DCLS	VA DCLS	VA DCLS
Carbonyls	--	--	--	--	--	VA DCLS	VA DCLS	VA DCLS
PM_{10} Metals	--	--	--	--	--	VA DCLS	VA DCLS	VA DCLS
Hexavalent Chromium	--	--	--	--	--	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG
Seattle, WA: AQS Site Code = 53-033-0080								
VOCs	WSU	WSU	WSU	RJ Lee	ERG	ERG	ERG	ERG
Carbonyls	WSU	WSU	WSU	RJ Lee	ERG	ERG	ERG	ERG
PM_{10} Metals	WSU	WSU	WSU	RJ Lee	ERG	ERG	ERG	ERG
Hexavalent Chromium	--	--	WSU	RJ Lee	ERG	ERG	ERG	ERG
PAHs	--	--	--	--	--	ERG	ERG	ERG

Table 6-3. Analyzing Laboratories for the NATTS Sites by Year

Method Group	Analyzing Laboratory[a]							
	2003	2004	2005	2006	2007	2008	2009	2010
Horicon, WI: AQS Site Code = 55-027-0001								
VOCs	--	--	--	--	--	--	WSLH	WSLH
Carbonyls	--	--	--	--	--	--	WSLH	WSLH
PM_{10} Metals	--	--	--	--	--	--	WSLH	WSLH
Hexavalent Chromium	--	--	--	--	--	--	ERG	ERG
PAHs	--	--	--	--	--	--	ERG	ERG/ WSLH
Mayville, WI: AQS Site Code = 55-027-0007								
VOCs	WSLH	WSLH	WSLH	WSLH	WSLH	WSLH	WSLH	--
Carbonyls	WSLH	WSLH	WSLH	WSLH	WSLH	WSLH	WSLH	--
PM_{10} Metals	--	--	WSLH	WSLH	WSLH	WSLH	WSLH	--
Hexavalent Chromium	--	--	ERG	ERG	ERG	ERG	ERG	--
PAHs	--	--	--	--	--	ERG	ERG	--

--: Not applicable
[a]: Laboratory abbreviations are presented in Table 6-4 on the following page.

Table 6-4. Analyzing Laboratories for the NATTS Sites

Laboratory Code	Laboratory Entity
BAAQMD	Bay Area Air Quality Management District
CARB	California Air Resources Board
CDHE	Colorado Department of Health and Environment
EPA Region 1	U.S. EPA Region 1
EPCHC	Environmental Protection Commission of Hillsborough County
ERG	Eastern Research Group, Inc (EPA national contract laboratory)
GA DNR	Georgia Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
KYDES	Kentucky Department of Environmental Services
MADEP	Massachusetts Department of Environmental Protection
MDE	Maryland Department of the Environment
MIDEQ	Michigan Department of Environmental Quality
NYSDEC	New York State Department of Environmental Conservation
ODEQ	Oregon Department of Environmental Quality
PAMSL	Philadelphia Air Management Services Lab
PCDEM	Pinellas County Department of Environmental Management
RIDOH	Rhode Island Department of Health
RJ Lee	R.J. Lee Laboratory
RTI	Research Triangle Institute, Inc.
SC DHEC	South Carolina Department of Health and Environmental Control
SCAQMD	South Coast Air Quality Management District
SDAPCD	San Diego Air Pollution Control District
TCEQ	Texas Commission on Environmental Quality
VA DCLS	Virginia Division of Consolidated Laboratory Services
VTDEC	Vermont Department of Environmental Conservation
WSLH	Wisconsin State Laboratory of Hygiene
WSU	Washington State University
WVDEP	West Virginia Department of Environmental Protection

6.3 NATTS Site Operator Comments

NATTS site operators were asked to provide perspective on issues that they faced throughout the period of the assessment, as well as provide recommendations for improving the NATTS Network. In reviewing the specific comments from the operators, it was apparent that many of the sites are experiencing similar issues, which are presented below:

Data Reporting:

- Including data review as part of EPA's Technical Systems Audits (TSAs).
- Additional flagging options in AQS would be beneficial to tell a more accurate story about the data.
- Issues with uploading data to AQS, especially for replicate data.
- Firm guidance from EPA on when to void or flag data for the NATTS Network would be helpful and would provide consistency in data reporting.
- Difficulty of getting analytical results in a timely manner to meet NATTS requirements, thus requiring the operating agency to switch analytical laboratories.
- Additional/more targeted training from EPA on how to properly handle and validate air toxics data.
- Data generated under the national contract laboratory should include sampling frequency code.
- Inconsistencies in blank-correcting data.
- Additional guidance on the concept of submitting data "below method detection limit" and potential lack of legal defensibility.

Logistical:

- Occasionally chain-of-custody forms are not consistently filled out.
- Difficult to pick up samples on weekend and holidays.
- Personnel and laboratory changes, which lead to lack of historical consistency.
- Occasional power outages or issues with the sampling trailer.
- Due to remote nature of some sites, it's difficult to make up missed samples.
- The logistics of supporting a remotes site can be a challenge, such as for shipping of supplies, audits, equipment repairs, troubleshooting over the phone, etc.
- Concerns about the way that canisters are shipped as the shipping containers do not appear to be protective enough. On occasion, canisters were received and did not contain a full vacuum.
- Requirements from the Red Book are difficult to be met due to obstructions.

Methods:

- Recommend periodic review of the sampling and analytical methods.
- Issues with analysis of acrolein.
- Challenges with finding low concentration challenge gases.
- Should consider tightening the TO-15 blank and canister cleanliness criteria (0.02 ppb) as a significant number of target list analytes are regularly measured below this level in the ambient canister samples.
- High volume samplers have poor flow control.
- Better understanding of resolving TO-15 analytes in Selected Ion Monitoring (SIM) and SIM/Scan modes.
- Consider dropping poorly resolved analytes from the target list and adding other analytes.

Program Office

- Recommend setting aside resources for equipment replacement.
- Provide additional oversight on QA/QC criteria on all NATTS analytical laboratories.
- More specialized topics for the NATTS quarterly conference calls.
- The NATTS Network has allowed programs to further develop, refine, and maintain capacity in air toxics monitoring and analysis.
- More coordinated effort to have all NATTS laboratories test 100% of canisters in inventory for 30-day stability.
- Inconsistencies in the NATTS Technical Assistance Document (TAD).
- Oversee the schedule for sites purchasing annual base support through the national contract.
- Reality check on how to best implement the NATTS TAD considering limitations on resources and staff knowledge.

Proficiency Testing:

- PT program has been beneficial in assessing laboratory’s strengths and weaknesses.
- More regular PT program throughout the year are preferred.
- PT concentrations for 2010 were too high and unrealistic for what is observed.
- Suggest other Non-NATTS laboratories be involved in the NATTS PT Program.

Sampling:

- Sampling lines and samplers were infrequently changed.
- More “set timeframes” for annual certifications under the national contract.
- From a field perspective, some sampling equipment could be improved.
- Inconsistencies with PUF cartridges.
- Volumetric issues.
- Some sampling equipment is old, and will need to be replaced.
- Some sampling equipment continually breaks down and needs fixing or the “guts” of the machine is entirely replaced.
- “Through the probe” verification can be difficult and expensive.
- Due to noise issues of PAH sampling, housing was built to reduce noise.
- Using traditional metal screened glass sleeves would allow higher sample volumes possibly lowering MDLs and extending life of motors.
- Resources provided are inadequate for practical application of several QA/QC requirements as outlined in the NATTS TAD.

7.0 NATTS CONCENTRATION DATA

This section provides a statistical overview of the NATTS data at both the national level and the site level and describes the data treatments that were necessary for data consistency. Statistics include detection rates, average concentrations, and data distribution. This section also compares urban versus rural sites and makes inter-comparisons of sites that are in close proximity to one another.

Prior to these analyses, EPA followed up with NATTS site operators about data that were expected to be in AQS, but were not. The results of those discussions are summarized in Table 5-6 of Section 5, AQS Data Reporting. Nearly all of the data records used for this assessment were from AQS, with two exceptions:

- Grand Junction, CO: Provided 2010 PM_{10} metals data directly to EPA in January 2012.
- Chesterfield, SC: Provided 2010 PM_{10} metals data directly to EPA in January 2012. Additionally, a significant portion of VOC and carbonyl data were missing from the December 2011 AQS data pull, and the data were sent to EPA in January 2012.

The entire NATTS dataset from 2003 to 2010 encompasses over 225,000 primary, secondary, and replicate data records. *Primary* data refers to the actual NATTS concentrations, while secondary data refers to measures of precision in comparison to the primary data. Secondary data is measured as either *collocate* and/or *duplicate* data. *Replicate* data refer to measures of laboratory data in re-analyzing a sample (primary or secondary) twice. More information on these terminologies are presented in Section 8.6, Precision.

Table 7-1 presents an overview of the number of records by year. Since 2003, the number of concentration records has generally increased for each concentration type as the number of sites participating has increased, and through better guidance on AQS reporting.

Table 7-1. NATTS Concentration Records By Year

Year	# of Primary Records	# of Secondary Records	# of Replicate Records	Total for Year
2003	7,829	1,182	361	**9,372**
2004	15,787	2,904	486	**19,177**
2005	19,115	3,544	1,030	**23,689**
2006	19,394	4,371	1,406	**25,171**
2007	23,219	6,356	2,538	**32,113**
2008	27,370	6,579	2,322	**36,271**
2009	29,501	7,783	2,409	**39,693**
2010	29,595	7,338	2,769	**39,702**
TOTAL	**171,810**	**40,057**	**13,321**	**225,188**

Table D-1 presents the Primary Data and Table D-2 presents the Secondary and Replicate Data used for this assessment.

7.1 Data Treatments

While most of the data in AQS were ready for data analysis, EPA did apply specific data treatments as part of preparing the data in the master database. These include:

- *Surrogate Data*: If the primary data concentration was a non-detect or invalid, then either the collocate or duplicate data were used as a surrogate for that data record, if available.
- *Treatment of Non-Detects*: In accordance with NATTS data reporting policy (U.S. EPA 2009a, Section 5, Page 9 of 16), the value for each compound that is not detected is replaced with a 0.
- *Incorrect Non-Detect Substitution*: After careful review of the concentration data, a small portion of the NATTS concentration data is exactly equal to ½ MDL. In the past, state/local agencies would sometimes substitute non-detected concentrations with a value one-half of the MDL. Under the NATTS Program, this practice is not acceptable (see Section 4.7, *Reporting Requirements*), and agencies are mandated to report a 0 for non-detects, with appropriate data quality flagging. While under-MDL reporting of concentrations to AQS are encouraged and a measurement of ½ MDL could be legitimate, EPA saw consistent reporting of concentrations at ½ MDL for certain pollutants that are infrequently detected at that value. EPA believes these values were substituted for non-detects. These pollutants included, but were not limited to:
  - chloroform (318 records)
  - beryllium (PM_{10}) (247)
  - 1,3-butadiene (210)
  - trichloroethylene (209)
  - vinyl chloride (209)
  - carbon tetrachloride (172).

- *Units Conversion*: Regardless of the native units entered in AQS, all VOC and carbonyl concentrations and MDLs were converted to $\mu g/m^3$ and all PM_{10} metals, hexavalent chromium, and PAH concentrations were converted to ng/m^3.
- *Invalidated Data*: Certain datasets were later invalidated by NATTS operating agencies;
  - The Kentucky DEP has invalidated all of the VOC data generated under their program (January 3, 2003 to May 1, 2010) due to laboratory issues. These data were not used for data analyses.
  - The Arizona DEQ has invalidated a significant amount of carbonyl data for 2010 due to sampling equipment problems related to the ozone denuder.
  - The NYSDEC has invalidated a significant amount of PAH data for 2009 and 2010 due to sampler issues. _
- *Questionable Data*: In reviewing the concentrations, certain data values appeared to be out of range of typical concentrations. EPA followed up with NATTS Site Operators or the National

Contract Laboratory on specific concentrations and was able to achieve resolution by removing this data, which included:

- Mayville, WI: Blank PM_{10} metals sample on May 24, 2008 was incorrectly entered in AQS as collocated data. Also, invalidating primary hexavalent chromium sample on August 4, 2008 due to analytical error.
- Detroit, MI: Invalidating PM_{10} metals primary sample on December 22, 2010 and duplicate data on September 20, 2006 and September 26, 2006 due to contamination issues. Spiked PM_{10} metals samples on September 23, 2010 and September 29, 2010 data were incorrectly entered in AQS as primary data.
- Grand Junction: Invalidating collocated VOC data on September 17, 2010 due to potential analytical error. Also, invalidating collocated hexavalent chromium on September 16, 2009 and October 22, 2009 due to analytical error.
- Hazard, KY: Invalidating primary and collocated hexavalent chromium sample on May 11, 2006 and collocated hexavalent chromium sample on September 20, 2006 due to analytical error.

7.2 National Summary Statistics

This section summarizes the results of the statistical data analyses performed on the aggregated (i.e., national) dataset, which include: 1) prevalence and detection rate, 2) average concentrations, and 3) data distribution. The summary statistics in Table 7-2 present prevalence (number of detections), average concentrations, and distribution (percentiles) of the concentrations of NATTS core HAPs *across sites* from 2003-2010. These summary statistics are also broken down into rural and urban sites.

Every pollutant has an MDL. Quantification below the MDL is possible, although the measurement's reliability is lower. If a concentration does not exceed the MDL, it does not mean that the pollutant is not present in the air. If the method does not produce a concentration, the measurement is marked as ND, or "non-detect." Some NATTS core HAPs were always detected while others were infrequently detected. Formaldehyde and acetaldehyde had the greatest number of measured detections (10,397 and 10,292 respectively). Four other NATTS core HAPs had more than 9,000 detects from 2003 through 2010: benzene (9,652 detects), carbon tetrachloride (9,077), lead (PM_{10}) (9,217), and manganese (PM_{10}) (9,161). Conversely, vinyl chloride measured 1,833 detects over the eight-year period. It is important to note that the low number of non-detects may not be of concern if the MDL is lower than the health benchmark value by some margin of error. There is concern if non-detects are consistently reported and if the MDLs are higher than the health benchmark value.

Table 7-2. Summary of Concentrations for the NATTS Core Analytes Across Sites, 2003-2010

Analyte	Units	Site Type	# AQS Records	% Detections	Arithmetic Mean[a]	Percentile Value 5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m³	Urban	7,490	100%	1.88 ± 0.05	0.47	0.62	0.92	1.46	2.36	3.57	4.38
		Rural	2,854	99%	1.58 ± 0.06	0.35	0.47	0.71	1.12	1.82	3.07	4.17
		All Sites	10,344	99%	1.80 ± 0.04	0.42	0.56	0.86	1.38	2.25	3.46	4.32
Arsenic (PM_{10})	ng/m³	Urban	6,784	89%	1.15 ± 0.08	ND[b]	ND[b]	0.33	0.64	1.13	2.20	3.39
		Rural	2,865	88%	0.60 ± 0.04	ND[b]	ND[b]	0.17	0.49	0.69	1.16	1.64
		All Sites	9,649	89%	0.99 ± 0.06	ND[b]	ND[b]	0.28	0.55	1.01	1.89	2.96
Benzene	µg/m³	Urban	7,665	100%	1.14 ± 0.02	0.31	0.38	0.57	0.87	1.37	2.20	3.00
		Rural	2,488	81%	0.66 ± 0.04	ND[b]	ND[b]	0.16	0.48	0.86	1.47	2.00
		All Sites	10,153	95%	1.02 ± 0.02	0.03	0.26	0.48	0.78	1.28	2.05	2.81
Benzo(a)pyrene	ng/m³	Urban	3,217	64%	0.123 ± 0.030	ND[b]	ND[b]	ND[b]	0.04	0.12	0.27	0.41
		Rural	1,167	46%	0.086 ± 0.014	ND[b]	ND[b]	ND[b]	ND[b]	0.06	0.23	0.47
		All Sites	4,384	59%	0.113 ± 0.022	ND[b]	ND[b]	ND[b]	0.03	0.11	0.26	0.42
Beryllium (PM_{10})	ng/m³	Urban	6,704	72%	0.114 ± 0.014	ND[b]	ND[b]	ND[b]	0.01	0.02	0.11	0.50
		Rural	2,531	40%	0.037 ± 0.005	ND[b]	ND[b]	ND[b]	ND[b]	<0.01	0.04	0.27
		All Sites	9,235	63%	0.093 ± 0.010	ND[b]	ND[b]	ND[b]	0.00	0.02	0.10	0.50
Butadiene, 1,3-	µg/m³	Urban	7,692	86%	0.132 ± 0.006	ND[b]	ND[b]	0.04	0.08	0.15	0.29	0.43
		Rural	2,498	19%	0.012 ± 0.003	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]	0.01	0.06
		All Sites	10,190	69%	0.102 ± 0.005	ND[b]	ND[b]	ND[b]	0.05	0.13	0.24	0.38
Cadmium (PM_{10})	ng/m³	Urban	6,784	86%	0.28 ± 0.02	ND[b]	ND[b]	0.06	0.12	0.30	0.61	1.00
		Rural	2,530	83%	0.13 ± 0.01	ND[b]	ND[b]	0.03	0.07	0.14	0.27	0.46
		All Sites	9,314	85%	0.24 ± 0.01	ND[b]	ND[b]	0.05	0.10	0.24	0.50	0.90
Carbon Tetrachloride	µg/m³	Urban	7,662	97%	0.588 ± 0.004	0.35	0.44	0.50	0.57	0.69	0.77	0.87
		Rural	2,472	66%	0.371 ± 0.012	ND[b]	ND[b]	ND[b]	0.44	0.59	0.69	0.78
		All Sites	10,134	90%	0.535 ± 0.005	ND[b]	ND[b]	0.49	0.57	0.65	0.75	0.83

Table 7-2. Summary of Concentrations for the NATTS Core HAPs Across Sites, 2003-2010

Analyte	Units	Site Type	# AQS Records	% Detections	Arithmetic Mean[a]	Percentile Value						
						5th	10th	25th	50th	75th	90th	95th
Chloroform	µg/m^3	Urban	7,696	87%	0.222 ± 0.015	ND[b]	ND[b]	0.08	0.13	0.23	0.45	0.71
		Rural	2,499	41%	0.043 ± 0.003	ND[b]	ND[b]	ND[b]	ND[b]	0.07	0.11	0.15
		All Sites	10,195	75%	0.178 ± 0.012	ND[b]	ND[b]	0.02	0.10	0.20	0.38	0.61
Formaldehyde	µg/m^3	Urban	7,496	100%	3.00 ± 0.07	0.55	0.81	1.41	2.30	3.76	5.53	7.02
		Rural	2,911	100%	3.07 ± 0.11	0.55	0.73	1.21	2.15	3.91	6.29	7.95
		All Sites	10,407	100%	3.02 ± 0.06	0.55	0.79	1.35	2.26	3.81	5.73	7.37
Hexavalent Chromium	ng/m^3	Urban	5,327	72%	0.043 ± 0.002	ND[b]	ND[b]	ND[b]	0.02	0.05	0.10	0.16
		Rural	2,276	42%	0.027 ± 0.004	ND[b]	ND[b]	ND[b]	ND[b]	0.02	0.05	0.15
		All Sites	7,603	63%	0.038 ± 0.002	ND[b]	ND[b]	ND[b]	0.01	0.04	0.09	0.15
Lead (PM_{10})	ng/m^3	Urban	6,784	99%	5.66 ± 0.28	1.00	1.07	2.00	3.47	6.28	10.89	16.39
		Rural	2,518	99%	2.63 ± 0.19	0.46	0.66	1.08	1.83	3.03	4.75	6.55
		All Sites	9,302	99%	4.84 ± 0.21	0.72	1.00	1.60	2.96	5.22	9.81	14.10
Manganese (PM_{10})	ng/m^3	Urban	6,719	100%	11.78 ± 0.66	1.13	1.59	2.60	5.15	11.02	23.00	38.99
		Rural	2,530	98%	3.79 ± 0.19	0.34	0.60	1.27	2.51	4.56	7.96	11.55
		All Sites	9,249	99%	9.60 ± 0.49	0.71	1.15	2.07	4.17	9.09	18.70	30.59
Naphthalene	ng/m^3	Urban	3,208	100%	93.20 ± 2.80	21.34	27.10	42.70	72.30	118.00	178.30	231.65
		Rural	1,156	100%	41.96 ± 3.30	4.82	7.16	12.00	20.45	48.43	105.95	151.75
		All Sites	4,364	100%	79.63 ± 2.34	9.38	14.20	29.20	58.70	105.00	166.00	215.85

Table 7-2. Summary of Concentrations for the NATTS Core HAPs Across Sites, 2003-2010

Analyte	Units	Site Type	# AQS Records	% Detections	Arithmetic Mean[a]	Percentile Value						
						5th	10th	25th	50th	75th	90th	95th
Nickel (PM_{10})	ng/m^3	Urban	6,785	96%	2.50 ± 0.10	0.28	0.53	0.90	1.67	2.82	4.85	6.95
		Rural	2,515	82%	0.95 ± 0.13	ND[b]	ND[b]	0.08	0.43	0.92	1.75	2.96
		All Sites	9,300	92%	2.08 ± 0.08	ND[b]	0.09	0.61	1.21	2.43	4.20	6.17
Tetrachloroethylene	µg/m^3	Urban	7,685	88%	0.398 ± 0.134	ND[b]	ND[b]	0.07	0.16	0.34	0.68	1.00
		Rural	2,498	26%	0.047 ± 0.013	ND[b]	ND[b]	ND[b]	ND[b]	0.03	0.07	0.20
		All Sites	10,183	72%	0.312 ± 0.101	ND[b]	ND[b]	ND[b]	0.13	0.27	0.54	0.88
Trichloroethylene	µg/m^3	Urban	7,694	57%	0.078 ± 0.023	ND[b]	ND[b]	ND[b]	0.03	0.08	0.16	0.26
		Rural	2,479	13%	0.010 ± 0.003	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]	0.03	0.03
		All Sites	10,173	46%	0.061 ± 0.018	ND[b]	ND[b]	ND[b]	ND[b]	0.05	0.13	0.21
Vinyl chloride	µg/m^3	Urban	7,609	20%	0.006 ± 0.001	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]	0.02	0.03
		Rural	2,494	13%	0.005 ± 0.001	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]	0.01	0.01
		All Sites	10,103	18%	0.006 ± 0.001	ND[b]	ND[b]	ND[b]	ND[b]	ND[b]	0.01	0.03

[a] In calculations involving non-detects (ND), a value of zero is used.
[b] ND = non-detect. No results of this chemical were registered by the laboratory analytical equipment.

Eight NATTS core HAPs had detection rates at a minimum of 90% over the 8-year period:

- acetaldehyde, 99%
- benzene, 95%
- carbon tetrachloride, 90%
- formaldehyde, 100%
- lead (PM_{10}), 99%
- manganese (PM_{10}), 99%
- naphthalene, 100%
- nickel (PM_{10}), 92%.

Trichloroethylene and vinyl chloride were detected less than 50% (46% and 18%, respectively).

7.3 Urban and Rural Sites Comparison

In 2010, urban sites constitute 20 of the 27 NATTS sites. Table 7-2 also presents aggregated summary statistics based on the urban and rural classifications. With the exception of formaldehyde and vinyl chloride, the concentrations of NATTs core HAPs at urban sites were significantly higher on average than at rural sites. Formaldehyde is most associated with automobile exhaust, but can be formed secondarily in the atmosphere. Vinyl chloride is typically emitted from chemical manufacturing facilities, and the lack of significant difference between urban and rural sites might suggest that these sources are not nearby a NATTS site or that they are emitted at low enough levels.

NATTS core HAPs with more than a 3-to-1 urban to rural concentration ratio include:

- beryllium ratio = 3.1 to 1
- 1,3-butadiene ratio = 10.8 to 1
- chloroform ratio = 5.2 to 1
- manganese (PM_{10}) = 3.1 to 1
- tetrachloroethylene ratio = 8.5 to 1
- trichloroethylene ratio = 7.7 to 1

NATTS core HAPs with less than a 1.5-to-1 urban to rural concentration ratio include:

- acetaldehyde ratio = 1.2 to 1
- benzo(a)pyrene ratio = 1.4 to 1
- formaldehyde ratio = 0.98 to 1
- vinyl chloride ratio = 1.1 to 1

7.4 Site-Level Overview Statistics

This section summarizes the results of the statistical data analyses performed at the site level, which include: 1) detection rate, 2) average concentrations, 3) data distribution, and 4) maximum concentration. The summary statistics in Tables D.3-1 through D.3-30 in Appendix D.2 present prevalence (number of detections), average concentrations, standard deviation, maximum concentration, and distribution (percentiles) of the concentrations of NATTS core HAPs *at the site level* from 2003-2010.

The site-level statistical summaries in Tables D.3-1 through D.3-30 are useful when performing inter-site comparisons. An example of such type of comparison is presented in Section 7.5 through analysis of four pairs of NATTS sites that are in close proximity to one another.

Figures 7-1 through 7-18 graphically summarize the number of concentration records available for each pollutant by site for all years through 2010. Pollutant concentrations that were identified as ½ MDL, as discussed in Section 7.2, were treated as non-detects. All invalidated concentrations identified in Section 7.1 not included in these graphics. It is important to remember that not all sites have been participating in the NATTS for the entire assessment period (e.g., Los Angeles, CA) or relocated during the assessment period (e.g., Bronx, NY) and the total number of detect and non-detect records at these sites may not be comparable to other sites. Refer to Section 3.1 for more details.

The following observations are made regarding the detection rates of the NATTS core HAPs at the various NATTS sites:

- Acetaldehyde: All of the sites had *greater* than 90% detection of acetaldehyde.
- Arsenic (PM_{10}): Only 7 of the 30 sites had *less* than 90% detection of arsenic (PM_{10}). Of those, this pollutant was detected less than 50% at Grand Junction, CO (18%) and Providence, RI (37%).
- Benzene: Only 6 of the 30 sites had *less* than 90% detection of benzene. Detection rates at Chesterfield, SC and Horicon, WI were the lowest at 57% and 59%, respectively.
- Benzo(a)pyrene: Only 4 of the 30 sites had *greater* than 90% detection of benzene (Roxbury, MA, Detroit, MI, Bronx (#1), NY, and Houston, TX).
- Beryllium (PM_{10}): Only 10 of the 30 sites had *greater* than 90% detection of beryllium (PM_{10}). This pollutant was *never* detected at Grayson Lake, KY.
- 1,3-Butadiene: Only 12 of the 30 sites had *greater* than 90% detection of 1,3-butadiene. This pollutant was *never* detected at Richmond, VA or Horicon, WI.
- Cadmium (PM_{10}): Only 9 of the 30 sites had *less* than 90% detection of cadmium (PM_{10}). This pollutant was *rarely* detected at Grand Junction, CO (13%), Grayson Lake, KY (2%), and Providence, RI (24%).

- Carbon Tetrachloride: Only 7 of the 30 sites had *less* than 90% detection of carbon tetrachloride. This pollutant was detected less than 50% at La Grande, OR (26%), Portland, OR (28%), Chesterfield, SC (34%), and Horicon, WI (10%). Carbon tetrachloride is found globally as a result of its significant past uses in refrigerants and propellants for aerosol cans and its chemical persistence. Virtually all uses have discontinued. However, it is still measured throughout the world as a result of its slow rate of degradation in the environment and global distribution in the atmosphere. Typically, carbon tetrachloride concentrations are fairly uniform across the U.S., and the non-uniformity of concentrations at these 4 sites may indicate a QA concern.
- Chloroform: Half of the 30 sites had *greater* than 90% detection of chloroform. This pollutant was *rarely* detected at La Grande, OR (5%), Portland, OR (8%), Chesterfield, SC (10%), and Richmond, VA (3%).
- Formaldehyde: All of the sites had *greater* than 98% detection of formaldehyde.
- Hexavalent Chromium: Only 4 of the 30 sites had *greater* than 90% detection of hexavalent chromium (Phoenix, AZ, Los Angeles, CA, Rubidoux, CA, and Bronx(#2), NY). This pollutant was *rarely* detected at La Grande, OR (14%), Portland, OR (22%), and Underhill, VT (19%). The San Jose site did not collect hexavalent chromium during the assessment period.
- Lead (PM_{10}): Only 1 of the 30 sites had *less* than 90% detection of lead (PM_{10}), which was at Grand Junction, CO (86%).
- Manganese (PM_{10}): Only 2 of the 30 sites had *less* than 90% detection of manganese (PM_{10}), which were at the Grayson Lake, KY and Hazard, KY sites (89% at both sites).
- Naphthalene: All of the sites had *greater* than 97% detection of naphthalene.
- Nickel (PM_{10}): Only 6 of the 30 sites had *less* than 90% detection of nickel (PM_{10}). This pollutant was *rarely* detected at Grayson Lake, KY (15%).
- Tetrachloroethylene: Only 11 of the 30 sites had *greater* than 90% detection of tetrachloroethylene. This pollutant was *rarely* detected at La Grande, OR (3%), Portland, OR (11%), Chesterfield, SC (5%), Richmond, VA (11%), Horicon, WI (3%), and Mayville, WI (10%).
- Trichloroethylene: Only 4 of the 30 sites had *greater* than 90% detection of tetrachloroethylene (San Jose, CA, 92%; Bronx (#1), NY,94%; Bronx (#2), NY, 93%; and Rochester, NY, 93%). This pollutant was *rarely* detected at South DeKalb (<1%), La Grande, OR (2%), Portland, OR (1%), Chesterfield, SC (2%), Underhill, VT (8%), Richmond, VA (2%), Horicon, WI (2%), and Mayville, WI (2%). Trichloroethylene was *never* detected at Grayson Lake, KY.
- Vinyl Chloride: None of the 30 sites had *greater* than 90% detection of vinyl chloride. This pollutant was *rarely* detected at Phoenix, AZ (4%), Rubidoux, CA (<1%), Grand Junction, CO (6%), Chicago, IL (5%), La Grande, OR (2%), Portland, OR (1%), Chesterfield, SC (2%), Underhill, VT (7%), Richmond, VA (1%), Seattle, WA (2%), and Mayville, WI (2%). Vinyl chloride was *never* detected at Los Angeles, CA, San Jose, CA, South DeKalb, GA, Grayson Lake, KY, and Horicon, WI.

Figure 7-1. Acetaldehyde Concentration Records by Site, 2003-2010

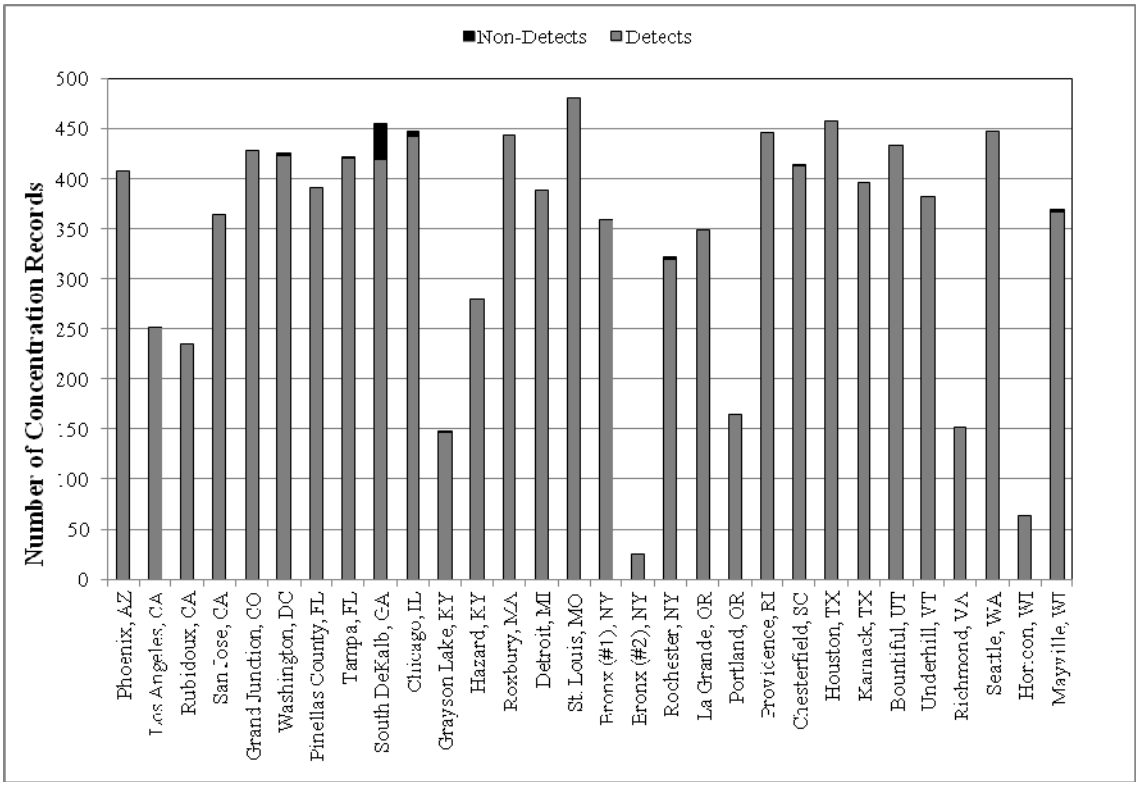


Figure 7-2. Arsenic (PM_{10}) Concentration Records by Site, 2003-2010

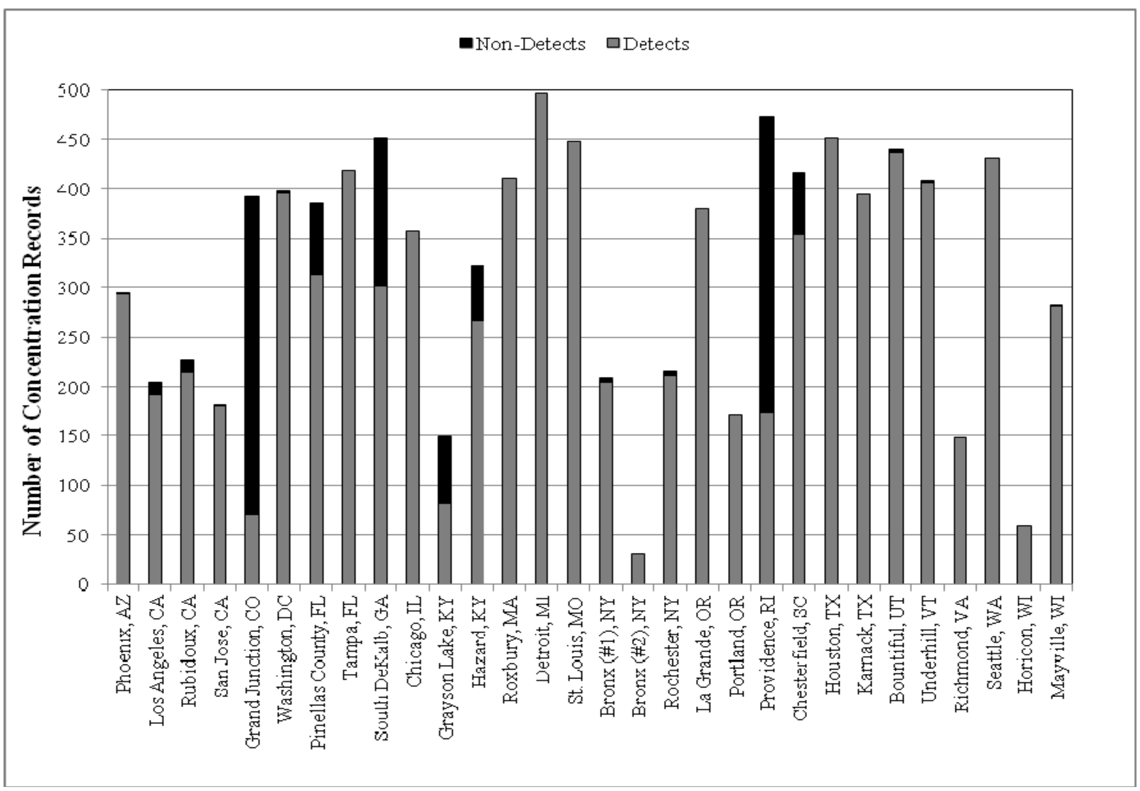


Figure 7-3. Benzene Concentration Records by Site, 2003-2010

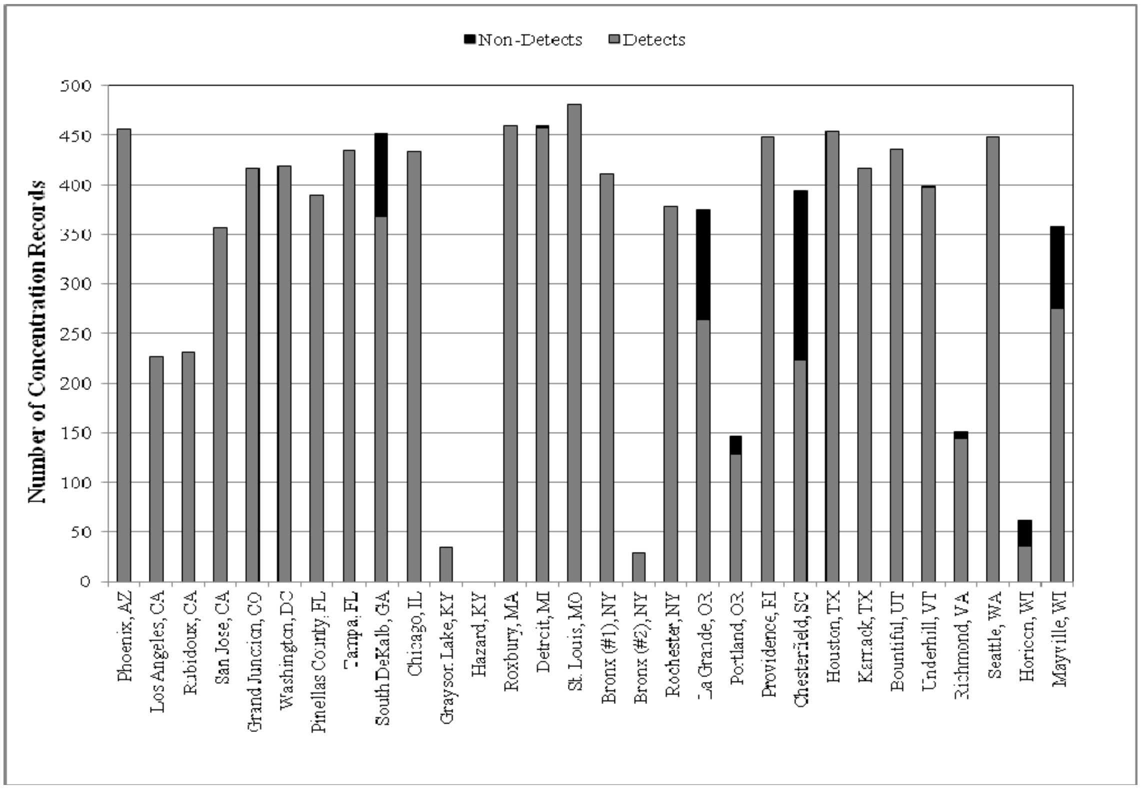


Figure 7-4. Benzo(a)Pyrene Concentration Records by Site, 2007-2010

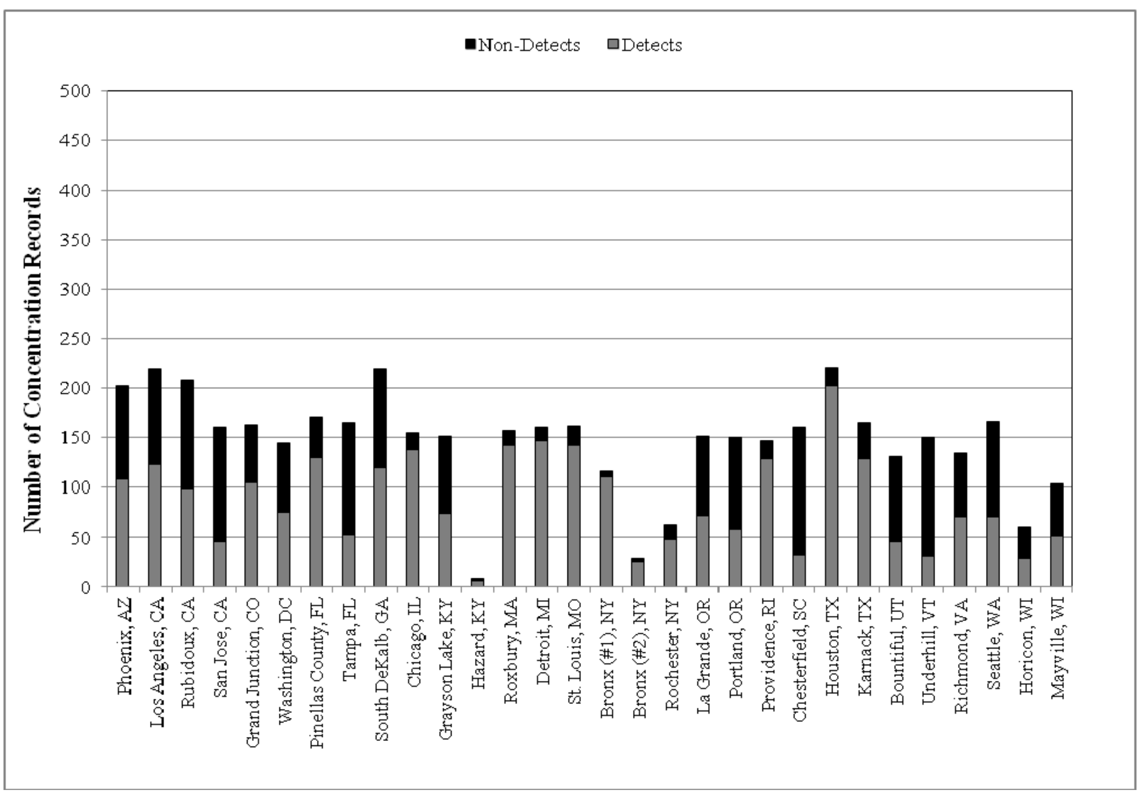


Figure 7-5. Beryllium (PM_{10}) Concentration Records by Site, 2003-2010

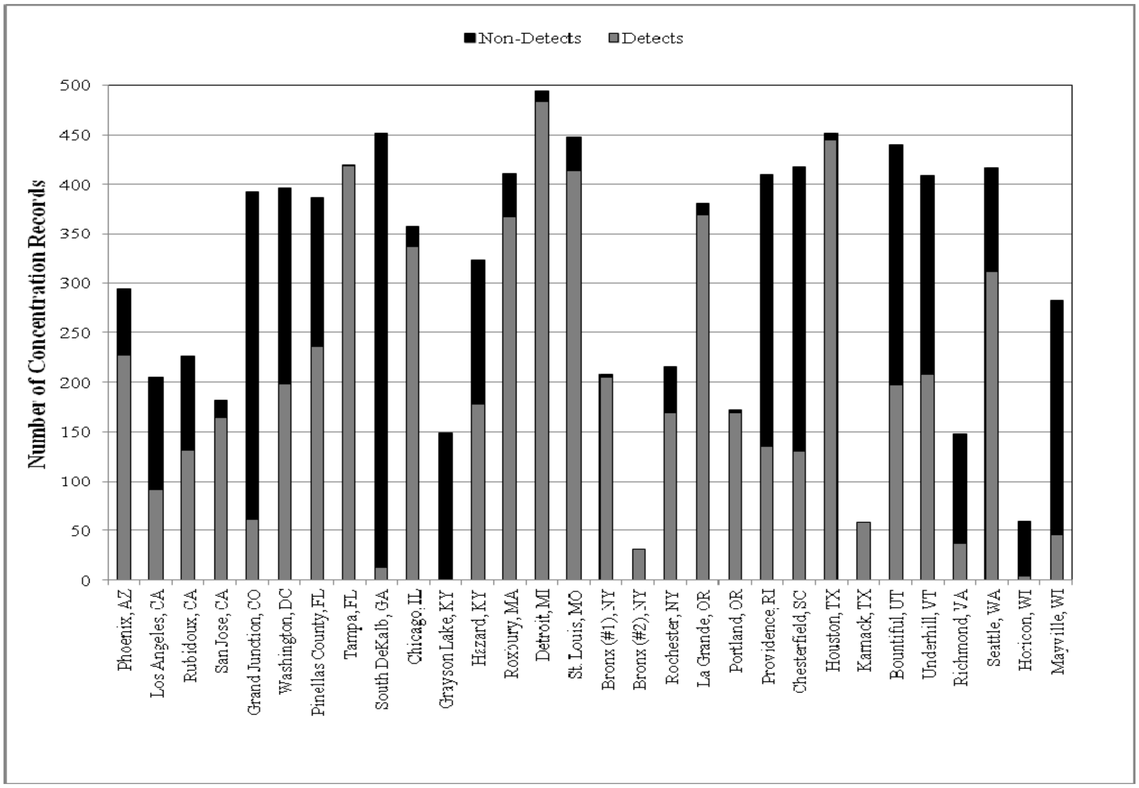


Figure 7-6. 1,3-Butadiene Concentration Records by Site, 2003-2010

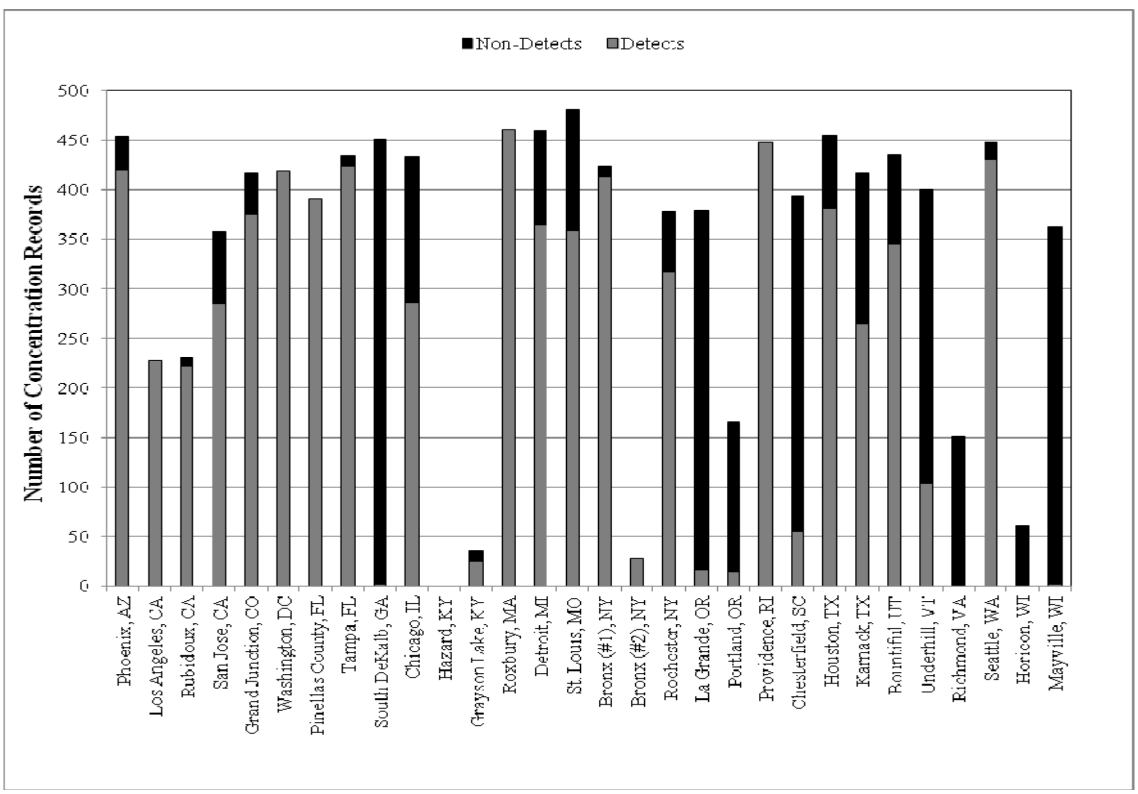


Figure 7-7. Cadmium (PM_{10}) Concentration Records by Site, 2003-2010

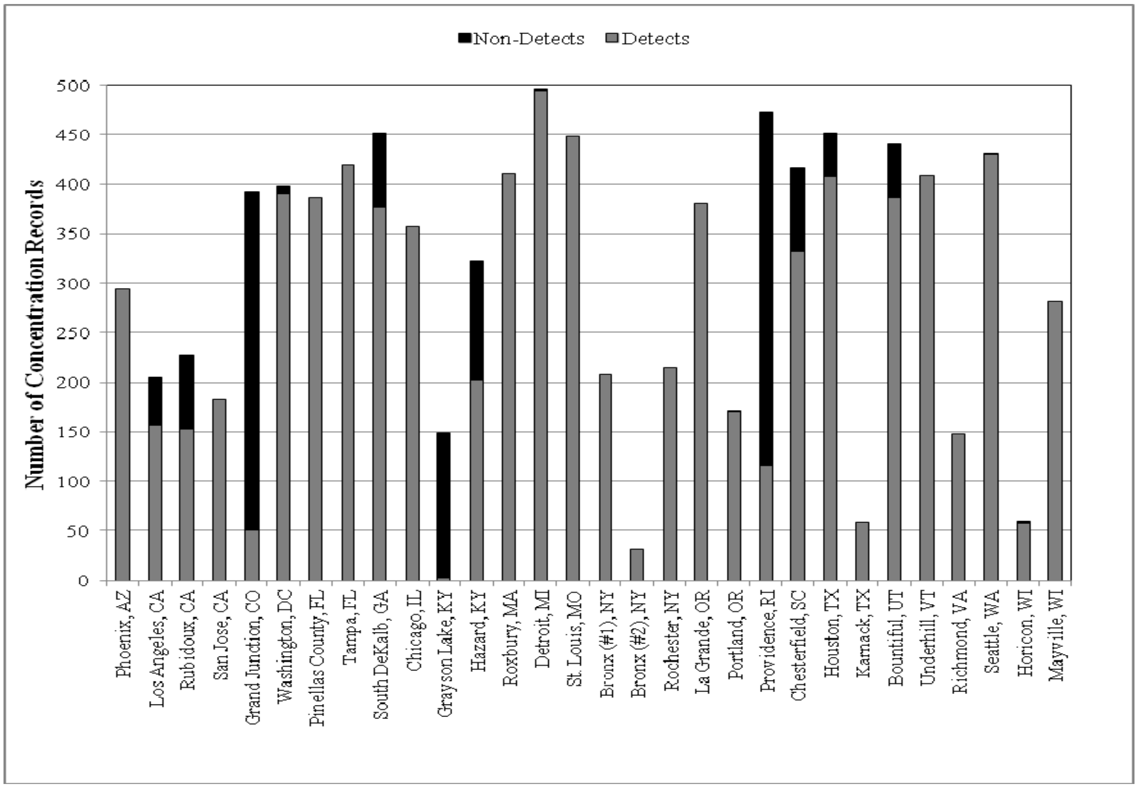


Figure 7-8. Carbon Tetrachloride Concentration Records by Site, 2003-2010

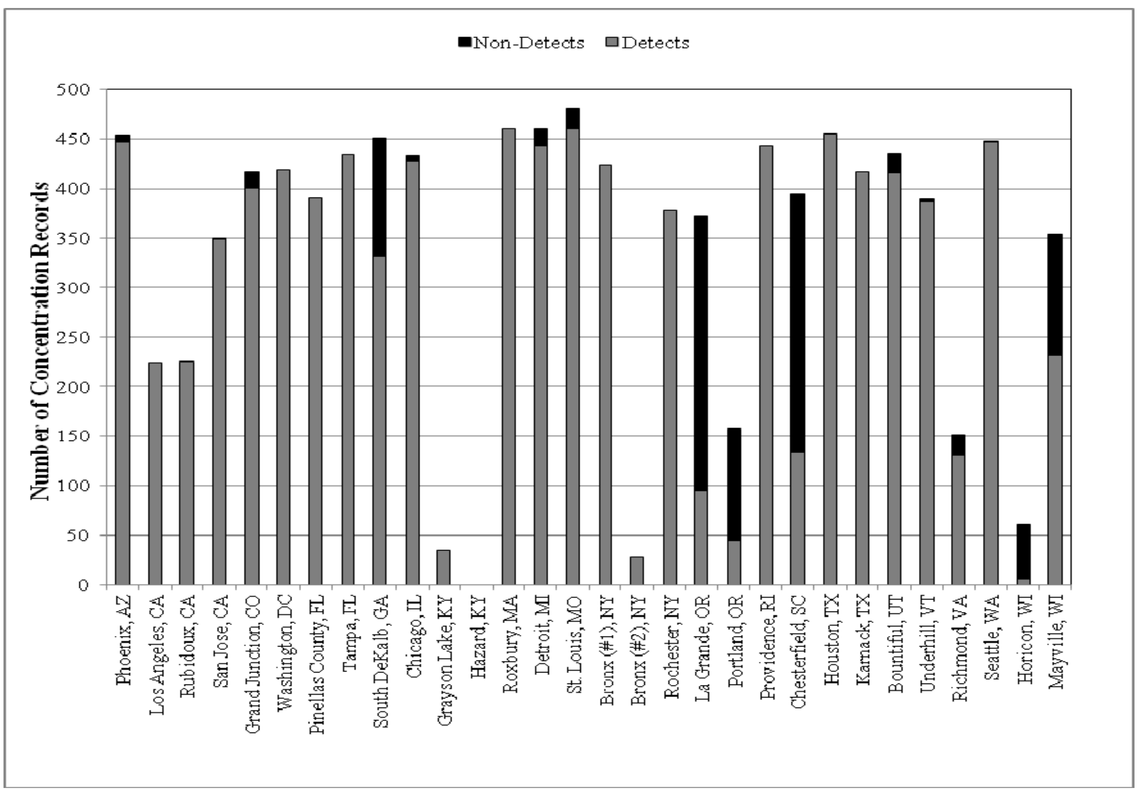


Figure 7-9. Chloroform Concentration Records by Site, 2003-2010

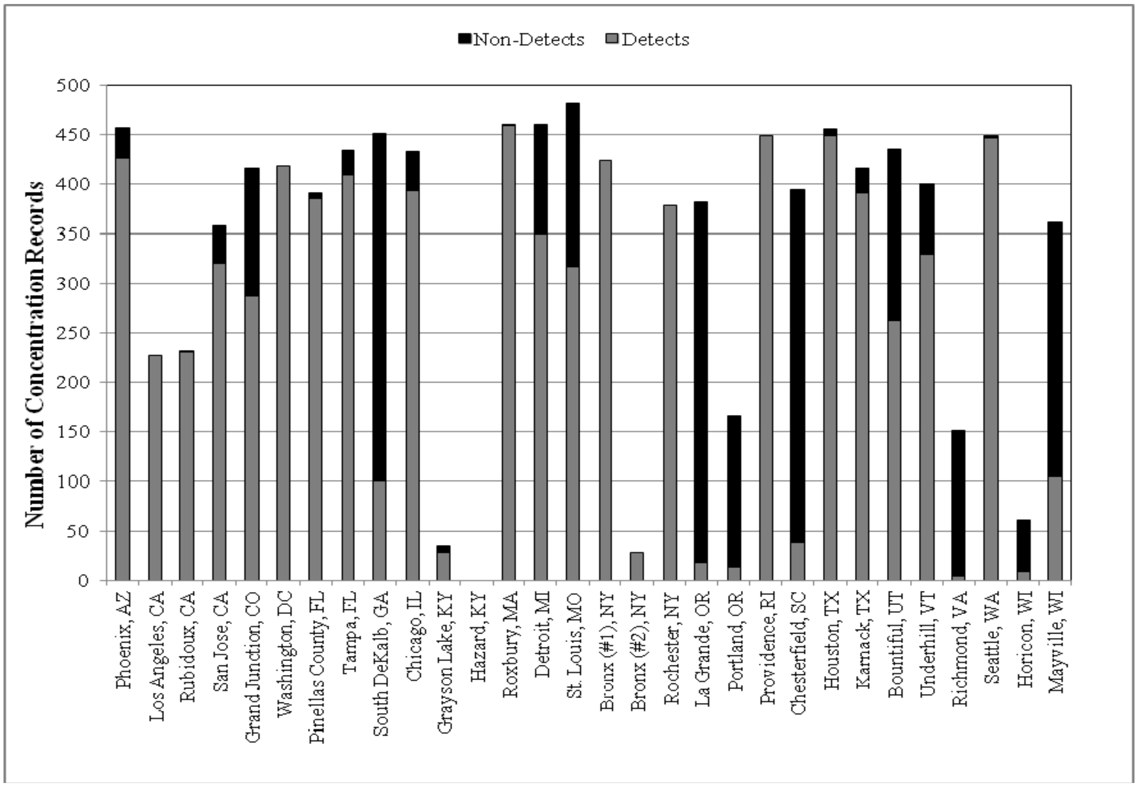


Figure 7-10. Formaldehyde Concentration Records by Site, 2003-2010

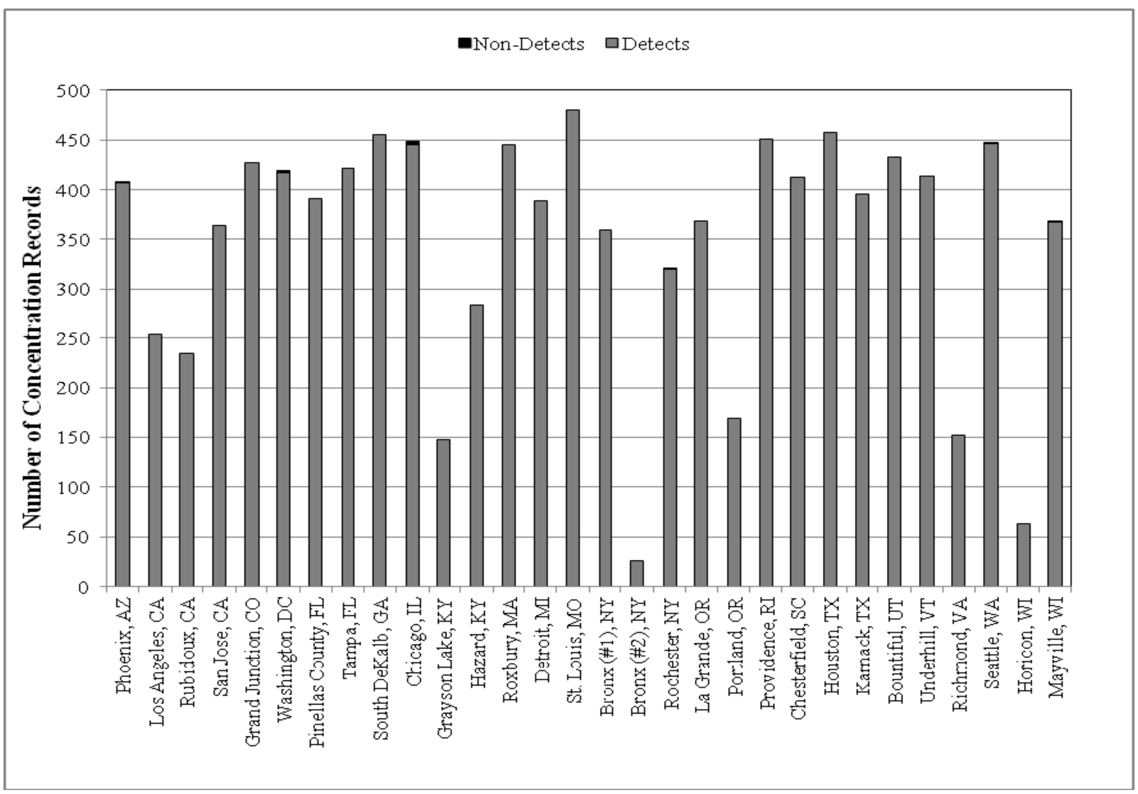


Figure 7-11. Hexavalent Chromium Concentration Records by Site, 2005-2010

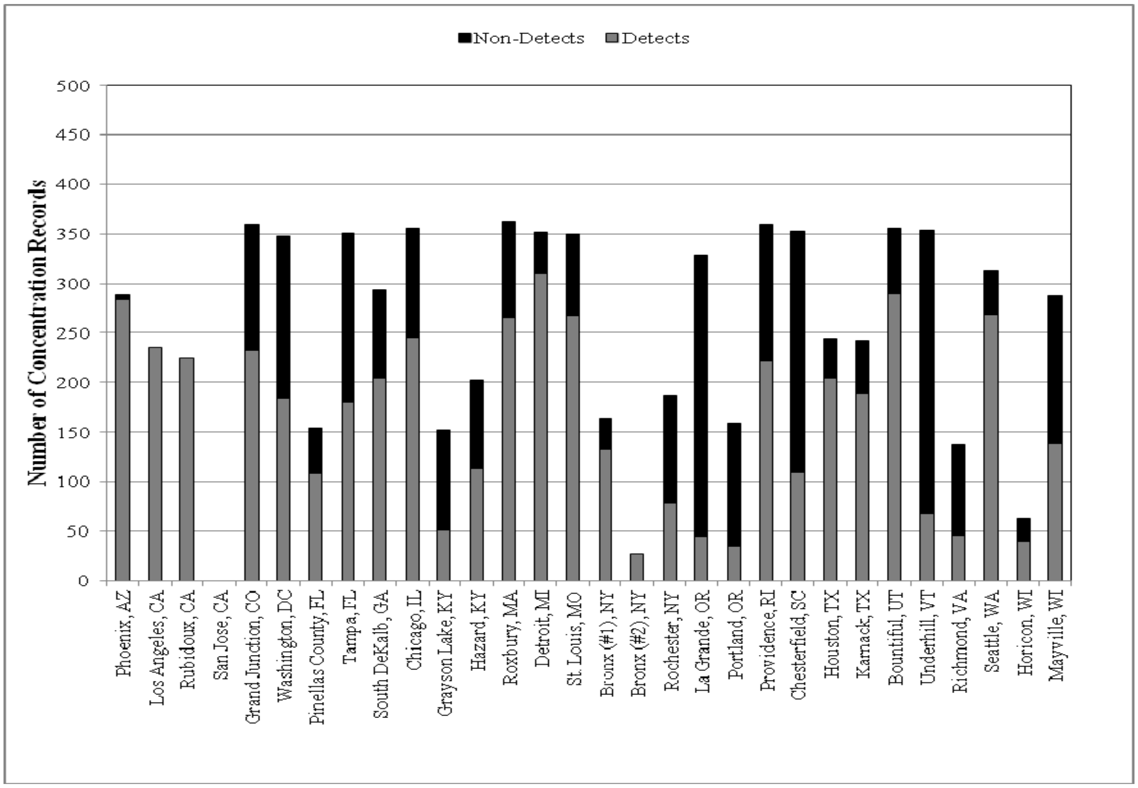


Figure 7-12. Lead (PM_{10}) Concentration Records by Site, 2003-2010

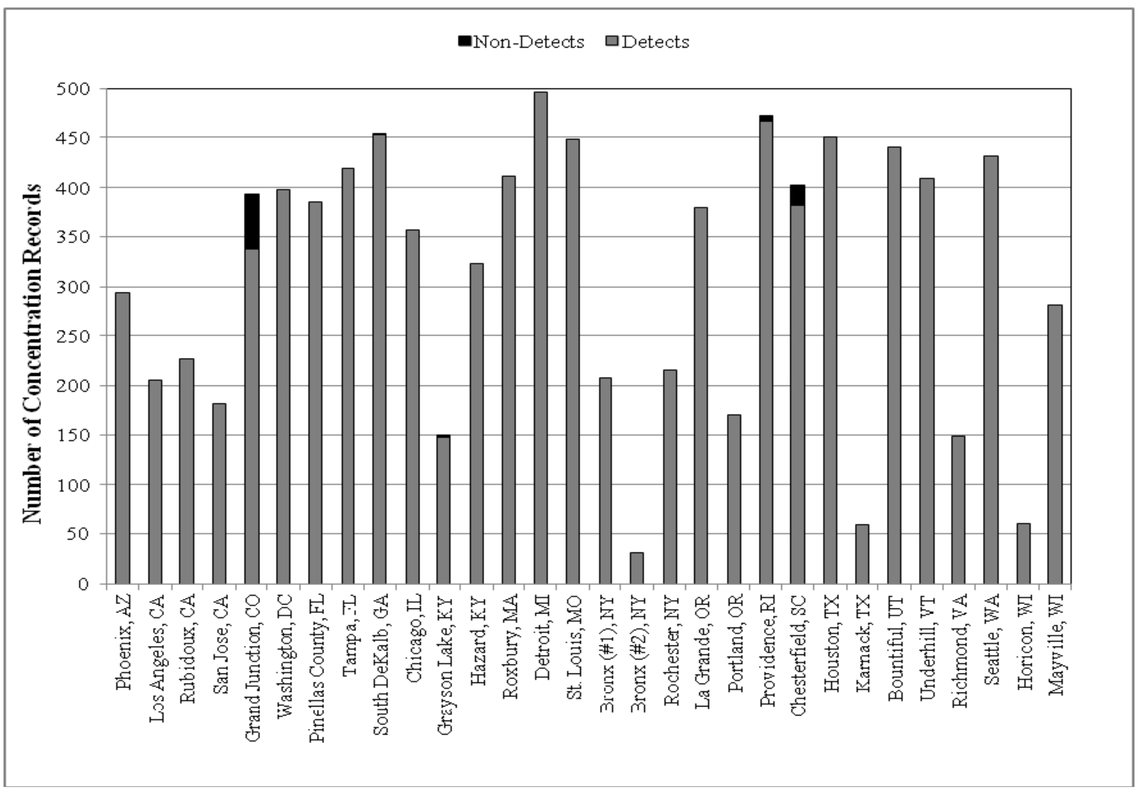


Figure 7-13. Manganese (PM_{10}) Concentration Records by Site, 2003-2010

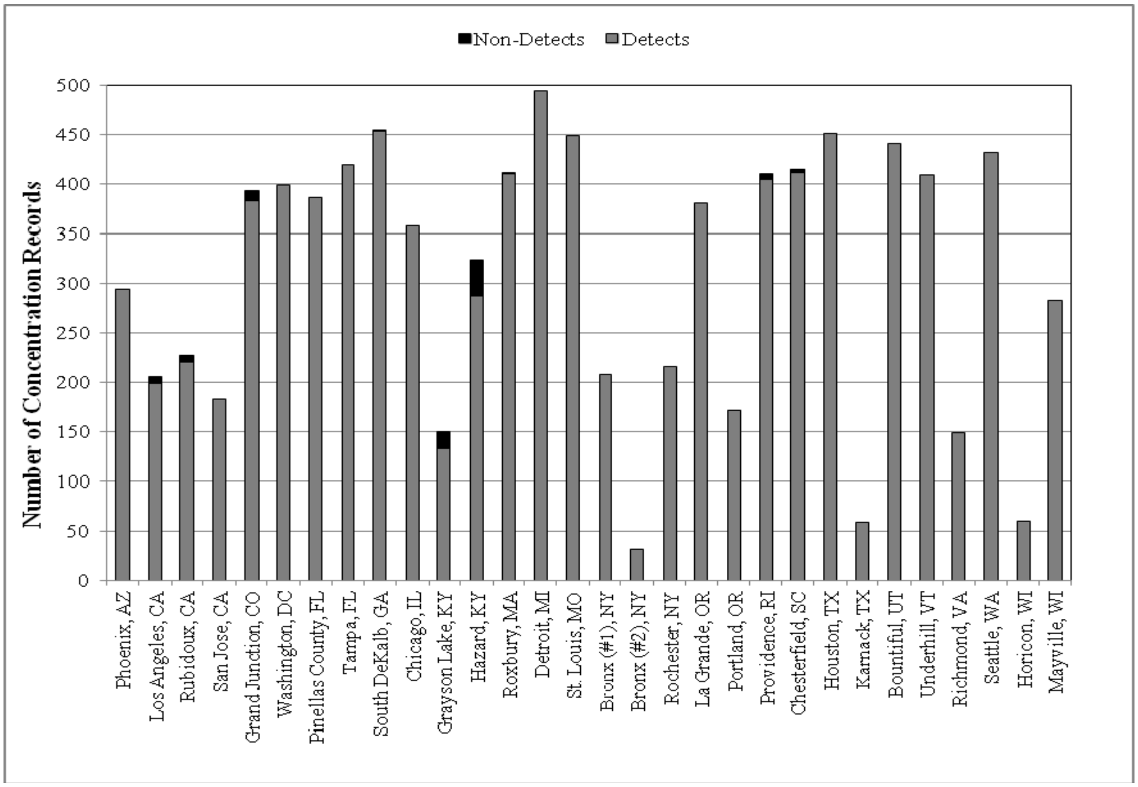


Figure 7-14. Naphthalene Concentration Records by Site, 2007-2010

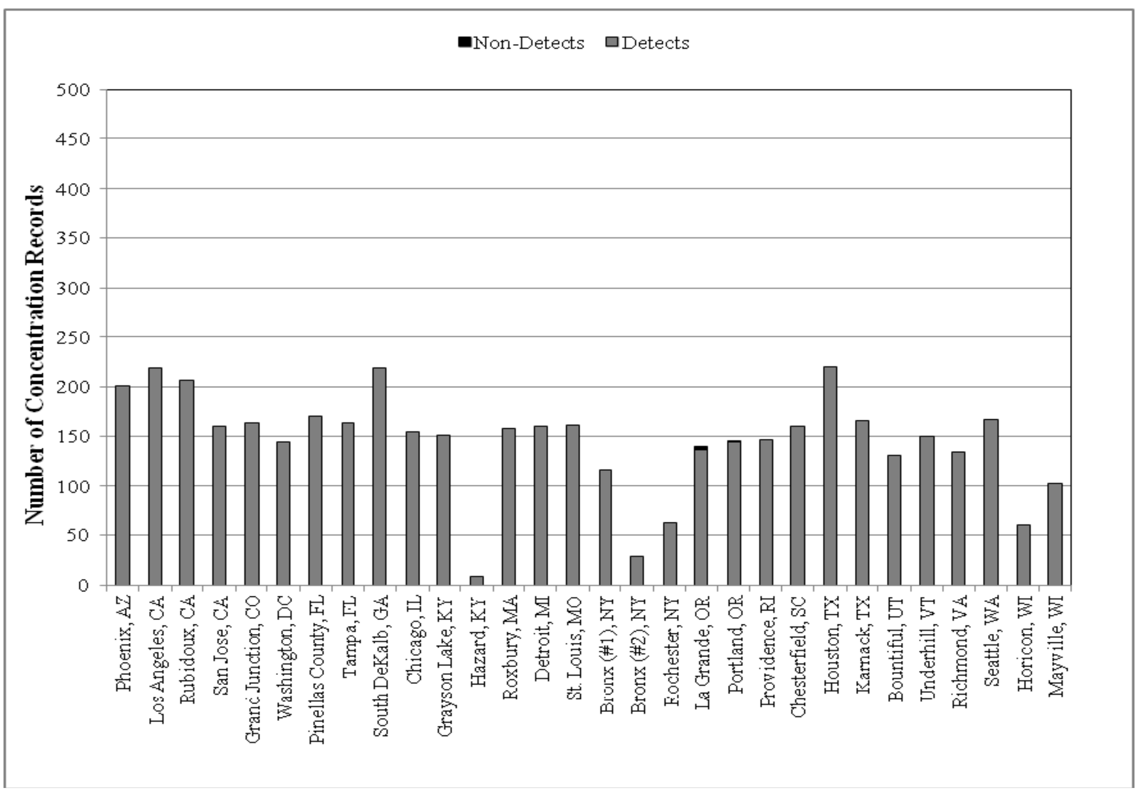


Figure 7-15. Nickel (PM_{10}) Concentration Records by Site, 2003-2010

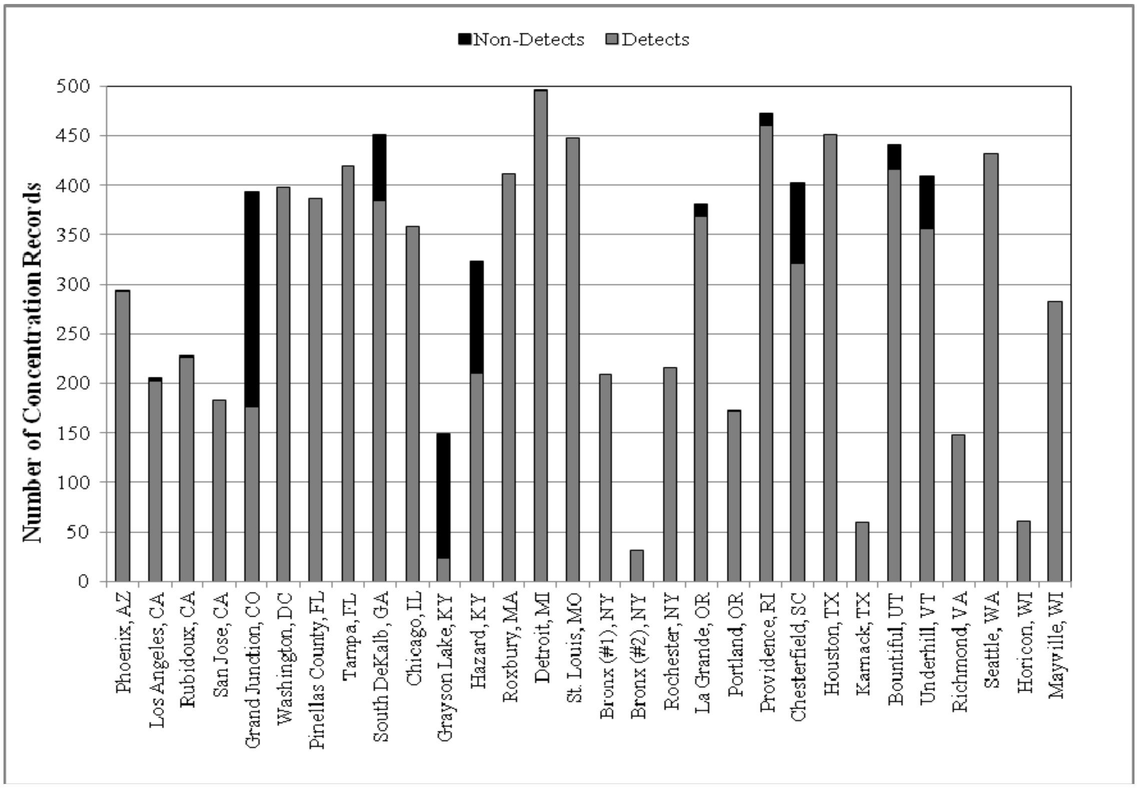


Figure 7-16. Tetrachloroethylene Concentration Records by Site, 2003-2010

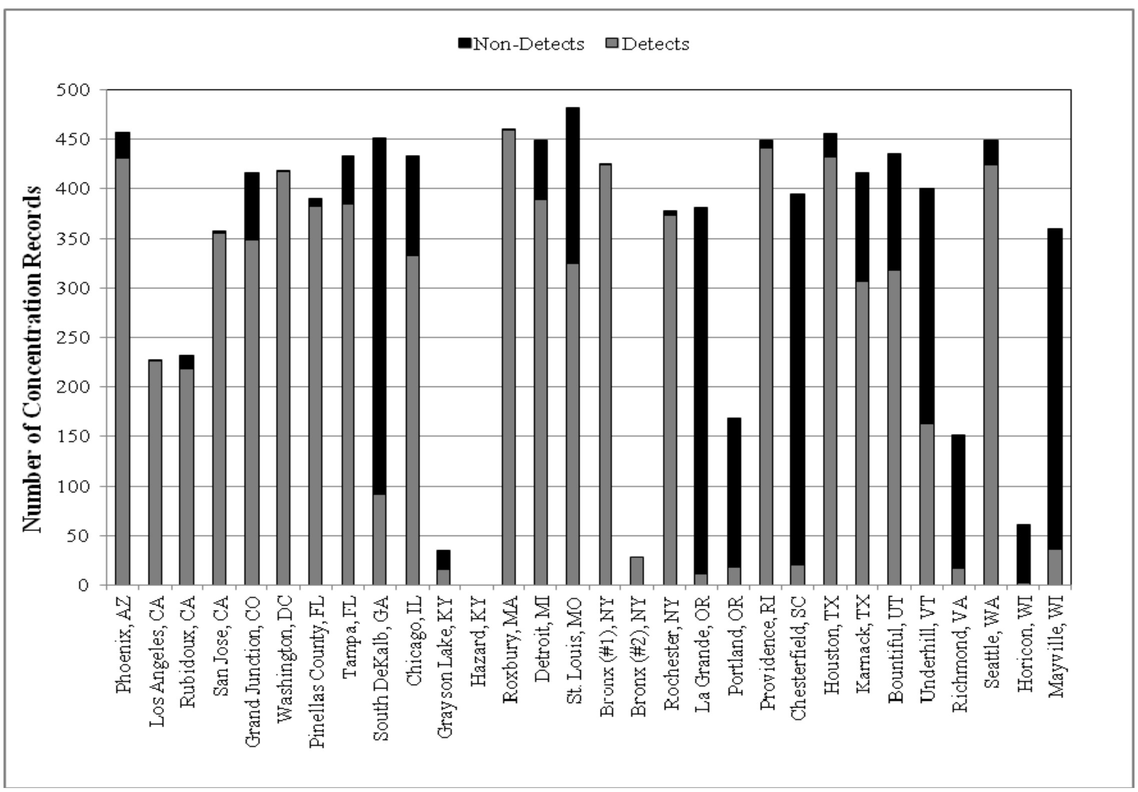


Figure 7-17. Trichlorotheylene Concentration Records by Site, 2003-2010

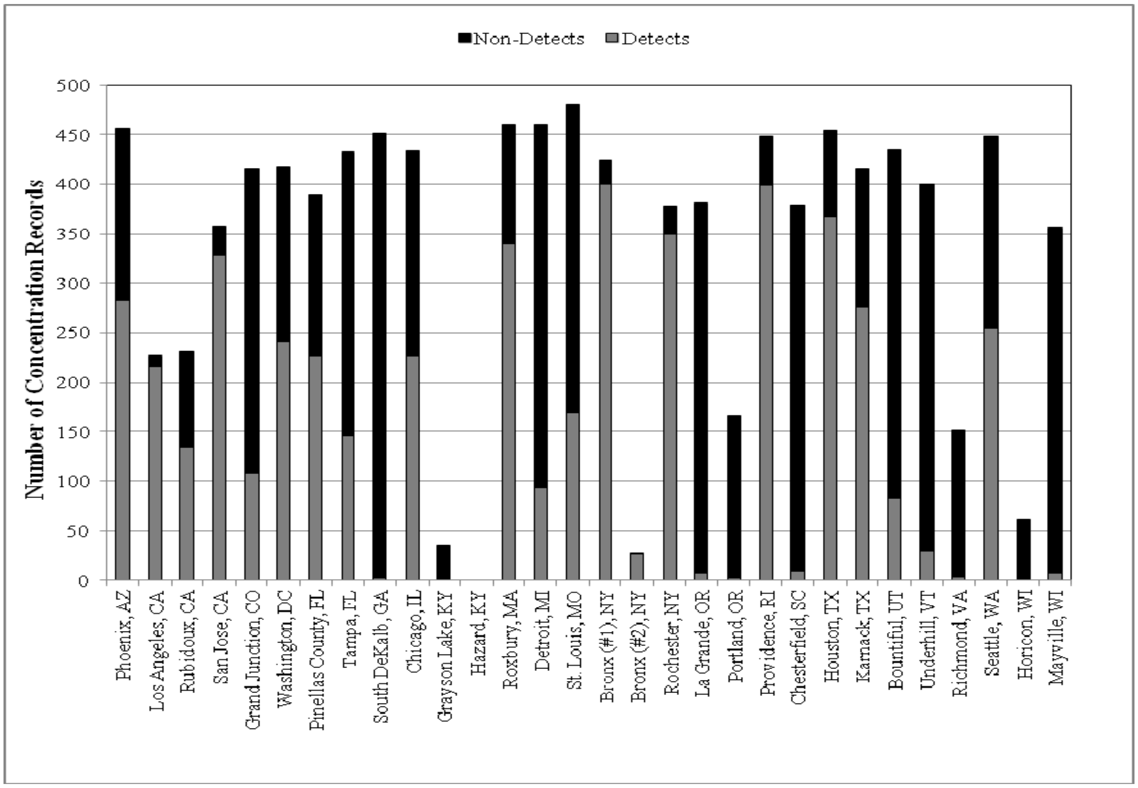
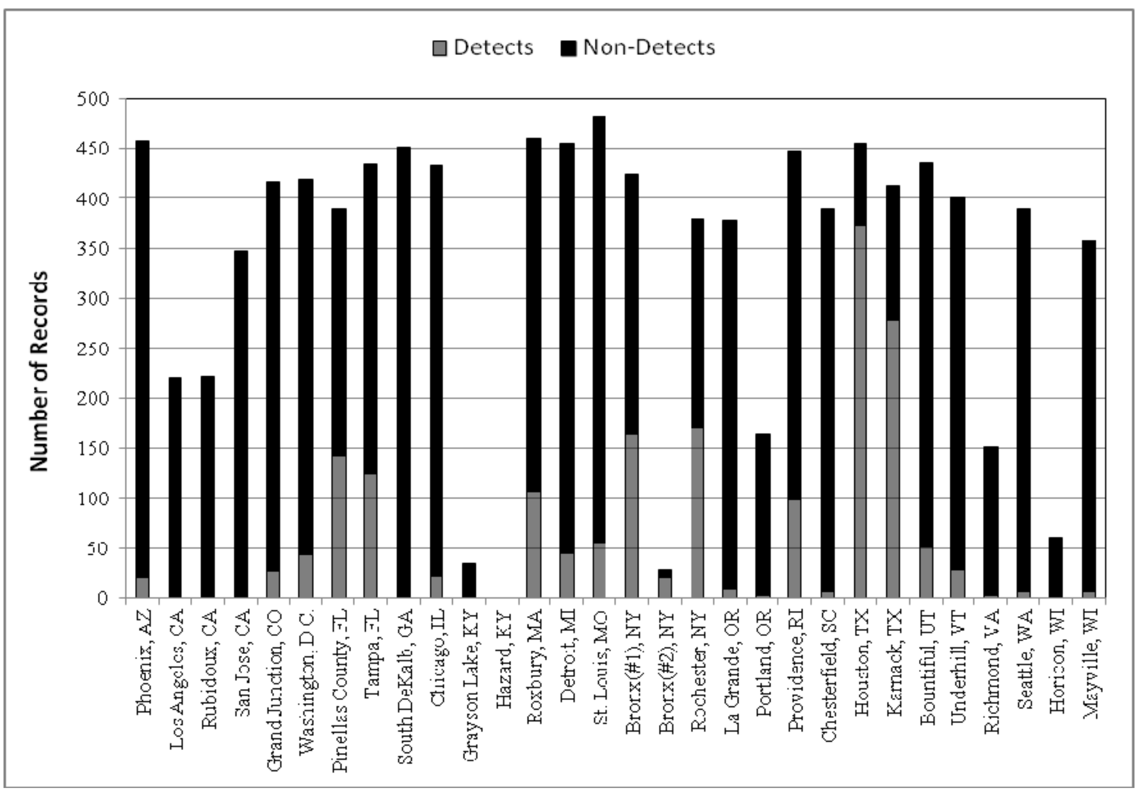


Figure 7-18. Vinyl Chloride Concentration Records by Site, 2003-2010



7.5 Site Inter-comparisons

As part of this assessment, EPA was interested in comparing the concentration data between four pairs of sites that are close together:

- Los Angeles, CA and Rubidoux, CA
- Pinellas County, FL and Tampa, FL
- Providence, RI and Roxbury, MA
- Richmond, VA and Washington, D.C.

For this inter-comparison, EPA developed datasets that consisted of only concentrations in which the paired sites sampled on the same day. Average concentrations for each of the NATTS core HAPs were calculated along with the confidence interval using Student's *t*-test at the $\alpha = 0.05$ level. Statistical significance was then compared for each NATTS core HAP, and are denoted with yellow shading.

Los Angeles, CA and Rubidoux, CA

Table 7-3 presents the inter-comparison statistics between Los Angeles, CA and Rubidoux, CA. These two sites are located within 50 miles of each other. The Los Angeles, CA site is more urban than the Rubidoux, CA site. The following observations are made for these NATTS sites:

- There was *no significant difference* in acetaldehyde, arsenic (PM_{10}), benzo(a)pyrene, beryllium (PM_{10}), cadmium (PM_{10}), carbon tetrachloride, chloroform, formaldehyde, lead (PM_{10}), manganese (PM_{10}), nickel (PM_{10}), and vinyl chloride concentrations between the sites.
- Benzene, 1,3-butadiene, naphthalene, tetrachloroethylene, and trichloroethylene were significantly higher in Los Angeles, CA than Rubidoux, CA.
- Hexavalent chromium was significantly higher in Rubidoux, CA than Los Angeles, CA.

Table 7-3. Inter-comparison of NATTS Core HAPs for the Los Angeles, CA and Rubidoux, CA NATTS Sites

Pollutant	Units	# of Concurrent Sample Days	Mean of Measurements ± Confidence Interval	
			Los Angeles. CA	Rubidoux, CA
Acetaldehyde	µg/m^3	225	2.60 ± 0.19	2.56 ± 0.18
Arsenic (PM_{10})	ng/m^3	196	1.61 ± 0.96	1.93 ± 1.28
Benzene	µg/m^3	221	1.44 ± 0.11	1.09 ± 0.09
Benzo(a)pyrene	ng/m^3	192	0.09 ± 0.02	0.07 ± 0.02
Beryllium (PM_{10})	ng/m^3	196	0.98 ± 0.30	1.01 ± 0.30

Table 7-3. Inter-comparison of NATTS Core HAPs for the Los Angeles, CA and Rubidoux, CA NATTS Sites

Pollutant	Units	# of Concurrent Sample Days	Mean of Measurements ± Confidence Interval	
			Los Angeles. CA	Rubidoux, CA
Butadiene, 1,3-	μg/m^3	221	0.17 ± 0.02	0.10 ± 0.01
Cadmium (PM_{10})	ng/m^3	196	0.24 ± 0.05	0.16 ± 0.04
Carbon tetrachloride	μg/m^3	218	0.49 ± 0.01	0.48 ± 0.01
Chloroform	μg/m^3	221	0.16 ± 0.01	0.15 ± 0.01
Formaldehyde	μg/m^3	227	4.41 ± 0.32	4.48 ± 0.33
Hexavalent Chromium	ng/m^3	219	0.11 ± 0.01	0.19 ± 0.03
Lead (PM_{10})	ng/m^3	196	7.85 ± 0.83	6.73 ± 0.75
Manganese (PM_{10})	ng/m^3	196	13.26 ± 1.82	16.02 ± 2.36
Naphthalene	ng/m^3	191	135.35 ± 14.78	75.82 ± 8.57
Nickel (PM_{10})	ng/m^3	196	3.73 ± 1.52	1.99 ± 0.25
Tetrachloroethylene	μg/m^3	221	0.24 ± 0.02	0.15 ± 0.02
Trichloroethylene	μg/m^3	221	0.141 ± 0.023	0.023 ± 0.035
Vinyl chloride	μg/m^3	214	0	0.0002 ± 0.0005

Yellow shading represents statistically significant difference based on $\alpha = 0.05$

Pinellas County, FL and Tampa, FL

Table 7-4 presents the inter-comparison statistics between Pinellas County, FL and Tampa, FL. These two sites are located within 40 miles of each other. The following observations are made for these NATTS sites:

- There was *no significant difference* in arsenic (PM_{10}), formaldehyde, lead (PM_{10}), manganese (PM_{10}), nickel (PM_{10}), and vinyl chloride concentrations between the sites.
- Acetaldehyde, benzene, benzo(a)pyrene, 1,3-butadiene, chloroform, hexavalent chromium, naphthalene, tetrachloroethylene, and trichloroethylene were significantly higher in Pinellas County, FL than Tampa, FL.
- Beryllium (PM_{10}), cadmium (PM_{10}), and carbon tetrachloride were significantly higher in Tampa, FL than Pinellas County, FL.

Table 7-4. Inter-comparison of NATTS Core HAPs for Pinellas County, FL and Tampa, FL NATTS Sites

Pollutant	Units	# of Concurrent Sample Days	Mean of Measurements ± Confidence Interval	
			Pinellas County, FL	Tampa, FL
Acetaldehyde	μg/m^3	380	2.46 ± 0.29	1.50 ± 0.12
Arsenic (PM_{10})	ng/m^3	378	1.48 ± 0.21	1.21 ± 0.11
Benzene	μg/m^3	375	0.89 ± 0.06	0.48 ± 0.02
Benzo(a)pyrene	ng/m^3	152	0.06 ± 0.01	0.02 ± 0.01
Beryllium (PM_{10})	ng/m^3	378	0.032 ± 0.006	0.067 ± 0.007
Butadiene, 1,3-	μg/m^3	375	0.13 ± 0.01	0.07 ± 0.01
Cadmium (PM_{10})	ng/m^3	378	0.13 ± 0.01	0.18 ± 0.02
Carbon tetrachloride	μg/m^3	375	0.527 ± 0.007	0.545 ± 0.06
Chloroform	μg/m^3	375	0.20 ± 0.01	0.15 ± 0.03
Formaldehyde	μg/m^3	380	2.22 ± 0.59	2.36 ± 0.24
Hexavalent Chromium	ng/m^3	145	0.021 ± 0.006	0.007 ± 0.002
Lead (PM_{10})	ng/m^3	378	2.10 ± 0.17	2.47 ± 0.26
Manganese (PM_{10})	ng/m^3	378	2.81 ± 0.26	2.76 ± 0.23
Naphthalene	ng/m^3	150	88.99 ± 10.63	42.01 ± 3.78
Nickel (PM_{10})	ng/m^3	378	3.39 ± 0.18	3.63 ± 0.21
Tetrachloroethylene	μg/m^3	374	0.19 ± 0.02	0.09 ± 0.01
Trichloroethylene	μg/m^3	374	0.039 ± 0.005	0.018 ± 0.003
Vinyl chloride	μg/m^3	375	0.007 ± 0.001	0.007 ± 0.001

Yellow shading represents statistically significant difference based on $\alpha = 0.05$

Providence, RI and Roxbury, MA

Table 7-5 presents the inter-comparison statistics between Providence, RI and Roxbury, MA. These two sites are located within 40 miles of each other. The following observations are made for these NATTS sites:

- There was *no significant difference* in acetaldehyde, arsenic (PM_{10}), benzene, 1,3-butadiene, carbon tetrachloride, formaldehyde, lead (PM_{10}), naphthalene, nickel (PM_{10}), tetrachloroethylene, and vinyl chloride concentrations between the sites.
- Benzo(a)pyrene, chloroform, and trichloroethylene were significantly higher in Providence, RI than Roxbury, MA.
- Beryllium (PM_{10}), cadmium (PM_{10}), hexavalent chromium, and manganese (PM_{10}), were significantly higher in Roxbury, MA than Providence, RI.

Table 7-5. Inter-comparison of NATTS Core HAPs for Providence, RI and Roxbury, MA NATTS Sites

Pollutant	Units	# of Concurrent Sample Days	Mean of Measurements ± Confidence Interval	
			Providence, RI	Roxbury, MA
Acetaldehyde	$\mu g/m^3$	396	1.56 ± 0.08	1.45 ± 0.07
Arsenic (PM_{10})	ng/m^3	386	0.39 ± 0.22	0.51 ± 0.04
Benzene	$\mu g/m^3$	399	0.93 ± 0.06	0.99 ± 0.05
Benzo(a)pyrene	ng/m^3	129	0.18 ± 0.03	0.12 ± 0.02
Beryllium (PM_{10})	ng/m^3	375	0.0014 ± 0.0003	0.0041 ± 0.0019
Butadiene, 1,3-	$\mu g/m^3$	399	0.12 ± 0.01	0.11 ± 0.01
Cadmium (PM_{10})	ng/m^3	386	0.05 ± 0.03	0.29 ± 0.03
Carbon tetrachloride	$\mu g/m^3$	393	0.54 ± 0.01	0.56 ± 0.01
Chloroform	$\mu g/m^3$	399	0.113 ± 0.004	0.105 ± 0.004
Formaldehyde	$\mu g/m^3$	402	2.62 ± 0.13	2.85 ± 0.16
Hexavalent Chromium	ng/m^3	348	0.016 ± 0.003	0.038 ± 0.006
Lead (PM_{10})	ng/m^3	386	6.04 ± 3.82	4.26 ± 0.35
Manganese (PM_{10})	ng/m^3	375	3.36 ± 0.22	3.82 ± 0.21
Naphthalene	ng/m^3	129	89.16 ± 10.27	73.69 ± 6.30
Nickel (PM_{10})	ng/m^3	386	3.16 ± 0.66	2.51 ± 0.25
Tetrachloroethylene	$\mu g/m^3$	399	0.26 ± 0.02	0.26 ± 0.02
Trichloroethylene	$\mu g/m^3$	399	0.15 ± 0.02	0.05 ± 0.01
Vinyl chloride	$\mu g/m^3$	399	0.001 ± 0.0002	0.0008 ± 0.0002

Yellow shading represents statistically significant difference based on $\alpha = 0.05$

Richmond, VA and Washington, D.C.

Table 7-6 presents the inter-comparison statistics between Richmond, VA and Washington, D.C. These two sites are located within 100 miles of each other. The following observations are made for these NATTS sites:

- There was *no significant difference* in arsenic (PM_{10}), benzene, benzo(a)pyrene, lead (PM_{10}), naphthalene, nickel (PM_{10}), trichloroethylene, and vinyl chloride concentrations between the sites.
- Acetaldehyde and cadmium (PM_{10}) were significantly higher in Richmond, VA than Washington, D.C.
- Beryllium (PM_{10}), 1,3-butadiene, carbon tetrachloride, formaldehyde, hexavalent chromium, manganese (PM_{10}), and tetrachloroethylene were significantly higher in Washington, D.C than Richmond, VA.

Table 7-6. Inter-comparison of NATTS Core HAPs for Richmond, VA and Washington, D.C. NATTS Sites

Pollutant	Units	# of Concurrent Sample Days	Mean of Measurements ± Confidence Interval	
			Richmond, VA	Washington, D.C.
Acetaldehyde	µg/m^3	151	1.49 ± 0.09	0.84 ± 0.10
Arsenic (PM_{10})	ng/m^3	145	0.78 ± 0.08	0.72 ± 0.07
Benzene	µg/m^3	146	0.63 ± 0.07	0.76 ± 0.07
Benzo(a)pyrene	ng/m^3	124	0.08 ± 0.02	0.07 ± 0.02
Beryllium (PM_{10})	ng/m^3	145	0.003 ± 0.001	0.046 ± 0.016
Butadiene, 1,3-	µg/m^3	146	0	0.12 ± 0.02
Cadmium (PM_{10})	ng/m^3	145	0.19 ± 0.02	0.12 ± 0.01
Carbon tetrachloride	µg/m^3	146	0.52 ± 0.04	0.65 ± 0.01
Chloroform	µg/m^3	146	0.017 ± 0.018	0.324 ± 0.048
Formaldehyde	µg/m^3	151	3.22 ± 0.31	4.73 ± 0.93
Hexavalent Chromium	ng/m^3	130	0.006 ± 0.002	0.011 ± 0.003
Lead (PM_{10})	ng/m^3	145	3.24 ± 1.02	3.35 ± 0.31
Manganese (PM_{10})	ng/m^3	145	3.29 ± 0.33	4.80 ± 0.58
Naphthalene	ng/m^3	124	115.98 ± 15.83	119.04 ± 14.37
Nickel (PM_{10})	ng/m^3	145	0.95 ± 0.06	1.06 ± 0.10
Tetrachloroethylene	µg/m^3	146	0.08 ± 0.04	0.32 ± 0.03
Trichloroethylene	µg/m^3	146	0.02 ± 0.02	0.04 ± 0.01
Vinyl chloride	µg/m^3	146	0.005 ± 0.007	0.011 ± 0.003

Yellow shading represents statistically significant difference based on $\alpha = 0.05$

8.0 MQO Scoring To Identify Datasets Suitable for Trends Analysis

This section identifies which datasets are of sufficient quantity and quality to meet the program-level data quality objective of assessing trends in ambient air concentrations of the NATTS core HAPs over two consecutive 3-year periods.

Data collected under the NATTS Network are expected to meet specific method quality objectives (MQOs) for completeness, sensitivity, bias, and precision—as described in Section 4. The NATTS Network and corresponding requirements were designed such that data meeting all four MQOs would be of sufficient quantity and quality to meet the program-level data quality objective (DQO) of assessing trends. However, as the Network has been implemented, not all resulting datasets meet *every* MQO, but such datasets can still be of sufficient quality and quantity to assess trends. For datasets that do not meet every MQO, EPA needed a way to delineate which of those datasets were *close enough* to the MQO to be useful for trends assessment. Thus, EPA developed scoring criteria to help define the quality of data that are at or near the four MQOs. This section describes the scoring criteria that EPA developed and then applied to pollutant datasets to identify which pollutant datasets are potentially suitable for assessing trends. Note that the pollutant datasets must meet the criteria specified in this section *and* be for *consecutive* years to be used for assessing trends.

For this discussion, the term "pollutant dataset" means the set of pollutant concentrations submitted to AQS by a monitoring site for an *individual pollutant* for a specific year. For example, a site's set of benzene concentrations for 2005 would constitute that site's 2005 benzene pollutant dataset.

8.1 MQO Scoring Treatment

EPA developed scoring criteria to identify how closely pollutant datasets meet the four MQOs. The scoring criteria determine whether a pollutant dataset meets the MQOs, or is close enough to the MQOs to be used for trends analysis, and accounts for the fact that MQOs have not been applied consistently for all years of the NATTS network.

A and B Rating. The scoring criteria for the four program-level MQOs (completeness, sensitivity, bias, and precision) apply to each pollutant dataset. A pollutant dataset receives 4, 3, or 0 points for each of the four MQOs based on the criteria in Table 8-1. The scoring system is similar to an academic grading system, in which a 4.0 equals an "A" and a 3.0 equals a "B." If a pollutant dataset meets the required NATTS MQO criterion, then it is assigned 4 points (meets MQO); if a dataset is just outside of the MQO criterion, then it is assigned 3 points (just outside of the MQO), and if a dataset is farther outside of the MQO criterion, then it is assigned 0 points (does not meet MQO).

Note that the tables in this section employ a green/yellow/red/gray color scheme to identify the quality of the dataset: green = A-rated; yellow = B-rated; red = does not meet MQO; and gray = data were not expected or were not available.

Table 8-1. MQO Scoring Criteria

Rating (#points assigned)	MQO #1 Completeness (based on 1-in-6 day sampling)	MQO #2 Sensitivity (based on experimentally-determined MDLs)	MQO #3 Bias (based on PTs)	MQO #4 Precision (based on paired measurements ≥ MDL)
A-Rated (4 pts. per MQO)	≥ 85%	Avg. MDL to NATTS Target Ratio ≤ 1.00	± 25%	± 15%
B-Rated (3 pts. per MQO)	75% to 85%	Avg. MDL to NATTS Target Ratio 1.00 to 1.50	± 25% to ± 35%	± 15% to ± 25%
Does not meet MQO (0 pts. per MQO)	< 75%	Avg. MDL to NATTS Target Ratio > 1.50	> ±35%	> ±25%
Not rated	Data were not rated	Data were not rated	Data were not rated	Data were not rated

MQO Weighting. When the MQOs were developed, it was envisioned that they would have equal weighting when assessing a pollutant dataset because all four MQOs are important metrics of data quality. Equal weighting is preferred, but is not applied for this assessment because the MQOs did not apply consistently for all years leading up to this assessment. If the MQOs were assessed with equal weighting (25% / 25% / 25% / 25%), then it is possible that some pollutant datasets that would otherwise be suitable for assessing trends would be omitted from trends analysis. To address the fact that MQOs have not applied consistently for all years leading up to this assessment, and to include as many high-quality datasets as possible for trends analysis, EPA developed a weighting scheme of 40% / 30% / 20% / 10% based upon the following rationale.

Completeness (40%). When assessing data to determine their suitability for use in assessing trends, quantity and quality are cited as the two principle general measures. Of the four NATTS data measures (completeness, sensitivity, bias, and precision), completeness is the only one that addresses data *quantity*; sensitivity, bias, and precision all address data *quality*. Therefore, completeness is weighted most heavily among the four NATTS data measures.

Precision (10%). Among the three data *quality* measures, precision receives the least weight because precision measures were not required under the NATTS during the assessment period (i.e., through 2010) and were reported on a voluntary basis. Thus, precision data were not reported as often as other MQOs (2,095 out of 2,827 (74%) pollutant datasets had precision data that were available for scoring precision). Across the NATTS, duplicate and collocated sampling did not occur uniformly, but rather for only select pollutants at select sites; consequently, method precision calculations were not uniformly possible across the network. Likewise, the degree to which replicate analyses were performed by the NATTS labs for the various methods was neither consistent nor uniform for data used in this assessment. Because collocated and duplicate sampling, as well as replicate analyses, were voluntary during the assessment period, precision must be weighted the least. Note that while method precision is not and cannot realistically be required for all method groups and all sites (e.g., a platform may be too small and in an urban area with no allowance for expansion), effective July 2011 not less than six replicate analyses are required per year for all labs and analytes to calculate *analytical* precision.

Sensitivity (30%) and Bias (20%). Between the remaining two data quality indicators, EPA decided to weigh sensitivity more heavily than bias because sensitivity data (i.e., reported MDLs) are more complete. All labs calculate analyte-specific MDLs at least annually and nearly all sites reported these data to EPA. Thus, nearly all datasets had associated MDLs that were available for scoring sensitivity. On the other hand, there were not as many opportunities to generate bias data (via the Proficiency Testing (PT) sample program run by the EPA Office of Air Quality Planning and Standards) because of variability in PT frequency, by analyte group and year. Further, among those PT opportunities, not all NATTS labs were able to participate in each due to reasons such as a lab’s analytical equipment being inoperative at the time of a PT. Thus, proficiency testing yielded bias data for 2,486 of 2,827 (88%) datasets that could be used for scoring. Although bias is a valuable measure of data quality, the bias dataset is not as complete as the sensitivity dataset, hence, sensitivity is weighted more heavily for this assessment.

Weighting Factor. A weighting factor is used to reflect the weight of the MQO. Specifically, a weighting factor of 1.6 is used for MQO #1 Completeness to reflect the 40% weighting (1.6/4.0=0.4 or 40%); 1.2 is used for MQO #2 Sensitivity (1.2/4.0=0.3 or 30%); 0.8 is used for MQO #3 Bias

(0.8/4.0=0.2 or 20%); and 0.4 is used for MQO #4 Precision (0.4/4.0=0.1 or 10%). Table 8-2 and the two equations that follow illustrate how the weighting scheme is applied.

Table 8-2. MQO Scoring Using Weighted Scores

	MQO #1 Completeness (40% or 1.6/4.0)		MQO #2 Sensitivity (30% or 1.2/4.0)		MQO #3 Bias (20% or 0.8/4.0)		MQO #4 Precision (10% or 0.4/4.0)		
Rating	**Raw score**	**Wt. score (=raw x 1.6)**	**Raw score**	**Wt. score (=raw x 1.2)**	**Raw score**	**Wt. score (=raw x 0.8)**	**Raw score**	**Wt. score (=raw x 0.4)**	**Total Weighted Points**
A-rated	4	6.4	4	4.8	4	3.2	4	1.6	16
B-rated	3	4.8	3	3.6	3	2.4	3	1.2	12
Does not meet MQO	0	0	0	0	0	0	0	0	0
No score	--	--	--	--	--	--	--	--	--

Equations: Computing Total Weighted Points

Step 1: The weighted score is calculated as follows:

$$\textbf{(weighted score)}_{\textbf{MQO\#}} = \textbf{raw score X the MQO-specific weighting factor}$$

Where:

raw score = score assigned to the MQO based on Table 8-1

MQO-specific weighting factor = 1.6 for completeness
1.2 for sensitivity
0.8 for bias
0.4 for precision

Step 2: The total weighted score is calculated as follows:

$$\textbf{total weighted score} = \textbf{(raw score)}_{\textbf{MQO\#1}} + \textbf{(raw score)}_{\textbf{MQO\#2}} + \textbf{(raw score)}_{\textbf{MQO\#3}} + \textbf{(raw score)}_{\textbf{MQO\#4}}$$

Number of MQOs that apply. The scoring scenario as discussed up to this point assumes that all four MQOs are available for scoring. However, because precision measurements were not required for the assessment period and because of variability in PT frequency (for measuring bias), some datasets could not be scored for these two MQOs. Therefore, the number of points necessary to rate data as A or B had to be adjusted based on the number of MQOs available for scoring. By considering only the MQOs for which data were expected, the scoring criteria do not penalize a site's dataset for *unavailable* MQOs. Instead, the total number of possible points is adjusted based on the number of MQOs that *are available*.

Table 8-3 shows the *minimum* score necessary to achieve the respective data ratings, based on the available MQOs.

Table 8-3. MQO Scoring Based on Number of Available MQOs

For these available MQOs…				…this is the *minimum* score for this rating.		
MQO #1 Completeness (based on 1-in-6 day sampling)	**MQO #2 Sensitivity (based on experimentally-determined MDLs)**	**MQO #3 Bias (based on PTs)**	**MQO #4 Precision (based on paired measurements ≥ MDL)**	**A-rated**	**B-rated**	**Does not meet MQO**
✓	✓	✓	✓	16	12	<12
✓	✓	✓	--	14.4	10.8	<10.8
✓	✓	--	✓	12.8	9.6	<9.6
✓	✓	--	--	11.2	8.4	<8.4
✓	--	--	--	Not scored because the pollutant dataset could not possibly reach the minimum score for B-rated data		
--	✓	--	--			
--	--	✓	--			
--	--	--	✓			

"--" = MQO was not available for scoring

The first four rows of Table 8-3 reflect the four combinations of MQOs that were scored for this assessment—that is, all 2,827 datasets that were scored for this assessment could be scored for *at least* MQO #1 (Completeness) *and* MQO #2 (Sensitivity). Datasets without *both* completeness and sensitivity MQO data could not possibly reach the minimum score for B-rated data and thus were not scored. More than 200 datasets that were not scored because the dataset lacked completeness (e.g., sampling began or ended mid-year).

Example: Computing Total Weighted Points

Following is a representative excerpt from Tables E-2 through E-19 (Raw, Weighted, and Total Weighted MQO Scores by Pollutant) in Appendix E for the Phoenix, AZ acetaldehyde datasets. The total weighted points are calculated by multiplying the raw score by the weighting factor for each MQO, then summing the weighted points to reach total weighted points. The total weighted points are compared to the minimum values in Table 8-3—considering the number of available MQOs—to determine the rating.

For these tables, note the following:

- "0" means the MQO was expected but not reported, or the individual MQO received less than a B rating. Where "0" appears, the MQO *is available* for scoring.
- "--" means the MQO was not expected (because it was not required or because the lab did not receive a PT sample). Where "--" appears, the MQO *is not available* for scoring.

Excerpt from Table E-2 (Raw, Weighted, and Total Weighted MQO Scores for Acetaldehyde):

Year	MQO#1 Completeness		MQO#2 Sensitivity		MQO#3 Bias		MQO#4 Precision		Total Weighted Points
	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted	
Phoenix, AZ (AQS Site Code: 04-013-9997)									
2003	4	6.4	0	0	--	--	--	--	6.4
2004	4	6.4	4	4.8	--	--	--	--	11.2
2005	3	4.8	4	4.8	--	--	--	--	9.6
2006	3	4.8	4	4.8	--	--	--	--	9.6
2007	4	6.4	4	4.8	4	3.2	4	1.6	16
2008	4	6.4	4	4.8	4	3.2	4	[illegible]	16
2009	[illegible]	6.4	4	4.8	4	3.2	4	[illegible]	16
2010	[illegible]	6.4	4	4.8	4	3.2	4	[illegible]	16

- Example weighting: 4 x 1.6 = 6.4. See Table 8-2 for weighting.
- MDLs were expected, but not reported. Thus, this MQO *is available* for scoring and the dataset receives a "0" for Sensitivity.
- Bias and precision data were not expected. Thus, MQOs 3 and 4 *are not available* for scoring. This is denoted with "--".
- Scoring is based on two available MQOs. See Table 8-2 for weighting.
- Scoring is based on four available MQOs. See Table 8-3 for # of MQOs.

Step 1: Each pollutant dataset receives a "raw" score of 4, 3, or 0 for each MQO, based on the scoring criteria in Table 8-1.

Step 2: The raw score is multiplied by the weighting factor to reflect the weighting in Table 8-2.

weighted score = raw score x the MQO-specific weighting factor

Where:

raw score	=	score assigned to the MQO based on Table 8-1
MQO-specific weighting factor	=	1.6 for completeness 1.2 for sensitivity 0.8 for bias 0.4 for precision

Step 3: Once the raw scores are weighted, the points are summed, resulting in total weighted points for the pollutant dataset. Note that the potential number of total points depends on the number and types of MQOs that can be scored for that pollutant dataset, based on Table 8-3.

Observations for the Phoenix, AZ acetaldehyde scoring excerpt:

- In 2003, MDLs for the Phoenix site were not reported to AQS; thus, this dataset received a "0" for Sensitivity and total weighted points were below the minimum for "B" rating. However, in 2004, Phoenix reported an MDL with an "A" rating. With a "4" for both Completeness and Sensitivity, this dataset had 11.2 points, which is the minimum number of points for A rating when the completeness and sensitivity MQOs are scored (see Table 8-2 for weighting).
- In 2005 and 2006, completeness dropped to "3," but this was still enough for 9.6 total weighted points, which is enough for a B rating when the completeness and sensitivity MQOs are available for scoring.
- In 2007 through 2010, the Phoenix acetaldehyde datasets received the most possible points, resulting in A-rated pollutant datasets.

8.2 Results of MQO Scoring by Pollutant Group

EPA evaluated 2,827 pollutant datasets (site, year, pollutant) and assigned points as described above. Of these 2,827 pollutant datasets, 2,192 (78%) are rated as A or B and thus are of sufficient quantity and quality for assessing trends. These 2,192 datasets were used to assess trends in ambient air concentrations. Results of trends analysis are presented in Section 9 of this assessment.

Table 8-4 shows the number and percentage of pollutant groups that are suitable for trends analysis.

Table 8-4. Count and Percentage of Suitable Data by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet MQO	
		#A	%A	#B	%B	# Not	% Not
VOCs	1,259	662	53%	190	15%	407	32%
Carbonyls	362	228	63%	59	16%	75	21%
PM_{10} Metals	946	535	57%	284	30%	127	13%
Hex Chrome	128	94	73%	20	16%	14	11%
PAHs	132	113	86%	7	5%	12	9%
Total	2,827	1,632	58%	560	20%	635	22%
		2,192 pollutant datasets (78%) are suitable for assessing trends					

Table E-1 in Appendix E uses green and red highlighting to indicate whether a pollutant dataset meets the MQOs for trends analysis: green = suitable for trends analysis; red = not suitable for trends analysis. Note that B-rated pollutant datasets are highlighted green (not yellow) *only in Table E-1* to show that they are suitable for assessing trends. For all other tables in this section and Appendix E, B-rated datasets are highlighted yellow.

In Table E-1, "Y" indicates that the pollutant dataset meets the MQOs and is suitable for trends analysis. Pollutant datasets that are highlighted red are not suitable for trends analysis. Instead of simply using an "N" to indicate a pollutant dataset is not suitable for trends analysis, Table E-1 uses footnotes to indicate *why* a pollutant dataset is not suitable for trends analysis. These footnotes appear in Figure 8-1.

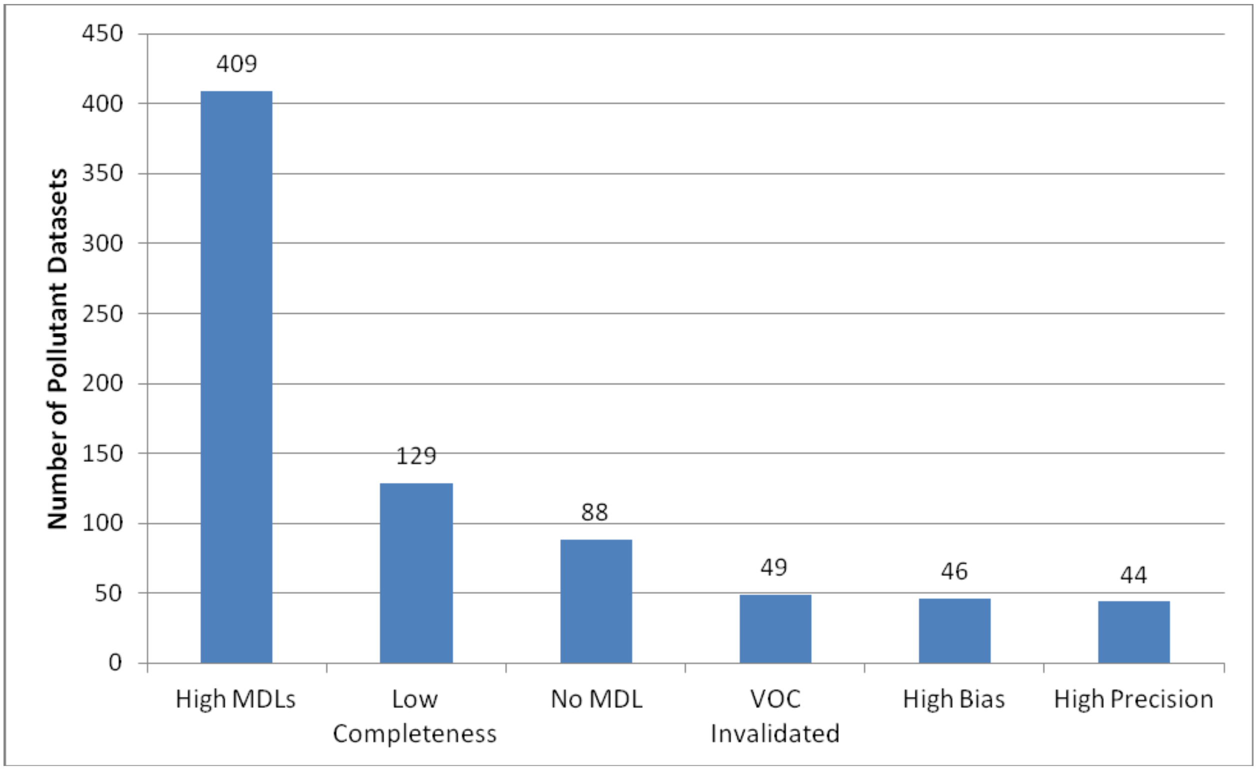
Tables E-2 through E-19 provide the raw, weighted, and total weighted scores for each of the 18 core pollutants. Pollutant datasets for which the total weighted points are highlighted green (A rating) and yellow (B rating) are of sufficient quantity and quality and are suitable for assessing trends. (Note that 3-year block trends analysis requires six *consecutive* years (2005-2010) of pollutant datasets to meet the NATTS DQO. This is discussed in more detail in Section 9.)

Observations of MQO Scoring-Overall

Note that these observations include datasets from the years 2003 and 2004, however, for assessing trends, datasets from only 2005-2010 are included in the DQO trends analysis because the DQO trends analysis covers that most recent 6 consecutive years of data (i.e., 2005-2010).

- 2,192/2,827 pollutant datasets (78%) met the MQOs and are suitable for assessing trends
- 635/2,827 datasets (20%) did not meet the MQOs
  - Figure 8-1 indicates, by count, the most common reasons pollutant datasets did not meet MQOs.
  - For approximately 1 in 7 (15%) of the cases in which datasets did not meet the MQOs, more than one reason applies.
  - High MDLs was the most common reason that datasets did not meet MQOs.

Figure 8-1. Reasons That Pollutant Datasets Were Not Suitable for Trends Analysis



High MDLs. The MDL for the pollutant dataset was greater than 1.5 times the NATTS target MDL, and the Sensitivity MQO was scored as 0. Refer to Table E-21 for more detailed information.

Low completeness. The site did not sample the minimum number of samples within the year on a 1-in-6 day sampling schedule, and the Completeness MQO was scored a 0. Refer to Table E-20 for more detailed information. Or, low completeness. The site sampled the minimum number of samples within the year on a 1-in-6 day sampling schedule, but the dataset did not meet the 75% minimum completeness, and the Completeness MQO was scored as 0. Refer to Table E-20 for more detailed information.
No MDL. The MDL for this pollutant dataset was not reported to EPA or AQS, and the Sensitivity MQO was scored as 0. Refer to Table E-21 for more detailed information.

VOC invalidated. VOC results were invalidated by the state agency. Refer to Table E-20 for more detailed information.

High Bias. The % Difference value for this pollutant dataset was outside of ±35%, and the Bias MQO was scored as 0. Refer to Table E-22 for more detailed information.

High Precision. The %CV value for this pollutant dataset was outside of ±25%, and the Precision MQO was scored a 0. Refer to Table E-23 and Table E-24 for more detailed information.

Section 6 of this assessment may identify other reasons pollutant dataset(s) did not meet the MQOs. Section 6 includes an inventory of laboratory sampling and analytical equipment, as well as information from site operators that was gathered during interviews.

By Pollutant Group: Which pollutant groups had the lowest/highest percentage of A/B datasets?

A-rated:

- Max %: PAHs (86%)
- Min %: VOCs (53%)

B-rated:

- Max %: PM_{10} metals (30%)
- Min %: PAHs (5%)

Does not meet MQOs:

- Max %: VOCs (32%)
- Min %: PAHs (9%)

Not scored: Why were some pollutant datasets not scored?

- PAH datasets. Fifteen sites began sampling PAH mid-year 2007 or 2008, thus, not enough data were collected to meet the completeness MQO, which is on an *annual* basis. Sites that began sampling PAH mid-year accounted 34 of the datasets that could not be scored.
- Site moves. Three sites changed locations during the course of the assessment, thus not enough data were collected to meet the completeness MQO, which is on an *annual* basis. Sites that moved mid-year accounted for 85 of the datasets that could not be scored.
- Began or ended mid-year. Other than the PAH datasets and the site moves, 96 pollutant datasets could not be scored because they started mid-year. Not enough data were collected to meet the completeness MQO, which is on an *annual* basis.

By Site: Did sites consistently generate A/B datasets?

The following sites were generally consistent in generating A/B quality data for all years:

- Phoenix, AZ
- Grand Junction, CO
- Washington, DC
- Pinellas County, FL
- Tampa, FL
- South DeKalb, GA
- Chicago, IL
- Roxbury, MA
- Detroit, MI

- St. Louis, MO
- Bronx#1 and #2, NY
- Rochester, NY
- Providence, RI
- Bountiful, UT
- Underhill, VT
- Richmond, VA
- Seattle, WA

By Site: What are the reasons datasets received an "N"?

Phoenix, AZ

- 2003 VOCs (3) - high MDLs
- 2003 carbonyls - no MDLs reported to AQS or EPA
- 2005 and 2006 formaldehyde - low completeness

Los Angeles and Rubidoux, CA

- 2007-2010 VOCs (5) - high MDLs
- 2007, 2009, 2010 formaldehyde - high MDLs
- 2007 PM_{10} metals Los Angeles - low completeness
- 2008 and 2009 PM10 metals - no MDLs reported to AQS or EPA

San Jose, CA

- 2003-2006 - low completeness (1-in-12 day sampling, instead of 1-in-6 day)
- 2003-2010 vinyl chloride - high MDLs
- Note: Hexavalent chromium was not sampled at the San Jose, CA site throughout the assessment period.

Grand Junction, CO

- 2004 VOCs (2) - high MDLs
- 2005-2009 arsenic - high MDLs
- 2005 and 2010 beryllium - high MDLs
- 2005 PM_{10} metals - no MDLs reported to AQS or EPA to AQS

Washington, DC

- 2004-2005 VOCs (3) - high MDLs
- 2005 carbonyls and PM_{10} metals - no MDLs reported to AQS or EPA
- 2005, 2007, and 2008 carbonyls - high MDLs
- 2008 PAHs, and several 2009 and 2010 PM_{10} metals - high MDLs
- 2008-2009 PM_{10} metals (3) - high MDLs

Pinellas County, FL and Tampa, FL

- 2006 nickel - high MDL
- 2005-2010 arsenic - high MDLs

South DeKalb, GA

- 2003-2004 VOCs - high MDLs
- 2004-2010 carbonyls - high MDLs
- 2007-2008 hexavalent chromium - low completeness

Grayson Lake and Hazard, KY

- State of Kentucky has invalidated all of the VOC data generated under their program (January 3, 2003 to May 1, 2010) due to laboratory issues

Roxbury, MA

- 2003 carbon tetrachloride - high MDL
- 2004 PM_{10} metals - low completeness

Detroit, MI

- 2003-2004 VOCs (4) - high MDLs
- 2007-2008 carbonyls - low completeness
- 2010 manganese - high bias

St. Louis, MO

- 2003-2004 VOCs (5) - high MDLs

Bronx #1, NY

- 2003 VOCs - no MDLs reported to AQS or EPA
- 2006 VOCs - low completeness
- 2009 carbonyls - low completeness
- 2008-2010 arsenic - high MDLs

Rochester, NY

- 2006 VOCs (2) - high MDLs and high bias
- 2007 and 2009 carbonyls - low completeness
- 2008-2010 arsenic - high MDLs

LaGrande, OR

- 2004-2010 VOCs (5) - high MDLs
- 2004-2006 carbonyls - no MDLs reported to AQS or EPA
- 2007, 2008, 2010 PAHs - low completeness
- 2005, 2006, 2008 vinyl chloride - high bias

Portland, OR

- 2008 benzene - high bias
- 2008-2010 VOCs (3) - high MDLs
- 2008 hexavalent chromium and PAHs - low completeness

Providence, RI

- 2003 carbon tetrachloride - high MDL
- 2003 carbonyls and PM_{10} metals - no MDLs reported to AQS or EPA
- 2004-2006 PM_{10} metals (2) - high MDLs

Chesterfield, SC

- 2004-2010 VOCs, formaldehyde - high MDLs
- 2008 PM_{10} metals (2) - low completeness

Houston, TX

- 2003-2010 VOCs - high MDLs
- 2003-2004 PM_{10} metals (3) - high MDLs
- 2006-2008 hexavalent chromium - high MDLs
- 2010 PAHs - high bias

Karnack, TX

- 2004-2010 VOCs - high MDLs
- 2004-2006 arsenic - high MDLs
- 2006-2008 hexavalent chromium - high MDLs

Bountiful, UT

- 2004 VOCs (2) - high MDLs

Underhill, VT

- 2004-2005 VOCs (2) - high MDLs

Richmond, VA

- 2010 VOCs (2) - high MDLs

Seattle, WA

- 2003 VOCs, carbonyls, PM_{10} metals - no MDLs reported to AQS or EPA
- 2006 VOCs, carbonyls, PM_{10} metals, hexavalent chromium - low completeness

Horicon, WI

- 2010 VOCs (5) - high MDLs

Mayville, WI

- 2004-2009 VOCs (5) - high MDLs
- 2009 acetaldehyde - high MDL

8.3 Completeness (MQO #1; weighting 40%)

Completeness is the number of valid samples *actually* collected and analyzed versus the number of samples *scheduled* to be collected. A valid sample means that the sampling system successfully collected an air sample and the air sample was successfully analyzed. A sample may be invalid for many reasons, including power failures, analytical instrument malfunction, torn filters or other damage to the sample. Completeness is considered to be a quantitative measure of the reliability of air sampling and laboratory analytical equipment and corresponding procedures. Also, considering the multiple steps of sampling and analysis, it is considered to be a measure of program management efficiency. EPA evaluated and scored the completeness of the pollutant datasets submitted by the NATTS sites to AQS.

Completeness Requirement. The NATTS Network requires 1-in-6 day sampling—the sampling system collects one sample for each pollutant group every sixth day. If a site does not collect a valid sample on a scheduled sampling day, it can make up the sample during the same quarter if the sample is collected on a day that is not already scheduled for 1-in-6 day sampling.

Based on the 1-in-6 day sampling schedule, the NATTS Network requires a minimum completeness of 85% on a quarterly basis. Completeness is measured as a percentage:

$$\%\ \text{completeness} = \left(\frac{\#\ \text{of valid samples collected}}{\#\ \text{of samples scheduled to be collected}} \right) \times 100$$

Scoring. To evaluate the completeness of the pollutant datasets, EPA rated each pollutant dataset based on percent completeness of 1-in-6 day sampling. Each pollutant dataset received a score based on the following criteria, which are listed in Table 8-1.

- A-rating: % completeness ≥85%
- B-rating: % completeness 75-85%
- Does not meet MQO: % completeness <75%

For the purpose of assessing trends, a pollutant dataset was not considered for assessing trends if the dataset was not *scheduled* for at least 46 samples per year (45 in 2007) (i.e., 75% of a full year). Note that a site that began or ended sampling mid-year may have greater than 85% completeness for the scheduled samples, but because there were less than 46 samples scheduled, the pollutant dataset was not considered for trends analysis. Pollutant datasets that were scheduled for less than 46 samples are grayed out (i.e., were not scored) in the completeness tables.

If a site did not follow a schedule of 1-in-6 day sampling, then it does not meet the MQO for data completeness. For example, the San Jose site collected samples on an approved 1-in-12 day sample schedule. On a 1-in-12 day sampling schedule, the site had greater than 75% completeness for all pollutants. However, on a 1-in-6 day sampling schedule, the site did not meet 75% completeness.

Scoring Results. EPA evaluated the completeness of each pollutant dataset (site, year, pollutant) and assigned points as described in Section 8.1.

Table 8-5 summarizes the MQO scoring results for completeness by pollutant group.

Table 8-5. Summary of MQO Scoring Results for Completeness by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet	
		#A	% A	#B	% B	# Not	% Not
VOCs	1,374	1,134	83%	32	2%	208	15%
Carbonyls	362	313	86%	17	5%	32	9%
PM_{10} Metals	946	903	95%	22	2%	21	2%
Hex Chrome	128	123	96%	1	1%	4	3%
PAHs	132	120	91%	1	1%	11	8%
Total	2,942	2,593	88%	73	2%	276	9%
		2,666 pollutant datasets (90% of those scored) meet the Completeness criteria					

Table E-20 (Results of MQO Scoring by Pollutant—Completeness) in Appendix E shows the percent completeness by pollutant (i.e., by each of the 18 core HAPs) at each NATTS site.

Tables E-2 through E-19 (Raw, Weighted, and Total Weighted MQO Scores by Pollutant) provide the raw, weighted, and total weighted scores for each of the 18 core pollutants at each NATTS site for each of the four MQOs, including completeness.

Observations-overall:

- 2,942 pollutant datasets were scored for completeness
- 90% of the 2,942 pollutant datasets meet the completeness MQO

Observations by site (See Table E-20 in Appendix E):

- Most sites collected the pollutant groups that they were scheduled to collect. However, several sites did not collect all of the pollutant groups they were scheduled to collect:
  - Phoenix did not collect PM_{10} metals in 2004 or 2005

- San Jose did not collect PM_{10} metals in 2004-2007
- San Jose did not collect hexavalent chromium in 2005-2010
- Chicago did not collect PM_{10} metals in 2004
- Bronx#1 did not collect PM_{10} metals in 2004-2006
- Bronx#1 did not collect hexavalent chromium in 2005-2006
- Rochester did not collect PM_{10} metals in 2004-2006
- Rochester did not collect hexavalent chromium in 2005-2006
- Providence did not analyze for beryllium or manganese in 2003
- Houston did not collect hexavalent chromium in 2005
- Karnack did not collect hexavalent chromium in 2005

• In 2003-2006, San Jose collected samples on an approved 1-in-12 day sampling schedule. However, those pollutant datasets do not meet the completeness MQO, which is 85% completeness on a 1-in-6 day schedule.

• In 2006, Seattle had low completeness because of issues with sampling and analysis.

Observations by pollutant:

• The distribution of pollutant datasets that did not meet the completeness MQO is nearly even across pollutant groups. However, carbonyls had the highest number of pollutant datasets that did not meet the completeness MQO.

8.4 Sensitivity (MQO #2; weighting 30%)

A method detection limit (MDL) sensitivity analysis is a statistical assessment used to compare the performance of different laboratories that are using the same sampling methods. EPA evaluated the performance of the laboratories supporting the NATTS sites by comparing the laboratory-derived MDL to the target MDL that is listed in Section 4.

Sensitivity Requirements. Each year, laboratories must experimentally determine MDLs in accordance with 40 CFR, part 136, Appendix B. It has been EPA's desire that the responsible NATTS AQS reporting entities submit these MDLs to AQS in conjunction with their concentration data. Beginning July 1, 2011, EPA mandated that the laboratory-derived MDLs be reported with NATTS concentration data. For this assessment, EPA obtained each site's MDL from one of three sources: AQS; the annual QAARs; or directly from the laboratory. Often, laboratory MDLs change or fluctuate through a sampling year. Thus, for this analysis, EPA used the minimum reported value for each site's experimentally-determined MDL by pollutant and by year. MDLs were available for over 96% of the concentration data.

EPA publishes target MDLs in the NATTS Workplan Template (U.S. EPA, 2012b). The target MDLs for each NATTS core HAP typically represent the lowest chronic health risk benchmarks for cancer and/or noncancer. EPA used a noncancer hazard quotient (HQ) = 0.1 as analogous to lifetime cancer risk of 10^{-6}, which is consistent with EPA's approach in the School Air Toxics Ambient Monitoring Plan (U.S. EPA, 2009c). Table 8-6 lists the target MDLs for the NATTS Network for the period of this assessment (through 2010), as well as for 2011 and 2012. Note that the target MDLs for year 2012 were used for MQO scoring, with the exception of trichloroethylene. For trichloroethylene, the historical value of 0.50 $\mu g/m^3$ was used because the new health risk benchmark (and hence the new MDL) was not released until after this assessment was completed.

Table 8-6. MDLs For the Years 2009-2012

Pollutant	Pollutant Group	Units of Measure	2009 (NATTS TAD 4/1/09)	2010 (NATTS Work plan template 2/1/10)	2011 (NATTS Work plan template 2/9/11)	2012 (NATTS Work plan template 4/11/12)
Acrolein	VOC	µg/m^3	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.09
Acetaldehyde	Carbonyl	µg/m^3	≤ 0.009	≤ 0.45	≤ 0.45	≤ 0.45
Arsenic (PM_{10})	PM_{10} Metal	ng/m^3	≤ 0.0010	≤ 0.23	≤ 0.23	≤ 0.23
Benzene	VOC	µg/m^3	≤ 0.13	≤ 0.13	≤ 0.13	≤ 0.13
Benzo(a)pyrene	PAH	ng/m^3	≤ 0.91	≤ 0.91	≤ 0.91	≤ 0.91
Beryllium (PM_{10})	PM_{10} Metal	ng/m^3	≤ 0.42	≤ 0.42	≤ 0.42	≤ 0.42
Butadiene, 1,3-	VOC	µg/m^3	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10
Cadmium (PM_{10})	PM_{10} Metal	ng/m^3	≤ 0.56	≤ 0.56	≤ 0.56	≤ 0.56
Carbon tetrachloride	VOC	µg/m^3	≤ 0.17	≤ 0.067	≤ 0.067	≤ 0.17
Chloroform	VOC	µg/m^3	≤ 0.50	≤ 0.50	≤ 0.50	≤ 0.50
Formaldehyde	Carbonyl	µg/m^3	≤ 0.10	≤ 0.98	≤ 0.98	≤ 0.08
Hexavalent Chromium	Hexavalent Chromium	ng/m^3	≤ 0.08	≤ 0.08	≤ 0.08	≤ 0.08
Lead (PM_{10})	PM_{10} Metal	ng/m^3	≤ 1.0	≤ 150.0	≤ 150.0	≤ 15.0
Manganese (PM_{10})	PM_{10} Metal	ng/m^3	≤ 1.0	≤ 5.0	≤ 5.0	≤ 5.0
Naphthalene	PAH	ng/m^3	≤ 0.029	≤ 0.029	≤ 0.029	≤ 0.029
Nickel (PM_{10})	PM_{10} Metal	ng/m^3	≤ 2.10	≤ 2.10	≤ 2.10	≤ 2.10
Tetrachloroethylene	VOC	µg/m^3	≤ 0.17	≤ 0.17	≤ 0.17	≤ 0.17
Trichloroethylene	VOC	µg/m^3	≤ 0.50	≤ 0.50	≤ 0.50	≤ 0.20
Vinyl chloride	VOC	µg/m^3	≤ 0.11	≤ 0.11	≤ 0.11	≤ 0.11

Bold = pollutants for which the MDL changed over the period 2009-2012.

Notes:

- The 2012 MDLs were used for scoring the Sensitivity MQO, with the exception of trichloroethylene, for which the historical value of 0.50 µg/m^3 was used because the new health risk benchmark (and hence the new MDL) was not released until after this assessment was completed.
- The MDLs in this table may differ from those in the Technical Assistance Document for the National Air Toxics Trends Stations Program (U.S. EPA, 2009a) because the MDLs in this table reflect health risk benchmarks as of April 2012.
- Acrolein: The acrolein health benchmark is the minimum risk level (MRL) as determined by the Agency for Toxic Substances and Disease Registry (ATSDR). The ATSDR MRL for acrolein was derived for intermediate-duration inhalation exposure (15–364 days).
- Carbon tetrachloride: The required MDL for carbon tetrachloride increased in 2012 due to an increase in the health benchmark value for cancer risk. A review of NATTS MDL data reveals that the 2011 MDL is not being met consistently, thus the MDL was increased in 2012.
- Formaldehyde: The required MDL for formaldehyde was lowered in 2012 due to a decrease in the health benchmark value for noncancer risk. A review of NATTS MDL data reveals that the 2012 MDL is achievable, thus it is being lowered in 2012.
- Lead: The required MDL for lead was lowered in 2012 due to a decrease in the health benchmark value for noncancer risk. A review of NATTS MDL data reveals that the 2012 MDL is achievable, thus it is being lowered in 2012.

- Tetrachloroethylene: Although the health benchmark value for cancer and noncancer risk for tetrachloroethylene has increased, the required MDL for 2012 remains the same as the 2011 MDL. A review of NATTS MDL data reveals that the 2011 MDL is achievable, thus the MDL does not need to be increased.
- Trichloroethylene: The required MDL for trichloroethylene was lowered in 2012 due to a decrease in the health benchmark value for cancer and noncancer risk. A review of NATTS MDL data reveals that the 2012 MDL is achievable, thus it is being lowered in 2012.

Scoring. To evaluate the quality of MDLs for laboratories supporting NATTS sites, EPA compared the site's experimentally-determined MDL to the target MDL (Tables 4-2 through 4-6) as a ratio:

$$\text{ratio} = \left(\frac{\text{experimentally determined MDL}}{\text{target MDL}} \right)$$

EPA scored the ratio of the experimentally-determined MDL to the target MDL, based on the following criteria, which are listed in Table 8-1.

- A-rating: Laboratory MDL vs. NATTS Target MDL Ratio of $\leq$1. A value of less than or equal to 1.0 means the laboratory's MDLs are meeting the Sensitivity MQO.
- B-rating: Laboratory MDL vs. NATTS Target MDL Ratio of 1.00 to 1.50. An MDL between 1.0 and 1.50 means the laboratory is generating results that are not meeting the Sensitivity MQO, but would likely be able to reach the target MDL with minor adjustments in laboratory procedures. Minor adjustments in laboratory procedures can include improved training of laboratory personnel or updates to QAPPs and SOPs.
- Does not meet MQO: Laboratory MDL vs. NATTS Target MDL Ratio of >1.50. An MDL greater than 1.50 means the laboratory is generating results that are not meeting the Sensitivity MQO, would likely be able to reach the target MDL with major adjustments in laboratory procedures. Major adjustments can include replacing underperforming analytical equipment or addressing improper handling of sampling media, which can lead to contamination.

Scoring Results. EPA evaluated the sensitivity (i.e., experimentally-determined MDL) of each pollutant dataset (site, year, pollutant) and assigned points as described in Section 8.1. For those pollutant datasets for which MDLs were not reported to AQS or EPA, a value of 0 was scored for the sensitivity MQO. This is because EPA has repeatedly encouraged operating agencies to report these data, although the data are not required.

Table 8-7 summarizes the MQO scoring results for sensitivity by pollutant group.

Table 8-7. Summary of MQO Scoring Results for Sensitivity by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet MQO	
		#A	**%A**	**#B**	**%B**	**# Not**	**% Not**
VOCs	1,459	895	61%	113	8%	339	31%
Carbonyls	329	312	95%	17	5%	0	0%
PM_{10} Metals	897	868	97%	29	3%	0	0%
Hex Chrome	127	127	100%	0	0%	0	0%
PAHs	180	180	100%	0	0%	0	0%
Total	2,992	2,382	80%	159	5%	451	15%
		2,541 pollutant datasets (85% of those scored) meet the Sensitivity criteria					

Table E-21 (Results of MQO Scoring by Pollutant—Sensitivity) in Appendix E shows the ratio of the laboratory's experimentally-determined MDL to the target MDL for each of the 18 core HAPs at each NATTS site.

Tables E-2 through E-19 (Raw, Weighted, and Total Weighted MQO Scores by Pollutant) in Appendix E provide the raw, weighted, and total weighted scores for each of the 18 core pollutants at each NATTS site for each of the four MQOs, including sensitivity.

Observations-overall:

- 85% of the 2,992 pollutant datasets meet the sensitivity MQO.

Observations by site (See Table E-21 in Appendix E):

- VOCs: Several sites/laboratories had high MDLs for several VOCs.
  - Los Angeles and Rubidoux, CA
  - San Jose, CA - Improved by 2008-2010
  - Grayson Lake, Hazard, KY - State of Kentucky has invalidated all of the VOC data generated under their program (January 3, 2003 to May 1, 2010) due to laboratory issues
  - La Grande and Portland, OR
  - Chesterfield, SC
  - Houston and Karnack, TX
  - Horicon and Mayville, WI

- Carbonyls: Several sites/laboratories had high MDLs for carbonyls.
  - Los Angeles, Rubidoux, CA - high formaldehyde MDLs
  - San Jose, CA - Improved by 2007-2010
  - South DeKalb, GA
  - Chesterfield, SC - High MDLs for formaldehyde only
- PM_{10} Metals: Several sites/laboratories had high MDLs, especially for arsenic.
  - Grand Junction, CO
  - Washington, DC
  - Pinellas County and Tampa, FL - arsenic only
  - Grayson Lake and Hazard, KY - Improved by 2010
  - Bronx #1, Bronx #2, and Rochester, NY
- Hexavalent chromium: All sites achieved MDL targets, except for Houston and Karnack, TX for years 2006-2008. Improved by 2009-2010.
- PAHs: All sites met the target MDL.

Observations by pollutant: Figure 8-2 shows, by percentage, which pollutants had the most datasets that were outside of the Sensitivity MQO.

- VOCs: Higher MDLs than the other pollutant groups.
  - More than 25% of the benzene, 1,3 butadiene, carbon tetrachloride, tetrachloroethylene, vinyl chloride, and arsenic datasets exceeded the Sensitivity MQO.
- Carbonyls: Generally met Sensitivity MQO.
- Formaldehyde MDLs were more challenging than acetaldehyde MDLs, but more than 85% of the formaldehyde datasets met the Sensitivity MQO.
- PM_{10} Metals: Generally met Sensitivity MQO, except arsenic, for which 30% of the datasets did not meet the Sensitivity MQO.

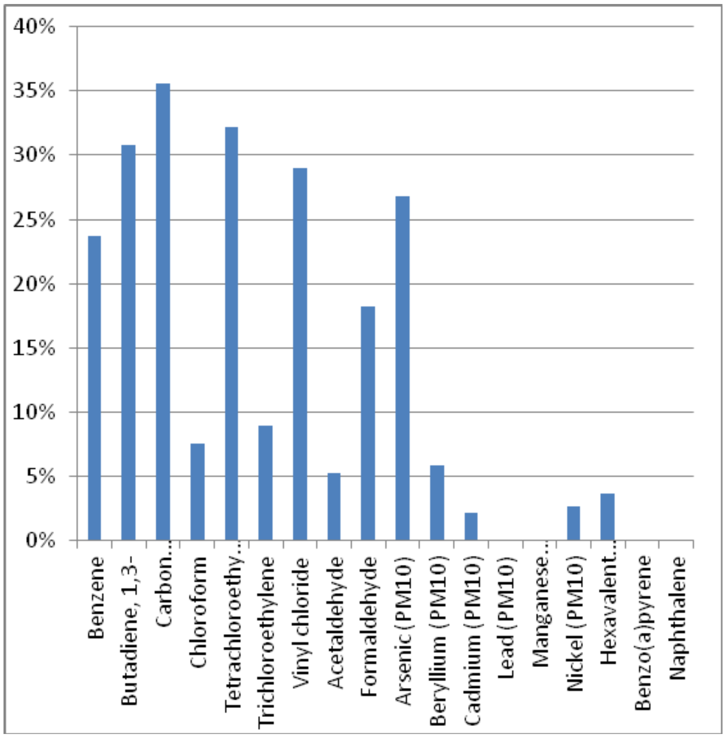


Figure 8-2. Percentage of Pollutant Datasets Exceeding the Sensitivity MQO

Observations: 2010 MDLs vs. observed concentrations. To provide a snapshot of how well sites/laboratories' experimentally-determined MDLs stand in 2010, EPA further analyzed MDLs for the 2010 reporting year. Figures E-1 through E-18 in Appendix E (Comparison of the 2010 Method Detection Limits by NATTS Site, the Target MDL, and the 5^{th} and 95^{th} Percentile Concentrations of All NATTS Detects) graph the experimentally-determined MDL for each site versus the target MDL for each of the 18 core HAPs. The figures also show the range of observed concentrations (the 5^{th} through the 95^{th} percentile), which is indicated with the yellow bar. Note that the target MDL is based on the concentration for a 1-in-a-million cancer risk, the hazard quotient divided by 10, or from feedback from the site operators.

Improvements in equipment, training, and methods since the inception of the NATTS Network have improved the sensitivity of laboratory analysis over time.

- For five pollutants (acetaldehyde, arsenic, benzene, carbon tetrachloride, and formaldehyde), the observed concentrations are *above* the target MDL.
- For six pollutants (benzo(a)pyrene, beryllium, chloroform, lead, trichloroethylene, and vinyl chloride), the observed concentrations fall *below* the target MDL.
- Many sites reported an experimentally-determined MDL well below the target MDL.
  - Benzo(a)pyrene (all sites/laboratories met the target MDL in 2010)

  - Hexavalent chromium (all sites/laboratories met the target MDL in 2010)
  - Lead (all sites/laboratories met the target MDL in 2010)
  - Manganese (all sites/laboratories met the target MDL in 2010)
  - Naphthalene (all sites/laboratories met the target MDL in 2010)
  - Nickel (all sites/laboratories met the target MDL in 2010)
- However, the target MDL was harder to achieve for some pollutants:
  - Acetaldehyde (1 site did not meet the target MDL in 2010)
  - Arsenic (6 sites did not meet the target MDL in 2010)
  - Benzene (8 sites did not meet the target MDL in 2010)
  - Beryllium (2 sites did not meet the target MDL in 2010)
  - 1,3-butadiene (10 sites did not meet the target MDL in 2010)
  - Cadmium (1 site did not meet the target MDL in 2010)
  - Carbon tetrachloride (9 sites did not meet the target MDL in 2010)
  - Chloroform (3 sites did not meet the target MDL in 2010)
  - Formaldehyde (7 sites did not meet the target MDL in 2010)
  - Tetrachloroethylene (10 sites did not meet the target MDL in 2010).
  - Trichloroethylene (6 sites did not meet the target MDL in 2010).

8.5 Bias (MQO #3; weighting 20%)

Bias is the percentage difference between a *measured* concentration and the *true* concentration. The NATTS Network assesses the bias of NATTS analytical laboratories to determine whether there is a systematic deviation from the true concentration being reported.

Bias is determined through periodic (once or twice annually) proficiency testing of samples of VOCs, carbonyls, PM_{10} metals, hexavalent chromium, and PAHs. A proficiency test, or PT, is a type of assessment in which a sample, the composition of which is unknown to the analyst (i.e., single blind), is provided to the laboratory to test whether the analyst/laboratory can produce analytical results within the specified acceptance criteria.

Bias requirements. The NATTS acceptance criteria for bias is ≤ ±25% coefficient of variation. An independent organization—one that does not perform analysis for any of the NATTS sites—generates spiked samples containing known amounts of the HAPs of interest and delivers these spiked samples to each laboratory. The laboratory analyzes the samples and reports the value. Bias is measured in percent difference:

$$\%\,\text{difference} = \left(\frac{(\text{measured concentration - true concentration})}{\text{true concentration}}\right) \times 100$$

The NATTS Proficiency Testing (PT) program began in 2004. Annual bias results are summarized in the annual Quality Assurance Annual Reports (QAARs), which are available at www.epa.gov/ttnamti1/airtoxqa.html. Table E-22 in Appendix E shows which pollutant datasets have PT data.

Scoring. To evaluate the bias of laboratory measurements, EPA scored the percent difference based on the following criteria, which are listed in Table 8-1.

- A-rating: Bias ≤ ±25%
- B-rating: Bias ±25% to ±35%
- Does not meet MQO: Bias >±35%

Scoring Results. EPA evaluated the bias of each pollutant dataset (site, year, pollutant) and assigned points as described in Section 8.1.

Table 8-8 (Summary of MQO Scoring Results for Bias by Pollutant Group) summarizes the MQO scoring results for bias by pollutant group.

Table 8-8. Summary of MQO Scoring Results for Bias by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet MQO	
		#A	%A	#B	%B	# Not	% Not
VOCs	1,149	1,040	91%	69	6%	40	3%
Carbonyls	336	330	98%	6	2%	0	0%
PM_{10} Metals	845	736	87%	72	9%	37	4%
Hex Chrome	44	44	100%	0	0%	0	0%
PAHs	112	104	93%	0	0%	8	7%
Total	2,486	2,254	91%	147	6%	85	3%
		2,401 pollutant datasets (97% of those scored) meet the Bias criteria					

Table E-22 (Results of MQO Scoring by Pollutant—Bias) in Appendix E shows the percentage difference between a measured concentration and the true concentration for each of the 18 core HAPs—for which proficiency tests were completed.

Tables E-2 through E-19 (Raw, Weighted, and Total Weighted MQO Scores by Pollutant) in Appendix E provide the raw, weighted, and total weighted scores for each of the 18 core pollutants at each NATTS site for each of the four MQOs, including bias.

Observations-overall:

- 97 percent of pollutant datasets meet the bias criteria

Observations by site (See Table E-22 in Appendix E):

- Sites generally met the bias MQO.
- In 2010, only a few sites did not meet the bias MQO:
  - Detroit, MI - lead and manganese
  - Providence, RI - arsenic and beryllium
  - Horicon, WI - 1,3-butadiene and carbon tetrachloride

Observations by pollutant:

- The number of pollutant datasets that did not meet the bias MQO ranged from 0 to 7
- 1,3-butadiene (5/178) and beryllium (7/165) had the most datasets the did not meet the bias MQO
- All sites met the bias MQO for benzene, chloroform, tetrachloroethylene, carbonyls, hexavalent chromium, and PAHs.

8.6 Precision (MQO #4; weighting 10%)

Precision assesses whether the data collection approach is *repeatable*. This step is important for determining whether the measurement system is under control. Precision is assessed through the use of duplicate or collocated sampling, or duplicate filters/sampling media. The difference between duplicate and collocated sampling is that duplicate sampling collects a sample through a single probe and collocated sampling collects two separate samples from two separate, but adjacent, sampling probes.

Duplicate samples are collected simultaneously using either one or two flow control devices, through a common inlet probe so that sampling and measurement is for the exact same parcel of air. The sampling system divides the sample into a primary and replicate sample for measurement. Because the primary and replicate samples are collected through a common sampling probe (i.e., the same parcel of air), the potential variability of the target pollutants in the air parcel is not a factor.

Collocated samples are collected simultaneously using two completely separate collection systems that have separate inlets positioned in close proximity to each other. These two samples are considered the primary and replicate samples. Because the primary and replicate samples are collected through separate sampling probes (i.e., not the same parcel of air), the potential variability of the target pollutants in the air parcel is a factor.

Precision can be measured in two ways: overall method precision and analytical precision. Overall method precision estimates precision for the total data collection system, i.e., the estimate includes imprecision related to field, preparation, handling and laboratory operations. Analytical precision estimates only values generated by laboratory analysis (i.e., reweighing a filter or GC/MS analysis).

Precision Requirements. Duplicate and/or collocated samples (for measuring precision) were not required by the NATTS Network during the assessment period. However, for the assessment period (i.e., before 2011), the NATTS program strongly encouraged sites to collect 10 percent of total samples (i.e., six samples per year for 1-in-6 day sampling) for measuring precision. In addition, sites were encouraged to collect six blanks and six replicates during the sampling year.

Precision is measured as a coefficient of variation (%CV) between paired measurements and is calculated as follows:

$$\%CV = 100 * \sqrt{\frac{\sum_{i}^{n}=1\left[\frac{(p-r)}{0.5*(p+r)}\right]^2}{2n}}$$

Where: p = primary data
r = replicate data
n = # of pairs

Scoring. To evaluate the precision of laboratory measurements, EPA scored the percent coefficient of variation (%CV) based on the following criteria, which are listed in Table 8-1.

- A-rating: %CV ≤ ±15%
- B-rating: %CV ±15% to ±25%
- Does not meet MQO: %CV >25%

Scoring Results. EPA evaluated the overall method precision and analytical precision of each pollutant dataset (site, year, pollutant) and assigned points as described in Section 8.1. Based on AQS reporting, sites were not consistent in reporting overall method precision versus analytical precision. For MQO scoring, if both overall method precision and analytical precision were reported, the best of the two reported values was chosen for scoring. In addition, EPA calculated precision on only data for which both of the paired measurements were at or above the reported MDL.

Table 8-9 summarizes the MQO scoring results for overall method precision by pollutant group.

Table 8-9. Summary of MQO Scoring Results for Overall Method Precision by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet MQO	
		#A	%A	#B	%B	# Not	% Not
VOCs	521	341	65%	88	17%	92	18%
Carbonyls	229	160	70%	34	15%	35	15%
PM_{10} Metals	484	263	54%	106	22%	115	24%
Hex Chrome	111	56	50%	39	35%	16	14%
PAHs	49	35	71%	7	14%	7	14%
Total	1,394	855	61%	274	20%	265	19%
		1,129 pollutant datasets (81% of those scored) meet the Overall Method Precision criteria					

Table 8-10 summarizes the MQO scoring results for analytical precision by pollutant group.

Table 8-10. Summary of MQO Scoring Results for Analytical Precision by Pollutant Group

Pollutant Group	# Pollutant Datasets Scored	A-rated		B-rated		Does Not Meet MQO	
		#A	%A	#B	%B	# Not	% Not
VOCs	383	315	85%	37	10%	31	8%
Carbonyls	126	120	97%	2	2%	4	3%
PM_{10} Metals	71	69	97%	2	3%	0	0%
Hex Chrome	88	80	91%	7	8%	1	1%
PAHs	33	33	100%	0	0%	0	0%
Total	701	617	88%	48	7%	36	5%
		665 pollutant datasets (95% of those scored) meet the Analytical Precision criteria					

Table E-23 (Results of MQO Scoring by Pollutant—Precision-Overall) in Appendix E shows results of the overall method precision (in terms of absolute value) for each of the 18 core HAPs for which overall method precision measurements were completed.

Table E-24 (Results of MQO Scoring by Pollutant—Precision-Analytical) in Appendix E shows results of the analytical precision (in terms of absolute value) for each of the 18 core HAPs for which analytical precision measurements were completed.

Tables E-2 through E-19 (Raw, Weighted, and Total Weighted MQO Scores by Pollutant) in Appendix E provide the raw, weighted, and total weighted scores for each of the 18 core pollutants at each NATTS site for each of the four MQOs, including overall method and analytical precision.

Observations-overall (See Tables E-23 and E-24 in Appendix E):

- 81 percent of the scored pollutant datasets meet the overall method precision criteria
- 95 percent of the scored pollutant datasets meet the analytical precision criteria

Observations by site (See Tables E-23 and E-24 in Appendix E):

- Los Angeles and Rubidoux, CA - high overall precision for carbonyls, several PM_{10} metals, and hexavalent chromium.

- San Jose, CA - low analytical precision for VOCs, but high overall precision for 1,3 butadiene, chloroform, and tetrachloroethylene for 2003-2010.
- Grand Junction, CO - high precision for benzene, carbon tetrachloride, tetrachloroethylene, lead, and nickel in 2010.
- Washington, DC - high overall precision for 1,3 butadiene.
- Tampa, FL - high overall and analytical precision for carbonyls in 2007, but low precision for carbonyls in 2010; high overall precision for nickel in 2010.
- South DeKalb, GA - high overall precision for seven pollutants in 2010: tetrachloroethylene, acetaldehyde, formaldehyde, arsenic, cadmium, manganese, and nickel.
- Chicago, IL - low analytical precision all years; high analytical precision for several VOCs and metals in 2010.
- Grayson Lake, KY - high overall precision for benzene, carbon tetrachloride, and manganese in 2008-2010 (State of Kentucky has invalidated all of the VOC data generated under their program (January 3, 2003 to May 1, 2010) due to laboratory issues).
- Hazard, KY - high overall precision for manganese and nickel in 2007.
- Roxbury, MA - high precision for 1,3 butadiene in 2004, 2005, and 2007-2010; high overall precision for cadmium in 2003-2006 and 2009.
- Detroit, MI - low analytical precision; high overall precision for chloroform and three metals in 2010.
- Chesterfield, SC - high overall precision for metals in 2004-2009; high overall precision for five metals and hexavalent chromium in 2010.
- Bountiful, UT - high overall precision for nickel in 2004-2005, 2007-2010; high overall precision for carbon tetrachloride in 2010.
- Seattle, WA - high overall precision for naphthalene in 2010.
- Horicon, WI - high overall precision for nickel in 2010.
- Mayville, WI - high overall precision for lead in 2009.

Observations by pollutant:

For analytical precision, trichloroethylene had the most datasets (5 out of 48) that were outside of the precision MQO.

Figure 8-3 shows, by percentage, which pollutants had the most datasets that were outside of the overall method precision MQO.

- Nickel (27%), cadmium (25%), chloroform (23%), 1,3-butadiene (18%), and trichloroethylene (18%) had the highest percentage of datasets exceed the precision MQO (datasets for which overall method precision was measured).

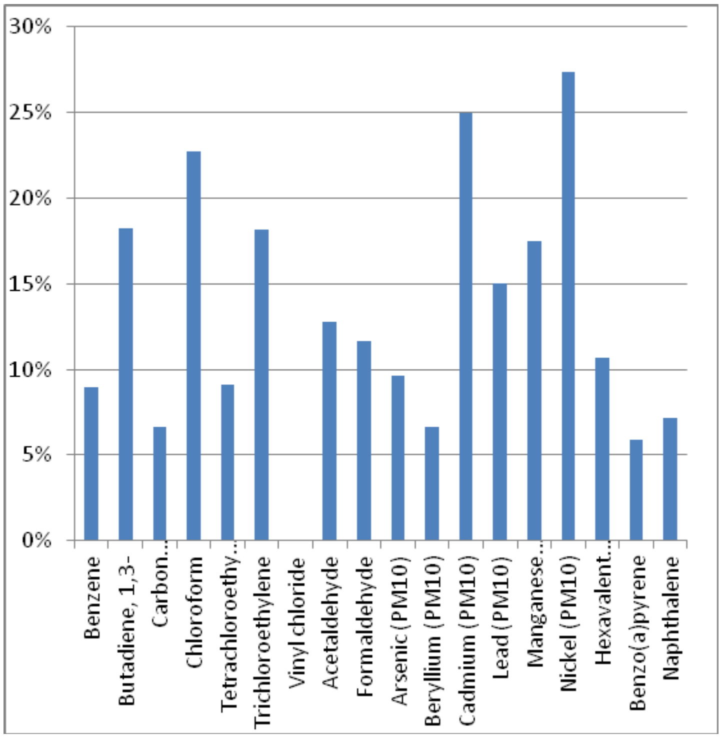


Figure 8-3. Percentage of Pollutant Datasets Exceeding the Overall Method Precision MQO

9.0 TRENDS IN THE CONCENTRATION OF THE NATTS CORE HAPS

This section presents trends in ambient air concentrations of the NATTS core HAPs over two consecutive 3-year periods, consistent with the program-level data quality objective (DQO). This section also presents results of rolling averages on a site basis.

Using only the pollutant datasets that were determined to be acceptable for assessing trends (according to the criteria set forth in Section 8 of this assessment), EPA calculated trends in three ways:

- Annual averages for each site and pollutant and trendline (see Figures F1-1 through F1-28 and Tables F2-1 through F2-18 in Appendix F).
- Consecutive 3-year block averages *across multiple sites* (see Table 9-1 and Figures 9-1 through 9-4 in this section).
- Rolling 3-year averages *for individual sites* (see Figures F3-1 through F3-25 in Appendix F).

To calculate these trends, EPA first calculated an annual average concentration of each NATTS core HAP for each site. Using these annual average concentrations, EPA used 3-year block averages to calculate trends across multiple sites, and used 3-year rolling averages to calculate trends for individual sites.

Consistent with other sections of this assessment, the term “pollutant dataset” means the set of pollutant concentrations for a specific monitoring site for an individual pollutant for a specific year.

9.1 Calculating Annual Average Concentrations

Using the 24-hour concentration data of the 2,192 pollutant datasets that were determined to be acceptable for assessing trends, EPA calculated annual average concentrations for each NATTS site and NATTS core HAP. Calculating annual averages consisted of averaging all detects and non-detects within the calendar year for all pollutant datasets. The NATTS reporting policy is to replace each non-detect with a 0 and a "ND" flag. Therefore, in this analysis, we used "0" for compounds that were not detected. If a value for a compound was reported below the MDL (not including ½ MDL substitution for data), then the actual value was used.

A total of 2,192 annual averages were calculated by site and pollutant, along with corresponding confidence intervals. These annual averages are presented by site in Appendix F, Figures F1-1 through F1-28 for sites and pollutants with at least two annual averages, and by pollutant in Appendix F, Tables F2-1 through F2-18. These annual average concentrations are used as the basis for the 3-year block averages across sites as discussed in Section 9.2 and the 3-year rolling averages discussed in Section 9.3.

9.2 3-Year Block Averages to Identify Trends

The program-level DQO of the NATTS monitoring network is the following:

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

Using the annual average concentration of each NATTS core HAP for each site as determined in Section 9.1, EPA used the following equations to calculate 3-year block averages ($\overline{X}$ and $\overline{Y}$) for the respective years 2005-2007 and 2008-2010. From the 3-year block averages, EPA calculated the trend (T) as a percent difference. The following equations are from the *Draft Report on Development of Data Quality Objectives (DQOs) for the National Ambient Air Toxics Trends Monitoring Network* (U.S. EPA, 2002) and are defined in detail in the subsections below.

$$\overline{X} = \left(\frac{\overline{X}_1 + \overline{X}_2 + \overline{X}_3}{3} \right) \quad \text{and} \quad \overline{Y} = \left(\frac{\overline{Y}_1 + \overline{Y}_2 + \overline{Y}_3}{3} \right)$$

$$T = \left(\frac{\overline{Y} - \overline{X}}{\overline{X}} \right) \times 100$$

Calculating two consecutive 3-year block averages*:* In order to assess trends for two consecutive 3-year periods, a site's pollutant datasets must be for the *consecutive* years 2005-2010. If a site's pollutant datasets are not for the consecutive years 2005-2010, then that site's pollutant datasets were not included in the trend calculation for that specific pollutant. Because not all sites had pollutant datasets for the consecutive years 2005-2010, the number of sites that were used to determine a trend for each pollutant varies. The figures in this section indicate the number of sites that were included in the calculations for 3-year block averages and the corresponding trends.

Calculating 3-year block averages and percent difference: The analysis of trends is based on the percent difference between the mean of the first three annual concentrations and the mean of the second three annual concentrations. The 3-year block averages for an individual pollutant were calculated as follows:

$$\overline{X} = \left(\frac{\overline{X}_1 + \overline{X}_2 + \overline{X}_3}{3}\right) \quad \text{and} \quad \overline{Y} = \left(\frac{\overline{Y}_1 + \overline{Y}_2 + \overline{Y}_3}{3}\right)$$

Where:

$\overline{X}$ = 3-year block average concentration of pollutant *a* for years 1 through 3 (*i.e., 2005-2007*)
$\overline{X}_1$ = annual average concentration of pollutant *a* for year 1 *(i.e., 2005)* across sites
$\overline{X}_2$ = annual average concentration of pollutant *a* for year 2 *(i.e., 2006)* across sites
$\overline{X}_3$ = annual average concentration of pollutant *a* for year 3 *(i.e., 2007)* across sites

and

$\overline{Y}$ = 3-year block average concentration of pollutant *a* for years 4 through 6 (*i.e., 2008-2010*)
$\overline{Y}_1$ = annual average concentration of pollutant *a* for year 4 *(i.e., 2008)* across sites
$\overline{Y}_2$ = annual average concentration of pollutant *a* for year 5 *(i.e., 2009)* across sites
$\overline{Y}_3$ = annual average concentration of pollutant *a* for year 6 *(i.e., 2010)* across sites

As an example, EPA calculated 3-year block averages and the corresponding DQO trend for acetaldehyde *across sites* as follows.

Example: Acetaldehyde DQO Trend—Across 13 Sites

Step 1: Calculate an annual average acetaldehyde concentration from the daily acetaldehyde concentrations to get an annual average acetaldehyde concentration *for individual sites for each of the 6 years*. (See Section 9.1 and Appendix F, Tables F2-1 through F2-18.)

Step 2: Average the annual average acetaldehyde concentrations that were calculated for individual sites to get an annual average acetaldehyde concentration *across multiple sites for each year* (X_1, X_2, X_3, Y_4, Y_5, and Y_6).

Equation Variable	Year	Number of Sites	Annual Pollutant Average Across Multiple Sites (μg/m³)
$\overline{X}_1$	2005	13	2.02
$\overline{X}_2$	2006	13	2.07
$\overline{X}_3$	2007	13	2.02
$\overline{Y}_1$	2008	13	1.59
$\overline{Y}_2$	2009	13	1.69
$\overline{Y}_3$	2010	13	1.88

Step 3: Average the multi-site annual acetaldehyde averages within the respective block (*i.e., 2005-2007 and 2008-2010*) to get a 3-year block pollutant average ($\overline{X}$ and $\overline{Y}$) using the following equations:

$$\overline{X} = \left(\frac{\overline{X}_1 + \overline{X}_2 + \overline{X}_3}{3}\right) \quad \text{and} \quad \overline{Y} = \left(\frac{\overline{Y}_1 + \overline{Y}_2 + \overline{Y}_3}{3}\right)$$

$$\overline{X} = \left(\frac{2.02 + 2.07 + 2.02}{3}\right) \quad \text{and} \quad \overline{Y} = \left(\frac{1.59 + 1.69 + 1.88}{3}\right)$$

$$= 2.03 \qquad\qquad = 1.72$$

Step 4: Calculate the trend as a percent difference.

$$\%DIFF_{acetaldehyde} = 100 * \frac{[(\overline{Y} - \overline{X})]}{\overline{X}}$$

$$\%DIFF_{acetaldehyde} = 100 * \frac{(1.72 - 2.03)}{2.03}$$

$$\%DIFF_{acetaldehyde} = -15.5\%$$

For each site-pollutant combination, EPA applied the above average equations to the *six-year consecutive* pollutant datasets (2005-2010) that were determined to be of sufficient quantity and quality to assess trends.

DQO Trends Results: Table 9-1 presents the 3-year block averages and percent difference for each pollutant. Figures 9-1 through 9-4 graph the percent difference of the 3-year block averages for the 18 NATTS core HAPs. (Note that these results use *zero* as the surrogate for non-detects in calculating the annual averages, which is consistent with the historical NATTS approach (see Section 10 for further discussion regarding the use of zeros for non-detects).)

Table 9-1. Results of DQO Trends Analysis—3-year Block Averages and Percent Difference

Pollutant	Pollutant Group	Number of Sites Used in Averaging	2005-2007	2008-2010	%Difference
Acetaldehyde	Carbonyl	13	1.93	1.62	-15.9%
Arsenic (PM_{10})	PM_{10} Metals	8	0.89	0.78	-12.2%
Benzene	VOC	14	1.07	0.87	-18.2%
Beryllium (PM_{10})	PM_{10} Metals	12	0.056	0.043	-22.2%
Butadiene, 1,3-	VOC	12	0.119	0.086	-28.3%
Cadmium (PM_{10})	PM_{10} Metals	14	0.27	0.19	-28.6%
Carbon tetrachloride	VOC	10	0.57	0.62	8.7%
Chloroform	VOC	15	0.21	0.24	16.5%
Formaldehyde	Carbonyl	12	2.87	2.34	-18.6%
Hexavalent Chromium	Hexavalent Chromium	12	0.026	0.016	-37.4%
Lead (PM_{10})	PM_{10} Metals	12	4.63	3.02	-34.6%
Manganese (PM_{10})	PM_{10} Metals	13	6.20	5.30	-14.6%
Nickel (PM_{10})	PM_{10} Metals	11	1.85	1.25	-32.4%
Tetrachloroethylene	VOC	12	0.39	0.22	-42.6%
Trichloroethylene	VOC	15	0.057	0.038	-33.5%
Vinyl chloride	VOC	13	0.0029	0.0034	15.9%

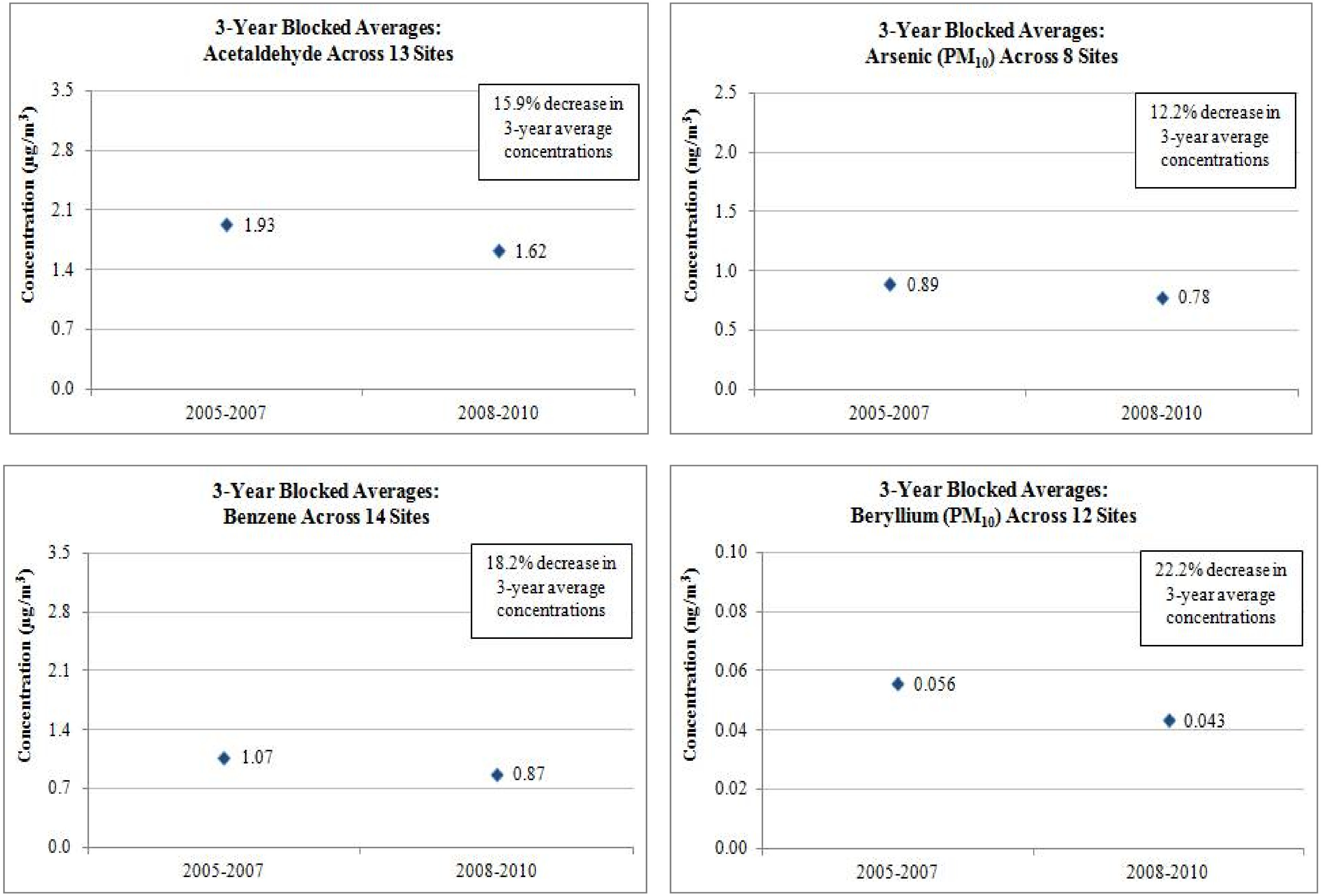


Figure 9.1. Acetaldehyde, Arsenic (PM_{10}), Benzene, and Beryllium (PM_{10}) 3-Year Blocked Averages

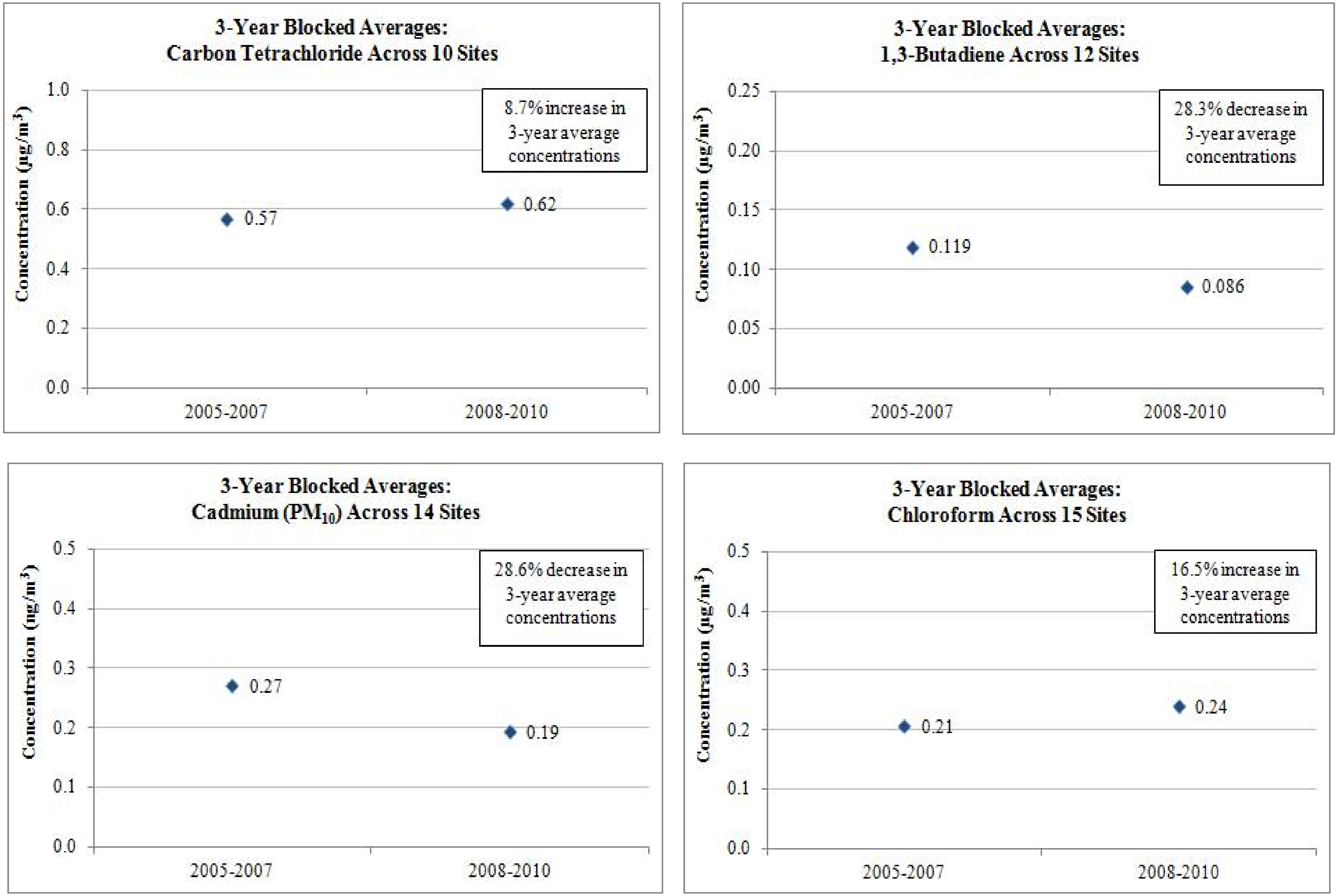


Figure 9-2. 1,3-Butadiene, Cadmium (PM_{10}), Carbon Tetrachloride, and Chloroform 3-Year Blocked Averages

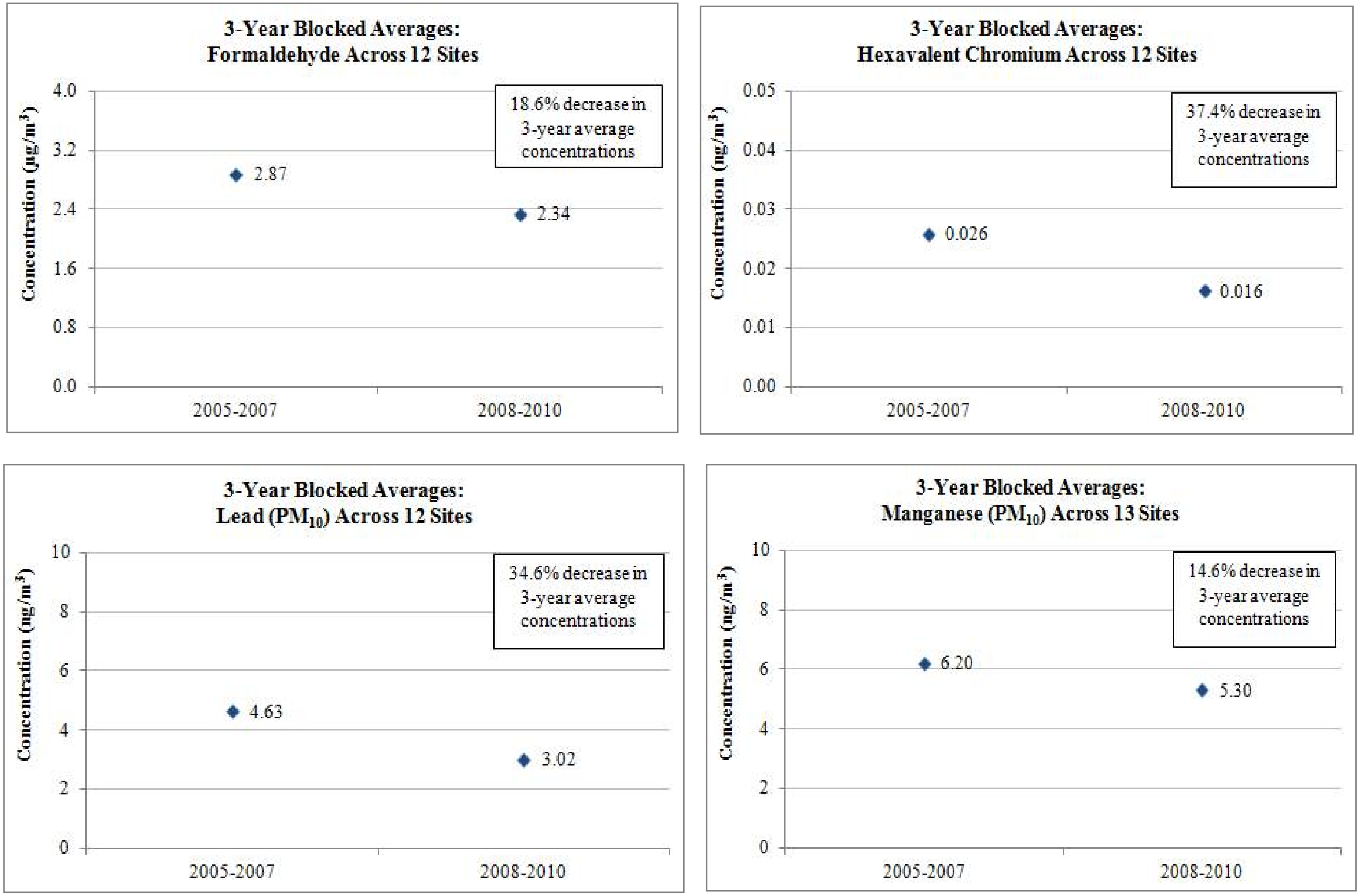


Figure 9-3. Formaldehyde, Hexavalent Chromium, Lead (PM_{10}), and Manganese (PM_{10}) 3-Year Rolling Blocked Averages

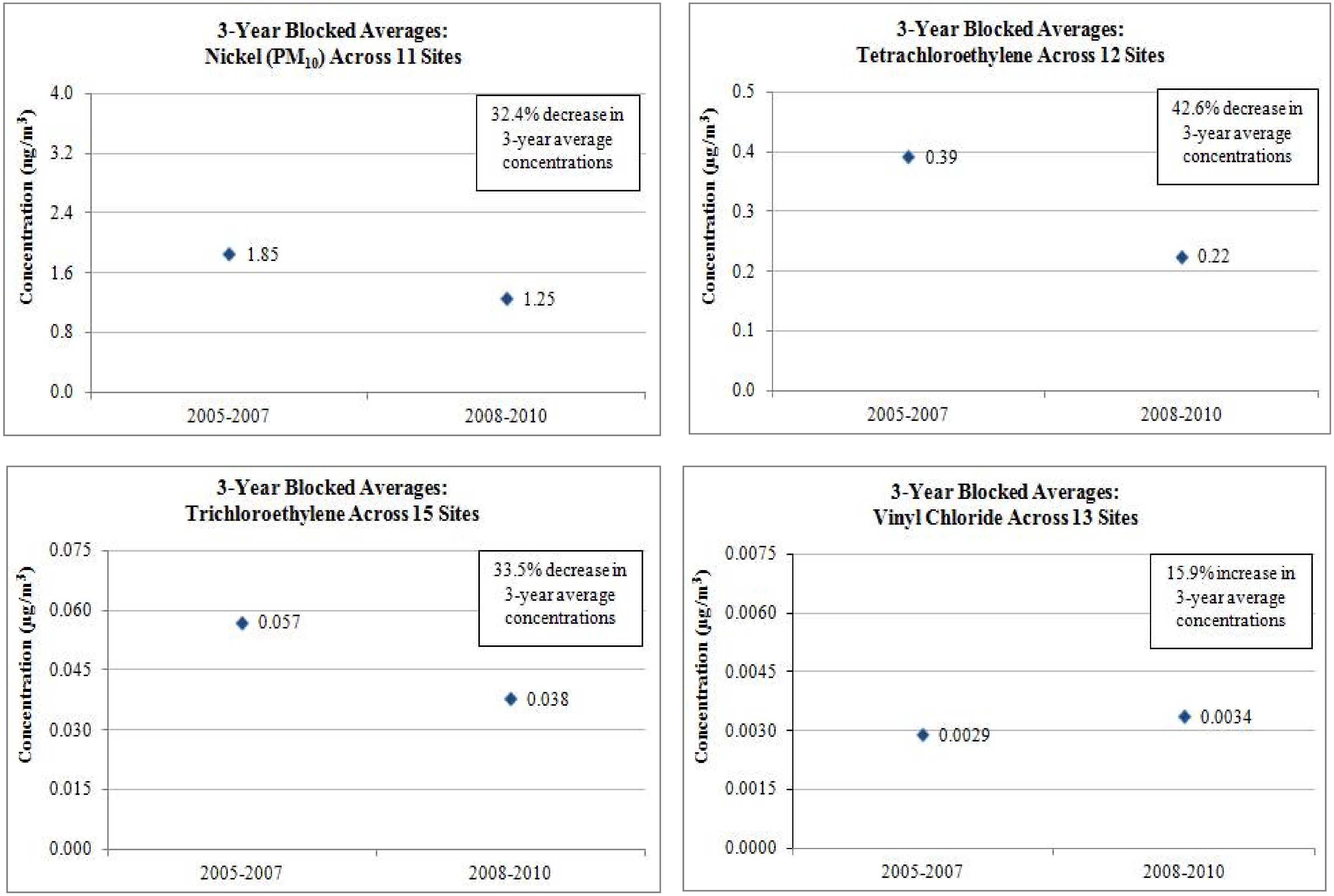


Figure 9-4. Nickel (PM_{10}), Tetrachloroethylene, Trichloroethylene, and Vinyl Chloride 3-Year Blocked Averages

9.3 Rolling Averages to Identify Trends

Using the annual average concentration of each NATTS core HAP for each site as determined in Section 9.1, EPA used the following equations to calculate 3-year rolling averages of each NATTS core HAP for each individual site.

Calculating rolling averages*:* In order to calculate 3-year rolling averages, the pollutant datasets must be for *consecutive* years. EPA included as many consecutive pollutant datasets as possible.

Using equations similar to those used for calculating 3-year block averages, EPA calculated a series of 3-year rolling averages for an individual NATTS core HAP as follows:

$$\overline{X}_a = \left(\frac{\overline{X}_{a,1} + \overline{X}_{a,2} + \overline{X}_{a,3}}{3} \right)$$

$$\overline{X}_b = \left(\frac{\overline{X}_{a,2} + \overline{X}_{a,3} + \overline{X}_{a,4}}{3} \right)$$

$$\overline{X}_c = \left(\frac{\overline{X}_{a,3} + \overline{X}_{a,4} + \overline{X}_{a,5}}{3} \right)$$

Where:

$\overline{X}_a$ = average concentration of pollutant *a* for years 1-3 (*e.g., 2005-2007*)

$\overline{X}_b$ = average concentration of pollutant *a* for years 2-4 (*e.g., 2006-2008*)

$\overline{X}_c$ = average concentration of pollutant *a* for years 3-5 (*e.g., 2007-2009*)

$\overline{X}_{a,1}$ = average concentration of pollutant *a* for the respective year 1, 2, 3, 4, 5, 6, 7, or 8 *(2003, 2004, 2005, 2006, 2007, 2008, 2009, or 2010)*

In a 3-year rolling average, a series of 3-year averages is calculated by dropping the first-year value when a fourth-year value is added. Thus, this pattern of equations can continue for years into the future, hence a "rolling" average.

As an example, EPA calculated 3-year rolling acetaldehyde averages for Houston, TX as follows.

Example: Acetaldehyde Rolling Averages for Houston, TX for the Years 2003-2010

Step 1: Calculate an annual average acetaldehyde concentration from the daily acetaldehyde concentrations to get an annual average acetaldehyde concentration *for individual sites for each of the 8 years*. ($X_{a,1}$ through $X_{a,8}$) (See Section 9.1 and Appendix F, Tables F2-1 through F2-18.)

Houston, TX - Average Acetaldehyde Concentration for Years 2003-2010

Variable	Year	Concentration (μg/m^3)
$\overline{X}_{a,1}$	2003	2.25 ± 0.46
$\overline{X}_{a,2}$	2004	2.66 ± 0.45
$\overline{X}_{a,3}$	2005	2.19 ± 0.35
$\overline{X}_{a,4}$	2006	1.76 ± 0.29
$\overline{X}_{a,5}$	2007	1.61 ± 0.32
$\overline{X}_{a,6}$	2008	1.27 ± 0.24
$\overline{X}_{a,7}$	2009	1.39 ± 0.22
$\overline{X}_{a,8}$	2010	1.35 ± 0.22

Step 2: Average the annual acetaldehyde averages for Houston, TX within the first 3-years (*i.e., 2003-2005*) to get an average concentration of pollutant *a* for years 1-3 (X_a)

$$\overline{X}_a = \left(\frac{\overline{X}_{a,1} + \overline{X}_{a,2} + \overline{X}_{a,3}}{3}\right)$$

$$= \left(\frac{2.25 + 2.66 + 2.19}{3}\right)$$

$$= 2.37$$

Step 3: Repeat Step 3 using the next 3 years of data (*i.e., 2004-2006*) to get an average concentration of acetaldehyde for Houston, TX for years 2-4 ($X_{bar,b}$)

$$\overline{X}_b = \left(\frac{\overline{X}_{a,2} + \overline{X}_{a,3} + \overline{X}_{a,4}}{3}\right)$$

$$= \left(\frac{2.66 + 2.19 + 1.76}{3}\right)$$

$$= 2.20$$

Step 4: Continue until all possible rolling 3-year averages have been calculated.

For each site-pollutant combination, EPA applied the above rolling average equations to the *consecutive* pollutant datasets that were determined to be of sufficient quantity and quality to assess trends. Note that for some sites, the consecutive pollutant datasets covered only 4 years (i.e., years 2007-2010), which yielded two 3-year rolling data points. For other sites, the consecutive pollutant datasets covered up to 8 years (i.e., years 2003-2010), which yielded six 3-year rolling data points.

Figures F3-1 through F3-25 in Appendix F present results of the 3-year rolling average calculations.

10.0 OBSERVATIONS AND RECOMMENDATIONS

This section summarizes the observations and recommendations of this assessment.

This section summarizes the major observations and results for this assessment and provides recommendations based on those observations and results, as applicable. EPA conducted this NATTS Network assessment as part of its overall National Monitoring Strategy, Air Toxics Component (U.S. EPA, 2004), which requires that the NATTS Network be evaluated and modified as needed, every 6 years:

> *Although the longevity of trends sites typically extends over a decade or more, the NATTS must be evaluated, and modified as needed, on 6-year intervals to assure continued relevancy, consistent with the procedures established under the National Strategy.*

The overarching purpose of this assessment is to determine the degree to which the NATTS Network objectives are being met. The objectives of the assessment are both *quantitative* and *qualitative*: A *quantitative* assessment was completed through the data reported to AQS and other directly relevant reported information, such as Proficiency Testing (PT) samples. A *qualitative* assessment was completed through other means such as interviews with the operating agencies and discussions with EPA regional offices.

The assessment examined whether data collected under the program are complete enough and are of adequate quality to meet the program-level data quality objective. The program-level data quality objective (DQO) of the NATTS Network is the following (U.S. EPA, 2002):

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

EPA previously determined that the trends network objective will be attained for monitoring sites that meet the following requirements (U.S. EPA, 2002):

- A 1-in-6-day monitoring frequency with at least an 85% quarterly completeness.
- Precision controlled to a coefficient of variance (CV) of no more than 15%.

10.1 NATTS Program-Level DQO

- **<u>Observation</u> – The NATTS Program-Level DQO was able to be calculated for 16 out of 19 NATTS core HAPs**.

- Under the original vision of the NATTS program, it was anticipated that four pollutants (arsenic, benzene, 1,3-butadiene, and formaldehyde) would be used as surrogates to assess whether the NATTS Program-Level DQO was met. By 2005, EPA had increased the NATTS target list to 17 core HAPs. Since 2008, EPA had increased the NATTS target list to 19 core HAPs.
- For this assessment, EPA identified data for 16 out of19 NATTS core HAPs that met the Program-Level DQO, as described in Section 8. Using these suitable data, EPA calculated trends for 16 NATTS core HAPs for two successive 3-year periods, as presented in Section 9. Acrolein was not considered for trends due to data quality issues that are described in Section 5, and the two PAHs (naphthalene and benzo(a)pyrene) were added in 2008.
- **Recommendation – The Program Office should consider reviewing the list of required NATTS core HAPs to determine if pollutants need to be added or removed.** Preliminary work has begun on reviewing the entire suite of pollutants that are available for the five method groups. Of primary importance to adding or removing pollutants are the following criteria: 1) associated chronic health benchmark level, 2) frequency of detection, 3) MDL achievability, 4) AQS reporting, and 5) other information, such as the pollutant being a NATA risk driver or of interest to EPA. An initial list of 59 pollutants has been identified using the above criteria.

- **<u>Observation</u> - Although determined to be appropriate at the onset of the NATTS Network, the program-level DQO may need to be refined.**
  - The data generated by NATTS monitoring sites were, in general, consistent, high-quality datasets that met the DQO. Many sites employed the same sampling and analytical procedures, which helps ensure data consistency needed for trends analysis.
  - Approximately 78% of the pollutant datasets (pollutant dataset means the set of pollutant concentrations submitted to AQS by a monitoring site for an individual pollutant for a specific year) were suitable for trends analysis.
  - Trends were calculated using 3-year block averages (i.e., 2005-2007 and 2008-2010) of the "trends-suitable" annual averages, which may be too exclusive if an annual average is not suitable for trends analysis. Additionally, the ability to detect a 15% difference may not be applicable to all NATTS core HAPs.
  - **Recommendation – The Program Office should consider convening a DQO Work Group to review the Program-Level DQO for appropriateness to the NATTS goals**. For this assessment, uneven weighting was applied to the four method quality objectives (MQOs) due to specific data not being available or required. Additionally, the DQO Work Group should assess alternative approaches to trends analysis beyond the 3-year block averages by considering 3-year rolling averages and 1-year annual averages.

10.2 NATTS MQOs

- **<u>Observation</u> – The NATTS MQOs are relevant to meeting the Program-Level DQO, but may need to be refined.**

- EPA's Completeness MQO was relevant in determining if data were of sufficient quantity. Nearly 95% of the pollutant datasets met the Completeness MQO.
- EPA's Sensitivity MQO was relevant in determining if the method detection limits were consistently meeting the target values listed in the NATTS Work Plan template. Approximately 81% of the pollutant datasets met the Sensitivity MQO.
- EPA's Bias MQO was relevant in determining laboratory performance through its Proficiency Testing (PT) program. Of the pollutant datasets that were assessed, approximately 97% met the Bias MQO.
- While not as frequently reported (due to it not being required) EPA's Precision MQO was also relevant in determining overall method precision and analytical precision. Of the pollutant datasets that were assessed, approximately 80% of the overall method precision and 96% of the analytical precision met the Precision MQO.

• <u>**Observation**</u> **– Although many NATTS sites have collected data of sufficient quantity and quality for a 6-year trends analysis, many sites did not meet select requirements for all NATTS core HAPs.**

- In 2005 there were 23 NATTS sites operating. By pollutant, it was expected that data from 23 sites would be used for the trends calculations for all NATTS core HAPs, with the exception of hexavalent chromium. Hexavalent chromium was to be measured at 22 sites from 2005-2010 (hexavalent chromium was added to Pinellas County, FL in 2008).
- Three of the original 23 sites relocated during the assessment period, and were not able to calculate 3-year block averages from 2005-2010 because a full year's worth of data are needed for 6 consecutive years to calculate 3-year block averages.
- The number of sites having sufficient quality and quantity for the core HAPs ranged from eight (arsenic) to 15 (chloroform and trichloroethylene). The reasons for the low number of sites include:
  - ▪ Not enough samples were collected, thus not meeting the Completeness MQO. Although the required completeness was specified as 85% on a 1-in-6 day sampling schedule, EPA deemed 75% completeness on a 1-in-6 day sampling schedule were sufficient for this assessment. Completeness deficiencies include:
    - completeness percentages were less than 75%;
    - sampling was not conducted on the required 1-in-6 day schedule; or
    - the NATTS operating agency did not sample for a particular pollutant group.
  - ▪ Method detection limits (MDLs) were outside of the accepted target levels for one or more years in the 6-year period thus not meeting the Sensitivity MQO. Although the required sensitivity was specified as meeting the target MDLs in the NATTS Work Plan template, EPA deemed that ratios above the target MDL level between 1 and 1.5 were sufficient for this assessment. Some MDLs were outside of this 1.5 ratio. MDLs greater than the 1.5 ratio were the primary reason that pollutant datasets were not suitable for trends analysis.
  - ▪ Bias percent differences were outside of the accepted ranges for one or more years in the 6-year period, thus not meeting the Bias MQO. Although the required bias was specified as having the NATTS core HAPs meeting ±25% percent difference, EPA

determined that percent differences within ±35% were sufficient for this assessment. Some pollutant percent differences were outside of 35%.

  - Percent Coefficient of Variation (%CV) was outside of the accepted ranges for one or more years in the 6-year period thus not meeting the Precision MQO. Although the required precision (analytical and overall method) was specified as having the NATTS core HAPs meeting ±15% CV, EPA determined that %CV within ±25% was sufficient for this assessment. Some pollutant %CV were outside of 25%.

10.3 NATTS Data Reporting

- **<u>Observation</u> – Although reporting of data into EPA's Air Quality System (AQS) was generally complete, there are still deficiencies in reporting.**
  - Over 96% of the expected datasets were reported to EPA's AQS. However, there were method-level and pollutant-level datasets that were either not sampled for or not reported to AQS. Additionally, EPA received some 2010 pollutant datasets more than 8 months after the required deadline.
  -
- **<u>Observation</u> – Some pollutants were incorrectly coded under the wrong AQS Site Code, and POCs reporting was sometime inconsistent.**
  - Through this assessment, it was discovered that benzene concentrations for 2005 in Washington, D.C. were incorrectly coded in AQS under another AQS Site Code.
  - One of the challenges of retrieving the NATTS data from AQS is determining which parameter occurrence code (POC) relates to NATTS data vs. other air monitoring programs. The POCs were not always consistent each year.
  -
  - Entity-entered MDLs into AQS (those submitted by the NATTS sites) accounted for only 65% of the concentration data. Of the remaining 35% of non-AQS data, approximately 27% were obtained from EPA's Quality Assurance Annual Reports (QAARs). This high percentage (27%) indicates that some NATTS sites have MDLs readily available but choose not to enter that data into AQS. As of July 1, 2011, EPA has mandated that MDLs be entered into AQS with the concentration records.
- **Observation – There was improvements in data reporting is some areas.**
  - Important data quality information such as under-MDL reporting, non-detect reporting, null codes reporting, data qualifier codes reporting, and precision data were reported by most sites for most years.
  - Approximately 85% of all applicable datasets also reported Other HAPs (i.e., non-NATTS core HAPs) associated with the sampling and analysis methods, such as for methylene chloride.
  - Approximately 89% of all applicable datasets also reported non-HAPs associated with the sampling and analysis methods, such as for methyl ethyl ketone.
  - Many sites also collected and reported criteria pollutant measurements and meteorological parameters concurrently with NATTS sampling.

- **Recommendation – The Program Office and the Regional Office should provide more guidance and oversight in ensuring that NATTS data are reported more completely and in a timely manner. In addition, the Program Office should work with affected parties to identify and correct issues and impediments to timely data submission.**
- **Recommendation – The Program Office should continue to encourage agencies operating NATTS sites to report all of its monitoring data (other HAPs, non-HAPs, criteria pollutant, and meteorological) to AQS.**
- **Recommendation – The Program Office should require agencies operating NATTS sites to report its AQS Site Code, POC, and analytical laboratory annually to both their Regional Offices and the Program Office.**

10.4 NATTS Data Quality

- **<u>Observation</u> – Select instances of questionable NATTS data concentrations were found to be resident in AQS.**
  - A small portion of the NATTS concentration data are exactly equal to ½ MDL. In the past, state/local agencies would sometimes substitute non-detected concentrations with a value one-half of the MDL. Under the NATTS Network specifications, this practice is not acceptable, and agencies are mandated to report a “0” for non-detects, with appropriate data quality flagging. While under-MDL reporting of concentrations to AQS are encouraged and a measurement of ½ MDL may be legitimate, EPA has repeatedly seen concentrations reported at ½ MDL for certain pollutants that are infrequently detected at that level (e.g., vinyl chloride).
  - In reviewing the concentrations, certain data values appeared to be out of range of typical concentrations. EPA followed up with NATTS site operators or the national contract laboratory on specific concentrations and was able to achieve resolution by determining that the questionable concentrations were due to contamination or the entry of lot blank concentrations.
  - **Recommendation – The Program Office should consider conducting an annual data review as part of its QAAR.** EPA currently prepares an annual QA Annual Report (QAAR) which reviews the AQS data information for the program’s MQOs (completeness, sensitivity, bias, and precision), but not for review of data concentrations.
- **<u>Observation</u> – The NATTS Proficiency Testing (PT) Program has been extremely beneficial in improving laboratory performance.**
  - Site operators commented on the benefits of participating in the PT Program. Fifteen of the 25 participating laboratories did not report any bias results outside the acceptable MQO used for this assessment. Only a small set of pollutants were challenging for specific laboratories.
  - While the PT Program has been beneficial in improving laboratory performance, samples were not sent on regular schedules each year. Bias is an important MQO, and in certain years, only one PT sample per pollutant group was sent to participating laboratories. An additional PT could potentially identify laboratory performance issues.
  - Also, in 2010, there was only one round of carbonyl PT samples sent to participating labs. Unfortunately, the laboratory supporting the Chesterfield, SC NATTS site was

experiencing laboratory equipment issues when the PT sample arrived. The equipment was not brought back online until after the hold time of carbonyl audit sample.

- Several NATTS operators commented that the most recent PT samples sent for 2011 were not realistic (i.e., concentrations were too high) versus the concentrations observed in a typical atmosphere.
- **Recommendation – The Program Office should consider increasing PT samples to at least twice a year and having audit sample concentrations prepared to more typical concentration range.** The NATTS data collected over the last 8 years can provide the basis for the typical ranges observed in the atmosphere for both urban and rural locations, as presented in Section 7.

- **Observation – The current methodology for calculating precision uses data of limited certainty.**
  - Under the current methodology for calculating precision, EPA considered paired datasets that may have concentrations that are non-detect or below the MDL. Additionally, the current guidance uses a surrogate value of ½ MDL for non-detects. By using these approaches, significant uncertainty is introduced and can lead to misinterpretations about the precision based on concentrations that are not above the method detection limit. For this assessment, EPA adopted the procedure of examining only precision data in which both pairs of data (primary and secondary) are at or above the MDL.
  - **Recommendation – The Program Office should consider adopting the precision calculations procedure developed in this assessment for its annual QAARs.**

10.5 NATTS Sampling and Analytical Equipment

- **Observation – Some NATTS sites (or their contracted laboratories) are operating sampling and analytical equipment that was purchased prior to 2001.**
  - Approximately one-third of sampling equipment and one-fifth of analytical equipment was first deployed prior to 2001.
  - Many NATTS sites (or their contracted laboratories) would like to replace older equipment if resources are available. Some sites have multiple samplers andor components on the shelf ready to be replaced or refurbished.
  - Many NATTS sites do not annually certify sampling equipment due to resource and/or logistical constraints.
  - In lieu of certification, some sites replace internal components of sampling equipment (such as tubing, solenoids, etc.). However, replacement of components does not remove the need for certification.
  - **Recommendations – The Program Office should:**
    - **Work with the Regional Offices to re-task any residual NATTS funds to purchase/upgrade sampling and/or analytical equipment;**
    - **Ensure that annual certifications of samplers and components have occurred for agencies that receive base site support under the national contract; and**

- **Develop a sampler loaner program (as practical) such that sites can maintain continuity by not missing scheduled samples for agencies that do not receive base site support under the national contract.**

10.6 NATTS Data Analysis

- **<u>Observation</u> – Detection Rates were high for the majority of NATTS core HAPs.**
  - Eight NATTS core HAPs had detection rates greater than 90% during the 8-year period: acetaldehyde, 99%; benzene, 95%; carbon tetrachloride, 90%; formaldehyde, 100%; lead (PM_{10}), 99%; manganese (PM_{10}), 99%; naphthalene, 100%; and nickel (PM_{10}), 92%.
  - Trichloroethylene and vinyl chloride were detected less than 50% (46% and 18%, respectively.
- **<u>Observation</u> – The concentrations measured at urban versus rural NATTS locations are significantly different for most NATTS core HAPs.**
  - With the exception of formaldehyde and vinyl chloride, pollutant concentrations at urban sites were significantly higher than at rural sites. There was no significant difference for formaldehyde and vinyl chloride.
  - **Recommendation – The Program Office should further conduct detailed analysis on the NATTS data to further investigate the differences between urban and rural concentrations and also other applications such as pollutant tracer analysis, NATA background concentrations, etc.**
  - **Recommendation – The Program Office should further conduct detailed data analysis to identify whether NATTS data are able to measure the progress toward emission and risk reduction goals.**
  - **Recommendations – Data analysis objectives should be reviewed/revised for uses such as trends and supporting other air toxics programs.**

10.7 Current Network Design

- **<u>Observation</u> – New sites have not been added to the NATTS Program since 2008.**
  - The current number of 27 sites in the NATTS Network has remained the same since 2008. The Program Office should consider adding at leasr one urban and one rural site using the following criteria:
    - Recent NATA results (e.g., Are there geographic areas not represented by high risk NATA areas?)
    - Spatial geographic coverage (e.g., Are there geographic "holes" across the United States not represented?)
    - Areas of interest (e.g., increased areas of energy production)
    - Logistics (e.g., Is there an NCore site that can be used? Is there staff available to run the instrumentation or would a contractor be necessary?)

        - Potential redundancy of sites that are close together (e.g., Are the concentrations between two sites consistently similar?).
    - A preliminary review of the NATTS sites geographically would suggest adding one site in a rural area that is in one of the Region 7 states (Iowa, Nebraska, Missouri, or Kansas).
    - Additionally, the eastern Ohio/western Pennsylvania area was a recent priority focus during the School Air Toxics Monitoring Program and was an area of interest for high risk based on NATA 2005 results.
    - Also, the Gulf of Mexico (specifically along the Louisiana coast) was identified as an area of interest during the 2010 BP Oil Spill based on a lack of air toxics monitoring data in this region.
    - Based on the inter-comparison of concentrations at four pairs of sites that are close to one another (Los Angeles, CA-Rubidoux, CA; Pinellas County, FL-Tampa, FL; Providence, RI-Roxbury, MA; and Richmond, VA-Washington, D.C.), there were statistically significant differences in concentrations for some pollutants, but no statistically significant difference for other pollutants.
    - **Recommendation – Based on the above factors, the Program Office should consider reviewing the current network sites and supplement the network to improve its representativeness. The Program Office should also consider relocating sites that are consistently under-performing.**

10.8 NATTS Program Office

- **<u>Observation</u> – Some of the sampling and analysis methods approved for the NATTS program may need refinement, and possibly made more prescriptive.**
    - Some EPA Compendium Methods have not been revised in as many as 10 years. Because the compendium methods are structured as guideline methods as opposed to reference methods, they are performance-based and not prescriptive.
    - **Recommendation – The Program Office should review the current sampling and analytical methodologies and update as necessary.**
- **<u>Observation</u> – This assessment contains a wealth of information that can help identify programmatic issues and shape the NATTS program for future years.**
    - Several issues were raised by the agencies operating NATTS sites and in assessing the data itself. Some issues have been rectified when raised, while others will need additional time to reconcile. The results of this assessment can be used to make the NATTS Program and other EPA monitoring programs more consistent.
    - **Recommendation – The Program Office should review the information in this assessment to identify NATTS sites and associated laboratories that are under-performing and assist them to achieve performance standards or identify appropriate alternatives.**
    - **Recommendation – The Program Office should ensure that future updates to the *Technical Assistance Document For The National Air Toxics Trends Stations Program* reflect observations from this assessment.**

- **Recommendation – The Program Office should consider integrating the results and observations from this assessment to benefit other EPA monitoring programs. In addition, NATTS protocols should be utilized in other programs, if applicable.**
- One comment observed by the agencies operating NATTS sites was the benefit of the interviews conducted by EPA and the need for more regular communication between the Program Office, Regional Office, and the agencies operating NATTS sites.
- **Recommendation – The Program Office should conduct regular conference calls with the Regional Offices and the agencies operating NATTS sites.**

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