OFFICE OF INSPECTOR GENERAL

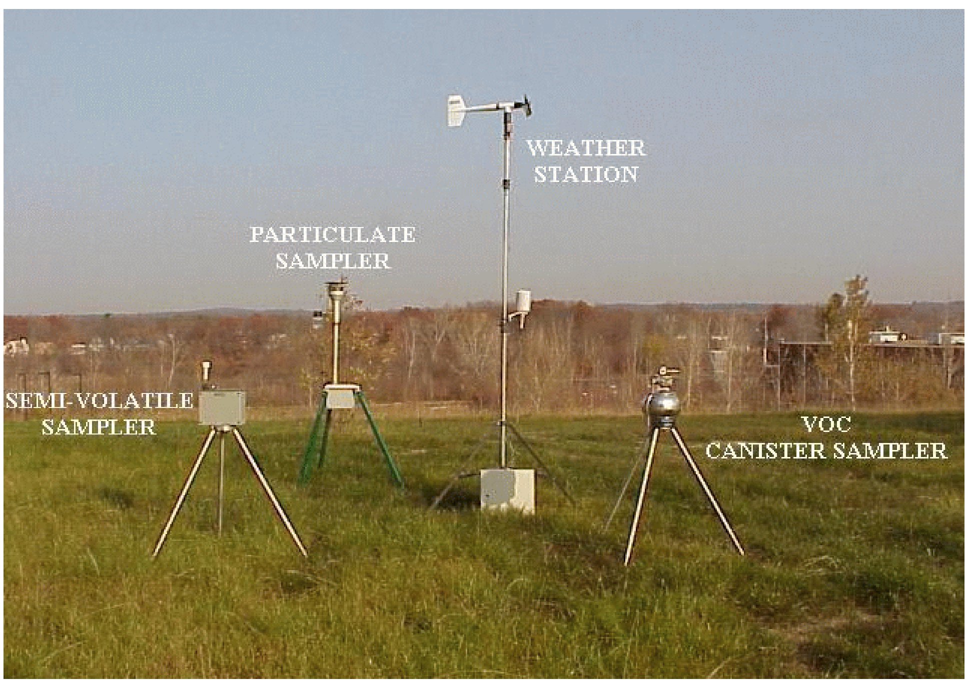
Catalyst for Improving the Environment

Evaluation Report

Progress Made in Monitoring Ambient Air Toxics, But Further Improvements Can Increase Effectiveness

Report No. 2005-P-00008

March 2, 2005



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Abbreviations

AQS	Air Quality Subsystem
CAA	Clean Air Act
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
FY	Fiscal Year
GIS	Geographical Information System
MACT	Maximum Achievable Control Technology
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NATTS	National Air Toxics Trends Stations
OAQPS	Office of Air Quality Planning and Standards
OAR	Office of Air and Radiation
OIG	Office of Inspector General
ORD	Office of Research and Development
PAH	Polynuclear Aromatic Hydrocarbons
POM	Polyclic Organic Matter
QAPP	Quality Assurance Project Plan
VOC	Volatile Organic Compound

Cover photo: Photograph of several types of air samplers used in ambient air toxics monitoring.
Source: http://www.epa.gov/region1/lab/images/posters/mvc-001f.jpg

U.S. Environmental Protection Agency
Office of Inspector General

2005-P-00008
March 2, 2005

At a Glance

Catalyst for Improving the Environment

Why We Did This Review

We performed this review to evaluate EPA's progress in establishing a national network and determine the status of ambient air toxics monitoring nationwide. A viable ambient monitoring program to detect areas of unhealthy air toxics concentrations and to measure national and local trends in those concentrations is key to assessing progress in reducing air toxics-related health risks.

Background

The Clean Air Act (CAA) identifies 188 air toxics. EPA defines air toxics as "those pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects." EPA's goal is to reduce unacceptable health risks from air toxics for 95 percent of the population by 2020. Ambient monitoring is important to assess progress towards meeting this goal.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:

www.epa.gov/oig/reports/2005/20050302-2005-P-00008.pdf

Progress Made in Monitoring Ambient Air Toxics, But Further Improvements Can Increase Effectiveness

What We Found

The CAA does not require a national air toxics monitoring network, but EPA and State and local agencies have recognized such a network is needed. Since 2000, EPA has significantly increased its ambient air toxics monitoring efforts and funding to establish a national network and support State and local agencies' monitoring activities. EPA recently established 23 national sites to assess ambient air toxics trends, and State and local agencies have established over 300 fixed ambient air toxics monitoring stations nationwide. Further, in 2004 EPA began awarding grants to State and local agencies to conduct short-term, local-scale monitoring projects.

Still, additional effort and improvement is needed to ensure that sufficient ambient air toxics data is available to identify areas of unhealthy ambient air toxics concentrations, identify national air toxics trends, and assess the effectiveness of air toxics reduction strategies. For example, there was little association between the location of State and local air toxics monitors and areas estimated to have high health risks from air toxics exposure. Also, we identified inconsistencies in the sampling frequencies and quality assurance measures for the national trends sites. Key barriers to ambient air toxics monitoring included adequacy of funding and lack of methods to monitor certain air toxics.

What We Recommend

We recommend a number of actions to improve the effectiveness of ambient air toxics monitoring. For example, with respect to monitoring conducted on a local-scale (i.e., certain State and local network monitors and EPA's local project grant program), EPA should develop a strategy – in coordination with its State, local, and tribal partners – for siting monitors in locations that are estimated to present the greatest health risks from exposure to air toxics. We also recommend several actions for improving the programmatic aspects of the national trends sites, particularly with respect to quality assurance, quality control, and data completeness. In addition, we recommend that EPA's Office of Research and Development place greater emphasis on methods development for analyzing ambient air toxics concentrations. The Agency generally agreed with our draft report's recommendations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

March 2, 2005

MEMORANDUM

SUBJECT: Progress Made in Monitoring Ambient Air Toxics,
But Further Improvements Can Increase Effectiveness
Report No. 2005-P-00008

FROM: Kwai-Cheung Chan */s/*
Assistant Inspector General for Program Evaluation

TO: Jeffrey R. Holmstead
Assistant Administrator for Air and Radiation

William H. Farland
Acting Deputy Assistant Administrator for Science

This memorandum transmits the results of an Office of Inspector General (OIG) evaluation regarding the Environmental Protection Agency's (EPA's) implementation of a national ambient air toxics monitoring network. This report contains findings that should help EPA improve its national monitoring network. Also, the report describes problems encountered in implementing a national monitoring network and contains corrective actions the OIG recommends. This report represents the opinion of the OIG and the findings contained in this report do not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established procedures.

Action Required

In accordance with EPA Manual 2750, as the action official, you are required to provide this Office with a written response within 90 days of the final report date. The response should address all recommendations. For the corrective actions planned but not completed by the response date, please describe the actions that are ongoing and provide a timetable for completion. Where you disagree with a recommendation, please provide alternative actions for addressing the findings reported.

We appreciate the efforts of EPA officials and staff in working with us to develop this report. If you or your staff have any questions regarding this report, please contact me at (202) 566-0827 or Rick Beusse, Director for Program Evaluation - Air Issues, at (919) 541-5747.

Attachment

cc: Stephen D. Page, Director, Office of Air Quality Planning and Standards
Thomas C. Curran, Deputy Director, Office of Air Quality Planning and Standards
Pete Cosier, OAR Audit Followup Coordinator
Cheryl Varkalis, ORD Audit Followup Coordinator
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Chapter 1
Introduction

Purpose

The Environmental Protection Agency (EPA) defines air toxics as "those pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects." Although a national network to monitor air quality for the six pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS) has existed for many years as required by the Clean Air Act (CAA), a similar monitoring program for air toxics was not required by the Act for the 188 known air toxics. Historically, ambient air monitoring for air toxics has been primarily conducted at the State and local level based on State and local initiatives. In 1999, EPA began designing a national ambient air toxics monitoring network. Accordingly, we conducted this review to evaluate EPA's progress in establishing a national network and the status of ambient air toxics monitoring nationwide. Our specific objectives were to determine:

- The status of EPA, State, and local agency efforts to monitor toxics in ambient air.
- The progress EPA, State, and local agencies have made in implementing a national air toxics ambient monitoring network that meets the stated objectives of the network.
- What barriers, if any, exist to the implementation of the national air toxics ambient monitoring network.

Background

Over half of the 188 identified air toxics are known or suspected to cause cancer. Further, non-cancer health effects include damage to the immune, respiratory, neurological, and reproductive systems, and child developmental problems. People can be exposed to air toxics through the air, physical contact, or ingestion.

EPA and State Programs to Address Air Toxics Pollution

The 1990 CAA Amendments required a two-phased approach to reducing air toxics emissions and risks from large stationary sources of toxic air pollution (e.g., factories, refineries, and power plants). See Table 1.1 for descriptions and status of the two phases.

Table 1.1: Two Phases for Reducing Air Toxics Emissions and Risks from Large Stationary Sources

	Description	Status
Phase 1	EPA was required to set technology-based emissions standards, referred to as Maximum Achievable Control Technology (MACT) standards, for major sources of Air Toxics that were to reflect, at a minimum, the level of emissions that the best performing 12 percent of sources in the category were achieving in practice.	Completed in February 2004
Phase 2	EPA is required to assess the risks to human health remaining from each source category 8 years after the MACT was implemented (i.e., residual risk).	Issued 1 proposed residual risk standard; currently assessing residual risks for several MACT standards

EPA is also required to address emissions from area sources (i.e., smaller stationary sources such as gas stations and dry cleaners) that emit air toxics that pose the greatest threat to human health in urban areas.

The 1990 CAA Amendments also include a provision for the regulation of toxic air pollution from motor vehicles and fuels. In 2001, EPA established a list of 21 Mobile Source Air Toxics. The Act specifies that EPA sets standards that reflect the greatest degree of emission reduction for these toxics that is achievable through the application of technology, considering availability and cost. EPA has issued rules that reduce air toxics emissions from mobile sources, some of which were directed specifically at air toxics, while others were put in place to primarily address other pollutants but have also reduced air toxics (e.g., particulate matter and hydrocarbon standards). Further, many communities have initiated local programs to reduce air toxics emissions and health risks, including voluntary measures and additional State or local restrictions on emissions.

Air Toxics Emissions and Risks

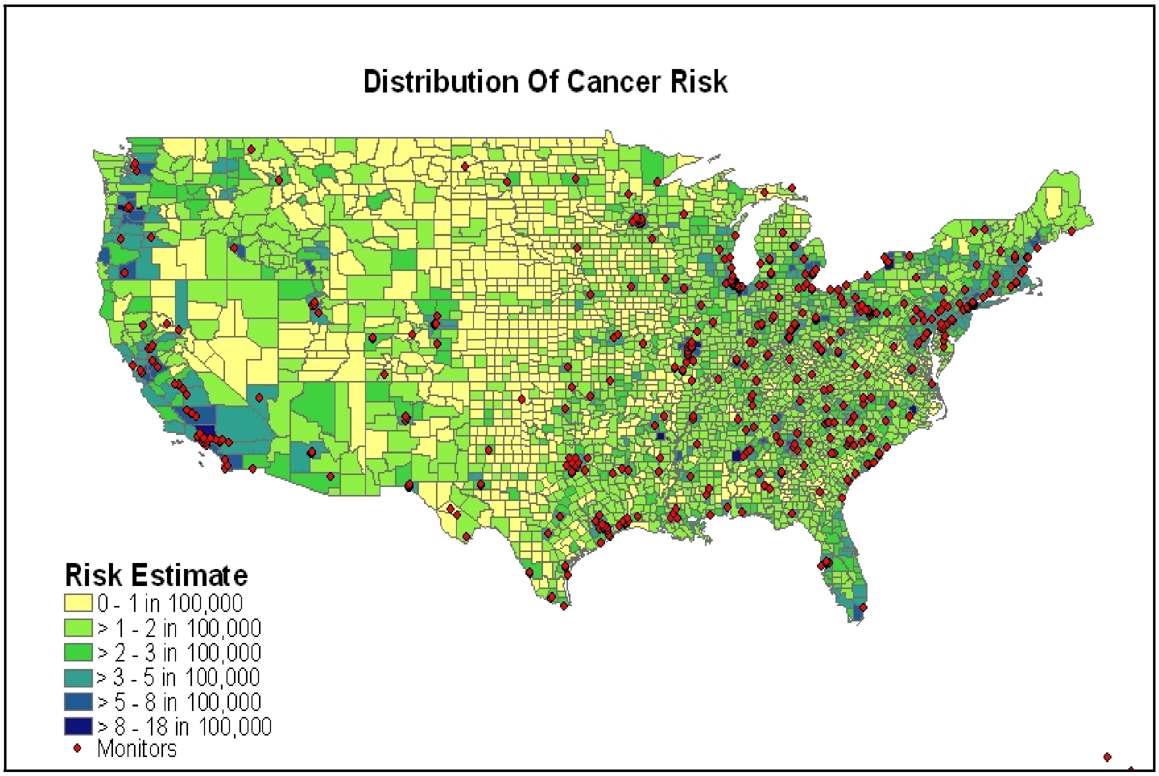
EPA develops nationwide estimates of air toxics emissions every 3 years and records this data in the National Emissions Inventory. These emission inventories are used to measure the air toxics program's success in reducing emissions. The inventories are often estimated based on emission factors and source activity data. A prior Office of Inspector General (OIG) evaluation found that, although the accuracy of the emission inventories is improving, further improvements are needed. Nonetheless, this is the highest quality emissions data available, and EPA uses the data for regulatory planning and support and for national, regional, and State emission trends in publicly released reports.

These emissions inventories measure program effectiveness and are input into air dispersion models to estimate ambient air toxics concentrations due to the large number of air toxics, and the relatively few number of ambient air toxics monitors. Estimates of ambient concentrations are in turn used to estimate human exposure to air toxics and, ultimately, health risks to humans from this exposure.

We recognize that additional research is needed to better understand the relationship between ambient concentrations of air toxics and human exposure. This relationship determines the effect of ambient concentrations in a particular geographic area on potential health risks.

EPA performs a national assessment of the risks to humans posed by air toxics, referred to as the National Air Toxics Assessment (NATA). The first such assessment was based on the 1996 emission inventory. EPA is planning to complete a second NATA based on 1999 emissions data in 2005. Limitations and uncertainties associated with NATA results are discussed in Appendix A. Figure 1.1 shows the distribution of excess lifetime cancer risks from air toxics exposure by county as estimated by the 1999 NATA.

Figure 1.1: Distribution of Cancer Risk



Role of Ambient Monitoring in the Air Toxics Program

Title I of the CAA required EPA to establish NAAQS standards for pollutants of national concern and develop a comprehensive network of air monitors to assess compliance with these NAAQS. Consequently, ambient monitoring under the NAAQS program is key to identifying areas where the public is exposed to unhealthy air

> As noted in EPA's Air Toxics Monitoring Strategy, ambient monitoring data is probably the most acceptable measure of air program progress.

and where control measures are needed to improve air quality. However, as required by CAA Section 112, the primary focus of the air toxics program has been on reducing air toxics emissions, and an ambient monitoring network was not required. The success of the air toxics program has been measured by the amount of emissions reductions achieved as opposed to measured changes in air quality. EPA has used air dispersion modeling to estimate the impact of air toxics emissions on ambient air concentrations of air toxics and, ultimately, on human health.

EPA plans to increase the role of ambient monitoring in its overall air toxics program with the development of a national air toxics monitoring program, as outlined in its National Monitoring Strategy Air Toxics Component, Final Draft, July 2004. In general, EPA plans to use ambient air toxics monitoring to support the air toxics program's efforts to reduce human exposure and health risks from air toxics. The monitoring data provided by the ambient air toxics monitoring program is intended to support four major objectives:

- Establish trends and evaluate the effectiveness of air toxics emissions reduction strategies.

- Characterize ambient concentrations (and deposition) in local areas. Air toxics originate from local sources and can concentrate in relatively small geographical areas, producing the greatest risks to human health.

- Provide data to support, evaluate, and improve air quality models. Air quality models are used to develop emission control strategies, perform exposure assessments, and assess program effectiveness.

- Provide data to support scientific studies to better understand the relationship between ambient air toxics concentrations, human exposure, and health effects from these exposures.

Development of the National Air Toxics Monitoring Program

The Office of Air and Radiation's Office of Air Quality Planning and Standards (OAQPS) outlined its plan for a national ambient air toxics monitoring network in the Air Toxics Monitoring Concept Paper, issued February 29, 2000. This paper outlined the role of monitoring in the National Air Toxics Program, the objectives and principles of a national network, the strategic approach that would be taken in this monitoring effort, and the rollout of the monitoring activities. The Concept Paper was later revised and EPA outlined a national program and strategy in the National Monitoring Strategy Air Toxics Component (Strategy). As discussed in the Strategy, the national air toxics monitoring program is comprised of four different monitoring efforts:

- National Air Toxics Trends Stations (NATTS)[1]
- EPA funded local-scale projects to assess conditions at the local level
- Existing State and local program monitoring
- Persistent bio-accumulative toxics monitoring

The monitoring program for persistent bio-accumulative toxics primarily consists of deposition monitoring, not ambient air monitoring. Several monitoring programs operated by various Federal agencies have been established to measure the presence of toxics in various media (e.g., water, fish tissue). These toxics impact human health through multiple exposure pathways, with exposure through ingestion generally presenting a greater health risk than exposure from inhalation. For example, mercury (which is emitted into the air by various stationary sources) primarily impacts human health when people consume fish that contain large amounts of methylmercury due to the process of bio-accumulation. Because of the unique nature of these toxics and the wide range of monitoring programs used to monitor the deposition of these toxics, we did not include these networks in our review. We discuss the other monitoring efforts below.

NATTS Network

The objective for the NATTS network is to provide long-term monitoring data for certain priority air toxics across representative areas of the country in order to establish overall trends for these pollutants. As of January 2004, EPA had established 23 NATTS in 22 cities.

Local-scale Projects

EPA's initial ambient air toxics monitoring pilot studies disclosed that significant variations in pollutant concentrations occurred across a city and that these variations cannot be characterized by a single monitoring site. As a result, EPA decided that local-scale projects consisting of several monitors operated for a period of 1 to 2 years should be incorporated into the national air toxics monitoring strategy. Accordingly, in Fiscal Year (FY) 2004, EPA selected 16 local-scale project proposals (of the 49 submitted) for grant awards based on the available funding of $6.2 million.

Existing State and Local Monitoring

Many State and local agencies implemented ambient air toxics monitoring networks as part of their State or local air toxics programs and have operated these networks for several years. Since 1987, EPA has assisted State and local monitoring efforts by hiring a contractor for the laboratory analysis of air toxics samples collected by State and local agency monitors. In FYs 2003 and 2004,

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[1] Stations can include several monitors.

EPA re-directed $6.5 million in Section 105 grant funding (Federal funding provided to State and local air pollution control agencies to support their air pollution planning and control programs) from criteria pollutant monitoring to air toxics monitoring.

Other Related Monitoring Efforts

In addition to air toxic-specific monitoring activities, several other monitoring programs that are primarily intended to address other air pollution concerns incorporate some aspects of air toxics monitoring. For example, EPA's Photochemical Assessment Monitoring Stations (PAMS) collect data on certain volatile organic compound and carbonyl air toxics. In addition, EPA's IMPROVE[2] and CASTNET[3] networks collect data on certain air toxics metals. Further, the results of some particulate matter monitoring is speciated (i.e., the individual compounds comprising the particulate matter are analyzed) to identify certain air toxics compounds.

Our analysis found that air toxics data collected from 542 air monitoring locations were reported in EPA's Air Quality Subsystem (AQS) for the period January 1, 2003, through September 15, 2004.

Scope and Methodology

To assess the overall status of air toxics monitoring efforts, we used Geographical Information System (GIS) software to compare the locations of all air toxics monitoring sites recorded in AQS to areas of the country with reportedly high air toxics emissions or high estimated health risks from air toxics. To assess EPA's progress in establishing a national network, we compared information on national trends site and local-scale project implementation to the objectives enumerated in EPA's strategic planning and guidance documents. We conducted interviews and reviewed various studies, reports, funding, and strategic planning documents to identify barriers to ambient air toxics monitoring.

We conducted our field work from January 2004 to September 2004 in accordance with *Government Auditing Standards,* issued by the Comptroller General of the United States. Appendix A describes our scope and methodology in more detail. Our evaluation had various limitations (including data and generalization limitations) that are discussed in detail in Appendix A.

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[2]Interagency Monitoring of PROtected Visual Environments (IMPROVE) sites are located in rural areas, primarily near national parks, are operated by Department of the Interior Federal Land Managers, and primarily monitor for haze.

[3]Clean Air Status and Trends Network (CASTNET) is the nation's primary source for data on dry acidic deposition and rural, ground-level ozone.

Limitations

We used the results of EPA's 1999 NATA to identify areas with high risk from exposure to air toxics. There are limitations and uncertainties associated with EPA's NATA assessment; thus the NATA results could identify areas as potentially high risk when they are not or vice versa. Also, ambient monitoring concentrations would not necessarily represent a person's actual exposure to air toxics, since personal exposure is impacted by numerous variables, including the amount of time spent indoors, outdoors, or driving.

Results in Brief

In the past few years, EPA has made progress in developing a national ambient air toxics monitoring program. EPA's efforts have included developing a national ambient air toxics monitoring strategy, analyzing several years worth of previously collected State and local ambient air toxics data, establishing a national network of 23 sites to measure long-term trends in national concentrations of certain high priority air toxics, and initiating short-term local-scale monitoring projects to characterize local air toxics concentrations. Still, additional steps can be taken to improve the effectiveness of EPA and State and local ambient air monitoring efforts.

Many high risk areas do not have ambient air monitoring for air toxics. For example, 45 of the 50 census tracts with the highest estimated cancer risks from air toxics exposure – based on the 1999 NATA results – did not have ambient air toxics monitors. Although many of the counties that these census tracts were located in did have at least one ambient air toxics monitor, past monitoring efforts have shown that air toxics concentrations vary widely within a county and one particular monitor may not be representative of the ambient air concentrations in different neighborhoods throughout an urban area. EPA's local-scale projects could be used to help obtain air monitoring coverage in these unmonitored high risk areas.

With respect to its network for obtaining long-term trends data, EPA needs to ensure that the 23 national sites operate consistently and on the same sampling schedules in order to obtain sufficient data to develop long-term trends.

Several barriers, many of which will require long-term attention to resolve, prevent the implementation of a comprehensive ambient monitoring program at both the national and State levels. Our interviews of over 50 officials from various organizations identified several barriers to the implementation of a comprehensive national monitoring network. Prominent among these barriers was a lack of funding, particularly at the State and local level, and a lack of ambient monitoring methods for key pollutants.

We recommend that Assistant Administrator for the Office of Air and Radiation (OAR) integrate results from the NATA and other risk models in siting air toxics monitors to characterize local-scale air toxics concentrations. This includes incorporating additional criteria into the local-scale project selections to locate monitors in areas where NATA or other risk analyses indicate that the population is at increased risk of health effects from exposure to air toxics. We also recommend that the local-scale program periodically re-visit locations in order to evaluate progress in reducing air toxics emissions. We recommend that OAR work with the respective regional office program representatives to ensure that the NATTS sufficiently address all program requirements, including the scale of monitoring being conducted and the frequency of sampling. We also recommend that OAR, prioritize the barriers to ambient air toxics monitoring and develop a long-term strategy for addressing these barriers, and that the Assistant Administrator, Office of Research and Development (ORD), emphasize air toxics methods development for key air toxics in the ORD Air Toxics Research Strategy.

In responding to our draft report, the Agency stated that our draft report's recommendations generally align with their current program improvement efforts, but were concerned that our draft report may not communicate the necessary balance among program priorities, both within the air toxics program and across other programs. We added language in the final report to address these concerns and made other technical clarifications recommended by the Agency, as appropriate.

Chapter 2
EPA's National Air Toxics Program Needs Greater Integration of Health Related Risk Data

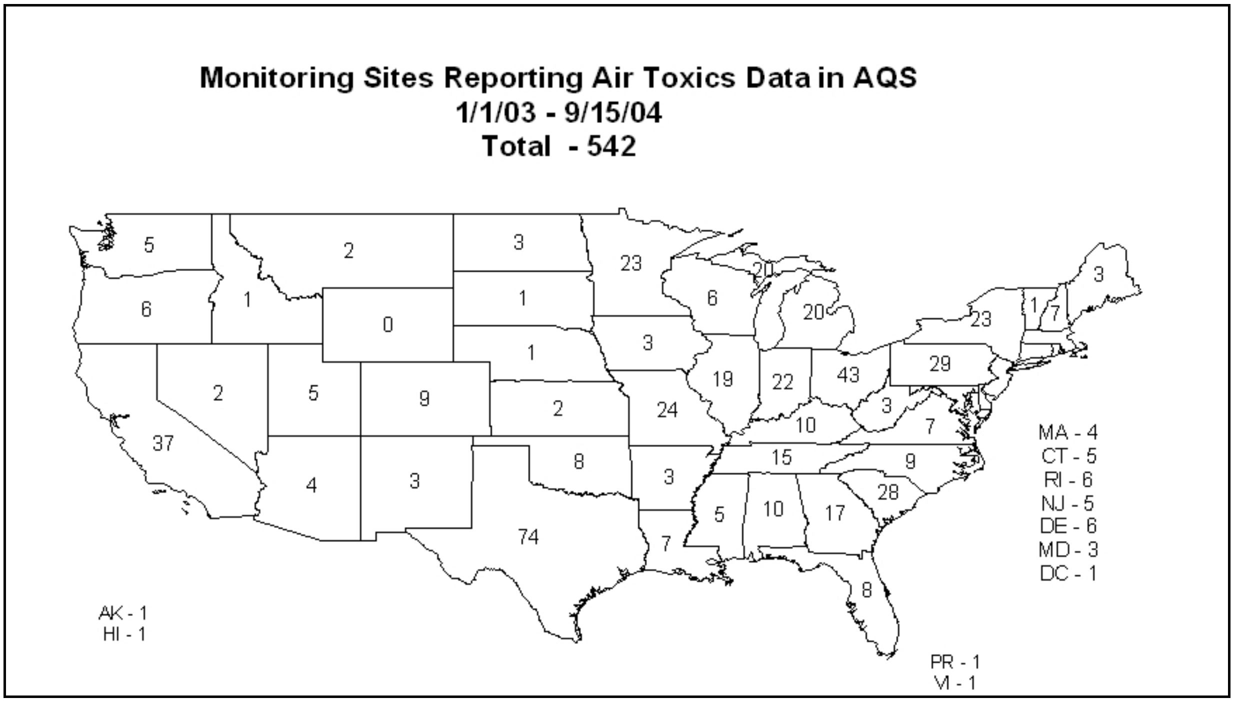
Our analysis to determine whether air toxics monitors were located in areas estimated to have high cancer risks from air toxics exposure found little association between the placement of air toxics monitors and census tracts estimated to have excessive levels of risks from air toxics. The majority of existing air toxics monitors were established and operated by State and local agencies and were not originally established as part of an EPA-administered national network. However, much of this monitoring data has been submitted to EPA. Given the large number of air toxics and the cost of monitoring, we believe EPA should incorporate a targeted approach to local-scale ambient air toxics monitoring in its national strategy, including placing monitors in those areas believed to present the greatest risks to the public. We found that 45 of the 50 areas with the highest estimated cancer risks from air toxics do not have ambient air toxics monitoring. Because many existing monitors are under the control of State and local air toxics programs, EPA will need to coordinate with State and local agencies to more effectively site these monitors.

Information Used in Our Analysis

We used data from EPA's NATA to identify the census tracts and counties with the highest levels of estimated cancer risks from air toxics exposure. It should be noted that there is considerable uncertainty regarding the relationship between emissions, ambient concentrations, and human exposure that may affect the identification of high risk areas (see Appendix A for a discussion of NATA limitations). Nonetheless, the NATA provided the best available data on high risk areas for purposes of this analysis. In addition to NATA, we reviewed EPA's National Emissions Inventory to identify counties with the highest levels of air toxics emissions. In order to identify the location and type of air toxics monitoring conducted across the county, we identified all monitoring locations for which data was submitted to EPA's AQS for the 21-month period January 1, 2003 through September 15, 2004. We compared these three sets of data to determine whether ambient air toxics monitoring was being conducted in areas estimated to have high cancer risks from air toxics exposure and in areas with high emissions of air toxics. Since EPA has not yet published its most recent NATA results, EPA and State and local monitoring agencies would not have been expected to site monitors based on this information. However, we believed it was important to use the most recent risk data in performing our analysis to provide the most benefit in developing future monitoring plans.

The following figure shows the number of monitoring sites reporting data on any air toxics compound in EPA's AQS.

Figure 2.1: Monitor Sites Reporting Air Toxics Data into AQS



Monitors Not Located in 45 of the 50 Census Tracts with High Estimated Cancer Risks

Our initial analysis focused on the extent to which ambient air monitoring occurred in the 50 census tracts estimated to have the greatest cumulative cancer risks from air toxics. We looked at census tract risk as opposed to county-wide risk because prior EPA monitoring studies showed that air toxics concentrations varied widely within counties and tend to be elevated in areas close to the sources of air toxics emissions. We found that ambient air toxics monitoring was conducted in only 5 of the top 50 census tracts based on EPA's most recent NATA data. The following table summarizes the results of our analysis and includes the population for the tracts we reviewed:

Table 2.1: Monitors in 50 Census Tracts with Highest Cancer Risks

	Census Tracts		Population	
	No.	Percent	No.	Percent
Tracts with monitors	5	10%	10,552	7%
Tracts without monitors	45	90%	145,383	93%
Tracts in sample	50	100%	155,935	100%

Although monitors were located in only 5 of the 50 census tracts, in many instances monitors were located in the county that included the census tract. The 50 census tracts were located in 27 counties and 2 cities. Of these 29 counties and cities, 19 had air toxics monitors.[4] However, given the wide variation in air toxics concentrations over a geographic area and the propensity for elevated concentrations near the sources of emissions, the concentrations measured at these monitors may not be representative of air toxics concentrations in the census tracts.

We expanded our analysis to further explore the placement of monitors in higher risk census tracts by determining the number of monitors in the top 1, 5, 10, 20, and 25 percent of census tracts in terms of cumulative cancer risk. The following table shows the results of our analysis. The 99th percentile in the following table includes the top one percent of counties in terms of estimated cancer risks; the 95th percentile includes the top five percent of counties in terms of estimated cancer risks; and so on.

Table 2.2: Monitors Located in High Risk Census Tracts

Sample Size	No. of Tracts	No. Tracts With Monitors	Percent of Tracts with Monitors	Population in Percentile	Percent of U.S. Population
99th Percentile	648	23	3.6%	2,351,277	0.8%
95th Percentile	3265	53	1.6%	13,186,452	4.7%
90th Percentile	6528	80	1.2%	26,019,679	9.2%
80th Percentile	13060	145	1.1%	52,646,787	18.7%
75th Percentile	16328	177	1.1%	66,665,285	23.7%

As shown in Table 2.2, air toxics monitoring is conducted in a small percentage of the census tracts containing the highest cancer risk from air toxics. For example, of the top 10 percent of high risk tracts (90th percentile), only 1.2 percent had an air toxics monitor located within the tract.

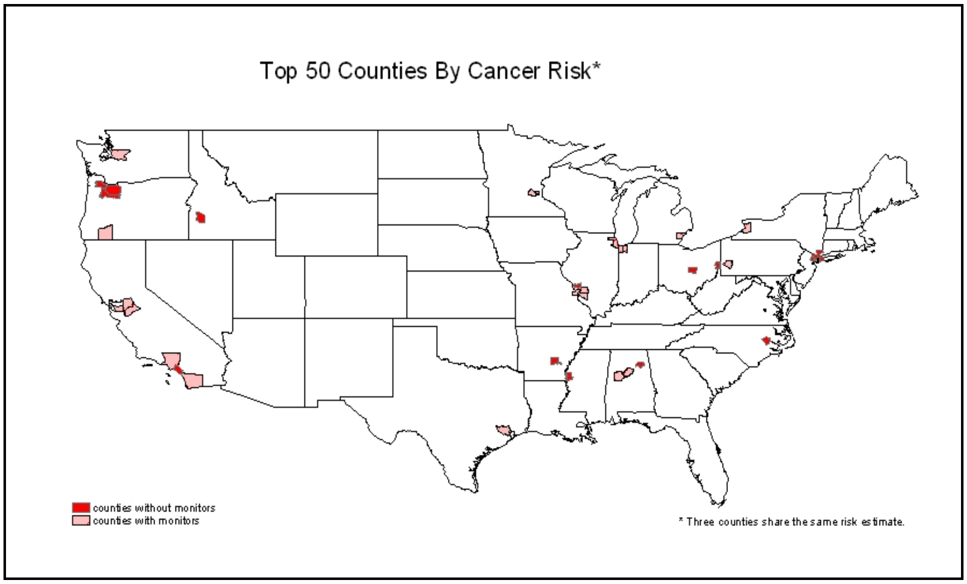
Better Correlation Between Air Monitoring and Risks at the County Level, But Many High Risk Counties Without Monitoring

After completing our initial analysis at the census tract level, we expanded our analysis to evaluate the correlation between the placement of monitors and the 50 counties with the highest estimated cancer risks. When using a larger area of comparison (i.e., the county instead of the census tract), a stronger relationship was evident between the existence of a monitor and estimated cancer risks. Specifically, our expanded analysis found that for estimated cancer risks, 33 of the

[4] Excludes fine particulate matter monitors that were also collecting air toxics data.

52[5] counties with the highest estimated cancer risks monitored for air toxics. The following figure shows the 52 counties with the highest estimated cancer risks and whether the county contained a monitor.

Figure 2.2: Highest Risk Counties



We also analyzed different percentiles of counties with respect to risks. Table 2.3 summarizes the results of this analysis.

Table 2.3: Monitors in High Risk Counties

Sample Size	No of Counties	No. of Counties with Monitors	Percent Counties with Monitors	Population in Percentile	Percent of U.S. Population
99th percentile	32	21	65.6%	36,157,497	12.9%
95th percentile	158	94	59.5%	117,078,706	41.6%
90th percentile	316	165	52.2%	167,754,549	59.6%
80th percentile	631	228	36.1%	214,517,588	76.2%
75th percentile	790	240	30.4%	226,892,933	80.6%
All counties	3141	297	9.5%	281,421,906	100.0%

We also compared the location of monitors to counties with the highest emission densities. We found better correlation at the county level; however, there were still many high risk areas without air toxics monitors. For example, of the top 10 percent of high risk counties (90th percentile), 52.2 percent had an air toxics

[5] Our analysis included 52 counties since 3 counties were tied for the 50th highest risk.

monitor located within the county. These results were similar to the results for the county risk comparison, as would be expected because those counties with the highest estimated cancer risks would likely have the highest emission densities as well.

Appendix B provides a more detailed discussion of the correlation among monitors and high risk and high emission areas, and Appendix C provides county risk estimates and monitor locations for States in all EPA Regions.

Number of Air Toxics of Concern Were Not Monitored

We also analyzed the extent to which air toxics identified as presenting the greatest estimated lifetime excess cancer risks to the most people were monitored. Based on the 1999 NATA results we identified the 10 air toxics presenting estimated cancer risks greater than 1 in 100,000 to the most people (this is shown in Figure 2.3). Similarly, we identified the 10 air toxics presenting estimated cancer risks greater than 1 in 10,000 to the most people (this is shown in Figure 2.4). EPA's air toxics goal is that excess lifetime cancer risks be no greater than 1 in 1,000,000. The two categories included 14 different air toxics with 6 air toxics appearing in both risk categories. No monitoring data were reported in AQS for five of the air toxics listed in the following charts (coke oven emissions,[6] hydrazine, POM,[7] ethylene oxide, and benzidine). The same 10 pollutants do not appear in both charts or in the same order since the number of people living in areas with different ambient concentrations and corresponding health risks would vary. For example, an air toxic with ambient concentrations that poses a 1 in 100,000 risk in areas with large populations, may not be present in those same areas at the higher concentrations needed to present the greater risk of 1 in 10,000.

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[6] No compounds or classes of compounds are unique to coke oven emissions, a listed hazardous air pollutant which is actually a complex mix of chemicals, many of which are also emitted by other sources. Consequently, AQS does not include data for "coke oven emissions."

[7] The term POM (polyclic organic matter) defines a broad class of compounds which includes PAHs (polynuclear aromatic hydrocarbons). PAHs are the most commonly measured group of POMs. AQS contains data for selected PAHs (e.g., napthalene, acenaphthelene, etc.) which can be used as a surrogate for total POM.

Figure 2.3: Air Toxics Presenting Cancer Risks > 1 in 100,000

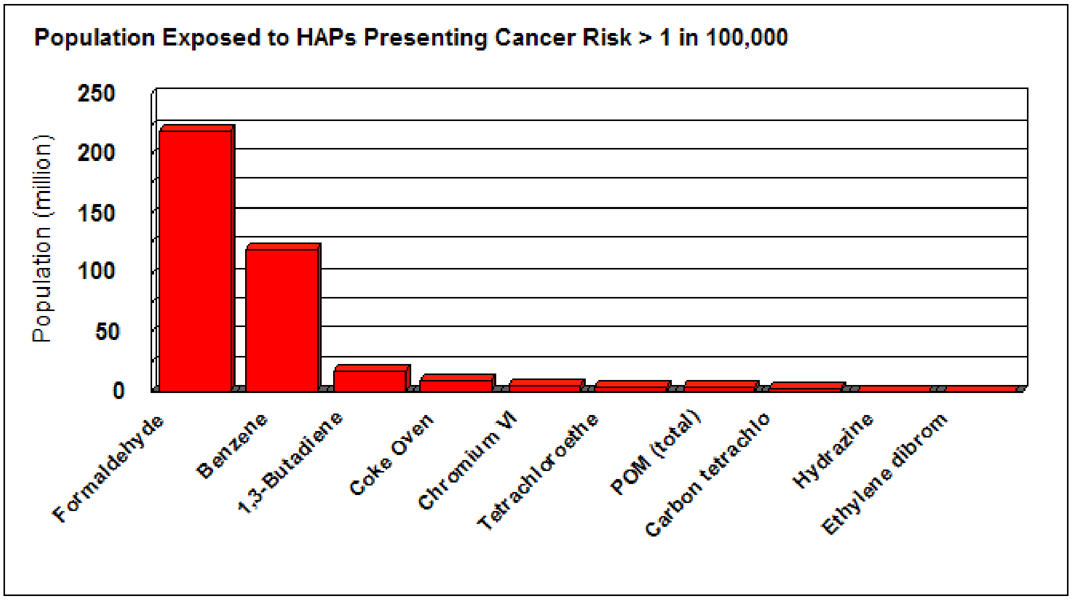
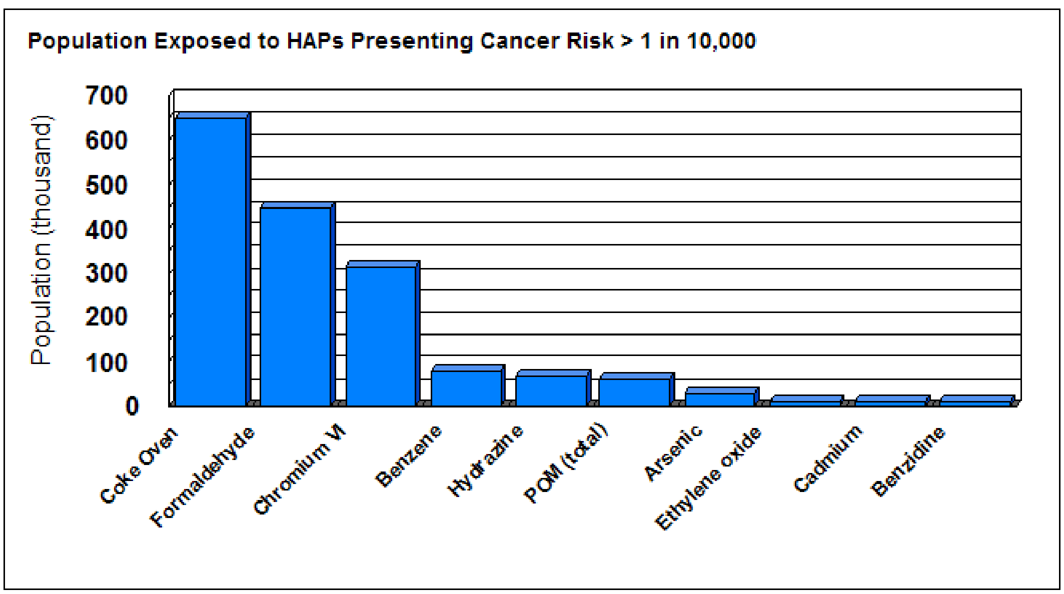


Figure 2.4: Air Toxics Presenting Cancer Risks > 1 in 10,000



As shown in the charts, formaldehyde and benzene exposed the greatest number of people to risks of cancer greater than 1 in 100,000. Coke oven emissions, formaldehyde, and chromium VI exposed the greatest number of people to risks of cancer greater than 1 in 10,000.

Three of the five air toxics with no monitoring data reported in AQS appeared on both lists. The following table summarizes the three pollutants with no monitoring data and the population at risk for each of these pollutants:

Table 2.4: High Risk Air Toxics with No Monitors

Air Toxics	Population Exposed to > 1 in 10,000 Risk	Population Exposed to > 1 in 100,000 Risk
Coke Oven	650,444	9,740,590
Hydrazine	70,664	1,064,503
POM	64,103	4,734,276
Totals	**886,115**	**135,237,126**

The 14 air toxics which present the greatest cancer risks to the largest numbers of population also included two air toxics (1-3 butadiene and chromium VI) for which EPA has not yet established approved routine monitoring methods.

Coordination Between the National Strategy and State and Local Monitoring Efforts Needs to Address High Risk Areas

State and local officials with monitoring jurisdiction for the 50 census tracts we reviewed were generally aware that the census tracts we had selected were likely high risk areas. In a few instances, State and local officials were surprised that the census tract showed up as a high risk area, and in one case State officials indicated that a source operating in that census tract in 1999 – the year that the risk estimates were based on – was no longer operating in that census tract.

The majority of these State and local agency officials told us that they did not consider the current level of ambient air toxics monitoring in their areas sufficient. These officials outlined several barriers to implementing more comprehensive networks, including a lack of funding, routine monitoring methodologies, and benchmarks against which to compare ambient concentrations. These barriers are discussed in Chapter 5.

Many State and local agencies have implemented and operated ambient air toxics monitoring activities in accordance with their State or local program requirements, not Federal (EPA) requirements. Beginning in FY 2003, EPA re-allocated section 105 grant funds to assist these efforts, primarily to help fund the entering of this data into EPA's AQS database. However, EPA has no statutory authority to mandate where these monitors are located. Accordingly, EPA must work cooperatively with State and local agencies to get monitors placed in areas where public health risks from air toxics exposures appear greatest. EPA has worked cooperatively with State and local agencies through the Standing Air Monitoring

Working Group to develop its air toxics monitoring strategy. EPA should continue to work with States, local agencies, and tribes to develop risk-based approaches to siting local-scale monitors.

EPA Region 4 has initiated such a risk-based approach to identifying counties for potential air toxics ambient monitoring activities. Region 4 uses a combination of NATA results, Centers for Disease Control health information, Toxics Release Inventory data, and U.S. census data to rank the relative risks for the counties in its region. The Director of one local agency told us that Region 4's risk program plus technical and equipment support from the region were a contributing factor to the local agency being able to establish ambient air toxics monitors in a high risk county. This local official also described tangible benefits that they obtained from their monitoring project. He told us that, as a direct result of the monitoring data they collected, they were able to enter into enforceable agreements with local industries to reduce their emissions. In addition, their local-scale[8] monitoring enabled them to identify potential under-reporting of fugitive emissions from some of the large stationary sources in their county.

Conclusions

We found gaps in existing monitor coverage with respect to areas with high estimated cancer risks and with respect to certain air toxics that are believed to present the largest risks to the most people. In order to better inform the public of potential health risks from air toxics and to measure progress in reducing public health risks, these gaps in monitoring coverage should be addressed. Also, EPA must do more to understand the link between ambient concentrations of air toxics and human exposure. While we recognize its limitations, EPA's NATA results may be used to better inform the siting of air toxics monitors. Further, once ambient air toxics data is collected, this data can be used to validate air quality models and improve risk assessments.

Recommendations

In order to better inform the public of potential health risks and to measure progress in reducing public health risks, we recommend the Assistant Administrator, Office of Air and Radiation:

2-1 Develop a strategy in coordination with State, local, and tribal partners to increase siting of local-scale monitors in locations that are estimated to present the greatest health risks from exposure to air toxics and are representative of different sources of air toxics emissions. This strategy would apply to State and local agency and tribal fixed monitors as well as the local-scale projects that EPA awards. The Strategy would not apply to

[8] Monitoring to characterize local concentrations of air toxics.

the NATTS which are designed to measure long-term trends in ambient concentrations.

2-2 Develop a method for identifying and prioritizing high risk areas for local-scale monitoring which uses various air toxics-related information and available health data (e.g., NATA results, emissions data, population data, etc.) that could be used by EPA, State and local agencies, and tribes to implement the strategy developed in recommendation 2-1.

2-3 Develop a strategy to better understand the relationship between ambient concentrations and the health risks associated with human exposure to air toxics. This strategy should include validation of results of air quality assessments that utilize human exposure modeling (e.g., NATA) and further exposure and health studies.

Recommendations regarding other issues discussed in this chapter (for example, monitoring methodologies) are included in later chapters.

Agency Comments and OIG Evaluation

The Agency generally agreed with our recommendations in Chapter 2. OAR noted that our draft report did not address the relationship of actual personal exposures to ambient concentrations and health risks, and suggested we add a recommendation to improve the understanding of this relationship, which we did. OAR also noted that NATA, which was used to identify areas with the greatest estimated health risks, includes the use of human exposure modeling to estimate actual exposures to air toxics, but also noted that there are uncertainties and limitations in the NATA exposure assessment. OAR also suggested we improve our Recommendation 2-2 by including a mechanism for evaluating whether identified locations truly are areas with elevated risks associated with exposure to air toxics.

We made changes to the report to further clarify that personal exposure to air toxics is not represented by ambient monitoring, and we added Recommendation 2-3 to address the need for a better understanding of the relationship of actual personal exposures to ambient concentrations and health risks. While our draft report already included a detailed discussion of the uncertainties and limitations of the NATA in Appendix A, we have further emphasized this point in Chapter 2. Notwithstanding these limitations, the NATA risk estimates were the best available data for identifying where air toxics risks are highest. EPA has made a commitment to ambient monitoring as an integral part of its air toxics program, and we agree that ambient monitoring should be conducted in areas that pose the greatest risks to the public. We also agree that ambient monitoring should be used in conjunction with other characterization tools. The full text of the Agency's response to the draft report is attached as Appendix H.

Chapter 3
Local-scale Projects Could Be Used to Fill Monitoring Gaps in High Risk Locations

The local-scale projects will meet the stated objectives of the strategy if implemented as they are proposed. EPA can further increase the usefulness of these projects by addressing high risk areas where previous monitoring has not occurred and by revisiting previously monitored areas to evaluate the success of air toxics reduction strategies. The local-scale projects allow for flexibility and are intended to identify potential air toxics problems at the local level. EPA started this component of its national program in FY 2004 by selecting 16 proposals – funded with Section 103 grant funds – to conduct local-scale ambient air toxics monitoring projects. The 16 projects selected, if implemented as planned, should meet the program objectives established by EPA for these projects. However, we believe these projects can provide additional public health benefits by monitoring in areas estimated to have excessive air toxics-related health risks. Further, these projects could be used to re-visit previously monitored areas to evaluate the success of air toxics reduction strategies.

Local-scale Projects to Characterize Local Air Toxics Concentrations

The local-scale studies are intended to provide monitoring data to better understand air toxics concentration gradients in urban areas. According to the air toxics monitoring strategy, the primary local-scale objective is to characterize ambient concentrations in local communities. As outlined in its Strategy, EPA established five specific goals for these projects, listed here in Table 3.1.

Table 3.1: Five Specific Goals for Local-scale Projects

	Desired Characteristic
1	Develop a baseline reference for air quality concentrations that can be used to measure the progress of a planned emissions reduction strategy program.
2	Characterize spatial differences in pollutant concentrations that are driven by factors unique to particular communities (e.g., roadways, airports, unique stationary sources).
3	Characterize pollutants that are not ubiquitous (e.g., hexavalent chromium), yet remain a problem on a national scale.
4	Evaluate air quality models that are used for exposure assessments.
5	Test the application of available advanced technologies that can be operated on a routine basis.

EPA awarded grants funds to State and local agencies to conduct local-scale projects based on a competitive award process. EPA evaluated the proposals primarily on how well they addressed the five main objectives for the program.

EPA received 49 proposals for these projects and selected 16 projects for a total grant award of $6.141 million.

Plans for Local-scale Projects Address Stated Objectives of Program

We reviewed the workplans for the 16 local-scale projects awarded by EPA to determine whether these workplans indicated that the projects, if implemented as planned, would meet the five specific goals for the program as discussed above. The plans for the selected local-scale monitoring projects generally indicated that these projects would meet the objectives of the program if implemented as planned. The results of our review for each of the five main objectives of the local-scale projects are discussed below.

Monitoring Data to be Used to Evaluate Emission Reductions Strategies

All of the 16 selected projects indicated in their project proposals that they plan to either (1) pre-monitor for a planned emission reduction project, (2) post-monitor to evaluate an implemented emission reduction project, or (3) correlate results with a community effort characterizing air toxics risks. Accordingly, each of the awarded projects, as planned, appears to meet the goal of establishing a baseline in evaluating emission reduction strategies.

Projects Plan to Characterize Spatial Differences

All of the accepted local-scale project proposals indicated that they will characterize spatial differences in ambient concentrations influenced by different sources unique to their community. Spatial difference refers to changes in air toxics concentrations from location to location. Unique sources included airports and industrial, mobile, mixed-use, port, stationary, and commercial sources.

Collectively, the Project Plans Indicated Monitoring Will Be Used to Characterize Non-ubiquitous Pollutants

The accepted project proposals indicate that many of the projects will monitor for these pollutants. This objective was adequately addressed in the selection of the first round of local-scale projects. One of the objectives for the local-scale projects is to characterize pollutants that may not be ubiquitous (e.g., hexavalent chromium), yet remain a problem on a national scale. This could include characterization of wood smoke problems that occur in many regions of the country (e.g., in the Northwest, upper Midwest, and Northeast).

All But One Project Plan Indicated Data Will Be Used to Evaluate Air Quality Models

All but one of the accepted local-scale project proposals indicated that the monitoring data will be used to facilitate the evaluation of air quality models.

EPA uses air dispersion models to estimate air toxics ambient concentrations. Accordingly, EPA plans to use the local-scale monitoring projects to support and evaluate modeling of ambient air conditions in other locations that have similar sources. Thus, EPA tried to include as many different types of emissions sources and scenarios as possible in the final projects selected. This aspect is important because air quality models require supporting observations to build confidence in model results. This information can also direct needed improvement in underlying model formulations or related emission inventories. One proposal qualified its intent to meet this objective by stating that the applicant would be willing to consider facilitating the evaluation of air quality models with EPA's input and if it is within the scope and budget of the project.

Most Projects Will Use Advanced Technologies

EPA wants the projects to include one or more non-routine advanced technologies that have strong potential for routine operations for State/local agencies and tribes. This criterion refers to the consideration of different types of monitoring and emerging continuous technologies. The intent is to encourage fresh uses of existing technologies to address gaps in continuous methods, given that virtually all routine toxics measurements use separate sampling and analysis approaches (i.e., sampling collection followed by laboratory analysis). However, this is not intended to serve as a vehicle for new methods development or research that is beyond the intended scope of resources. All but one accepted local-scale project proposal met the criterion of inclusion of one or more non-routine advanced technologies.

Improved Communication Between Regional Offices and Headquarters Needed

We contacted all 10 regional offices to determine the status of the project awards. We confirmed that at least 14 of the 16 grants had been awarded as of November 9, 2004, and that at least 1 of the remaining 2 grants had not been awarded, even though the project monitoring period was scheduled to start on October 1, 2004. According to OAQPS officials, communications between EPA's OAQPS and the Regional offices concerning the awards for the local-scale projects have improved. Further, they told us that 15 of the 16 grants have now been awarded and the final grant was scheduled to be awarded in December 2004.

EPA Plans for Improving the Local-scale Projects

EPA plans to make changes to the program based on the lessons they learned from the first year of awarding competitive grants for local-scale projects. EPA officials told us that the competitive process for the first year of the program tended to favor State and local agencies that had experience with ambient air toxics monitoring. In order to address this problem, a second category of projects – called Community Monitoring and Capacity Building – will be awarded to build the capacity for ambient air toxics monitoring in State and local agencies that do not have established monitoring programs. We also discussed with EPA officials the possibility of using local-scale projects to obtain current data for previously monitored locations in order to evaluate the effectiveness of air toxics emissions reduction programs. According to EPA officials any effort to target funding to specific areas will include deliberation with State and local agencies and would serve to supplement the local-scale monitoring projects. As discussed in Chapter 2, ambient monitoring was not conducted in 45 of 50 census tracts estimated to have the highest excess lifetime cancer risks from air toxics exposure. We noted that 4 of the 29 counties and cities where these 45 census tracts were located were awarded EPA grant funds for local scale monitoring projects.

Another suggestion provided by EPA officials to help improve local-scale projects was to attempt to tie community monitoring efforts to concurrent exposure and health studies. EPA lacks data on how ambient concentrations relate to actual human exposures and ultimately health impacts. Although conducting exposure and health studies is presently beyond the resource capabilities of the air toxics monitoring program, it may be possible to encourage collaboration with other organizations by including this as a potential criterion for future local-scale awards.

Conclusions

Local-scale projects are an essential part of EPA's efforts to characterize ambient air toxics concentrations in local communities and are intended to allow for flexibility in addressing a wide-range of air toxics issues at the local level. EPA has selected and approved funding for 16 local-scale projects. These projects, if implemented as planned, should address the objectives established by EPA for this component of the program. We believe this component of EPA's program could provide additional benefit by addressing the lack of monitoring in areas estimated to have excessive human health risks due to air toxics exposure and to evaluate the success of air toxics reduction strategies at the local level. In FY 2005, EPA plans to award grants to a second category of projects comprised of State and local agencies that do not have established air toxics monitoring programs and wants to set aside a portion of grant funds to be used to address certain areas and issues. We believe these plans provide an excellent opportunity to enhance EPA's air toxics monitoring program by addressing areas with estimated high risk or emissions that may otherwise go unmonitored.

Recommendations

In order to increase the number of local-scale monitoring projects that address areas with high health risks from air toxics exposure, we recommend that the Assistant Administrator, Office of Air and Radiation:

3-1 Develop a communication strategy to inform State and local officials of areas that may present high health risks from exposure to air toxics and of the opportunity to obtain funding for monitoring in these areas through EPA's local-scale monitoring program.

3-2 In order to encourage development and refinement of new methodologies retain the project selection criterion for employing non-routine, advanced monitoring technologies.

3-3 Add an additional criterion to the existing local-scale project selection criteria to:

a. Address areas where NATA or other risk analyses indicate that the population is at increased risk of health effects from exposure to air toxics (relative to other areas). This could also include encouraging proposals for local-scale monitoring projects with co-located exposure and health studies by rewarding them with extra points, but not penalizing projects that do not include such collaborations.

b. Periodically re-visit previously monitored locations in order to evaluate progress in reducing air toxics emissions.

3-4 Coordinate with Regional Offices to ensure that information on grant award status is timely submitted to the appropriate OAQPS officials.

Agency Comments and OIG Evaluation

The Agency generally agreed with the recommendations in chapter 3. With respect to recommendation 3-1, the Agency stated that OAR works directly with State, local, and tribal entities and through Regional contacts to help identify and characterize local scale risk issues. The Agency indicated that it has developed a website addressing high risk areas (NATA) and a website where the solicitations for Community Scale Monitoring project proposals are posted. The Agency also stated that the Program Office communicates new solicitations to the Regional Offices, Regional Planning Organizations, and to the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, which in turn communicate the solicitations to the State, local, and tribal entities. We realize that these websites and tools exist and commend EPA for developing them. However, we continue to believe that an extra step should be taken to contact the appropriate officials in areas identified with potential for high air toxics risks to ensure that they are aware of the risks, EPA's websites, and the local-scale project funding opportunity. The full text of the Agency's response to the draft report is attached as Appendix H.

Chapter 4
Greater Consistency in Operation of National Trends Sites Needed

EPA has established a comprehensive oversight process for reviewing the operation of its NATTS. EPA's oversight and our review identified inconsistencies in the operation of the NATTS. For example, all State agencies operating these sites did not prepare quality assurance plans that adequately address the requirements of the network, and preliminary data analysis indicated that not all sites were meeting data completeness objectives or timely submitting their monitoring data to EPA. Further, the grants awarded to the State and local agencies for operating these sites did not contain the same requirements and commitments for each site. Eliminating inconsistencies in the operation of these sites will help ensure that the network meets its objective of producing data that can be used to reliably assess long-term national trends in air toxics concentrations.

Site Characteristics for the NATTS

The NATTS were designed to estimate annual average concentrations of certain high priority air toxics in order to assess long-term trends in air quality. To accomplish this goal, the National Air Monitoring Strategy Air Toxics Component Draft (Strategy) identified nine desired site characteristics for the NATTS network, shown in Table 4.1 below.

Table 4.1: Nine Desired Characteristics for NATTS

	Desired Characteristic
1	The network should include neighborhood-oriented sites that are reflective of general population exposures.
2	The network should include rural sites that represent regional background and transport concentrations.
3	All sites should comply with established physical siting protocols.
4	The network should provide good geographic coverage and represent different climatological regimes.
5	The network should include appropriate numbers of sites with influences by specific emission sources.
6	All sites should monitor for a common sets of air toxics.
7	All sites should monitor on the same days/sampling schedule (e.g., 24-hr averages every 6th day) throughout the year.
8	All sites should use consistent sampling and analytical methods, laboratory procedures, and quality assurance protocols.
9	All sites should meet the data completeness requirements.

EPA has established several quality assurance and oversight procedures to ensure that these characteristic are met. In accordance with EPA requirements for ensuring that environmental data are useful to decision makers, each State and local agency operating a NATTS site was required to develop a Quality Assurance Project Plan (QAPP). The QAPPs were to be completed prior to the initiation of monitoring activities, and should address all aspects of planning, implementation, assessment, and reporting. In the case of the NATTS, the QAPPs should address the nine site characteristics established by EPA. Further, OAQPS plans to conduct 12 technical systems audits per year which check siting, assess the competence of site operators and laboratories, and assess the operation of field and laboratory equipment and staff. EPA plans to further evaluate laboratory performance by sending out performance samples to the laboratories. Additionally, OAQPS plans to conduct a detailed assessment of data quality after the first 3 years of NATTS monitoring.

In order to assess EPA's progress in establishing the NATTS network, we assessed whether the QAPP for each NATTS site addressed the nine site characteristics for the program. The NATTS were selected by EPA and are operated by State and local agencies with grant funding from EPA. We obtained and reviewed the QAPPs for 21 of the 23 NATTS sites.[9] We did not verify actual activities at the sites with on-site audits. However, we reviewed the results of technical audits and data completeness assessments completed by EPA and its contractors. The results of our review are discussed in the following sections.

Progress Made, But Improvements Needed in Quality Assurance for NATTS

1. Not All QAPPs Addressed Neighborhood-Oriented Siting When Required

Although the QAPPs are supposed to address the scale of monitoring, not all of them do. The QAPPs for six of the urban sites intended to monitor on the neighborhood scale did not indicate whether the monitor was sited as a neighborhood scale monitor. Sixteen of the 23 NATTS are located in urban areas and should reflect neighborhood-oriented siting. The "scale" of monitoring refers to an area that has relatively homogenous air concentrations for the pollutant of interest. Neighborhood scale monitoring refers to monitoring an area that has relatively uniform land use and dimensions between 0.5 and 4.0 kilometers. The neighborhood scale of monitoring is generally considered representative of population exposure. In addition, the QAPPs for 2 of these 16 sites were not provided to us; thus, we were unable to determine whether they addressed the siting of the monitor. Three of the seven rural sites will also monitor on the neighborhood scale to provide comparison between rural and urban monitoring results.

[9] Two State agencies responsible for operating NATTS did not provide us with the QAPPs for their respective NATTS.

2. *Only Two QAPPs for Rural Sites Indicate Regional Scale Monitoring*

EPA intended for some of the rural NATTS to monitor on the regional scale, but only two QAPPs mention using this scale. Regional scale monitoring covers an area of homogeneous geography ranging from tens to hundreds of kilometers. In order to collect data on regional air toxics concentrations, EPA selected seven rural sites. Three agencies operating these sites decided to monitor on the neighborhood scale. Two of the four remaining sites indicated in their QAPPs that they will be monitoring on a regional scale in order to represent regional background and transport concentrations. The other two sites did not address whether or not the monitor was sited as a regional scale monitor in their QAPPs. The failure to address the scale of monitoring in the QAPP does not necessarily mean that the monitor was inappropriately sited.

3. *Procedures in Place to Assess Compliance with Physical Siting Protocols*

It was beyond the scope of our review to determine whether the NATTS were complying with siting protocols. However, EPA has developed an adequate process to address the physical siting of the NATTS. In addition to meeting the neighborhood or regional scale siting requirements discussed above, all sites must comply with the physical siting criteria described in Appendix E of 40 Code of Federal Regulations (CFR) 58. EPA has implemented a process to determine whether sites comply with established physical siting protocols. EPA plans to have a contractor perform 12 site audits per year which will include evaluating compliance with physical siting protocols. Thus, each site will be audited every 2 years. As of July 6, 2004, four audits had been completed. Each of the four site audits concluded that the monitoring sites conformed to Appendix E of 40 CFR 58 for siting requirements.

4. *Sites Include Diverse Geographic Coverage*

The location of the NATTS represent diverse geographic areas and climates. The air toxics monitoring strategy calls for good geographic coverage and representation of different climatological regimes. The NATTS provide good geographic coverage with at least one site in each EPA region. The NATTS also provide a good representation and cross-section of different climatological regimes in the United States. Figure 4.1 shows the location of the 23 NATTS (2 sites are located in Tampa, Florida).

Figure 4.1: Location of NATTS

5. Guidance Needs to be Clarified to Explain Meaning of Specific Emission Sources

EPA’s program guidance was not clear for the characteristic to: “Include appropriate numbers of sites with influences by specific emission sources (mobile and stationary).” Agency officials interviewed had mixed views concerning how this characteristic should be interpreted. One interpretation was that the statement referred to monitoring for air toxics from specific emission sources at different sites. This would more correctly describe the local-scale projects meant to characterize spatial differences in pollutant concentrations driven by factors such as proximity to particular sources unique to particular communities. Another interpretation was that monitoring sites were to be located where they will not be unduly influenced by only one source category. Instead a site should monitor air toxics from multiple source types in order to assess national trends in air toxics concentrations.

6. *Most Sites Plan to Monitor for the Majority of the Core Air Toxics*

Most sites plan to monitor for a majority of the 19 "core" air toxics established as priorities for the NATTS network. EPA's Urban Air Toxics Program identified 33 high-priority urban air toxics. From these 33 air toxics EPA developed a list of 19 "core" air toxics representing the pollutants for which EPA eventually wants to develop trends information (see Table 4.2). However, because of limitations in available methodologies, EPA decided that at a minimum, in starting the network, each of the NATTS should monitor for at least 6 of these 19 pollutants. These six pollutants are considered national air toxics "drivers" (i.e., pollutants of concern in all areas of the country). Appendix D lists the 33 high-priority urban air toxics.

Table 4.2: Core Air Toxics

Required Monitoring	Desired Monitoring
1,3-butadiene	trichloroethylene
acrolein	tetrachloroethylene
arsenic	beryllium
formaldehyde	nickel
benzene	cadmium
hexavalent chromium *	acetaldehyde
	1,2-dichloropropene
	carbon tetrachloride
	lead
	chloroform
	manganese
	methylene chloride
	vinyl chloride

* Replaced total chromium in January 2005

Monitoring for all 6 required pollutants is planned for 8 sites. Monitoring for 5 of the 6 required pollutants, excluding acrolein, is planned at 12 of the 13 remaining sites. In discussing these omissions with OAQPS officials, they told us that an approved methodology had not been developed for acrolein, but they had hoped to have an approved routine methodology for acrolein by January 2005. The availability of methodologies for monitoring air toxics is discussed in more detail in Chapter 5. In addition, monitoring for 18 of the 19 target pollutants (excluding acrolein) is planned for 17 of the 21 sites for which we reviewed QAPPs. Monitoring of all 33 high-priority air toxics (including acrolein) is planned at 4 sites.

7. *Not All Sites Monitoring on the Same Schedule to Ensure Consistency*

Not all sites were using the same monitoring schedules. In order to produce consistent and comparable data across the NATTS network, all sites are required to monitor on the same days and sampling schedules throughout the year. The NATTS are to sample for one 24-hour period every 6 days in accordance with a monitoring schedule prepared by EPA. The QAPPs for 14 NATTS indicated that they will monitor on the 1-in-6 day sampling schedule for each pollutant as required by EPA. However, the QAPPs for 5 sites indicated that the monitoring sites will not employ the required 1-in-6 day sampling schedule. Two QAPPs did not address the sampling schedule.

8. *Need for More Consistency in Quality Assurance*

Improvements are needed in network implementation in three areas – sampling and analytical methods, laboratory procedures, and quality assurance protocols – to ensure that consistency in operation of the NATTS is achieved. As with any monitoring network, the NATTS should employ consistent sampling, analytical methods, laboratory procedures, and quality assurance protocols. Appendix E provides a definition of EPA's data quality indicators for environmental monitoring data and describes how the NATTS network addresses these indicators.

Improvements Needed in Sampling and Analytical Methods

The QAPPs generally indicated that the operating agencies planned to use the required sampling and analytical methods outlined in the Strategy. However, our review of the model QAPP prepared by OAQPS showed that the Agency referenced the wrong methods for sampling certain pollutants. For example, the Model QAPP referenced method TO-15 for acceptance criteria for filter design specifications for carbonyls. TO-15 is a sampling and analytical method for measuring volatile organic compound (VOC) concentrations in air. Also, changes in some of the approved methodologies were made since the model QAPP was developed. EPA plans to have each NATTS site audited once every 2 years; this audit will include a review of the sampling used for each NATTS site and the analytical methods used by each laboratory to analyze the sample results. This audit process should help ensure consistency in sampling and analytical methodologies.

Improvements Needed in Laboratory Procedures

EPA's initial laboratory audits have identified problems with laboratory quality assurance and control. The Agency plans to have a contractor perform audits on each analytical laboratory every two years. The results of eight completed laboratory audits showed that the majority of findings pertained to the quality assurance and quality control procedures of the laboratories. Findings included such issues as record keeping, administration, and problems related to the use of performance evaluation and blind samples. Some laboratories have already responded to the recommendations provided in the audit report, indicating that they will address the recommendations.

EPA has implemented or plans to implement procedures to ensure the quality of the NATTS monitoring data. In addition to the laboratory audits discussed above, EPA plans to use quarterly proficiency tests to assess laboratory procedures and analysis. A proficiency test is a type of assessment in which a sample of known composition is provided to the analyst, who does not know the composition, to test whether the laboratory can produce analytical results within the specified acceptance criteria. EPA also plans to implement calibration cylinder certification procedures. EPA plans to include the results of the audits in an annual Quality Assurance Report.

Improvements Needed in Quality Assurance Protocols

Not all sites had incorporated the data quality input and output parameters into their quality assurance plans that were needed to achieve the data quality objectives EPA established for the NATTS network. Data quality objectives are set to ensure that data meets the intended uses of decision makers. EPA established certain input parameters and output parameters for the six required pollutants. These input and output parameters represent the specific data requirements that need to be met in order to meet the data quality objectives. Examples of input parameters include target error rates, sampling rates (1 in every 6 days), and completeness criteria. The QAPPs did not list the input parameters for 9 of the sites and did not list the output parameters for 10 of the sites.

EPA has plans for addressing whether data quality requirements are met. For example, EPA plans to prepare an annual quality assurance report presenting the results of its oversight audits and other quality assurance measures. Further, after 3 years of program implementation, EPA plans to conduct an interpretive data quality assessment in order to determine whether the NATTS are achieving the data quality requirements used to develop the data quality objectives.

9. Preliminary Analysis Indicates Insufficient Data Capture for the NATTS

EPA's preliminary assessment of NATTS monitoring data indicated that a substantial amount of anticipated monitoring data had not been input into AQS. Based on analysis performed in planning the network, EPA determined that a sampling schedule of 1 in every 6 days with 85 percent data completeness[10] was needed in order to calculate annual average concentrations. EPA made an initial effort to assess data completeness by reviewing the first five quarters of data for the program (January 2003 through March 2003) that was input into the AQS as of July, 2004. This preliminary assessment indicated that a substantial amount of anticipated monitoring data had not been input into the system. For example, no data had been submitted for 7 sites, and none of the sites had submitted data for the 6 required air toxics. Only 5 sites met the 85 percent data completeness goal for all pollutants for which they had submitted data. Appendix F summarizes data completeness for the 23 NATTS as well as other site characteristics.

According to OAQPS officials, the State agencies operating the NATTS had informed them that they had input their monitoring data into AQS as required, thus they expected to see better indications of data completeness in AQS. EPA

[10] Data completeness is determined by dividing the total number of acceptable data values obtained by the total number of possible values based on a 1 in 6 day sampling schedule.

Regional officials and State agency officials responsible for operating these sites told us that these sites had started monitoring later in the program than the initial sites, and in some cases program officials were behind in entering their data into AQS. Further, OAQPS officials indicated that, in the early stages of a network, incomplete data reporting is not unexpected.

According to OAQPS officials, efforts are underway to improve data reporting by making software available at no costs for uploading data to AQS. Further, EPA plans to offer training in this software.

Inconsistencies in Grant Awards

Grant agreements were not consistent across regions in requiring the grantees to operate these sites as outlined in national guidance. State and local agencies operate the NATTS network sites with funding provided by EPA through CAA Section 103 grants. Section 103 grants are used for promoting coordination and acceleration of research, surveys, and studies related to the causes, health effects, welfare effects, extent, prevention, and control of air pollution. The respective EPA Regions award these grants for the sites in their regions. The grant agreements include commitments by the monitoring agency to conduct monitoring in compliance with the administrative and programmatic conditions listed in the grant award and work plan.

Our review of the grant awards for 17 of the NATTS found that the grant agreements were not consistent across regions in requiring the grantees to operate these sites as outlined in national guidance. For example:

- Only five grant awards (all from Region 4) specifically required data to be entered into AQS within 90 days of the end of each calendar quarter. Other grant awards required data to be entered within 120 or 180 days from the end of the quarter.
- In one instance, the grant work plan and the site's QAPP were not consistent in describing the scale of monitoring to be conducted. The grant work plan stated that the site would monitor on the urban scale, while the QAPP indicated that the site would monitor on the neighborhood scale.
- One grant work plan specified monitoring on a 1-in-12 day schedule even though national guidance required sampling on a 1-in-6 day schedule in order to collect sufficient data to compute annual average concentrations.

In order to meet its objective, the NATTS network needs to collect data in a consistent manner. This cannot be achieved if EPA regions establish different grant requirements for the operation of these sites.

Conclusions

The NATTS are an integral part of EPA' Strategy to monitor long-term trends in air toxics concentrations. In order to achieve these national objectives, consistency in monitoring siting, sample collection and analysis, quality control and assurance, and data reporting is essential. However, we found that some inconsistencies in the early operations of the network have occurred, including inconsistent application of quality controls, sites operating on different monitoring schedules, required pollutants not being monitored, and untimely data reporting. In addition, EPA guidance with respect to the consideration of emission sources when siting monitors was not clear. Further, the number of network sites that should be monitoring on a regional scale in order to identify background and transport concentrations was not clearly identified. These areas will need to be addressed expeditiously to help ensure the objectives of the NATTS are met.

Recommendations

In order to obtain data from the NATTS network that is suitable for measuring long-term trends in ambient air toxics concentrations, we recommend that the Assistant Administrator, Office of Air and Radiation:

4-1 Coordinate with EPA regional officials and State and local agency NATTS operators to ensure that these site operations are consistent with the current Technical Assistance Document in terms of monitoring schedule, required pollutants, data completeness, and timely data submission into AQS.

4-2 Coordinate with the regional office program representatives to ensure that the NATTS site QAPPs sufficiently address all program requirements including the scale of monitoring being conducted and detailed discussion of laboratory standard operating procedures.

4-3 Revise NATTS program guidance, including the model QAPP where appropriate, to:

   a. More clearly state and explain the desired site characteristic with respect to the influence of specific emission sources on air toxics concentrations monitored by NATTS, and
   b. Include the most recent approved and recommended methods.

4-4 Coordinate with the regional office program representatives to ensure that the NATTS site grant awards and workplan commitments are consistent with national guidance requirements for the NATTS.

Agency Comments and OIG Evaluation

The Agency generally agreed with the recommendations in chapter 4, noting that our recommendations generally align with their current improvement efforts. EPA suggested that recommendation 4-1 be re-worded in order to account for any changes that may occur in the Technical Assistance Document with respect to monitoring schedule, required pollutants, data completeness, and timely data submission into AQS. We made changes accordingly. The Agency also stated that Section 1.9 of the Technical Assistance Document already addressed recommendation 4-3 (a); however, we continue to believe that Section 1.9 does not adequately describe what is meant by "specific emission sources" and does not address the number of sites with influences by these "specific emission sources." EPA stated that recommendation 4-3 (b) was already addressed in the Technical Assistance Document. We agree but believe that the other guidance documents, in this case the model QAPP, should be updated accordingly.

Our draft report also contained a recommendation to identify the number and location of NATTS monitors for assessing background and regional transport of air toxics, but the Agency noted that such data is already collected from rural monitoring sites. However, as noted in our report, only two of seven rural sites had indicated that their monitors were actually operating on a regional scale. Also, three of the seven rural sites indicated that they were monitoring on the neighborhood scale, not the regional scale. Accordingly, at most four sites may be monitoring on the regional scale, and possibly only two sites. If only two sites are monitoring on a regional scale, we continue to be concerned as to whether this is sufficient to produce national trends data. Nonetheless, we have removed recommendation 4-3(c) from the final report since we believe the intent of that recommendation – ensuring that those sites designated to conduct regional scale monitoring are in fact monitoring on the regional scale – can be achieved through appropriate implementation of recommendation 4-2.

The full text of the Agency's response to the draft report is attached as Appendix H.

Chapter 5
Barriers to Implementing Effective Air Toxics Monitoring Networks

Stakeholder groups[11] we contacted identified several significant barriers to implementing and expanding air toxics monitoring activities at the local, State, and national levels. These barriers included:

- Lack of funding
- Lack of sampling methodologies or sufficiently sensitive methodologies
- Quality assurance of monitoring data
- Lack of health-related ambient air benchmarks for air toxics
- Higher priority placed on criteria pollutant programs
- No regulatory requirement for monitoring, and
- Lack of sufficiently qualified and trained staff

The primary and most significant challenges cited were lack of funding and methodological weaknesses for monitoring. EPA has addressed, and continues to address, several of these barriers through such action as providing local grants for monitoring, testing new methods for certain toxics, and dedicating a small portion of its air toxics budget to quality assurance efforts. However, these issues continue to pose significant challenges to air toxics monitoring activities at all levels, from the NATTS project to the local community level.

The following sections discuss each of the barriers identified.

Insufficient Funding to Develop Comprehensive Monitoring

Lack of funding was cited by more stakeholders than any other barrier. Air toxics monitoring is very expensive relative to monitoring for other pollutants such as criteria[12] pollutants, and the high costs are prohibitive for many local and State agencies, which constitute a key component of the national monitoring network strategy. Nearly all State and local representatives we contacted told us that they would like to do more air toxics monitoring, but did not have the funding to expand their current activities. This funding shortfall was also raised in a 2004 State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials report that listed air toxics monitoring as an important but underfunded activity cited by State and local agencies.

Several State and local agency officials told us that high costs prohibit them from conducting air toxics monitoring or expanding their existing programs. Several

[11] Stakeholder groups we contacted included EPA staff and management, researchers, State and local agency representatives, environmental organizations, and citizen action groups.

[12] Pollutants for which EPA has set National Ambient Air Quality Standards.

factors contribute to the high costs of air toxics monitoring. A State agency representative pointed out that a continuous air toxics monitor costs between $50,000 and $100,000, compared to about $10,000 to $15,000 for a continuous sulfur dioxide monitor. Also, for non-continuous monitors, collecting air toxics samples is relatively labor-intensive and the level of expertise required is relatively high, resulting in high labor costs. Furthermore, State agency representatives estimated analysis costs to be within the range of $40,000 to $75,000 a year for one site.

Some State and local agencies rely on EPA grant money to fund air toxics monitoring, but this may not be sufficient for all of the agencies. Until 2003, EPA did not provide annual Section 105 grant funding to assist State and local agencies in air toxics monitoring, although EPA had helped fund several short-term local-scale air toxics monitoring efforts. As discussed in Chapter 4, in FY 2004 EPA began a program to fund a certain number of local-scale projects each year through the Section 103 grant program. However, the available funding for the first year of this program did not meet the demand for these funds by State and local agencies. For example, EPA awarded 16 grants for local-scale air toxics monitoring projects in FY 2004, yet received almost 50 applications for these funds.

EPA is also limited by funding in its ability to expand the existing monitoring network. For example, EPA's budget for air toxics monitoring for FY 2004 was $16.5 million compared to its budget of over $43 million for fine particulate matter.

In FYs 2003 and 2004, EPA redirected $6.5 million in CAA Section 105 funds from criteria pollutants to air toxics monitoring. It also had a budget of $10 million in Section 103 grants to disperse to State and local agencies for monitoring activities. The OAQPS Air Monitoring Group Leader cautioned that the ambient air toxics program should not be expanded for the sake of expanding. He advocated a more methodical approach to increasing monitoring activity that would be based on filling data gaps.

Methodological Weaknesses

Weaknesses with the existing methodologies for monitoring air toxics were cited as a major barrier by all of the researchers and EPA staff and management we interviewed, and also by several of the State and local agency officials. A successful monitoring network requires routine and rigorous sampling and measurement methodologies to ensure data quality and consistency. EPA considers sampling and measurement methodology to be routine if "there is a written, frequently-used, demonstrated method including procedures for calibration of the target compound." EPA's Compendia of Methods for organic and inorganic compounds lists all of the methods for monitoring that are considered to be routine.

Given the large number of air toxics it is not feasible to comprehensively monitor for all of these pollutants. Accordingly, EPA's initial monitoring efforts have focused on identifying and monitoring for high priority air toxics. However, routine monitoring methods are not available for all of these high priority air toxics. In addition, for other air toxics the analytical method is not sensitive enough to detect down to levels of concern for the pollutant. These problems with analytical methodologies were noted in an October 2004 Science Advisory Board peer review report of EPA ORD's Air Toxics Research Strategy and Air Toxics Multi-Year Plan. According to the Science Advisory Board report, neither EPA's strategy or its multi-year plan adequately addressed the need for developing analytical methods for ambient air toxics monitoring. The Science Advisory Board report notes that improved analytical methods are necessary as EPA, States and tribes develop air toxics monitoring networks. Improved analytical methods are necessary to measure ambient air concentrations to improve the understanding of human exposures to air toxics, for evaluating models used to predict ambient concentrations, and ultimately to reduce uncertainty in risk assessment. The following sections discuss methodological concerns raised by stakeholders.

Routine Methods Not Available for Three of Six National Air Toxics of Concern

Integrated air sampling methods are the predominant type of monitoring employed for air toxics networks. These methods use a pump to draw an air sample across a collection device. For metals and carbonyls air toxics this collection device consists of some type of filter or reactive material that collects the air toxics. In the case of VOC air toxics the sample is collected in a canister. The pump can be programmed to collect air for a pre-set period of time (e.g., 1 hour to 24 hours). The collected samples are then sent to a laboratory for analysis.

In November of 2003, ORD researchers documented the availability of measurement methods for the 19 core air toxics targeted for monitoring as part of the NATTS network. Three (acrolein, 1,3-butadiene, and hexavalent chromium) of these 19 air toxics lack routine methods for measuring ambient air concentrations of these compounds. According to EPA, these three pollutants present health risks to a large segment of the population as shown in Table 5-1. Furthermore, these three toxics are among the six substances that are required to be reported at all the individual NATTS.

Table 5.1: Risk Driver Categories of Three Identified Risk Drivers Lacking Routine Methods

Air Toxic	Type of Risk Driver
chromium	national cancer risk driver
1,3-butadiene	regional cancer risk driver
acrolein	national non-cancer hazard driver

OAQPS officials told us that many of the methods that were approved as routine could still be improved to provide better ease of use and to improve their method detection limits. For example, OAQPS was having one of its contractors investigate methodological options for measuring acrolein. Further, according to these officials, NATTS will begin measuring and reporting data for chromium VI in January, 2005. The samplers and the analysis of filters will be provided by an EPA contractor.

Some Analytical Methods Cannot Detect Levels of Concern

Another problem cited by stakeholders is that some of the existing methods for measurement have inadequate method detection limits for certain toxics. Method detection limits are generally considered inadequate if they are not low enough to identify ambient concentrations at an established health benchmark level. For cancer causing air toxics this is generally considered to be at the concentration associated with a 1-in-1-million excess lifetime cancer risk. For non-cancer causing air toxics these are levels at which a lifetime exposure would create no appreciable risk of adverse health effects, referred to as the reference concentration. A 2001 Public Health Reports article[13] identified 12 air toxics for which the most commonly reported method detection limits were higher than the health benchmark (based on either a 1-in-1-million cancer risk or the reference concentration). Included in these 12 air toxics were 1,3-butadiene, arsenic, and chromium, all of which were determined to be national or regional risk drivers based on the 1999 NATA.

Several stakeholders also cited the lack of continuous monitoring methods for certain air toxics as a problem. Without continuous monitoring, spikes or peaks in concentrations that could potentially cause acute (short-term) health problems may not be detected. EPA is using the local-scale projects to attempt to address this technological barrier. Examples of continuous methods proposed in the selected local-scale projects include:

- Differential Optical Absorption Spectroscopy, and
- Fourier Transform Infrared Spectroscopy.

Differential optical absorption spectroscopy will be used to continuously measure formaldehyde, and can potentially make continuous measurements of benzene, napthalene NO_2, SO_2, toluene, xylenes, and styrene. Fourier transform infrared spectroscopy will be used to continuously measure VOCs. The local-scale projects will provide an opportunity to use these non-routine advanced technologies.

Ongoing Activities to Address Methods Development

Research is currently being conducted within EPA, and in other organizations, that shows promise in developing routine methods and improving method detection limits for acrolein and 1,3-butadiene. EPA is also conducting studies to improve the methodology for monitoring chromium VI (hexavalent chromium). This research is discussed in Appendix G.

Further, in a November 30, 2004 memorandum, the Assistant Administrator for ORD announced plans to establish an Applied Measurement Science Research Program. This program would address the "lack of any real Agency mechanism to address many of the day-to-day measurement science problems that face" the

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[13] Kyle, Amy D. "Evaluating the Health Significance of Hazardous Air Pollutants Using Monitoring Data," *Public Health Reports*. Vol. 116, Jan.-Feb. 2001.

Agency and the States. We recognize EPA's need to balance research efforts in several areas related to air toxics and to allocate limited research funds across various research programs. Thus, any potential changes in research funding to address issues presented in this report will need to be balanced against the need for research in other areas.

Stakeholders Concerned About Consistency of Data Reporting

Many State and local agency stakeholders we contacted had concerns about consistency in data reporting. For example, one State agency representative told us that not all State, local, and national monitoring programs submit data in the same format. Another official commented that the standards for data measurement entries in AQS (such as non-detect levels) were not appropriate for air toxics. To address the data reporting problem, EPA and the State and local agencies have established a data management team to identify, prioritize, and resolve problems concerning the submission of air toxics data to AQS.

State Officials Cited Lack of Health Benchmarks

Another common barrier cited by State and local agency representatives and environmental groups is the lack of ambient standards or benchmarks for assessing public health risks. State and local agency officials indicated that they have no health benchmarks with which to compare their data on ambient air concentrations for high-risk toxics, and this makes it very difficult to assess the level of risks for their communities. For example, EPA has not developed a health benchmark for diesel particulate matter, a suspected risk driver. Further, these officials told us that monitoring data is not very useful to communities if they do not also have guidelines for what that data means in terms of health risks, particularly because they do not have the resources to conduct risk assessments based on the monitoring data collected.

EPA officials noted that EPA has presented health-related benchmarks for a majority of the air toxics listed in the CAA on the Integrated Risk Information System web site. EPA ORD officials also noted that ORD is working to improve air toxics health benchmarks by updating and revising the risk assessment information for several air toxics listed in the Integrated Risk Information System. As previously noted, better information on human exposure is also needed for relating monitoring data to health risks.

Lack of a Statutory Requirement

One of the barriers faced by EPA is that it lacks a mandate for implementing a large-scale, nationwide monitoring network. Air toxics monitoring is not required or mandated by law, and this limits EPA's authority to impose strict guidelines or requirements on any of the monitoring conducted by local, State or tribal agencies. The only authority the Agency possesses over EPA-funded monitoring is to discontinue the funding or not renew the grant.

Higher Priority Placed on Other Pollutants

Several stakeholders from environmental groups, State and local agencies, and from within EPA told us that air toxics is not a high priority in the political and regulatory environment. In general, there is a higher priority placed on criteria pollutants because they are required by law to be monitored. States and local agencies that face limited budgets for air quality issues have a difficult time implementing air toxics monitoring when the political and regulatory environment focuses much more closely on criteria pollutants, such as particulate matter.

EPA officials noted that the health effects associated with particulate matter necessitate the level of monitoring and funding afforded this program. Further, particulate matter speciation monitoring provides collateral benefits to the air toxics program by helping understand the concentrations of certain air toxics (e.g., polynuclear aromatic hydrocarbons and metals). Similarly, monitoring for ozone precursors augments air toxics monitoring efforts.

Insufficient State and Local Agency Staff

State and local agency representatives we contacted identified barriers to their monitoring activities at the local level related to agency staffing issues. They said that State and local agencies have difficulty offering salaries that compete with private sector salaries to bring in and retain the highly trained and qualified staff air toxics monitoring requires. Further, the costs of training are very high, and one agency representative indicated that agencies sometimes lose staff to the private sector after they have spent money providing them with training.

Conclusions

Several barriers exist to the implementation of more comprehensive and effective monitoring networks, at both the State/local and national levels. Improvements are needed to adequately characterize ambient air monitoring concentrations and evaluate the success of air toxics programs. Some of these barriers are not easily overcome and impact other barriers (e.g., funding concerns); others will require long-term efforts to resolve (e.g., development of new and/or better monitoring methodologies). Given the varied nature of these barriers, we believe a long-term strategy and implementation plan is needed to address these barriers in a logical and sequential fashion.

Recommendations

We recommend that the Assistant Administrator, Office of Air and Radiation:

5-1 Prioritize the barriers to ambient air toxics monitoring and develop a long-term strategy and implementation plan for addressing these barriers.

We recommend that the Assistant Administrator, Office of Research and Development:

5-2 Consistent with ORD's plans to address measurement science problems, continue to coordinate with OAQPS officials to identify key air toxics in need of improved ambient air monitoring methodologies and incorporate plans for conducting research on improved methodologies for these key air toxics in ORD's Air Toxics Research Strategy.

Agency Comments and OIG Evaluation

The Agency generally agreed with the recommendations in this chapter, while also highlighting its need to balance the allocation of resources across various research programs. In its comments, EPA expressed concern that our draft did not sufficiently consider the need, given the "current environment of fiscal restraint," to balance the development of ambient air toxics monitoring methods with other research needs within the air toxics realm, and across Agency programs in general. We acknowledge EPA's need to balance resources for research across multiple areas, and have added language to the final report to further address this issue. The full text of the Agency's response to the draft report is attached as Appendix H.

Appendix A

Details on Scope and Methodology

Objective 1: What is the status of EPA, State, and local agency efforts to monitor toxics in ambient air?

We obtained an understanding of EPA's Air Toxics Monitoring Program by reviewing various EPA documents including program plans and components contained in OAQPS's National Air Toxics Monitoring Strategy. In addition, we conducted significant literature research and internet research on various components of the monitoring program. We also conducted several meetings with EPA staff and interviews with numerous stakeholders. We identified locations of existing national, State, and local monitors included in the proposed national monitoring network. Based on interviews with EPA staff, we also identified EPA's AQS as the most reliable repository of current monitoring data. AQS contains data submitted by monitoring operations from across the country and is updated quarterly on a calender year basis. We determined a working inventory of ambient air toxics monitors by extracting data from the AQS. The data extraction was conducted near the completion of field work (September 2004) resulting in 542 monitor sites reported during the period January 1, 2003, to September 15, 2004. Monitor counts may vary by period. The monitor inventory was used to determine the quantity of monitors by State, county and census tract. We used GIS to map the locations of the monitors and to determine the spatial distribution of the monitoring sites. We reviewed EPA documents related to Data Quality Objectives for the National Ambient Air Toxics Trends Monitoring Network. We also conducted an assessment of the monitor data appropriateness, reliability, and limitations.

Our initial analysis focused on the extent to which ambient air monitoring occurred in the 50 census tracts estimated to have the greatest cumulative cancer risks from air toxics. We took this approach because elevated ambient air toxics concentrations tend to be concentrated near the source(s) of the air toxics. Thus a monitor in a county may not be representative of air toxics concentrations throughout the county, and in particular, representative of smaller areas (e.g., census tracts) with elevated ambient concentrations. Similarly, county-wide estimates of risks from air toxics are not necessarily representative of the risks in smaller areas (such as a census tract) within a county. For the 50 census tracts in our initial sample, we interviewed State and local officials with jurisdiction for ambient air toxics monitoring in these areas to verify whether monitoring was being conducted or had been conducted in these census tracts, and to obtain information on their air toxics monitoring programs in general.

After completing our initial analysis at the census tract level, we expanded our analysis to evaluate the correlation between the placement of monitors within a county and counties with high estimated cancer risks and high emissions density.

> **Limitations:** Our analysis was limited to AQS data which may be incomplete. The primary reason for the incompleteness is that State and local agencies, in many cases, are not required to submit monitor data or identify gaps in the data. Also, monitor data and monitor counts reported in AQS vary dependent on a

number of factors, including term of the monitoring study. Some monitoring operations terminate after several weeks and data from short-term studies may not be included in AQS. There are other factors, such as sufficient data to calculate an annual average, that also may affect the monitor count. This limitation may impact our results by leading to underestimating or overestimating monitors in a particular location.

We obtained emissions data from the EPA's 1999 National Emissions Inventory. We reviewed documents related to the Data Quality Objectives for the National Emissions Inventory, including the 1999 National Emissions Inventory Preparation Plan (Revised, Feb. 2001). We also conducted an assessment of the emissions data appropriateness, reliability, and limitations. The data was formatted for total emissions for all air toxics, 33 priority air toxics, and individual air toxics by source category at national, State, and county levels. We determined emissions density for each State and county by calculating the ratio of total emissions to area (square miles). We used GIS to produce a map of the emissions data to determine the spatial distribution of emissions densities and to highlight areas where densities were highest (lowest). We then categorized the universe of counties' emissions densities by percentiles. We also chose a sample of the top 50 counties by emissions density. These samples were compared to monitor, risk, and population data to determine monitoring activity, cancer risks, and population in those areas. We drew conclusions concerning the extent of monitoring in geographic areas based on the results of this comparison.

Limitations: Various stakeholders, including the U.S. Government Accountability Office and the EPA's Office of Inspector General, among others, have reported that certain aspects of National Emissions Inventory's emissions estimation methods may lead to unreliable estimates of air emissions. A significant number of States and local agencies did not submit air toxics emissions information. For example for the 1999 inventory, 39 States, 9 local agencies, and 3 tribal agencies submitted emissions estimates. Also, studies have found that air toxics often are a localized problem and certain of EPA's emissions estimation methods do not accurately depict local variations. Therefore, our results based on National Emissions Inventory emissions estimates may underestimate or overestimate the level of emissions in a particular geographic area.

We obtained health risk data based on the 1999 NATA from OAQPS. OAQPS provided cumulative cancer and non-cancer risk estimates by county and census tract. We used GIS to determine the spatial distribution of cancer risks according to the NATA estimates. We categorized the risk estimates by percentiles for both counties and census tracts. We also selected the highest 50 from for both counties and census tracts. These samples were compared to monitor, emissions, and population data to determine monitoring activity, emissions density, and population for each sample. We drew conclusions concerning the extent of monitoring in these areas based on the results of this comparison. We selected pollutants from a list of high risk pollutants, as determined by the NATA, and compared them to monitor data found in AQS. We drew conclusions about the extent of monitoring for those pollutants based on the results of this comparison. We conducted interviews with officials and staff from each of the monitoring agencies represented in our sample of

50 tracts with highest risks. These interviews were conducted to determine the extent of monitoring and to provide general information concerning air toxics monitoring programs in those jurisdictions.

> **Limitations:** The NATA is limited by gaps in the data, limitations in computer models used, assumptions used in the assessment, and limitations in the overall design of the assessment. Therefore, our results based on the NATA risk estimates may underestimate or overestimate the health risks in a particular geographic area. Since our interviews with various stakeholders were not based on a random sample, the information resulting from these interviews may not be generalized to all jurisdictions or represent the views of all stakeholders.

Objective 2: What progress have EPA, State, and local agencies made in implementing a national air toxics ambient monitoring network that meets the stated objectives of the network?

In order to assess EPA's progress in establishing a national network, we compared information on national trends site and local-scale project implementation to EPA's strategic planning and guidance documents to determine whether the national trends sites and planned projects met the objectives for these monitoring programs. The National Monitoring Strategy Air Toxics Component provided background, requirements, objectives, and expectations for the national air toxics monitoring network. We interviewed and conferred with OAQPS officials, as well as region officials, to gain an understanding of the national strategy and program. We looked at EPA grant guidance to better understand funding for the NATTS, local-scale projects, and other tasks (e.g., data analysis). Technical documents (such as the Technical Assistance Document) were used to better understand the monitoring technology and requirements for the program. We used contractor documents to analyze the adherence of the NATTS with the desired site characteristics and understand the system in place for ensuring the achievement of these characteristics. Siting documents (including 40 CFR 58 Appendix E) facilitated the team's understanding of siting guidelines. We analyzed QAPPs to determine if the NATTS would meet the site characteristics laid out in the strategy. Further, we looked at other data quality documents (e.g., quality management plans and policy) to further our understanding of EPA's quality system. We analyzed local-scale project proposals to evaluate whether the selected projects would meet the overall objectives of the local-scale component of the strategy if implemented as planned. Grant awards and grant work plans helped determine the grant requirements for the NATTS and the local-scale projects.

> **Limitations:** We did not receive QAPPs for two of the NATTS. Therefore, we did not review QAPPs from all sites nor did we verify that the sites were operating as indicated in the plans.

Objective 3: What barriers, if any, exist to the implementation of the national air toxics ambient monitoring network?

We conducted 56 interviews with representatives from various stakeholder groups including EPA, State, and local agencies, air pollution organizations, researchers, environmental groups, and citizen action groups in order to understand their concerns and to ascertain what they perceived as existing barriers to implementing a national monitoring network. We tabulated their responses by category and determined the frequency of responses. We also reviewed various documents, including EPA strategies and plans, as well as studies and reports prepared by other organizations that addressed ambient air toxics monitoring to both identify barriers and actions that EPA or others may be taking to address these barriers.

Limitations: Because our interviews of various stakeholders were not based on a random sample, the information resulting from these interviews may not be generalized to all jurisdictions or represent the views of all stakeholders.

Statistical Correlation Between Monitoring and High Risk Areas

Our initial analyses showed a significant number of high risk/high emissions areas without monitors (see Chapter 2). In order to more fully understand the association between the risk/emissions and monitors, we calculated the statistical correlation between the variables for the applicable data sets and subsets. Our analysis was based on 542 monitor sites distributed over 297 counties, identified from AQS as reporting data for the period January 1, 2003, to September 15, 2004.

Our results show no correlation between emissions density and monitors for the 50 counties with highest estimated emissions density and no correlation between cancer risk and monitors for the 50 counties with highest estimated cancer risk. Although the correlations improve slightly when all counties with monitors are considered, the relationship remains very weak.

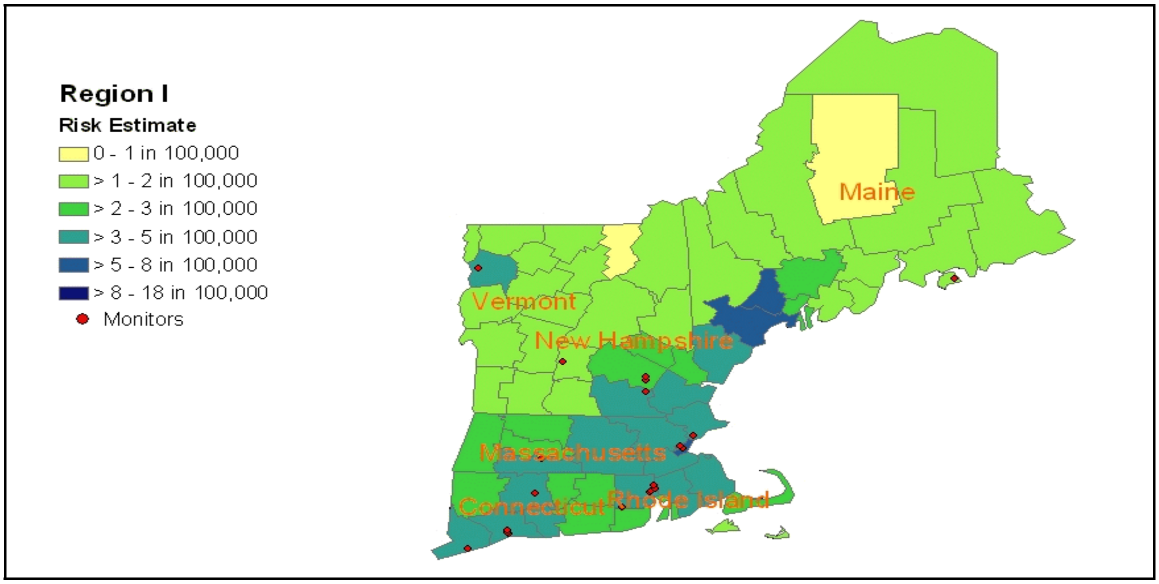
Correlation (w/monitors)	Emissions Density	Risk
All counties	0.21	0.42
All counties with monitors	0.08	0.23
Top 50 counties	-0.02	-0.01

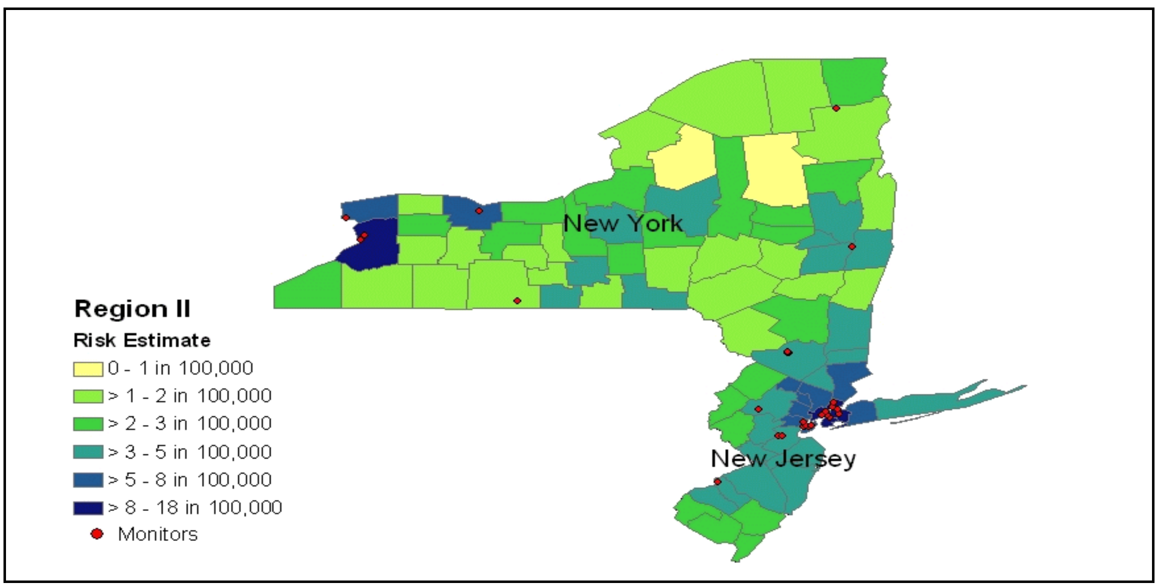
Coefficients range between -1 and 1 and those between -0.5 and 0.5 generally indicate very little association between the variables of interest. Since we obtained emissions and monitor data for the entire population of counties with monitors, there was no need for hypothesis tests or confidence intervals. The correlations between emissions density and the population of counties with monitors and cancer risk with the population of counties with monitors is shown in the table above.

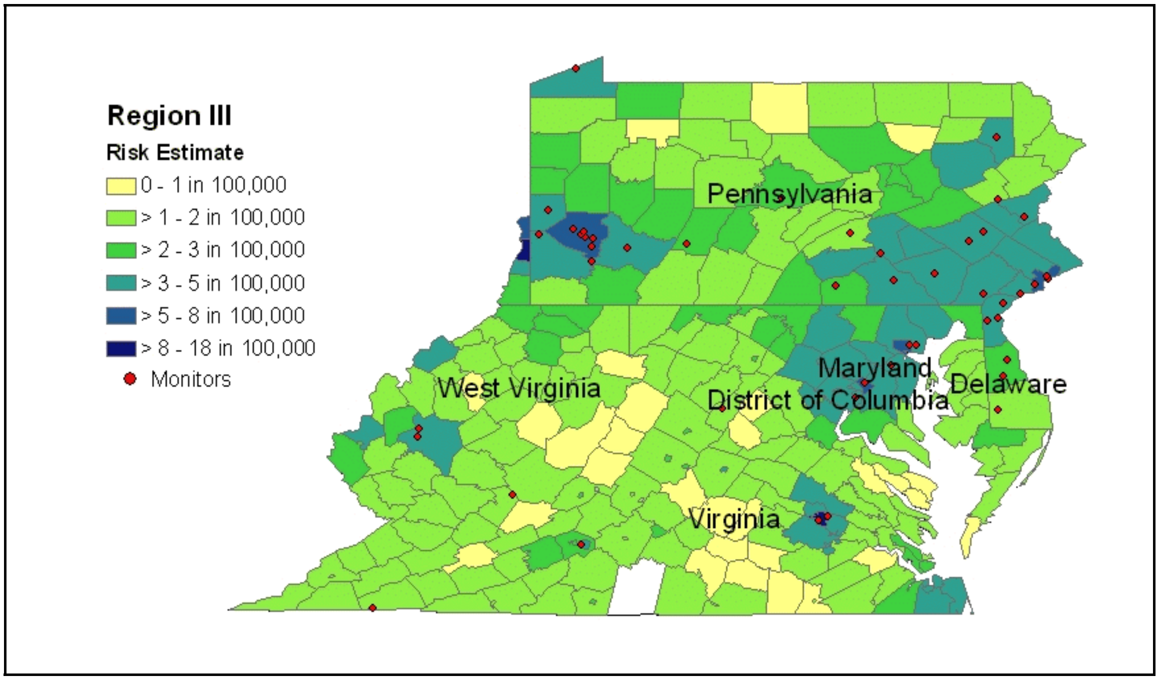
These computations support a conclusion of no significant association between either emissions density or cancer risk and monitoring activity.

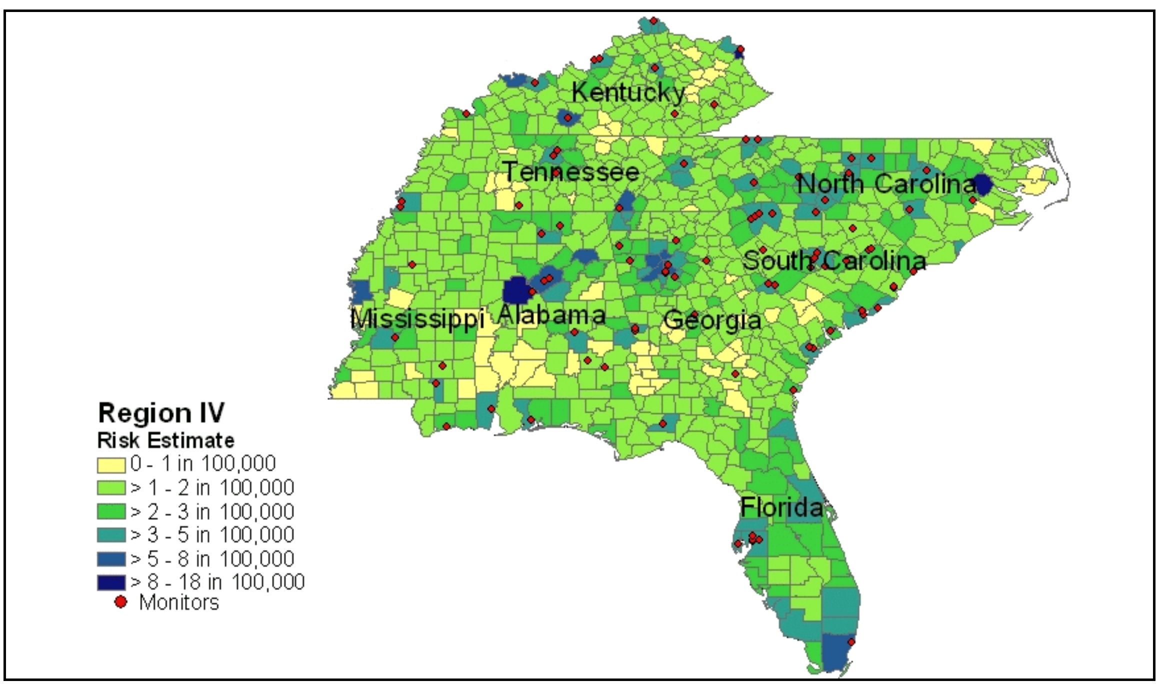
Cancer Risks Distribution and Location

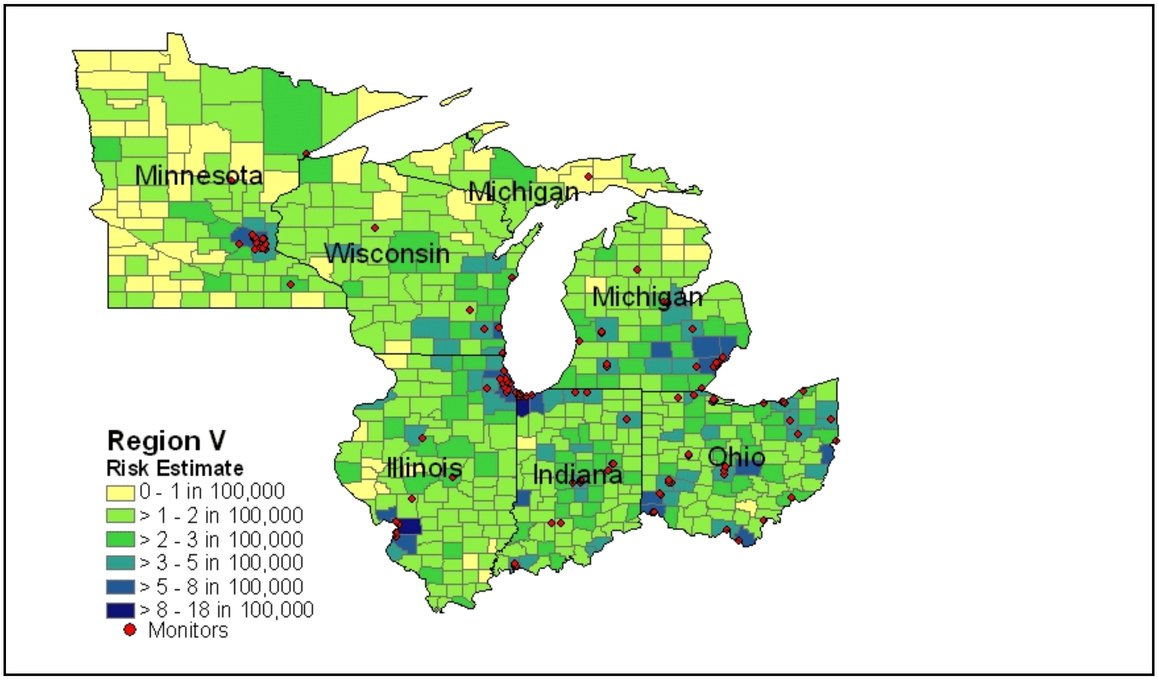
The following maps show EPA regions and counties within those regions with greater than 1 in 100,000 risk of cancer due to air toxics. The locations of air toxics monitors are also shown.

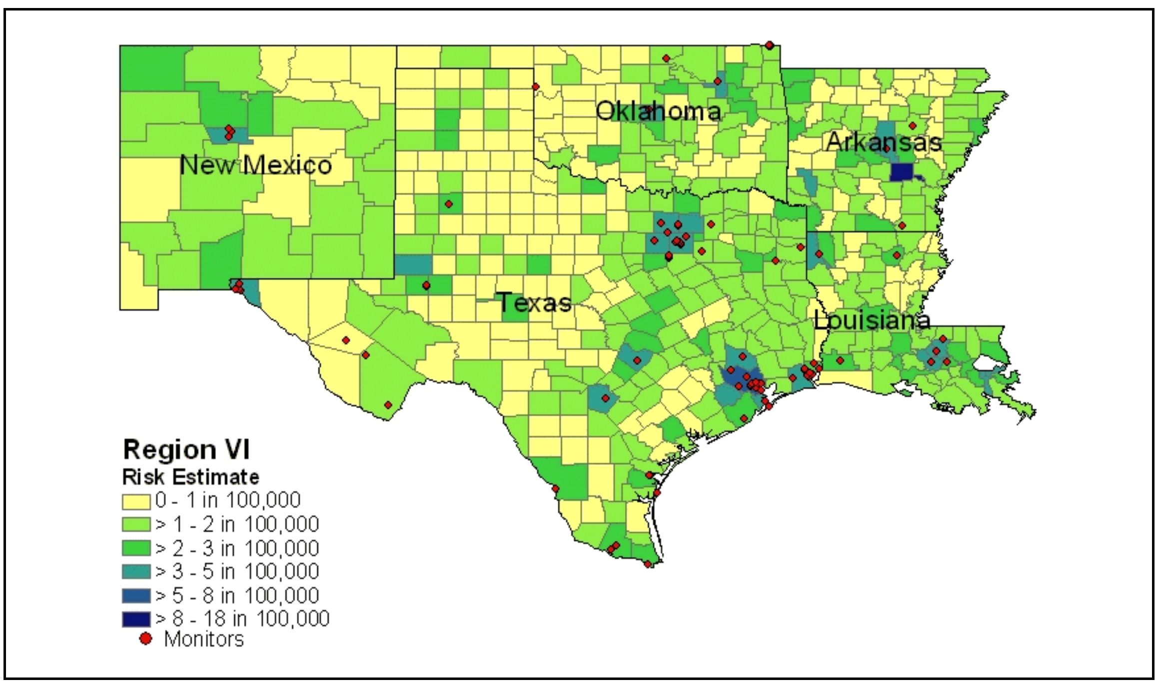


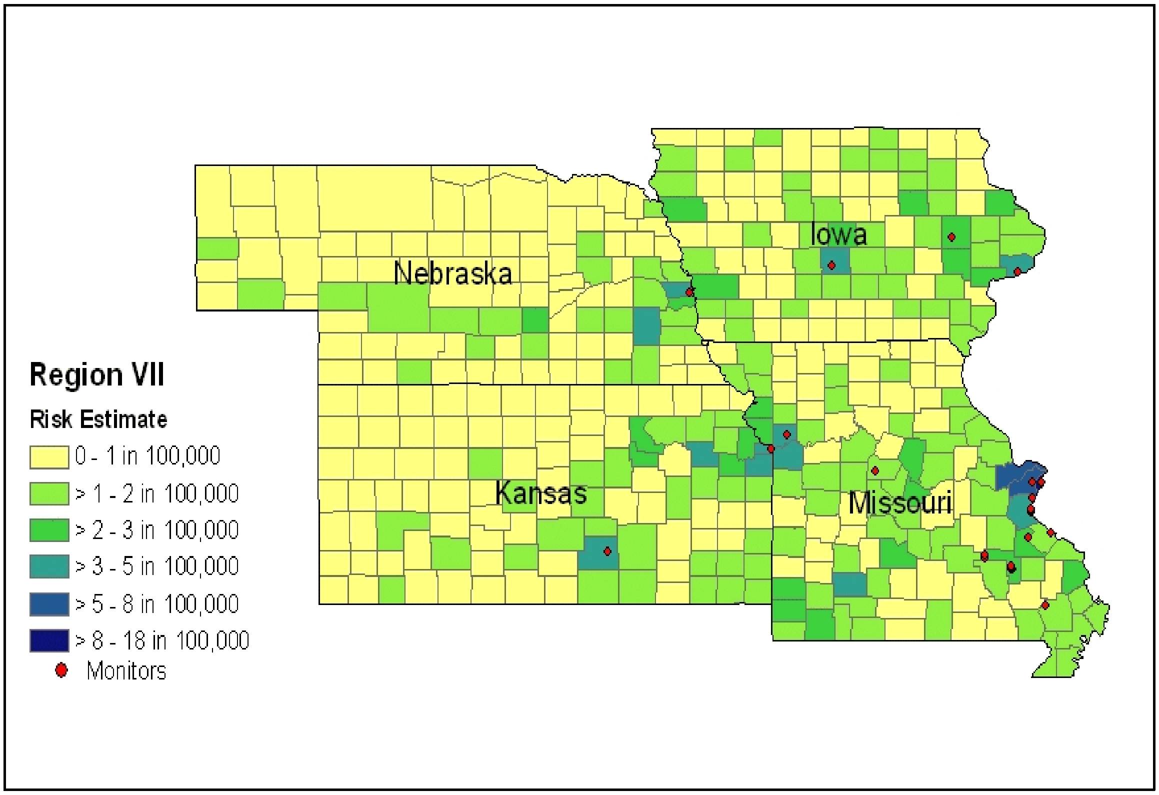



Region III
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors
Pennsylvania
West Virginia
Maryland
District of Columbia
Delaware
Virginia

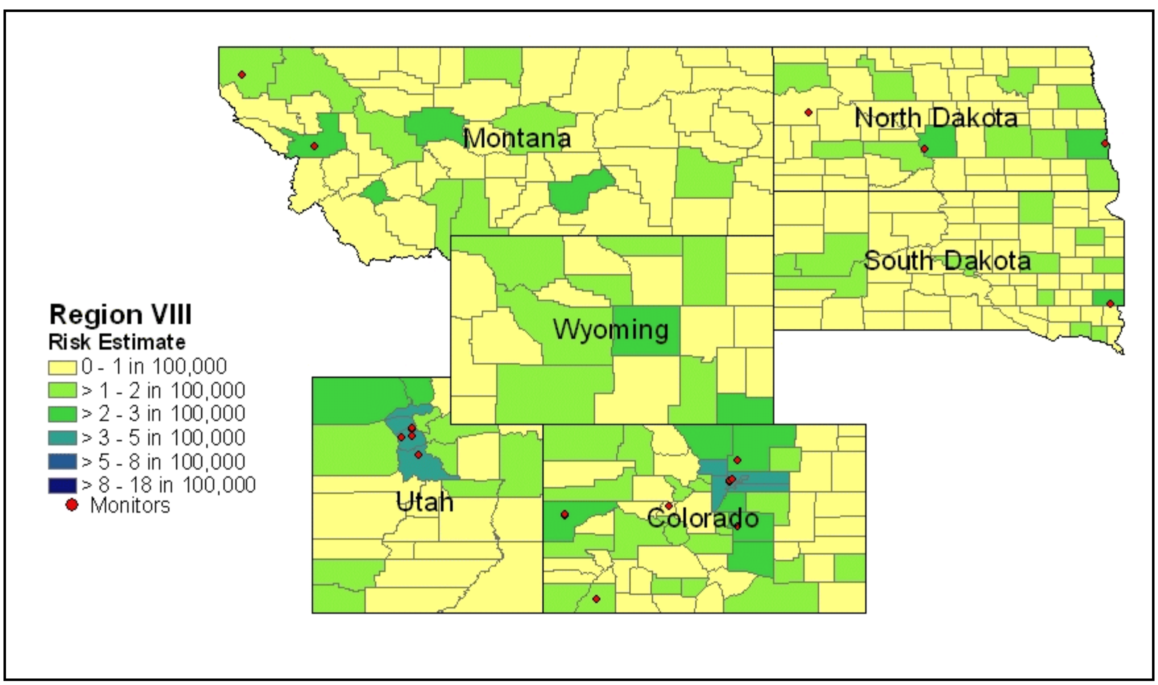

Kentucky
Tennessee
North Carolina
South Carolina
Mississippi
Alabama
Georgia
Florida
Region IV
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors


Minnesota
Michigan
Wisconsin
Michigan
Illinois
Indiana
Ohio
Region V
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors

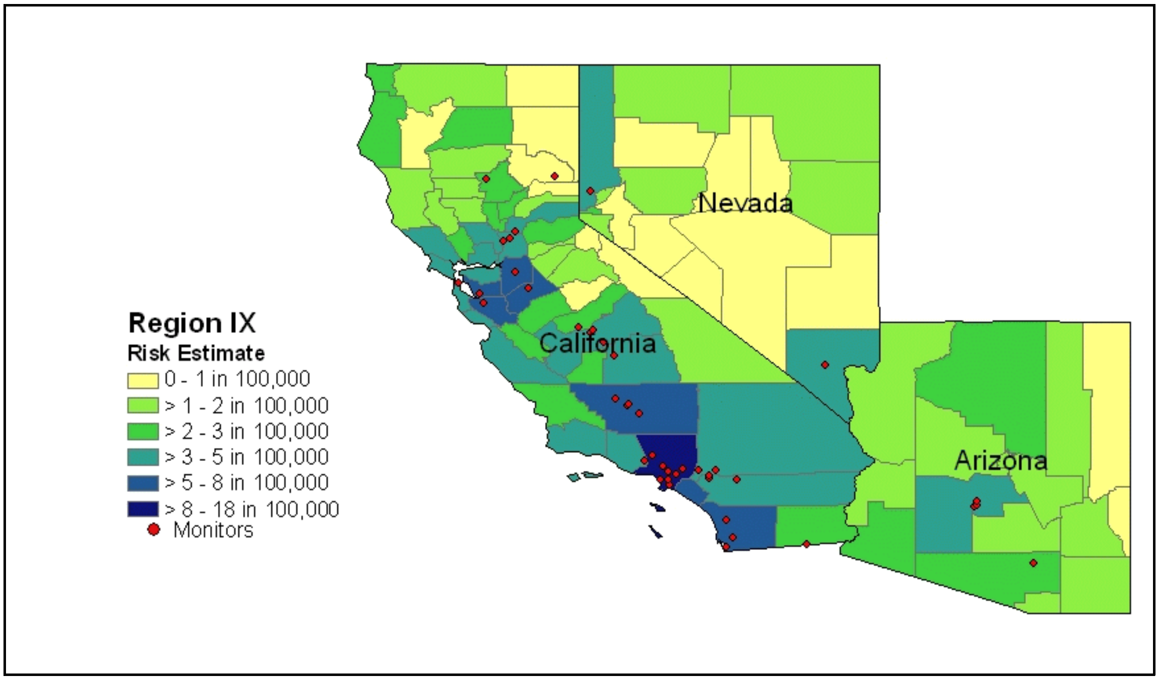

Oklahoma
Arkansas
New Mexico
Texas
Louisiana
Region VI
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors

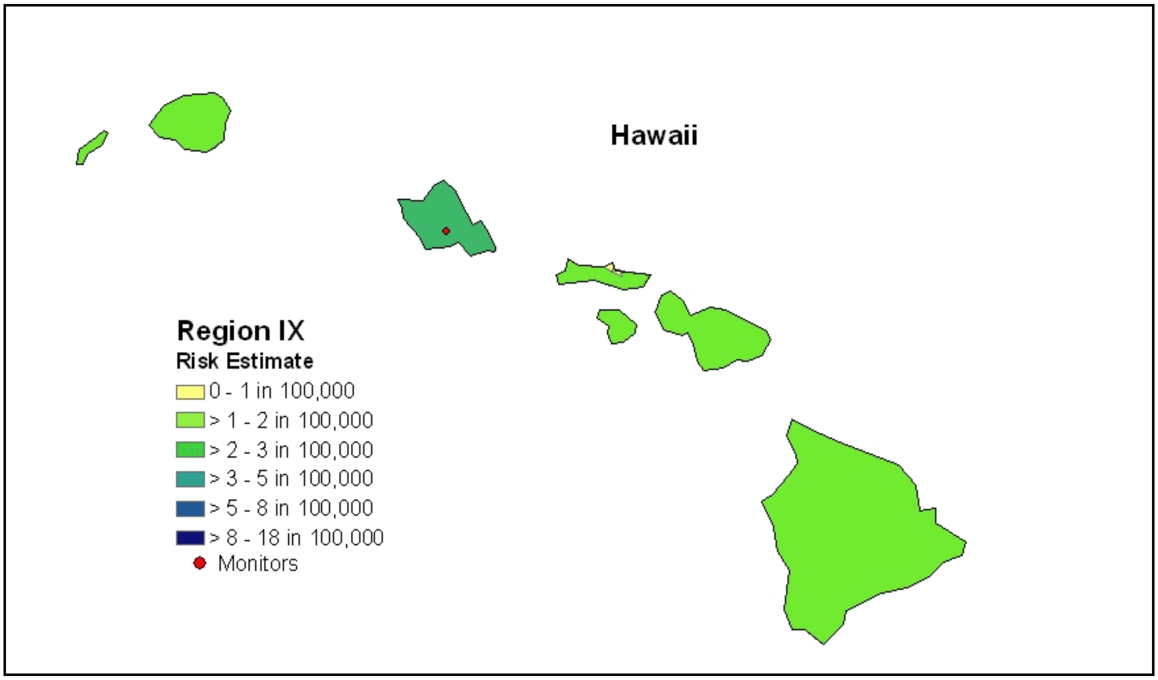


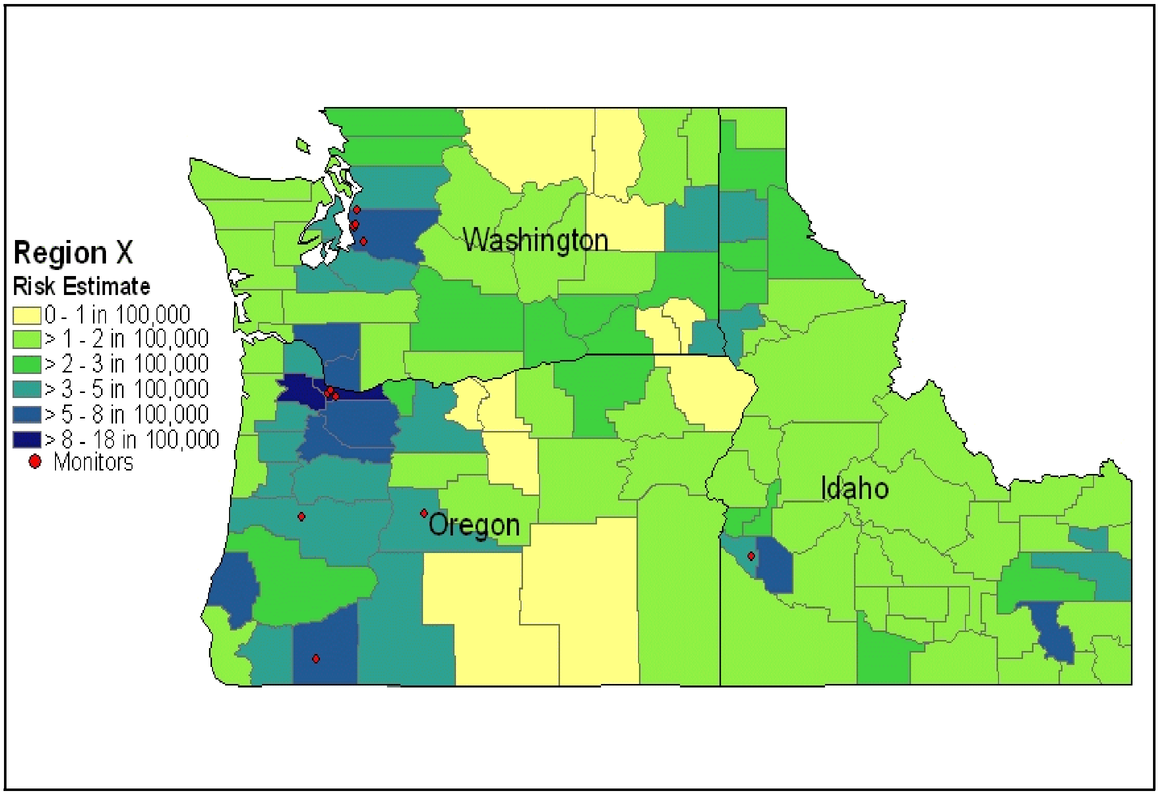
Region VII
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors
Nebraska
Iowa
Kansas
Missouri

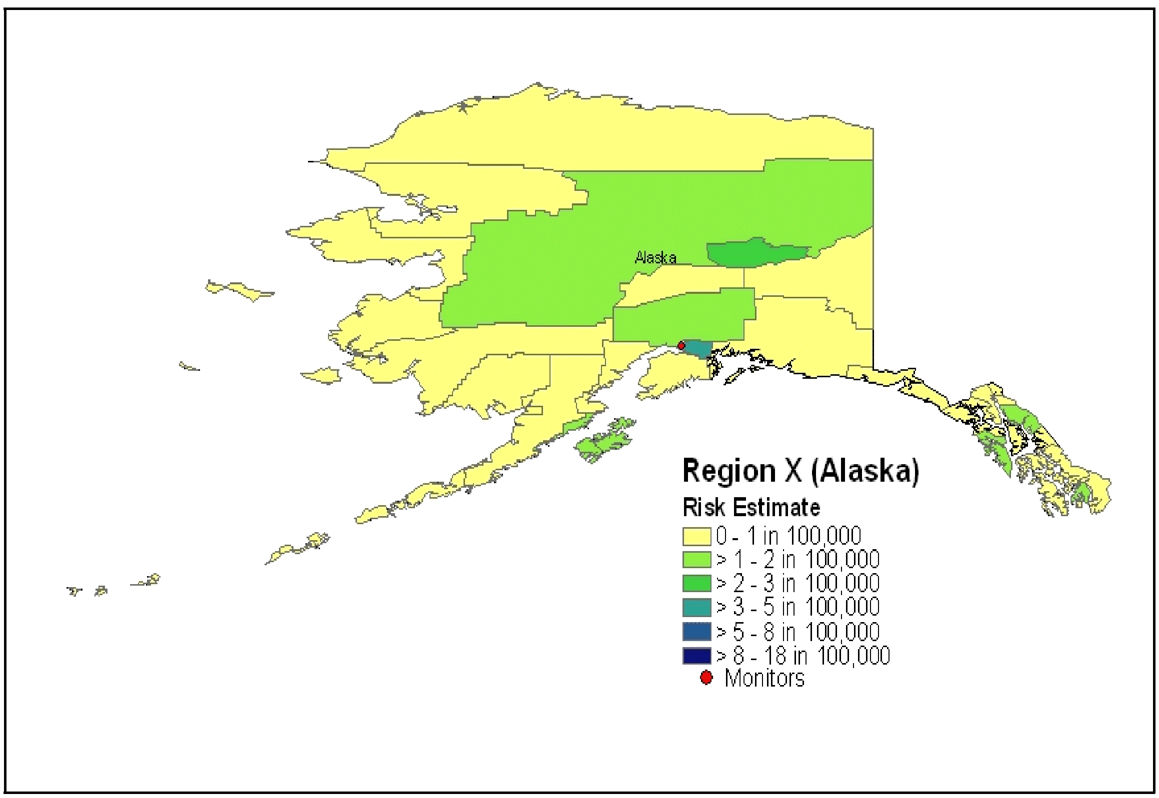


Region VIII
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors
Montana
North Dakota
South Dakota
Wyoming
Utah
Colorado


Nevada
California
Arizona
Region IX
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors


Hawaii
Region IX
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors


Region X
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors
Washington
Oregon
Idaho


Alaska
Region X (Alaska)
Risk Estimate
0 - 1 in 100,000
> 1 - 2 in 100,000
> 2 - 3 in 100,000
> 3 - 5 in 100,000
> 5 - 8 in 100,000
> 8 - 18 in 100,000
Monitors

Appendix D

List of 33 Urban Air Toxics

Type	Air Toxic Pollutant
Volatile Organic Compounds	acrylonitrile
	benzene
	1,3-butadiene
	carbon tetrachloride
	chloroform
	1,2-dibromoethane (ethylene dibromide)
	1,3-dichloropropene
	1,2-dichloropropene (propylene dichloride)
	ehtylene dichloride (1,2-dichloroethane)
	ethylene oxide
	methylene chloride (dichloromethane)
	1,1,2,2,-tetrachloroethane
	tetrachloroethylene (perchloroethylene)
	trichloroethylene
	vinyl chloride
Metals (Inorganic Compounds)	arsenic compounds
	beryllium and compounds
	chromium compounds
	lead compounds
	manganese compounds
Semi-Volatile Organic Compounds and other Air Toxics	2,3,7,8-tetrachlorodibenzo-p-dioxin (& congeners & TCDF congeners)
	coke oven emissions
	hexachlorobenzene
	hydrazine
	polycyclic organic matter (POM)
	polychlorinated biphenyls (PCBs)
	quinoline
Aldehydes (Carbonyl Compounds)	acetaldehyde
	formaldehyde
	acrolein

Appendix E

Data Quality Indicators

Table E.1: Data Quality Indicator Definitions

Data Quality Indicator	Definition
Precision	A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, expressed generally in terms of the standard deviation.
Bias (Accuracy)*	The systematic or persistent distortion of a measurement process which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Completeness	The percentage of valid data points relative to total possible data points.
Representativeness	A measure of the degree to which data accurately and precisely reflect a characteristic of a population parameter at a sampling point or for a process condition or environmental condition.
Comparability	A qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables.

** Bias is now used instead of accuracy*

Table E.2: How the Air Toxics Monitoring Program Addresses the Data Quality Indicators

Data Quality Indicator	Description
Precision	Accounted for in the Data Quality Indicators input parameters autocorrelation and Measurement Coefficient of Variation. The analysis of collocated sampling.
Bias (Accuracy)	Addressed through the Proficiency Testing program and technical systems audits to understand variability around what is thought to be the true value. EPA is interested in whether there are things in the operation of the monitoring site that cause the calculated value to be outside of the range of acceptable bias. Therefore, there is a qualitative and a quantitative component to bias. The quantitative component, the measurement quality objective is ±15% based on the measurement error coefficient of variation of (15%).
Completeness	Addressed by the quarterly completeness criterion (85%).
Representativeness	Requires sites to not use monitoring scales any lower than neighborhood scale. EPA does not want the monitoring organizations to be measuring so close to the source that they get higher numbers than the concentrations to which people are actually exposed.
Comparability	Requiring the monitoring organizations to use the same methods. However, now, if monitoring organizations can meet the Measurement Quality Objectives for precision and bias then they can use any method, as long as they meet those Measurement Quality Objectives. If they meet them, EPA will assume the systems are comparable. This helps make a more performance-based system and helps keep the door open to new technologies.

Appendix F

Summary of NATTS Characteristics

Region	City	Urban(U)/ Rural (R)	Monitoring Scale	No. of Core Air Toxics	Sampling Schedule	Data ***
1	Providence, RI	U	*	*	*	Most pollutants > 85%
	Chittenden, VT	R	Regional	18	1-in-6	No Data
	Roxbury, MA	U	Neighborhood	19	1-in-6	Varied among pollutants
2	New York City, NY	U	**	18	1-in-6	All pollutants > 85%
	Rochester, NY	U	**	18	1-in-6	No Data
3	Washington DC	U	Neighborhood	19	1-in-6	All pollutants > 85%
4	Atlanta, GA	U	Neighborhood	3	1-in-6	Most pollutants > 85%
	Tampa, FL	U	Neighborhood	18	1-in-6	All pollutants > 85%
	Tampa, FL	U	Neighborhood	18	1-in-6	All pollutants > 85%
	Hazard County, KY	R	Neighborhood	19	1-in-6	Varied among pollutants
	Chesterfield, SC	R	Regional	19	1-in-12	No Data
5	Detroit, MI	U	Neighborhood	19	1-in-6	Only metals > 85%
	Northbrook, IL	U	**	**	**	Varied among pollutants
	Mayville, WI	R	**	11	**	No Data
6	Houston, TX	U	**	19	1-in-6	One quarter complete
	Harrison County, TX	R	**	19	1-in-6	No Data
7	St. Louis, MO	U	**	17	1-in-6	Most pollutants > 85%
8	Bountiful, UT	U	Neighborhood	18	1-in-6	All pollutants > 85% for 2 quarters
	Grand Junction, CO	R	Neighborhood	18	1-in-6	No Data
9	San Jose, CA	U	*	*	*	No pollutants > 85%
	Phoenix, AZ	U	**	18	1-in-6	No pollutants > 85%
10	Seattle, WA	U	Neighborhood	18	1-in-6	All pollutants > 85%
	La Grande, OR	R	Neighborhood	19	1-in-6	No Data

Footnotes:
* = QAPP did not specify
** = Did not receive QAPP for this NATTS site
*** = refers only to pollutants for which data was entered

Note: Four characteristics are not listed in this schedule (Geographic diversity, physical siting, emission sources, and quality assurance)

Research Activities for Key Urban Air Toxics Measurement Methodologies

Acrolein

The Environmental and Occupational Health Sciences Institute has completed the first (laboratory) phase of an EPA contract for the development of a new method for sampling and measuring acrolein, which is considered to be a very unstable compound. The new method is similar to method TO-11A in EPA's Compendium of Methods, but uses DNSH (Dansylhydrazine) rather than DNPH (2, 4-Dinitrophenylhydrazine) as the derivatizing compound. This method allows for passive sampling and better detection of acrolein. The Principal Investigator on the study told us that the method has method detection limits sufficient to measure concentrations at the level of concern. The second phase of the research, field validation at four sites, is currently under way, and EPA is also testing the new method in the Detroit Exposure and Aerosols Research Study.

1,3-Butadiene

1,3-butadiene is a difficult compound to measure because once an ambient sample is captured in a canister, any nitrogen oxide (NO) and nitrogen dioxide (NO_2) in the sample begins to "attack" the butadiene, and the butadiene essentially decays. Independent researchers in Nevada are currently working on a new method for butadiene that removes the NO and NO_2 from the sample, thus preserving the original concentration of the butadiene. The device for removing the NO and NO_2 is called a NOx denuder, and the researchers say that this method provides sufficient method detection limits to measure risks at the 1-in-1-million level. This method is currently being tested in an EPA study relating to vehicle emissions being conducted in Kansas City.

Another method for measuring butadiene is being tested by EPA in the Detroit Exposure and Aerosols Research Study. This method involves the use of a sorbent that retains butadiene better than the sorbents used for sampling VOCs in other methods.

Hexavalent Chromium (Chromium VI)

It is difficult to monitor for chromium VI because it is has very poor recovery rates from sampling filters. Currently, NATTS are reporting only for total chromium, because using current methods that have poor recovery for chrome VI, they are getting "non-detect" readings for chromium VI. EPA contracted a research project with Eastern Research Group to improve the extraction and recovery of chromium VI from sampling filters. Using a cellulose filter rather than a Teflon filter (as is currently used), they have been able to improve sample recovery. EPA is now contracting another project to expand this research. This next step will study whether recovery of chromium VI remains adequate after up to a week of storage. Most agencies doing monitoring do not extract and analyze the samples right away. Instead, they are stored, or archived, for a period of time before they are analyzed. This research will study what level of recovery is possible after certain periods of storage.

According to staff in the OAQPS Monitoring and Quality Assurance Group who are overseeing the contract research, this method shows promise of becoming a standard, routine method. If the results from this current research demonstrate that this is a viable method (if recovery remains good after periods of up to a week of storage), EPA plans to incorporate it into the NATTS program.

Review of Measurement Methodologies

In terms of addressing methodological weaknesses, EPA's National Exposure Research Laboratory has developed a review of routine methods for 20 key and core urban air toxics, although its full review of all 33 urban air toxics has not yet been completed. The Agency has also contracted research for methods development; for example, the laboratory research conducted by the Environmental and Occupational Health Sciences Institute at Rutgers for a new method for acrolein. EPA is also field testing new methods for acrolein and 1,3-butadiene in ongoing Agency studies, such as the Detroit Exposure and Aerosol Research Study. In addition, in order to provide guidance to other parties conducting toxics monitoring, EPA has published the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air and the Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, which list and describe all the routine and widely accepted methods for monitoring that have been identified.

Appendix H

Agency Response to the Draft Report

FEB 15 2005

MEMORANDUM

SUBJECT: Response to the Draft Evaluation Report: Progress Made in Monitoring Ambient Air Toxics, But Further Improvements Can Increase Effectiveness, Assignment No. 2003-1299

FROM: Jeffrey R. Holmstead
Assistant Administrator

TO: J. Rick Beusse
Director for Program Evaluation, Air Issues

Thank you for providing us the opportunity to respond to the draft report from the Office of Inspector General (OIG) issued December 21, 2004. The purpose of this memorandum is to provide comments on the draft evaluation report, "Progress Made in Monitoring Ambient Air Toxics, But Further Improvements Can Increase Effectiveness, Assignment No. 2003-1299." This is a coordinated response from the Office of Air and Radiation (OAR) and the Office of Research Development (ORD).

The recommendations provided by the OIG generally align with our current improvement efforts. Our concern with the OIG report pertains to communicating the necessary balance among programmatic priorities, both within the air toxics monitoring program and across air and other media programs.

If you have additional questions or need clarifications, please contact Peter Tsirigotis at 919-541-9411.

Attachment

cc: Pete Cosier, Office of Air and Radiation, Audit Followup Coordinator (6102A)
Dr. Dan Costa, National Human and Environmental Effects Laboratory (B 143-02)
Thomas C. Curran, Deputy Director, Office of Air Quality Planning and Standards (C404-04)
Dr. Gary J. Foley, Director, National Exposure Research Laboratory (D305-01)
Tim Hanley, Ambient Air Monitoring Group (D243-02)
Michael N. Jones, Ambient Air Monitoring Group (D243-02)
Lek G. Kadeli, Acting Deputy Assistant Administrator for Management (S1O1R)
Ardra Morgan-Kelly, Audit Liaison, National Exposure Research Laboratory
William Lamason, Associate Director, Emissions, Monitoring and Analysis Division (C304-02)

Phil Lorang, Leader, Ambicnt Air Monitoring Group (D243-02)
Stephen D. Page, Director, Office of Air Quality Planning and Standards (C404-04)
Joann Rice, Ambient Air Monitoring Group (D243-02)
Dr. Rich Scheffe, Emissions, Monitoring and Analysis Division (C304-02)
Dr. Linda Sheldon, Director, Human Exposure and Atmospheric Sciences Division (E205 -0 1)
Laurie Trinca, Audit Liaison, Office of Air Quality Planning and Standards (C404-2)
Peter Tsirigotis, Director, Emissions, Monitoring and Analysis Division (C304-02)
John Vandenberg, Associate Director, National Center for Environmental Assessment (13243-01)
Timothy Watkins, Deputy Director, Human Exposure and Atmospheric Sciences Division (E205-01)

ATTACHMENT

Response to Draft Evaluation Report: Progress Made in Monitoring Ambient Air Toxics, But Further Improvements Can Increase Effectiveness, Assignment No. 2003-1299

We have the following general comments on the draft conclusions and recommendations:

General Comments

See Appendix I - Note 1 for OIG Evaluation

(1) *Resource Constraints and Needed Balance.* Allocation of funds within and across programs represents a challenging barrier to progress. Although this point is addressed in response to recommendation 5-1, it is sufficiently important to reiterate in this general comment section of the response. Given the current environment of fiscal constraint, garnering additional funding to further advance the Air Toxics Monitoring Program represents a very substantial challenge. Further, the report includes the recommendation to increase research efforts to develop ambient air toxics methods, but does not consider the need to balance research investments; this particular research need is among many in the air toxics realm. The OIG report cites the Science Advisory Board's (SAB's) review of the ORD Air Toxics Research Strategy and Multiyear Plan in making the recommendation to increase research efforts related to ambient monitoring methods, but the SAB also noted several other research areas related to air toxics that needed to be addressed. It must be duly noted tat as part of the Agency's annual planning and budgeting process, ORD works with EPA's program and regional offices to allocate funds across various research programs. This process ensures that media-specific recommendations are fully considered and that the areas of greatest need are given the highest priority. Using this process, OAR has an opportunity to elevate the relative priority of research supporting air toxics methods development within the air research budget. It is also important to note that ORD must also balance EPA's needs for research not only within the air research program, but also across all environmental activities.

(2) F*ocus on Characterizing High Risk Areas.* A majority of the proposed recommendations concentrate on characterization of the locations that pose the greatest risks. It is important to note that the air toxic program is not the criteria program in which attainment status is determined by an ambient monitoring approach. Further, while OAR recognizes the importance of air toxic monitoring in characterizing risks, we also believe that such monitors should be used in conjunction with other characterization tools (models, personal monitoring, and biomarkers) to more fully characterize air toxic risks.

(3) *Relationship of Personal Exposure, Ambient Concentrations, and Health Risks*. The report does not address the relationship of actual personal exposures to ambient air concentrations and health risks. Throughout the report, reference is made to the need to site air toxics monitors in the areas estimated to present the greatest health risks from exposures to air toxics. However, the report does not mention the fact

that an ambient monitor does not necessarily represent actual personal exposure to air toxics. This is important because the link between concentrations measured at an ambient site and the potential health risks is the actual exposure of an individual. A person's actual] exposure to air taxies will depend on many factors including their personal activities such as time spent in indoors, outdoors, and driving. The NATA National Scale Assessment, which is used in the report to identify the census tracks in the country with the greatest estimated health risks, does include the use of human exposure modeling to estimate actual exposures to air toxics, but there are uncertainties and limitations in the NATA exposure assessment. In summary, while the focus of this report is ambient monitoring network, the relationship of ambient concentrations to personal exposures should be acknowledged and the need to improve the understanding of this relationship for air toxics should be included as a recommendation.

See Appendix I - Note 2 for OIG Evaluation

<u>Responses to the Recommendations</u>

2-1 *Develop a strategy in coordination with State, local, and tribal partners to increase siting a/local-scale monitors in locations that are estimated to present the greatest health risks from exposure to air toxics and are representative of different sources of air toxics emissions. This strategy would apply to State and local agency and tribal fixed monitors as well as the local-scale projects that EPA awards. The strategy would not apply to the NATTS sites which are designed to measure long-term trends in ambient concentrations.*

This recommendation targets two separate and distinct components of the National Air Toxics Monitoring Program - the Section 103 funded competitively selected Community Scale Monitoring projects, and the Section 105 funded air toxics monitors. The Agency recognizes the value and importance of the siting criteria referenced in this recommendation, and intends to emphasize these criteria, along with other key criteria, in selecting the community-scale monitoring projects. Once selected, the Regional Offices overseeing the award and execution of these grants must ensure the agreed upon siting requirements are implemented. For the 105 funded air toxics monitoring, developing and successfully implementing a strategy to achieve the recommended siting objectives will present a substantial challenge given the relative autonomy with which State and local agencies may use these resources. OAR will continue to work with the Regional Offices and STAPPA/ALAPCO to further implement these objectives. As a final note, while some of the high-risk locations should be evaluated, the selection and variety of such areas need to be addressed systematically in light of siting considerations associated with competing objectives and limited resources.

2-2 *Develop a method for identifying and prioritizing high risk areas for local-scale monitoring which uses various air toxics related information and available health data (e.g., NATA results, emissions data, population data, etc.) that could be used by EPA, State and local agencies, and Tribes to implement the strategy developed in recommendation 2-1.*

This recommendation calls for the development of a method for identifying and prioritizing high-risk areas. Identifying areas with an elevated risk resulting from exposure to air toxics will be difficult given the characteristics of air toxic pollutants, issues related to air toxic exposure (discussed as a general comment), and the tools and resources available to estimate exposure and health risks. As a result, any method to identify high risk areas will no doubt include significant uncertainty. To improve this recommendation, it should also include some mechanism for evaluating whether the identified locations truly are areas with elevated risks associated with exposure to air toxics; this would likely prove very beneficial to the understanding of air toxics exposure and risks. Examples would be to include concurrent exposure and health studies in some local-scale monitoring programs. The draft report does mention this concept and correctly points out that doing so would be expensive and potentially beyond the resources and scope of the ambient air toxics monitoring program. However, because this type of information would be very important and informative for EPA's air toxics program, exploring alternative ways to address the need would be useful. One potential option could be to simply encourage proposals for local-scale monitoring projects with co-located exposure and health studies by "rewarding" extra points, but not "penalizing" projects that do not include such collaborations.

3-1 *Develop a communication strategy to inform State and local officials of areas that may present high health risks from exposure to air toxics and of the opportunity to obtain funding for monitoring in these areas through EPA's local-scale monitoring program.*

OAR works both directly with State, local, and Tribal (S/L/T) entities and through Regional contacts to help identify and characterize local scale risk issues. The NATA assessment is an attempt by the agency to identify high risk areas on a very broad scale. This information is presented on the Agency's website at http://www.epa.gov/ttn/atw/nata/. OAR is in the process of making improvements to this website by adding features such as improved questions and answers as well as GIS tools to help our partners better utilize and understand this information. It is also important to note that NATA has several limitations and that other tools may also be required to identify many high risk locations. Such tools may include: local scale assessments, multi-pathway assessments, monitoring efforts, health issues. Further we are working to train our S/L/T partners through the development of an Air Toxics Risk Assessment Reference Library as well as formal risk training classes that include information on how to both identify as well as communicate health risks. Regarding the communication of funding opportunities for monitoring in these areas, solicitations for Community Scale Monitoring project proposals are posted on http://www.fedgrants.gov/; the existence of new solicitations are communicated from the Program Office to the Regional Offices, Regional Planning Organizations, STAPPA and ALAPCO, which in turn are communicated to the appropriate S/L/T entities.

3-2 In order to encourage development and refinement of new methodologies retain the project selection criterion for employing non-routine, advanced monitoring technologies.

OAR intends to retain the Community Scale Monitoring project selection criterion for employing non-routine, advanced monitoring technologies.

3-3 Add an additional criterion to the existing local-scale project selection criteria to:

- *a. Address areas where NATA or other risk analyses indicates that the population is at increased risk (relative to other areas) of health effects from exposure to air toxics.*
- *b. Periodically revisit previously monitored locations in order to evaluate progress in reducing air toxics emissions.*

OAR agrees that further emphasis on areas where NATA or other risk analyses indicates that the population is at increased risk (relative to other areas) of health effects from exposure to air toxics is a worthy factor in assessing community-scale monitoring project proposals. That said, this proposed criterion will be weighed with other proposed additional criteria and given full consideration for inclusion, as discussed in the response to Recommendations 2-1 and 2-2. Regarding periodic reassessment of previously monitored locations to evaluate air toxics emission reduction progress, one of the National Air Toxics Trends Sites (NATTS) program objectives is to re-evaluate on an on-going basis the effectiveness of each monitoring site as well as the HAPs monitored. Also, given the very limited duration of this program to date, this proposed criterion will be better implemented after a few years of community-scale monitoring projects to ensure any reassessment activity is meaningful in terms of assessing progress.

3-4 Coordinate with Regional Offices to ensure that information on grant award status is submitted to the appropriate OAQPS officials.

OAR accepts the recommendation.

4-1 Coordinate with Regional officials and State and local agency NATTS site operators to ensure that these sites:

- *a. Monitor on 1-in-6 day schedules,*
- *b. Monitor for the minimum 6 required pollutants,*
- *c. Meet the 85 percent data completeness requirement, and*
- *d. Timely input monitoring data into AQS.*

OAR proposes that this recommendation be re-worded to read as follows: "Coordinate with Regional officials and State and local agency NATTS site operators to ensure that these site operations are consistent with the current Technical Assistance Document (TAD) in terms of monitoring schedule, required pollutants, data completeness and timely data submission into AQS." The reason for the proposed revision is to account for any changes that may (and likely will) arise in future updated versions of the TAD. OAR agrees that we must further the coordination efforts with Regional Offices and, to the extent appropriate and practicable, with the cognizant State and local agencies to ensure adherence to the cited monitoring requirements.

4-2 Coordinate with the Regional office program representatives to ensure that the NATTS site QAPPs sufficiently address all program requirements including the scale of monitoring being conducted and detailed discussion of laboratory standard operating procedures.

The grants establishing, operating, and maintaining the NATTS are between State and local agencies and the EPA Regional Offices; therefore, the principle responsibility to ensure adherence to the NATTS monitoring requirements must necessarily reside with the Regional Offices that oversee these grants. That said, OAR accepts the recommendation.

4-3 Revise NATTS program guidance, including the model QAPP where appropriate, to:

a. More clearly state and explain the desired site characteristic with respect to the influence of specific emission sources on air toxins concentrations monitored by NATTS sites,
b. Include the most recent approved and recommended methods, and
c. Identify the number and location of sites to monitor on the regional scale in order to assess background and regional transport concentrations.

OAR agrees that NATTS program guidance should be kept current to reflect the most recent methods updates and improvements. In addition to the model QAPP (referenced above), the NATTS Program Guidance includes the National Monitoring Strategy Air Toxics Component, Final Draft July 2004, and the Technical Assistance Document for the National Ambient Air Toxics Trends and Assessment Program, Draft June 2003 (henceforth referred to as the TAD). The recommended clarifications cited above in sub-items a and b arc, in fact, well addressed in the TAD (for sub-item a see Section 1.9, and Section 3.0, pages 2 and 3; for sub-item b see all 207 pages of Section 4). Sub-item c, "Identify the number and location of sites to monitor on the regional scale in order to assess background and regional transport concentrations," should be removed from the recommendation. The number and location of existing NATTS sites are known and will not be relocated so that they may provide a long term record of priority HAPs concentrations; further, sites "...to monitor on the regional scale in order to assess background and regional transport concentrations" are presently operating, namely the rural sites (see National Monitoring Strategy Air Toxics Component, Section 3.2.1).

4-4 Coordinate with the Regional office program representatives to ensure that the NATTS site grant awards and work plan commitments are consistent with the national guidance requirements for NATTS.

As stated in the response to Recommendation 4-I, OAR agrees that it must strengthen its coordination efforts with Regional Offices and, to the extent appropriate and practicable, with the cognizant State and local agencies to ensure that the NATTS site grant awards and work plan commitments are consistent with the national guidance requirements for NATTS. Again, it is important to note that the grants establishing, operating and maintaining the NATTS sites are between State and local agencies and the EPA Regional Offices; the principle responsibility to ensure that the NATTS site grant awards and work plan commitments are consistent with the national guidance requirements for NATTS must necessarily reside with the Regional Offices that oversee these grants.

5-1 Prioritize the barriers to ambient air toxics monitoring and develop a long-term strategy and implementation plan for addressing these barriers.

OAR concurs that there are significant barriers to expanding air toxics monitoring activities at the local, State, and National levels, and that foremost among these are lack of funding and methodological weaknesses for monitoring certain air toxics. Given the current environment of fiscal constraint, garnering additional funding, which is the principle limitation to addressing essentially all other identified barriers, represents a very substantial challenge.

See Appendix I - Note 3 for OIG Evaluation

<u>OIG Air Toxics Recommendations for Assistant Administrator, ORD</u>

5-2 Consistent with ORD's plans to address measurement science problems, coordinate with OAQPS officials to identify key air toxics in need of improved ambient air monitoring methodologies and incorporate plans for conducting research on improved methodologies for these key air toxics in ORD 's Air Toxics Research Strategy.

As stated in the general comments, there exists a necessary balance among programmatic priorities. ORD works with the program offices to balance its research portfolio across the various needs of the Agency; specific to this recommendation, ORD already works very closely with OAR to identify air toxics monitoring method needs. For example, (ORD) is currently working on methodological improvements for two of the three high priority air toxics identified in Table 5.1 of the OIG report as having methodological weaknesses (acrolein and 1, 3 butadiene). However, although this recommendation does not explicitly state that ORD should increase its resource investment in air toxics methods development, it is implied and the report does call for an increased effort and emphasis in the "At a Glance" and "Results in Brief' sections. As part of the ORD planning process, ORD works with the EPA program offices to prioritize research needs within its media-specific research programs; using this process, OAR has an opportunity to elevate the relative priority of research supporting air toxics methods development within the air research budget.

Specific Comments on Report Content

See Appendix I - Note 4 for OIG Evaluation

Page 6, first paragraph: This paragraph addresses other monitoring efforts related to air toxics monitoring. This paragraph is contained within the section entitled "Existing State and Local Monitoring". However, some of the monitoring programs listed are not operated by State and Local agencies (e.g., CASTNET). These monitoring efforts do fit under the overarching section, "Development of the National Air Toxics Monitoring Program." Therefore, the first paragraph on page 6 may be more appropriately labeled as "Other Related Monitoring Efforts."

Page 13, last paragraph: The wording in this paragraph is confusing. The paragraph states that the report "identified the 10 air toxics that were estimated to present a 1 in 100,000 or greater excess lifetime cancer risks to the most population, and the 10 air toxics that were estimated to present a 1 in 10,000 or greater excess lifetime cancer risk to the most population." As written, it seems as though any pollutant that presents 1 in 10,000 or greater risk would also be a pollutant that present the 1 in 100,000 risk, so it is not clear how each group of air toxics can contain 10 pollutants, i.e., the number of air totes that present a 1 in 100,000 risk should be greater than the number of air toxics that present a 1 in 10,000 risk. Also, the phrase "risks to the most population" might be more clearly described as "risks to the greatest number of people." After studying the charts on page 14, it appears the wording in the preceding paragraph was attempting to communicate that the OIG identified the air toxics that presented the greatest risks and then identified the specific toxics to which the greatest number of people were exposed. However, as written, this process is not clearly communicated in the paragraph.

Pages 13-15, "Number of Air Toxics of Concern Were Not Monitored": The text states that there are no monitored data reported in AQS for several of the air toxics presenting the greatest cancer risks. There are two toxics discussed for which OAR requests that the OIG add clarifying language to the text. First, POM is a class of compounds that is represented in air toxics monitoring by the collection and analysis of representative PAHs - polynuclear aromatic hydrocarbons (e.g., naphthalene, acenaphthene, etc). PAHs are listed in AQS. We request the text be modified to reflect this clarification. Second, there are no defined compounds or classes of compounds that represent coke oven emissions (COE). We request that the text be modified to reflect clarification as to why COE cannot be found in AQS.

Page 20, last paragraph: The first sentence states "The headquarters official responsible for managing this program was unable to tell us how many of the proposed local-scale projects had been awarded." At the time this person was initially contacted, he was new to the position; after two weeks in his new capacity as program manager, the situation was remedied. We request the OIG revise the descriptive text to reflect these circumstances.

Page 26, paragraph continued from previous page, last sentence: "The failure to address the scale of monitoring in the QAPP does not necessarily mean that the monitor was inappropriately sited." This is a general caveat that should be more centrally mentioned in the preface where the OIG describes its' approach. The issue is that the QAPP is a document tat details the data quality system of an environmental operation. Some QAPPs may have omissions; hence there is an inherent inaccuracy in the OIG approach of using QAPPs as a surrogate for verifying actual activity.

Page 39, first two paragraphs: These paragraphs identify the barrier that health benchmarks are not available for certain air toxics. There are health benchmarks for all 33 urban air toxics and for a majority of the 188 air toxics listed in the Clean Air Act. Some of these benchmarks could be considered outdated and some include a considerable amount of uncertainty. However, ORD has recently undertaken significant efforts to improve the Integrated Risk Information System (IRIS) that contains the available EPA health benchmarks. Furthermore, the process of identifying and prioritizing pollutants for new or improved health benchmarks in IRIS is performed by EPA Program Offices. As with the recommendation to increase ORD research efforts for air toxics monitoring methods, the need for increased research efforts related to developing improved health benchmarks must be balanced with other research needs of the Agency. OAR has the ability to increase the relative priority of research to improve air toxic health benchmarks through the ORD planning process. Finally, the two paragraphs at the top of page 39 also mention that monitoring data is not very useful to communities without guidelines for what the data means in terms of health risks. It is very important to note that personal exposure information is also critical for relating ambient air monitoring data to health risks (see 1st general comment).

Page 39, last sentence: Change "poly Aromatic hydrocarbons" to "polynuclear aromatic hydrocarbons."

Chapters 2-5: All OAR recommendations call for the Director of OAQPS to take action. The one recommendation pertaining directly to ORD, which is contained in Chapter 5, calls for the Assistant Administrator for ORD to take action. It is recommended that, for consistency, the recommendations for the Director of OAQPS be changed to recommendations for the OAR Assistant Administrator.

Page 60, last paragraph: Replace "put out" in the first sentence of this paragraph with "developed."

Appendix I

OIG Evaluation of Agency Response to Draft Report

Note 1 - OIG Evaluation of Agency's General Comments

Resource Constraints and Needed Balance. We acknowledge EPA's need to balance resources for research across multiple areas, and have added language to the final report to further address this issue.

Focus on Characterizing High Risk Areas. We are in agreement that ambient monitoring should be used in conjunction with other characterization tools (such as models and personal monitoring) to more fully characterize air toxics risks.

Relationship of Personal Exposure, Ambient Concentrations, and Health Risks. We have added language to the report further spelling out the limitation of NATA data. We also made changes to the report to further clarify that personal exposure to air toxics is not represented by ambient monitoring. In addition, as suggested in the Agency response, we added Recommendation 2-3 to the final report to address the need for better understanding of the relationship of actual personal exposures to ambient concentrations and health risks. Notwithstanding its limitations, the NATA risk estimates were the best data available identifying where air toxics risks are highest. We believe air toxics risk assessments, such as the NATA, could be improved or validated by use of ambient monitoring.

Note 2 - OIG Evaluation of Agency's Response to Recommendations

EPA made suggestions to improve several recommendations in our draft report. For example, OAR suggested we improve our Recommendation 2-2 by including some mechanism for evaluating whether identified locations truly are areas with elevated risks associated with exposure to air toxics, which we did in Recommendation 2-3. Our handling of the Agency's suggestions regarding our recommendations is discussed at the end of each chapter.

Note 3 - OIG Evaluation of Agency Response to Air Toxics Recommendations for Assistant Administrator, ORD

We recognize that the ORD and OAQPS participate in a process to identify research needs. Given ORD's recent guidance focusing on measurement research needs, we believe this coordination should address measurement research needs when appropriate, and in accordance with the recent ORD guidance on this issue.

Note 4 - OIG Evaluation of Agency Specific Comments on Report Content

The Agency made a number of technical comments on the draft report which we have incorporated as appropriate.

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