Community-Scale Air Toxics Ambient Monitoring Projects (CSATAM) Summary Report

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DISCLAIMER

The information presented in this document is intended as a technical resource to those conducting community-scale monitoring projects. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products. This is document and will be updated periodically as additional final reports are delivered.

The Environmental Protection Agency welcomes public input on this document at any time. Comments should be sent to Barbara Driscoll (driscoll.barbara@epa.gov).

FORWARD

In June 2009, Eastern Research Group (ERG) under subcontract to RTI International prepared a final technical report under Contract No. EP-D-08-047, Work Assignment 1-03. The report was prepared for Barbara Driscoll of the Air Quality Assessment Division (AQAD) within the Office of Air Quality Planning and Standards (OAQPS) in Research Triangle Park, North Carolina. The report was written by Regi Ooman and was incorporated into this final report.

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LIST OF ACRONYMS

AAMG	Ambient Air Monitoring Group
AAQD	Albuquerque Air Quality Division
ABC	Ambient Benchmark Concentrations
ACHD	Alleghany County Health Department
ADEQ	Arizona Department of Environmental Quality
AMTIC	Ambient Monitoring Technical Information Center
APCA	Air Pollution Control Agency
AQMS	Air Quality Management Section
ARTS	Austin-Round Rock Toxics Study
AWMA	Air and Waste Management Association
BC	black carbon
BTEX	benzene, toluene, ethylbenzene, xylenes
CAA	Clean Air Act
CACOG	Capital Area Council of Governments
CAMR	Clean Air Monitoring Rule
CAMx	Comprehensive Air Quality Model with Extensions
CARB	California Air Resources Board
CARE	Community Action for Renewed Environment
CMB	chemical mass balance
CMU	Carnegie Mellon University
CNEP	Cherokee Nation Environmental Program
CO	carbon monoxide
CO_2	carbon dioxide
DEC	Department of Conservation
DPM	diesel particulate matter
DQO	Data Quality Objective
DRC	diffusive rate constants
EC	elemental carbon
E-DATAS	Enhanced Delaware Air Toxics Assessment Study
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Division
ERG	Eastern Research Group
FRM	Federal Reference Method
FTIR	Fourier Transform Infrared Spectroscopy
GC	gas chromatograph
GRIC	Gila River Indian Community
HAP	hazardous air pollutant
HEALTH	Rhode Island Department of Health
IC/ICPMS	Ion Chromatography/Inductively Coupled Plasma-mass Spectrometry
ID	identifier
JATAP	Joint Air Toxics Assessment Project
LAMP	Large Area Monitoring Program
m/s	meters per second
MATES III	Multiple Air Toxics Exposure Study III
MATES II	Multiple Air Toxics Exposure Study II
MDEQ	Michigan Department of Environmental Quality
MLK	Martin Luther King

LIST OF ACRONYMS (Continued)

NATA	National-scale Air Toxics Assessment
NATTS	National Air Toxics Trends Station
NJDEP	New Jersey Department of Environmental Protection
NJTPK	New Jersey Turnpike
NO	nitric oxide
NO_x	oxides of nitrogen
OAQPS	Office of Air Quality, Planning, and Standards
OC	organic carbon
OEHHA	Office of Environmental Health Hazard Assessment
OWBs	outdoor wood boilers
OWFs	outdoor wood furnaces
PAH	polycyclic aromatic hydrocarbon
PAKS	passive aldehydes and ketones sampler
PASM	passive air sampling method
PCAQCD	Pinal County Air Quality Control District
PM	particulate matter
$PM_{0.27}$	particulate matter with aerodynamic diameter less than 0.27 microns
PM_1	particulate matter with aerodynamic diameter less than 1 micron
PM_{10}	particulate matter with aerodynamic diameter less than 10 microns
$PM_{2.5}$	particulate matter with aerodynamic diameter less than 2.5 microns
PMF	positive matrix factorization
ppb	parts per billion
QAPP	Quality Assurance Project Plan
RAIMI	Regional Air Impact Modeling Initiative
RARE	Regional Applied Research Effort
REL	Relative Exposure Limit
RFA	Request for Application
RfC	reference concentration
RI DEM	Rhode Island Department of Environmental Management
RRAMP	Roseville Railyard Ambient Monitoring Program
RSMS-3	Rapid Single-particle Mass Spectrometer
SO_2	sulfur dioxide
SRPMIC	Salt River-Pima Maricopa Indian Community
TAC	Technical Advisory Committee
TSP	total suspended particulate
U of D	University of Delaware
UCAMPP	Urban Community Air Toxics Monitoring Project, Paterson, NJ
$\mu g/m^3$	micrograms per cubic meter
UPRR	Union Pacific Rail Road
UV	ultraviolet
VOC	volatile organic compound(s)
WDNR	Wisconsin Department of Natural Resources

Abstract

This report presents results from EPA's Community-Scale Air Toxics Ambient Monitoring (CSATAM) Program—a program designed to help local communities identify and profile air toxics sources, develop and assess emerging measurement methods, characterize the degree and extent of local air toxics problems, and track progress of air toxics reduction activities. Since 2004, grants have been awarded from this program towards 52 unique projects to benefit local-scale monitoring efforts, of which 35 have sufficiently progressed to be described here. Geographically, grants have been awarded across the entire United States, in large, medium, and small communities. Awarded grants fall into one of three category bins: community-scale monitoring, method development/evaluation, and analysis of existing data. Each awarded grant generally runs from 18 to 36 months, but may have been extended due to project initiation difficulties. Each awardee has or will submit a final report to EPA at the end of the project period. Targeted pollutants generally reflected the National Air Toxics Trends System core compounds, criteria pollutants, and/or pollutants related to diesel particulate matter.

Other communities wishing to perform similar activities to the projects described in this report can benefit greatly by utilizing or modifying the tools developed from these awarded projects for their own end-use purposes.

1.0 Introduction

Under Section 103(b)(3) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) is authorized to award grants for research, investigations, experiments, demonstrations, surveys, and studies related to the causes, effects, extent, prevention and control of air pollution. Specifically, local-scale efforts to better characterize the distribution and sources of hazardous air pollutants, as well as to improved ambient air monitoring methods to achieve characterization and human exposure assessment goals, may be carried out under Section 103(b)(3) of the CAA.

In three separate Request For Application (RFA) cycles, EPA's Office of Air Quality Planning and Standards, Air Quality Assessment Division, Ambient Air Monitoring Group (AAMG) solicited proposals for grants to assist state and local communities in assessing local air quality. These EPA grants were designed to identify and profile air toxics sources, develop and assess emerging measurement methods, characterize the degree and extent of local air toxics problems, and track progress of air toxics reduction activities. The first RFA cycle was in 2003-2004 and 16 projects were selected for award from 49 proposals. The second RFA cycle was in 2005-2006, and 19 projects were selected for award from 58 proposals. The third RFA cycle was in 2007, and of the 60 eligible applications, funding was awarded in 2008 to 17 projects. These projects will soon be initiated, and will be discussed in a later summary report.

In these first two cycles, EPA anticipated awarding approximately 15 to 25 grants and cooperative agreements resulting from each RFA cycle, with funding amounts between $50,000 to $500,000 total funding per agreement. Although EPA estimated the project period for awards would be 18-36 months, each project was to be completed within a negotiated project performance period. Grants have been extended on a case-by-case basis if there were difficulties in project initiation.

2.0 Program Background Information

The community-scale air toxics ambient monitoring program has been developed as a piece of the overall National Ambient Air Monitoring Strategy (www.epa.gov/ttn/amtic/monitor.html). These projects supported EPA's efforts to reduce public exposure to hazardous air pollutants (HAPs), commonly called air toxics, by utilizing data from local-scale ambient air monitoring to advance mitigation of HAPs which supports EPA's overall goal to improve air quality.

The National Ambient Air Monitoring Strategy has provided a basic framework under which air toxics programs are well integrated. Two dominant principles of the national strategy specifically apply as follows:

- First, monitoring programs must have an appropriate balance between national prescriptive measurements (e.g., trends) and more flexibility to address local issues that are not well handled through a national design given the diversity of toxics issues across the nation. The balance between the National Air Toxics Trends Station (NATTS) network and the emerging community monitoring assessments reflects adherence to this principle.

- Second, the national strategy is directing a movement toward multiple measurements across numerous pollutant groups, recognizing the fact that most air pollution issues are well integrated from a scientific perspective, and enormous economies of scale are realized from integrating program management efforts across pollutant groups.

2.1 Proposal Focus

EPA was particularly interested in receiving air toxics monitoring related proposals from communities with the potential for the highest air toxics risk. While the NATTS program is intended to gather and assess priority HAP data on a national scale, a primary objective of the Community Monitoring Program is to identify and more accurately define the extent of local scale HAP impacts. To meet this objective, consideration of the National-scale Air Toxics Assessment (NATA) in planning and executing the prospective projects is appropriate (www.epa.gov/ttn/atw/natamain/). NATA is EPA's ongoing comprehensive evaluation of HAP in the United States. NATA assessments estimate the risk of cancer and other serious health effects from breathing air toxics. Assessments include estimates of cancer and non-cancer health effects based on chronic exposure from outdoor sources including assessment of non-cancer health effects for Diesel Particulate Matter (PM). NATA was developed as a tool to inform both national and more localized efforts to collect air toxics information, characterize emission and help prioritize pollutants/geographic areas of interest for more refined data collection.

Each community project proposal addressed one of the following three project bin categories:

(a) community-scale monitoring,

(b) methods development / evaluation, or

(c) analysis of existing data.

2.1.1 Community-Scale Monitoring

This category is intended to assist state and local agencies in assessing the degree and extent to which air toxics problems impact their respective communities. Successful proposals demonstrate a clear and compelling need or justification, examples of which may include the following:

- *Supporting health effects assessments*. The data collected from the National Air Toxics Monitoring Program can in some situations provide a valuable database for health scientists to investigate the relationship of ambient toxic concentrations and health impacts. In some instances, opportunities may arise for health studies to be conducted in conjunction with National Air Toxics Monitoring efforts, although direct linkage to an ongoing health study is not a precondition for project selection.

- *Evaluating and improving air quality models that in turn are used for exposure assessments*. Air quality models are an important tool for exposure assessments. However, they require supporting observations to instill confidence in model results, or to direct needed improvement in underlying model formulations or related emission inventories.

- *Baseline Analysis.* Developing a baseline reference frame of air quality concentrations can support estimates of community exposure and provide the basis for the longer term measuring of progress of a planned emissions strategy program. For example, characterization of base concentration levels can impact regulatory standards related to air toxics.

- *Characterizing Specific Pollutants of Concern.* Pollutants that are not ubiquitous, yet may present a local or regional scale concern (e.g., characterizing ambient /divalent mercury emissions, lead and other toxics near airports).

- *Developing Profiles.* Delineating local scale HAP concentration gradients that are driven by factors such as proximity to, and influence by, sources and other factors unique to particular communities may be important. While gradient delineation is not a purpose unto itself, it may be an integral part of a larger purpose such as conducting an exposure assessment, source characterization, or assessing the degree to which environmental justice may be a relevant issue in the affected community.

- *Characterizing Specific Emissions Sources of Concern*. Characterizing near-source concentrations from specific sources may be important. For example, characterizing emissions from transportation facilities, refineries, or other industry sectors may be important. In particular, it may be important to obtain information regarding substantially elevated ambient concentrations of toxics relevant to the source being investigated, including data on the pollutant profiles or source signatures. Such measurements assist regulators in their efforts to assess the impact of emission reduction measures (e.g., accountability) and to characterize risk and its causes for the most highly impacted populations.

2.1.2 Methods Development / Evaluation

This category is intended to develop new (or improve existing) methods for measurements (i.e., sampling and analysis, continuous monitoring) of select priority HAPs (i.e., those that emerged as national or regional drivers as a result of the 1999 NATA). Methods development is most critical for

HAPs that: 1) account for a significant contribution to the national risk, and 2) have an existing method detection limit higher than the concentrations established for one in a million cancer risk or non-cancer hazard quotient of one.

In addition, this category is used to evaluate advanced HAP monitoring technologies that can potentially operate on a routine basis. The target result of such projects is to ascertain the accuracy and cost-effectiveness (i.e., practical value) of existing innovative monitors, samplers, or analytical methods.

2.1.3 Analysis of Existing Data

This category is aimed at state, local, and tribal agencies that have already collected a significant amount of air toxics monitoring data and need support to interpret results. The objectives of a data analysis project should be consistent with those listed under Community-scale Monitoring: supporting health assessments, evaluating air quality models, or characterizing community exposures.

EPA intends that grant recipients increase their knowledge of air toxics data analysis, thus "empowering" themselves to become more proficient with tools and procedures needed to conduct viable statistical and trends analysis that meet the needs of the agency. Likewise, EPA intends that, where possible, the analysis be useful to other state, local, or tribal agencies, and become an integral part of the EPA's national data analysis trend effort.

Data analysis projects may quantify multi-year trends in HAP concentrations, statistical interpretations and relate these changes to trends in local emissions and contributions to potential transport of these pollutants. Monitoring data can be used as a measure of air program progress and accountability. Alternately, data analyses may help identify problem emissions sources that remain to be addressed. HAP sources can be identified using source apportionment techniques including meteorological analysis and receptor modeling.

EPA has funded a series of nationwide Air Toxic Data Analyses (Phase I – V) to characterize spatial and temporal variability in HAP concentrations (www.epa.gov/ttn/amtic/airtox-daw-2007.html). A primary limitation of these large scale studies is their lack of local information about specific emissions sources and regulatory changes. State and local agencies may do air toxics data analyses following methods similar to the national studies, but with a state-wide, urban or community focus to allow greater resolution and the benefit of local agency knowledge.

2.2 Expected Project Outcomes

Each project proposal was required to carefully consider and list explicit, project-specific anticipated outcomes—in particular short- and mid-term outcomes. Further, explicit links between the short-, mid-, and long-term outcome(s) should have been considered, developed, and articulated. A final report was required to be completed within 90 calendar days of the completion of the period of performance of each study. Awardees were instructed to include the following information in the final report:

1. Project activities over the entire period of funding, describing the recipient's achievements with respect to the stated project purposes and objectives;

2. Complete details of all technical aspects of the project, both negative and positive, the recipient's findings, conclusions, and results, including the associated quality assurance results; and

3. A description of the outcomes achieved or will likely occur following the project.

Recipients were also required to present project results at a national or EPA monitoring conference or workshop[1]. Additionally, prior to project initiation, all awardees were to have submitted to EPA's AAMG project manager a Quality Assurance Project Plan (QAPP) that was to be approved by their applicable EPA Regional office.

2.3 Uses of the Reports

At the end of each project, EPA also anticipated value-added results for specific purposes. Such results include the following:

1. *Data Products/Outputs*. The anticipated outputs for these projects are increased public availability of HAP data in a central repository (EPA's Air Quality System Database)[8]; source profiles associated with transportation, refineries, and other industry sectors; improved ambient HAP monitoring methods at levels and time intervals useful to exposure and risk assessment professionals; and individual community assessments of air toxics problems.

2. *Short-, Mid- and Long-Term Outcomes*. Through these projects EPA anticipates increased state and local Air Pollution Control Agency (APCA) ability to characterize the sources and local-scale distribution of HAPs, and assess human exposure and risk at a local scale. This increased ability facilitates APCA adoption of control measures that will reduce HAP emissions and public exposure. Short-term outcomes are expected to occur near the end of the grant, while mid- and long-term outcomes are expected to occur well after the grant is finished.

[1] This might also include a webinar type presentation through EPA with a national audience.

- Short-term outcomes can be: 1) problem identification; 2) increased community awareness (to include responsible parties/industry); 3) improved measurement techniques; and/or 4) validated or improved air quality models.
- Mid-term outcomes can be: 1) state or local policy actions(s); 2) responsible parties/industry mitigation action(s); 3) wide-scale deployment of a new measurement technique; and 4) community action to mitigate HAPs.
- Long-term outcomes can be: 1) reduced HAP emissions; 2) reduced ambient HAP concentrations; 3) reduced human exposure to HAPs; and 4) reduced adverse health effects from HAPs.

2.4 Scope of this Report

Eastern Research Group (ERG) evaluated the Community Air Toxics Monitoring Projects. Specifically, ERG reviewed the final reports from the completed community air toxics monitoring projects and interviewed project leads. In addition, project work plans were reviewed for projects for which a final report was not submitted. Individual project summaries include the following:

1) Project description;

2) Pollutants of interest;

3) Project purpose;

4) Results/conclusions;

5) Actions taken as a result; and

6) Technology transfer tools developed.

The Conclusions sections of this report documents information that can be learned from these projects, such as the following:

- What were the primary pollutants of concern?
- What were the primary sources of concern?
- What is the transferability or applicability of outcomes to similar scenarios in different locations?
- What is the quality of the data generated under the Community Air Toxics Monitoring Program?
- Were the selected Community Air Toxics Monitoring Program projects successful?

3.0 Summary of Awarded Projects

A total of 52 unique projects were awarded in each of the RFA cycles, of which 35 are presented in Table 3-1. This report will be updated as projects are deemed sufficiently complete to include. Final reports and project work plans are posted on EPA's Ambient Monitoring Technical Information Center (AMTIC) under the Local-Scale Monitoring Projects (www.epa.gov/ttn/amtic/local.html).

Other information in Table 3-1 includes the following: 1) submission of a final report; 2) presentation at a national or EPA workshop, conference or webinar; 3) project category bin; and 4) whether the awarded community also received a grant from EPA's Community Action for Renewed Environment (CARE) program (www.epa.gov/care/index.htm). Of the 35 projects included in this report, only 16 submitted final reports as of April 2009. The approximate locations of awarded projects are presented in Figure 3-1. Locations with a star indicate RFA cycle 1 awardees, while RFA cycle 2 awardees are denoted with a triangle. Project Identifiers (IDs) are also labeled accordingly. The majority of results for this report are drawn from the submitted reports; however, some information can be gleaned from the work plans of the remaining 19 projects.

Table 3-1. Summary of Awarded Projects

Project ID	Site/State	Project Category Bin	Final Report	Air Toxics Presentation	EPA CARE Community
1	Sun Valley, CA	Community-scale monitoring	Yes	Yes	No
2	Placer County, CA	Community-scale monitoring	Yes	Yes	No
3	Port of Tampa, FL	Sample Method Development	Yes	Yes	No
4	Allegheny County, PA	Analysis of Existing Data Community-scale monitoring	Yes	Yes	No
5	Paterson, NJ	Analysis of Existing Data Method Development/Evaluation	Yes	Yes	No
6	Milwaukee, WI	Method Development/Evaluation Community-scale monitoring	Yes	Yes	No
7	Detroit, MI	Method Development/Evaluation	Yes	Yes	Yes
8	Chicago, IL	Method Development/Evaluation (Phase 1); Community-scale monitoring (Phase 2)	Yes	Yes	No
9	Phoenix, AZ	Community-scale monitoring	Yes	Yes	Yes
10	Denver, CO	Method Development/Evaluation	Yes	Yes	Yes
11	Cherokee Heights, OK	Community-scale monitoring	Yes	Yes	Yes
12	Portland, OR	Community-scale monitoring	Yes	Yes	No
13	Wilmington, DE	Method Development/Evaluation Community-scale monitoring	Yes	Yes	No
14	Austin-Round Rock, TX	Community-scale monitoring	Yes	Yes	No
15	Spokane, WA	Community-scale monitoring	Yes	Yes	Yes
16	Warwick, RI	Community-scale monitoring	Yes	Yes	No
17	Louisville, KY	Analysis of Existing Data	No	Yes	No
18	Jefferson County, AL	Community-scale monitoring	No	No	No
19	Nez Perce Tribe, ID	Community-scale monitoring	No	No	No

Table 3-1. Summary of Awarded Projects (Continued)

Project ID	Site/State	Project Category Bin	Final Report	Air Toxics Presentation	EPA CARE Community
20	Albuquerque, NM	Community-scale monitoring	No	No	Yes
21	State of Connecticut	Analysis of Existing Data	No	No	No
22	Houston, TX	Analysis of Existing Data	No	No	No
23	Treasure Valley, ID	Community-scale monitoring	No	No	No
24	Indianapolis, IN	Community-scale monitoring	No	Yes	No
25	Port of Los Angeles, CA	Community-scale monitoring	No	No	No
26	Reno, NV	Method Development/Evaluation	No	Yes	No
27	State of New Jersey	Method Development/Evaluation	No	Yes	No
28	NJ Turnpike/ Secaucus, NJ	Community-scale monitoring	No	No	No
29	Rochester, NY	Community-scale monitoring	No	No	Yes
30	Tonawanda, NY	Community-scale monitoring	No	Yes	No
31	San Diego, CA	Community-scale monitoring	No	No	No
32	St. Regis Mohawk, NY	Community-scale monitoring	No	Yes	No
33	Burlington, VT	Community-scale monitoring	No	No	No
34	Hopewell, VA	Community-scale monitoring	No	No	No
35	Boulder, CO	Community-scale monitoring	No	Yes	Yes

Other observations include the following:

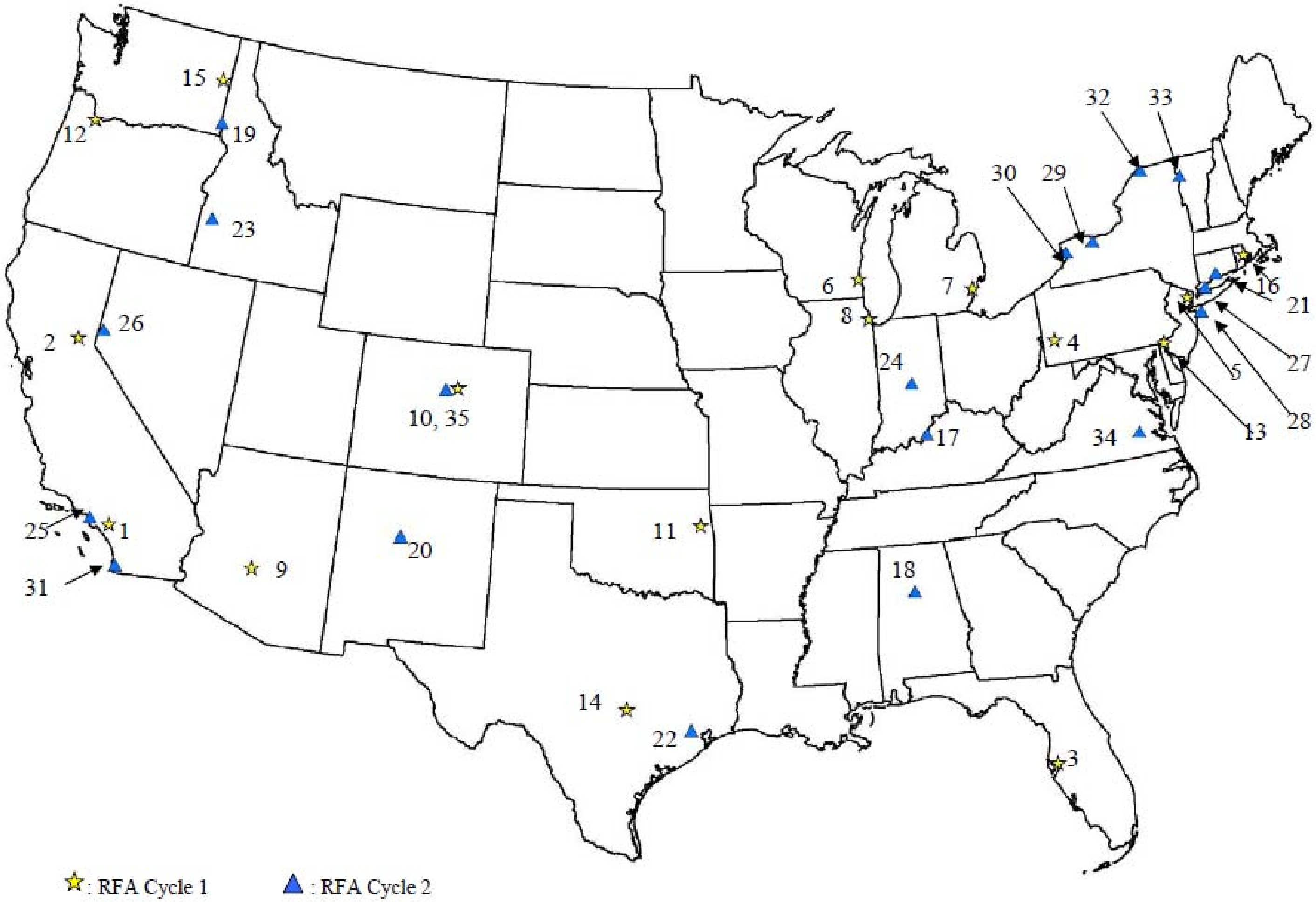
- The majority of the awarded projects (>20) fell in the "Community-Scale Monitoring" bin.
- Only eight of the 35 project locales also were identified as EPA CARE communities. However, no projects received CARE grants as a supplement to the Community-Scale grants.
- All 16 projects with submitted final reports have been presented at either an EPA workshop, EPA Conference, and/or an Air and Waste Management Association (AWMA) conference.

Awarded projects are categorized geographically by EPA Region in Table 3-2. Also included in this summary is the number of final reports submitted to EPA.

Table 3-2. Awards by EPA Region

EPA Region	# Awards	# Final Reports Submitted (November 2008)
1	2	0
2	7	2
3	3	2
4	2	1
5	5	3
6	3	2
7	0	0
8	3	1
9	6	3
10	4	2

Figure 3-1. Locations of Awarded Community Monitoring Program Grants (RFA Cycles 1 and 2)



Projects awarded during the first RFA cycle are denoted with a star, while a triangle represents project awarded during the second RFA cycle. For convenience, Project IDs match those in Table 3-1.

4.0 Project Summaries

Project summaries for 35 awarded projects are presented in this section. A QAPP containing data Quality Objectives (DQOs) was prepared by each awardee at the beginning of the project. Unless otherwise stated in the text below, all project DQOs were met.

4.1 First RFA Cycle Project Summaries

Projects 1 through 16 are summarized from the submitted final reports. Additionally, Project Leads for each of the completed projects were interviewed via telephone to fill data gaps for information not explicitly stated in the final reports. All submitted final projects for the first RFA Cycle are posted at http://www.epa.gov/ttn/amtic/20032004_CSATAM.html.

4.1.1 Sun Valley, CA (Project Report ID = 1)

The Air Toxics Study in Sun Valley was conducted by the South Coast Air Quality Management District (AQMD) with the purpose of monitoring air toxics sub-regionally in Sun Valley to complement the Multiple Air Toxics Exposure Study III (MATES III). Additional air toxics monitoring was conducted near population centers surrounded by various industrial sources in the Sun Valley region of the South Coast Air Basin. Key project information is summarized below.

Table 4-1. Key Project Information for Sun Valley, CA

Sites	Pollutants	Purpose	Project Goals
Fixed sites: - LA County Fire Station - Los Angeles County Unified School District Maintenance Yard (LAUSD) Micro site: - Fernangeles Elementary School - Burbank (MATESIII site) Mobile sites: - Stonehurst Avenue Elementary School (Stonehurst) - John H. Frances Polytechnic HS (Poly High)	VOCs, Carbonyls, PM_{10}, Metals, Elemental Carbon (EC), Organic Carbon (OC), Hexavalent Chromium	Community-scale monitoring	• Identify pollutant “hot spots” within the Sun Valley region. • Characterize the seasonal or spatial trends of air pollutant compounds. • Determine the impact of air toxic exposure to Sun Valley residents residing in the area surrounding the Bradley landfill and other industrial sources within the region.

Results of the study are:

- A “hot spot” source of hexavalent chromium was identified (Superior Plating Inc.). Measurable levels of hexavalent chromium concentrations were detected immediately downwind of the source. The concentration declines steadily short distances away until they are similar to background levels found at other monitoring sites. Superior Plating Inc. is no longer in operation.

- With the exception of hexavalent chromium, the toxic air contaminant concentrations were determined to be similar across the Sun Valley region with little variance across the region.

- Average concentrations of air contaminants entering Sun Valley on the predominant winds were only slightly changed across the Sun Valley.

- The Bradley Landfill had no significant influence on the levels of toxic air contaminants.

- PM_{10} concentrations are indicative of predominant wind patterns within the sub-region of Sun Valley.

- Variations in the PM_{10} concentrations were influenced by the abundance of crustal elements.

Action(s) Taken As A Result:

- Further validation of the chrome plater as being source of hexavalent chromium will be assessed through additional sampling. Specifically, South Coast AQMD is returning to the site with the elevated hexavalent chromium readings, during the same time of year as when the elevated readings were made, for 2 months to see if levels have in fact been reduced.

- Information from this study was used to supplement a larger study MATESIII. Information will be used as part of a strategy to reduce emissions and ambient concentrations, and thereby reduce public exposures to air toxics.

Lesson(s) Learned:

- If the technology were available and economically feasible, more real-time measurements would have been taken

Technology Transfer Tools:

- Outreach Materials: A number of materials are available on the AQMD website. These include presentation materials, posters, and workshop presentations. Website: http://www.aqmd.gov/pubinfo/webpubs.htm

- Enhanced Data Visualization: Interactive Map of the Basin using data from this study and MATES-III to identify the estimated modeled carcinogenic risk from air toxics by geographic location. The map can be found at internet site: http://www2.aqmd.gov/webappl/matesiii/

4.1.2 Placer County, CA (Project Report ID = 2)

The Roseville Railyard Ambient Monitoring Program (RRAMP) is an air monitoring study designed to characterize the magnitude of diesel particulate matter (DPM) emissions emanating from the Union Pacific Rail Road (UPRR) facility located in Placer County, CA. The railyard is considered one of the largest facilities in the western United States, operating year-round, 24 hours per day and servicing approximately 31,000 locomotives per year. This project was a follow-up study to one conducted from 2000-2003, which found excessive cancer levels and risks for the Roseville community. The results presented in the final report represent the first two years of a three year study. Upon completion of the 2007 summer field monitoring project and subsequent data analysis, a three-year trends analysis will be conducted. Key project information is summarized in Table 4-2.

Table 4-2. Key Project Information for Placer County, CA

Sites	Pollutants	Purpose	Project Goals
• Upwind of RR (2 sites) • Downwind of RR (2 sites)	Black Carbon (BC), $PM_{2.5}$, NO_x, Elemental carbon (EC), VOCs, Carbonyls	Emissions Monitoring and Characterization	• Obtain ambient DPM concentrations and on-site meteorological data during three successive intensive summer air monitoring periods • Provide public feedback regarding air quality conditions • Determine the localized air pollutant/toxic impacts from the air emissions of the Union Pacific Railroad facility. • Verify the effectiveness of implemented measures to reduce toxic air emissions upon completion of year 3. • Improve the accuracy of future health risk assessments.

Results of the study are:

- A review of the 2005 sampling period wind data resulted in a modification of 2006 air toxic sampling periods for the Federal Reference Method (FRM) filter-based samplers from a 12-hour and 24-hour basis to a 7-hour nighttime basis (10:00 PM to 5:00 AM) during which time winds generally blow from the upwind monitoring sites to the downwind monitoring site. The same pairs of monitoring sites were used.

- A forest fire affected the overall air quality near the monitoring sites which resulted in an extension of the 2006 sampling period by 2 weeks.

- Three screening criteria were established to determine the conditions for which upwind versus downwind analyses were appropriate: (1) winds need to be from a semi-circular arc between 45 degrees (i.e., northeasterly) through 225 degrees (i.e., southwesterly); (2) only winds speeds from 0.5 to 4 meters per second (m/s) were used to avoid calm or windy conditions; and (3) only overnight hours from 10 PM to 5 AM PST were used.

- Variations between baseline site measurements were insignificant for all pollutants monitored while large variations were evident between baseline (up-wind) and the downwind sites. The difference between downwind and upwind concentrations represents pollutant concentrations solely attributed to UPRR Railyard air emissions.

- Air emission concentrations of BC, PM, nitric oxide (NO), and oxides of nitrogen $(NO)_x$ were significantly higher downwind from the UPRR Railyard. The downwind sites show a very high percentage of NO_x as NO, meaning that these sites are dominated by fresh emissions.

- Summer 2006 VOC results showed that only the concentrations of acrolein, acetaldehyde, and formaldehyde were higher downwind of the UPRR Railyard, while acrylonitrile, chloroform, and toluene concentrations were higher upwind. Benzene concentrations were similar at both sites, suggesting a regional source. Upon review, the Technical Advisory Committee (TAC) unanimously concluded that these results are not very useful in quantifying the impact of the UPRR Railyard emissions on ambient air quality.

- Elemental and Organic analysis of ambient particulate samples collected by UC Davis from one pair of upwind/downwind sites (2005) indicate that the coarse soil around the UPRR Railyard is highly contaminated with petroleum products and three times richer in the most toxic components (e.g., benzo{a}pyrene) than exhaust from diesel trucks. Further, the soil contains anthropogenic metals (e.g., zinc and copper) at levels much higher than that of standard soils.

- Placer County District staff have informed the public of the monitoring project results and the status of UPRR's mitigation measures by (1) participating at quarterly meetings of the City Railyard Committee; (2) annual report submissions and presentations to the District's Governing Board ; (3) presentations at city and neighborhood association meetings; and (4) hosting tours of the RRAMP monitoring sites for community organizations.

Action(s) Taken As A Result:

- The railyard has voluntarily implemented a "hood project" and reduced idling time for their trains.

- City planning on developing a "greenbelt" around the railyard. Also land near the railyard is being redeveloped from residential to commercial reducing people's exposure.

- Additional monitoring and modeling are being conducted.

Lesson(s) Learned:

- Monitoring would be focused during the hours where the wind direction was upwind and downwind of the railyard.

Technology Transfer Tools:

- Project Work Plan: The information contained in the work plan can be implemented in a similar location. A unique sampling method was used to distinguish between air pollutant emission sources. Based on the predominant wind direction pollution contributions from one source was apparently isolated by measuring upwind and downwind of the source.

- Public Outreach Initiatives: District staff provide information on the monitoring project and the status of UPRR's mitigation measures to the public and City staff in the following ways: (1) participation at quarterly meetings of the City Railyard Committee; (2) submittal of an annual report plus a presentation to the District's Governing Board every December; (3) presentations at several city and neighborhood association meetings; and (4) hosting tours of the RRAMP monitoring sites for community organizations. Public meeting schedules as well as publications and presentations can be found on the website: http://www.placer.ca.gov/Departments/Air/railroad.aspx

4.1.3 Port of Tampa, FL (Project Report ID = 3)

The Environmental Protection Division (EPD) was awarded a community assessment grant to conduct additional sampling, analysis and characterization of the HAPs based on findings of the 1996 NATA, 2001 monitoring study in-house analysis, and local toxic monitoring efforts. The project was designed to conduct more comprehensive monitoring and assessment in the Tampa Bay. Key project information is summarized in Table 4-3.

Table 4-3. Key Project Information for Port of Tampa, FL

Sites	Pollutants	Purpose	Project Goals
Commercial: Gandy Residential: Sydney NATTS Rural: Simmons Park Urban: EPC Special Studies: Ybor City	Carbonyls, VOCs, Metals (PM_{10}), PM_{10} Black Carbon (BC)	Method Development/ Evaluation Health Risk Assessment	• Monitor air toxic emissions using open path air monitoring systems, CEREX Ultraviolet (UV), OPSIS DOAS; and a Fourier Transform Infrared Spectroscopy (FTIR) • Compare CEREX UV and FTIR monitoring results to established fixed point fixed point FRM monitoring results • Identify temporal and spatial variations of air toxics • Identify and characterize the air toxics of greatest potential public health threat • Distinguish between highway and marine diesel-PM emissions. • Establish baseline concentrations for future studies • Perform sufficient quality assurance and quality control procedures to validate the data, define precision and accuracy of the data

Results of the study are:

- Established a baseline understanding of Port source contributions.

- Comparisons of the fixed point monitors to the Open Path UV monitors were successful. The data demonstrated that the open path system was able to quantify ozone and sulfur dioxide for site evaluation purposes.

- Unable to distinguish differences between highway PM and marine diesel PM emission measurements at port location.

- No statistical difference was found between monitoring sites for ambient level concentrations of sulfur dioxide and ozone at the Port of Tampa.

- Comparison of monitoring results to 1996 NATA data. NATA modeling predicted 12 compounds would exceed health benchmarks in Tampa Bay area. Monitoring found 6 additional pollutants which exceeded health benchmarks not predicted by NATA.

- The concentration of most metals found in Ybor City from crematory emissions were above the EPA non-cancer and cancer health effects guidelines. Benzene was above EPA cancer health effects guidelines.

- Large differences in the detection limits and reporting levels of toxic data from different laboratories were found.

Action(s) Taken As A Result:

- Able to use results of port study and mobile unit Air "Hound" to measure VOCs at other toxics sources. Initiated monitoring program in community near a facility that was manufacturing Spas. Were able to monitor for styrene the pollutant of interest for a month in the neighborhood. Used the monitoring results to help with permitting new facilities.

- Data was used to evaluate a permit from a nearby crematory in Ybor City.

- Information from sulfur dioxide and ozone characterization used in long range planning.

- There is a better understanding of inter-laboratory comparisons throughout Region 4.

- A Region 4 workgroup was established to evaluate and establish minimum detectable limits for analytical methods.

Lesson(s) Learned:

- The evaluation of different methods of air toxic monitoring equipment was not as intercomparable as anticipated.

- There were large differences in the detection limits and reporting levels of toxic data from different laboratories.

Technology Transfer Tools:

- Project Work Plan: The results from the CBMP study have been used for subsequent studies in Hillsborough County. .

- Air Sampling Hardware- CEREX UV and FTIR air monitoring systems

- Public Outreach Initiatives: To address concerns from the public, a "Mobile Monitoring" program has been established that can monitor neighborhoods for specific chemicals of concern.

4.1.4 Allegheny County, PA (Project Report ID = 4)

The Allegheny County Health Department (ACHD) in collaboration with Carnegie Mellon University (CMU) investigated the ambient concentrations, health risks, and sources of hazardous air toxics for the heavily industrialized county of Allegheny, PA. Key project information is summarized below.

Table 4-4. Key Project Information for Allegheny County, PA

Sites	Pollutants	Purpose	Project Goals
• Industrial influenced urban sites: 2 residential sites Neville Island • Mobile influence urban sites: 2 sites Downtown Pittsburgh • Urban Background: 1 site Carnegie Mellon University. • Rural: 1 site	Benzene, Toluene Ethylbenzene, Xylenes (BTEX) compounds, PAHs, VOCs, Aldehydes, Black Carbon (BC), diesel PM	Health Risk Assessment	• Characterize the ambient concentrations of gas and particulate air toxics. • Determine seasonal and temporal variations. • Predict human exposure and health risks associated with cancer and non-cancer using risk assessment modeling. • Screen potential pollutant pairs mixtures based on their synergistic/antagonistic impacts of air toxicity for both cancer and non-cancer risks. • Determine sources of air toxics. • Verify receptor model predictions by comparing with NATA results. • Compare predicted air toxics concentrations and health risk results with those from other areas of the county. • Determine the relative importance of regional transport and local source air toxic contributions in the county.

Results of the study are:

- Pollutants that exhibited significant spatial variability were: vinyl chloride, chloroethane, acrolein, hexane, 1,3-butadiene, carbon disulfide, *m/p*-xylene, *o*-xylene, tetrachloroethylene, ethylbenzene, methylene chloride, styrene, 1,4-dichlorobenzene, trichloroethylene, hydrogen sulfide, and diesel PM.

- Pollutants with concentrations greater than the national 75th percentile and appear to be strongly influenced by local emissions sources were: benzene, toluene, propionaldehyde, tetrachloroethylene, ethyl benzene, methylene chloride, styrene, 1,4-dichlorobenzene, trichloroethylene, and hydrogen sulfide. These results suggest there is a potential air emissions problem in southwest PA.

- The major contributors of cancer risks at all monitoring sites were diesel PM, formaldehyde, benzene, and carbon tetrachloride. Formaldehyde and carbon tetrachloride were regionally distributed, thus limiting the site to site health risk variability. Trichloroethylene and 1,4-

dichlorobenzene contributed substantial risks at the downtown site. Diesel PM is a large risk driver throughout the county but is substantially high downtown.

- The Mixture-Interactions model predicted that interactions of acrolein and formaldehyde had the greatest potential for respiratory non-cancer effects and formaldehyde and acetaldehyde for respiratory cancers.

- Predictions made using Positive Matrix Factorization (PMF) modeling indicated benzene emissions from a metallurgical-coke production facility on Neville Island pose the a significant health risk to residential sites adjacent to the island.

- Comparing baseline concentrations between sites determined that an important local source of 1,4-dichlorobenzene and trichloroethylene existed with predicted concentrations 12 and 26 times higher in downtown Pittsburgh than at other sites. The source of pollutants has not been identified; however, trichloroethene appears to be associated with short-term episodes and may be related to a periodic event such as maintenance.

- Monitored results were within a factor of 10 to NATA predicted concentrations. The NATA model appears to underpredict contributions from industrial sources and overpredict mobile contributions. The worst model performance was for chlorinated compounds.

- Temporal analysis showed the characteristic emissions pattern to be a relatively stable background concentration with short periods of higher concentrations indicative of local source plume influences. The frequency and magnitude of the plumes exhibited spatial variations and appeared to be a function of wind direction.

- For carbonyl compounds, significant seasonal variations were found for propionaldehyde and formaldehyde. Propionaldehyde concentrations were highest in the fall with the seasonal variation being more pronounced at baseline and industrial sites. Formaldehyde concentrations were higher during the summer months.

- Benzene, acetone, 1,3-butadiene, and methyl ethyl ketone had statistically significant seasonal variations for at least one measured site. Acetone and methyl ethyl ketone had high summertime concentrations while benzene levels were higher during the winter months.

Action(s) Taken As A Result:

- Prioritized air toxics for Alleghany County. Evaluating data for regulatory consideration.

- Reviewing and strengthening anti-idling laws; and extending diesel retrofits to port authority buses.

- Reducing emissions from a large coke manufacturing facility on Neville Island that had begun to take place through a consent decree.

Lesson(s) Learned:

- Would have negotiated a longer project timeline and would have worked more effectively with Allegheny County in identifying and setting up monitors in the downtown area.

Technology Transfer Tools:

- Statistical/Analytical Tools: The bootstrap method was used to determine annual average concentrations. The mixture-interactions model used as a screening tool method to analyze potential mixture interactions provides an informed basis for prioritizing particular interactions effects based on observed co-occurrence data.

- Risk Communication: The report compared concentrations with cancer and non-cancer health benchmarks, and communicated results

4.1.5 Paterson, NJ (Project ID = 5)

The overall objective of the Urban Community Air Toxics Monitoring Project, Paterson, NJ (UCAMPP) was to characterize local air toxics related to different land use patterns in a highly industrialized urban community. Key project information is summarized in Table 4-5.

Table 4-5. Key Project Information for Paterson, NJ

Site	Pollutants	Purpose	Project Goals
• Background: Chester • Urban sites: 3 sites in Paterson	VOCs, Carbonyls, Metals, Hexavalent Chromium, PM_{10} PAHs, EC/OC	Health Risk Assessment	• Characterize the spatial resolution and concentration gradients of monitored air toxics. • Identify pollutant source signatures.
		Method Development/ Evaluation	• Evaluate modeling predictions (CALPUFF) of air toxics to monitoring results. • Assess the risk of air pollutants on the local community. • Field test the Passive Aldehydes and Ketones Sampler (PAKS) and compare results against those taken simultaneously with conventional sampling method TO-11A. • Evaluate the hexavalent chromium extraction method under development by EOSHI. • Develop tools that the NJ Department of Environmental Justice (NJDEP) and the local community could use to better address exposure and risk issues related to air toxics. • Identify and implement risk reduction strategies.

Results of the study are:

- Emissions from traffic, commercial activities, and the operation of industrial facilities significantly impact the air quality of Paterson.

- Temporal variations were seen for air pollutant levels in Paterson. Concentrations were higher during weekdays than weekends relative to the background site.

- Hexavalent chromium levels were significantly higher during the summer months, indicating the formation of hexavalent chromium through photo-oxidation for all sites.

- Higher concentrations were observed in winter than in summer for elemental carbon, carbonyls, many elements and most PAHs, indicative of higher combustion-source emissions. Meteorological factors such as lower photo-activity, lower mixing height, stagnation, and inversion may also contribute.

- The CALPUFF model predictions for benzene, and *p*-dichlorobenzene were in good agreement with monitored values. Predicted toluene concentrations were significantly different than monitored results.

- Annual average concentrations of acetaldehyde, acrolein, arsenic, benzene, 1,3-butadiene carbon tetrachloride, chloroform, hexavalent chromium, formaldehyde, and propylene were above NJDEP cancer health benchmark concentrations at all monitoring sites.

- Additionally, the annual average concentrations of *p*-dichlorobenzene, tetrachloroethylene, ethyl benzene, naphthalene were above the NJDEP cancer health benchmark in Paterson and not at the background site. Non cancer health benchmark was exceeded for annual average concentrations of chlorine in Paterson and for acrolein in Paterson and the background site.

- For acrolein, the noncancer risk was similar in Paterson and the background site.

- The combined cancer risk in Paterson was more than two times that of the background site; 846 in a million vs. 318 in a million respectively

- The PAKS method produced higher background levels than conventional sampling (TO-11A) possibly because the PAKS samplers are not air tight.

- Formaldehyde, acetaldehyde, and propionaldehyde concentrations were 4-5 times higher than PAKS.

- The EOSHI extraction method for hexavalent chromium produced promising results. An additional study, the "Development and Optimization of a Sampling and Analytical Method to Measure Hexavalent Chromium in Ambient Air" is being conducted to further improve the method. The EOHSI analytical method for hexavalent chromium is being compared to the NATTS analytical method in a newly awarded USEPA grant.

- The average concentration for acrolein measured by TO-15 was 2-3 times higher than PAKS, suggesting a potential positive artificial formation of acrolein in canister during storage.

- The overall concentrations precision was better using the conventional (TO-15) method.

Action(s) Taken As A Result:

- Risk reduction strategies that have been identified/implemented include the following:

- Identification of which industrial processes would benefit from a pollution prevention audit.
- Identification of fleets eligible for retrofits.
- Modeling efforts in conjunction with stack tests for grandfathered facility that emits lead. The second set of stack test results should be available in early 2009.
- Identification of an area to place a lead monitor near three lead emitters
- Educated the hospital on the dangers and legal implications of crushing mercury-containing light bulbs on site. They indicated they would not longer crush the bulbs on site.
- Handout EPA pamphlets about air pollution reduction strategies.
- Handout information on 1877-Warn-DEP
- Handout information on NJ's anti-idling legislation
- Sold some NJDEP anti-idling signs for facilities to hang up in Paterson and at their other NJ locations

- Using the monitoring equipment for additional sampling of hexavalent chromium with plans for additional research/method improvements.

- Used information from this project to help design an additional monitoring project.

Lesson(s) Learned:

- A detailed emissions micro-inventory should be completed before selecting analytes and monitoring locations. Such an inventory requires site visits.

- Site visits provide an excellent opportunity for identifying risk reduction strategies, outreach, and education.

- Use PM_{10} samplers & Met station in current Cr6 project

- Expand institutional knowledge at NJDEP

- Improve techniques for EI, site visits, sample tracking, QA/QC etc.

- Don't rely on one database to ID all potential sources

- Importance of drive through, site visits, e.g., potential lead problem

- Importance of weekly monitoring over the course of 1 year (e.g., observed high concentrations Cr6 during summer at all sites & observed high concentrations of *p*-dichlorobenzene and other compounds at site C

Technology Transfer Tools:

- <u>Risk Communication:</u> The report compared concentrations with cancer and noncancer health benchmarks, and communicated results

- Outreach Initiatives: A news release was published at the beginning of the study in 2005. Multiple presentations and posters communicating the findings from this study have been given at local, regional, and national meetings. There is a scientific website at http://www.state.nj.us/dep/dsr/paterson/

4.1.6 Milwaukee, WI (Project ID = 6)

The Wisconsin Department of Natural Resources (WDNR) conducted a community scale risk assessment to assess new modeling techniques and to better address the public's concern and interest in the safety of the air that is breathed. Three studies were conducted to investigate the relationship between benzene concentrations and distances from heavily trafficked roadways. Key project information is summarized in Table 4-6.

Table 4-6. Key Project Information for Milwaukee, WI

Site	Pollutants	Purpose	Project Goals
• Study 1: 10 sites North and South along and parallel to I-94, south of Menominee Valley • Study 2: 9 sites East and West along an isolated section of I-94 between Milwaukee and Madison • Study 3: 6 sites same as Study 1, plus 3 more sites in area	BTEX compounds	Method development/ Evaluation Health Risk Assessment	• Develop in-house analytical methods for passively sampled canisters and adsorbent tubes using existing analytical systems. Test the passive air sampling method (PASM) to establish comparability to existing active sampling systems (auto-GC) used by the Wisconsin DNR. • Deploy the PASM in a field study and use this information to optimize designs to support risk assessment modeling. • Compare modeled predictions to monitored results.

Results of the study are:

- Benzene concentrations predicted by the model were two orders of magnitude lower than the monitored results.

- Monitored benzene concentrations exhibited higher temporal variations than spatial variations.

- Higher benzene concentrations were observed on parallel city roadways west of I-94 rather than at the sites located on I-94. This suggests that urban traffic routes may have significant mobile source emissions, even though these routes have less traffic volume.

- Unexplainable differences in the ratios of toluene: benzene concentrations were noted between study locations and between sites with the studies. Rural toluene:benzene ratios were reversed, with most benzene concentrations exceeding observed toluene concentrations.

- Benzene concentrations at all study sites were higher than the one-in-a million risk concentration of 0.128 $\mu g/m^3$. The results presented here indicate that that risk above the one-in-a-million risk concentration benchmark are present at distances up to 600 meters from the heavily trafficked highway.

- PASM for short-term sampling and passive adsorbent tubes for longer timed measurements were successfully developed.

- Although biased low, PASM generated comparable data compared to results obtained using conventional auto GC and canister sampling techniques.

- Although background concentrations of target pollutants were low using PASM, the values must be included when processing the emissions data.

- Diffusive Rate Constants (DRC) for the PASM could not be verified. Thus literature DRC need to be employed to calculate all ambient concentrations.

- The Regional Air Impact Modeling Initiative (RAIMI) was used to evaluate risk. The modeled sharp concentration gradient across the study was inaccurate when compared to monitored results. Although a gradient was present, it was not the magnitude or at the location estimated by the model.

- Contrary to the predicted model, observed maximum concentrations were found at monitoring sites away from the interstate.

- Monitored benzene concentrations exceeded modeled estimates.

Action(s) Taken As A Result:

- Will continue model validations.

- Additional study looking at benzene using the same technology.

- Develop better tools for roadway characterizations.

- Information will be used to develop emission reduction strategies.

Lesson(s) Learned:

- None identified; overall, happy with project

Technology Transfer Tools:

- Statistical Tools: A series of statistical tools were developed that can be transferred to a similar study.

- Risk Communication: The report compared concentrations with cancer and noncancer health benchmarks, and communicated results

- Air Sampling Hardware. Housing for passive sampling tubes and sampling canisters were developed for roadside air toxics collection.

4.1.7 Detroit, MI (Project ID = 7)

The Michigan Department of Environmental Quality (MDEQ) established two new monitoring stations to examine the impact of air toxics emissions from mobile and stationary sources on the air quality in the Del Ray area in Detroit and near the international border crossing at the Ambassador Bridge. This project, *Delray Community Monitoring Project,* collected measurements that will be used to better understand the impact from these sources on ambient air. Hourly $PM_{2.5}$, trace CO, BC and EC/OC measurements were collected. Speciated organic carbon measurements were collected at Newberry School. This project also investigated the feasibility of using continuous formaldehyde samplers in an ambient monitoring program. Key project information is summarized in the table below.

Table 4-7. Key Project Information for Detroit, MI

Site	Pollutants	Purpose	Project Goals
Newberry School	-Speciated Organic Carbon -$PM_{2.5}$ -$PM_{2.5}$ hourly -Black Carbon -Metals ($PM_{2.5}$ TSP) -trace CO -continuous EC/OC	Sample analysis	• Generate actual ambient measurements of the air quality in the area. • Develop background levels in an area with expanding transportation activities. • Assess impact from delays at the Ambassador Bridge on air quality in the area. • Complement the Detroit Exposure Aerosol Research Study (DEARS). • Complement the Canadian bridge crossing monitoring project. • Investigate middle and micro variability in air toxics concentrations. • Field test continuous formaldehyde monitors, and trace carbon monoxide monitors.
Ambassador Bridge	-Black Carbon -trace CO -$PM_{2.5}$ -$PM_{2.5}$ hourly		• Understand diurnal variations in CO and formaldehyde and how they relate to other mobile sources oriented pollutants such as carbon black, and continuous fine particulate. • Generate a database to support source apportionment estimates of the contributions from motor vehicle and diesel exhaust to air quality. • Identify other possible tracer compounds for diesel by comparing speciated organic carbon measurements from Del Ray, an area heavily impacted by diesel with Allen Park, a population-oriented mobile source dominated site, the St. Louis super site and with the Class 1 Seney Wildlife Refuge

Results of the study are:

- The continuous formaldehyde units are not reliable enough for unattended operation in the field. The peristaltic pump requires constant maintenance and is not practical in field operations. It should be replaced with a syringe pump. Additionally, the instruments need a better mechanism to precisely regulate flow rates and optimize monitor performance. Reliance on the introduction of bubbles into the system to set the flows when bubbles cause deterioration in performance is contra indicated;

- Most measurements met or exceeded the NATTS data capture goal of 80%. However, vandalism at Newberry reduced data capture for several parameters in 2005. Additionally, instrument breakdown and lack of a spare unit limited the capture of EC/OC data at Newberry in 2007. The co-located $PM_{2.5}$ TEOM at FIA serves as the spare for MDEQs network;

- The nonparametric linear regression was shown to be a valuable tool in the identification of potential source emissions on ambient air quality. BC data identified the DIFT area as impacting the Newberry site and the Ambassador Bridge as impacting the FIA/Lafayette site. This also shows that these two new sites are sited properly;

- Elevated levels of CO, EC, $PM_{2.5}$ and BC were observed during the morning rush hour at Newberry School. However, any impact from the evening rush hour was diffuse. FIA/Lafayette also experienced elevated levels of CO, BC and $PM_{2.5}$ during the morning rush hour, confirming the mobile source impacts on these two stations; and

- Concentrations from mobile source emissions were higher near the Ambassador Bridge than at the Newberry site. BC concentrations were increased during the summer months at both sites, with higher levels observed during summer 2007 than during summer 2006.

Action(s) Taken As A Result:

- Continued monitoring at Newberry and FIA sites;

- Use of the project's results on the ongoing project "Analysis of Air Toxics Data: Quality Assurance Implications, Source Apportionment Uncertainty Analysis and Updated Risk Assessment";

- Utilization of nonparametric linear regression for "minute" data using a larger data set;

- Leverage of the acquired instrumentation in this grant by Region 5 EPA's Regional Applied Research Effort (RARE) grant to study the impact from locomotive emissions on ambient air quality;

- Creation of an upwind site to determine regional EC/OC (at Tecumseh);

- Development of a communication strategy to inform the public about the results;

- Building the capacity of source apportionment modeling in-house and enhanced statistical analysis; and

- Improvement of operating techniques and updating SOPs for the EC/OC samplers

Lesson(s) Learned:

- Several months of speciated organic carbon data were lost when the sampling site was vandalized. Security measures have since been installed to prevent the event from reoccurring;

- Assuming the formaldehyde samplers could be operated in the field was erroneous. They should have been initially deployed the to Filley Street site and not tested until the permeation source was repaired. The instruments need a better mechanism to precisely regulate flow rates and optimize monitor performance. Reliance on the introduction of bubbles into the system to set the flows when bubbles cause deterioration in performance is contra indicated. Additionally, contrary to manufacturer's recommendations, the inlet filters should not be reused;

- The scrubber and electronics should be housed above all fluid handling systems to minimize damage when leaks occur;

- Precision of the continuous samplers can be quite poor. However, by performing a step-wise optimization routine, precision can be improved. More precise control of factors that impact performance need to be added to the instruments. Once these modifications are made, a detailed SOP describing in detail every nuance of the optimization needs to be written; and

- Monthly conference calls with the formaldehyde sampler vendor should have been initiated sooner. The vendor should have been notified upon receiving the shipment a list of required spare fittings that were missing.

Technology Transfer Tools:

- <u>Statistical Tools:</u> A series of statistical tools were employed to analyze the round robin results. A statistical technique developed by CARB was used for the performance evaluation. This tool can be implemented elsewhere. Additionally, nonparametric linear regression was used by LADCO to analyze the BC and EC/OC data collected by this project. This technique could be transferred to other areas.

4.1.8 Chicago, IL (Project ID = 8)

The Large Area Monitoring Program (LAMP) project was designed to test an innovative diffusion tube (passive sampling) technology for measuring ambient air concentrations of the BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), and to perform a saturation study that would permit a preliminary characterization of BTEX concentrations throughout the Greater Chicago Metropolitan area. The project was implemented in two phases: a long-term 12-month study (Phase One), and a saturation study (Phase Two) of the Chicago metropolitan area. Key project information is summarized in Table 4-8.

Table 4-8. Key Project Information for Chicago, IL

Site	Pollutants	Purpose	Project Goals
Phase One • Near Chicago O'Hare Airport: Schiller Park • Urban Core: Chicago-Jardine • Downwind of Urban Core: Northbrook **Phase Two** • Phase One sites and 8 additional sites across metro-Chicago • 4 sites South of Chicago	BTEX compounds; VOCs	Method development/ Evaluation Assess human exposure	• Determine human exposure to BTEX with long-term monitoring (one year). • Provide baseline data to determine the effectiveness of future reduction strategies. • Establish average annual concentrations. • Compare the diffusion tube results to those obtained from VOC canisters and field gas chromatographs. • Determine spatial variability. • Characterize ambient air toxic concentrations near significant point sources, Chicago O'Hare Airport and expressways. • Identify "hot spots."

Results of the study are:

- BTEX concentrations near Chicago O'Hare Airport were 50% higher than those found at Northbrook or Chicago-Jardine, which were very similar to each other. The probably cause was associated to both expressway/arterial traffic and to airport traffic.

- Significant temporal variations in the BTEX concentrations were determined with the highest monthly concentrations being approximately 100% higher than the lowest months. The highest concentrations were found in January-February and August-September and the lowest were in March-April.

- The study results comparing the diffusion tube sampling method and conventional gas chromatograph monitoring were inconsistent from the previous findings. For the LAMP II study, the diffusion tubes sampling method generally overpredicted the BETX concentrations as measured by the field gas chromatographs. Further study is needed.

- Site-to-site variations in air pollutant levels were found during Phase Two sampling. In general, areas near expressways are likely to experience the highest levels of BTEX and the urban population areas are markedly higher than background. Emissions from Chicago O'Hare Airport and the traffic in and around it result in higher BTEX levels than were found in urban population areas.

- Phase Two found similar results with the three traffic oriented sites being the highest of all 15 study sites and to be approximately 50% higher than the urban population sites.

Action(s) Taken As A Result:

- Implementation of a second monitoring site at the airport and recommendations to FAA that when expansion of the airport occurs that air toxic emissions are included in the Environmental Impact Statement.

- Project design completed for a Phase 3 study

- The diffusion tubes will be used to collect additional grab samples for benzene evaluation
- Plan to show potential reductions in air toxics emissions following shut down of steel mill.

Lesson(s) Learned:

- A larger scope during the project using more sites and duplicative analysis would have enhanced the number of data points

Technology Transfer Tools:

- Air handling equipment: Passive air sampling using diffusion tubes was evaluated against conventional canister sampling collection and an on-site continuous gas chromatograph BETX analyzer.

4.1.9 Phoenix, AZ (Project ID = 9)

The Joint Air Toxics Assessment Project (JATAP) was a three-year project designed to assess cancer and noncancer human health risks from air toxics in the greater Phoenix Metropolitan area. JATAP is a consortium of federal, state, local, and tribal air pollution control officials from EPA Region 9, EPA Office of Air Quality, Planning, and Standards (OAQPS), Arizona Department of Environmental Quality (ADEQ), Maricopa County Environmental Services Division, Pinal County Air Quality Control District (PCAQCD), Intertribal Council of Arizona, Gila River Indian Community (GRIC), Salt River–Pima Maricopa Indian Community (SRPMIC), and Fort McDowell Yavapai Nation. Key project information is summarized in Table 4-9.

Table 4-9. Key Project Information for Phoenix, AZ

Site	Pollutants	Purpose	Project Goals
• Suburban/residential: Salt River St. Johns Queen Valley • Urban: NATTS South Phoenix Greenwood West Phoenix	VOCs, PAHs, carbonyls, metals (PM)	Health Risk Assessment	• Monitor and collect ambient air samples for pollutant concentration determination. • Validate the gaseous air toxics data. • Characterize the spatial and temporal variation of the air toxics concentrations. • Assess the cancer risks to the Phoenix community from the ambient air toxics concentrations. • Communicate JATAP findings with the Phoenix community.

Results of the study are:

- Sites located closer to the urban core of Phoenix had the highest annual average pollutant concentrations, while suburban sites had lower annual average concentrations.

- Phoenix urban concentrations of 1,3-butadiene, acetaldehyde, formaldehyde, chloroform, benzene, and tetrachloroethylene were above the 75th percentile national urban scale.

- Air toxics annual average concentrations were often higher than the one-in-a-million cancer benchmark for: 1,3-butadiene, acetaldehyde, benzene, carbon tetrachloride, chloroform, and tetrachloroethylene.

- Carbonyl compound concentrations at one urban site (Greenwood) were higher than those at other sites and were above the national 95th percentile. This suggests that there are additional emission sources at a local scale most likely from the nearby mobile sources extremely close to the monitor.

- Chronic exposure to formaldehyde levels at one urban site (Greenwood) exceeded non-cancer health effect reference concentration.

- Modest to good risk assessment model predictions were determined for carbon tetrachloride, acetaldehyde, benzene, dichloromethane, and formaldehyde.

- JATAP 2005 monitored results were within a factor or two above or below 1999 NATA modeled predictions.

- At all sites, concentrations of 1,3-butadiene, dichloromethane, tetrachloroethylene, trichloroethylene, and BTEX were higher in the cooler months than during the warmer months.

- In 2005, no statistically significant differences in air pollutant levels were observed between weekend and weekday time intervals.

- Benzene concentrations at the Supersite decreased between 1995 and 2005 by more than a factor of three (from 7.7 $\mu g/m^3$ to near 2 $\mu g/m^3$). This drop is consistent with efforts over the past decade to reduce benzene in gasoline, paint, and other consumer products. Formaldehyde concentrations are similar between the two time periods while acetaldehyde concentrations in 2005 are significantly lower than a decade ago.

- To communicate the project results to the Phoenix community, JATAP has presented the findings at scientific meetings. The presentations are posted on the Internet.

Action(s) Taken As A Result:

- DEQ helped the tribes with developing an emissions inventory;

- Continued discussion about an additional collaborative effort, perhaps adding additional pollutants or extend to other media.

- Project helped raise awareness of anti-idling for the school buses and more buses will be undergoing diesel retrofits.

- Evaluating other sources of emissions on tribal lands such as unpaved roads and agricultural burning.

Lesson(s) Learned:

- Low to non-detected urban Air Toxic concentrations need to be monitored using more sensitive monitoring equipment.

- Solicit additional funds for data analyses and risk analysis

Technology Transfer Tools:

- Statistical Tools: A series of statistical tools were developed that can be transferred to a similar study.

- Risk Communication: The report compared concentrations with cancer and noncancer health benchmarks, and communicated results

4.1.10 Denver, CO (Project ID = 10)

Denver's previous air toxics monitoring campaigns determined that mobile source air toxics and ozone precursor concentrations were as high as or higher than larger metropolitan areas such as Houston, TX or Los Angeles, CA. A second campaign found significant spatial distributions in air toxics concentrations over short distances within the city. Denver's Community Based Air Toxics Monitoring project was established to verify the spatial and temporal characteristics of air toxics across a relatively small geographic area (Denver County). Detailed statistical analyses were performed for all reported results, predictions, and sampling methods. Key project information is summarized below.

Table 4-10. Key Project Information for Denver, CO

Site	Pollutants	Purpose	Project Goals
• Residential near major roadways • Heavy industrial • Suburban light industrial	BTEX (1-hr, 4-hr, 24-hr), carbonyls (4-hr, 24-hr), ozone, black carbon (BC), carbon monoxide (CO)	Monitoring and Method development/ evaluation	• Monitor ambient air to determine the temporal and spatial variability of HAPs. • Establish baseline data for future emission reduction strategies. • Evaluate innovative sampling techniques against conventional methods. • Evaluate monitored results to model predictions. • Compare the monitored data with National Air Toxics Assessment and local AERMOD results for Denver.

			• Statistically determine if relationships exist between toxics and source categories. • Educate the community on the effects that personal habits have on air toxics concentrations.

Results of the study are:

- BTEX and CO emissions are the dominant air pollutants from mobile sources in Denver, and also have similar diurnal patterns with the lowest concentrations found in early afternoon.

- Daily (i.e. 24-hr) average concentrations from a single monitoring site were inadequate to characterize urban exposures based on the statistically significant spatial and temporal biases observed for all pollutants at all sites. The diurnal biases have implications in assessing risks based on 24-hr average ambient exposures.

- Differences in concentrations were also observed when comparing monitored values by season and day of week.

- Continuous sampling via Auto-Gas Chromatograph (GC) was determined to be a reliable, practical, and feasible means of collecting and analyzing time-resolved data. Short-term spikes in BTEX from cultural or sporting events were identified and can influence 24-hr average concentrations.

- The AERMOD model generally underpredicted ambient air toxic concentrations, however the model was able to correctly predict pollutants' spatial distributions. Model-to-monitor ratios for toluene and xylenes were lower than for benzene; it appears that toluene and xylenes are underestimated in the emissions inventory. DEH suspects it is a result of excess emissions from a numerous number of area sources.

- The diurnal pattern of CO, BTEX, and BC is different at the heavily industrial site than at the residential site near major thoroughfares; the morning peak at the industrial site occurred two hours earlier and had a less pronounced evening rush hour. This is indicative of fleet driving patterns and is a reflection of the mixed-use zoning in the area.

- Presentations and resources are available on the Denver Environmental Health Web site and numerous Internet sites.

Action(s) Taken As A Result:

- Made people aware of anti-idling laws in Denver, and schools agreed to follow these laws.

- As a result of increased modeling capabilities, the local agency is more confident about being prepared when additional roadway expansions occur within Denver.

Lesson(s) Learned:

- If not using an EPA contract lab, inter-laboratory sample analyses and Proficiency Tests should be performed before, during, and after the project.
- Real-time data, while valuable for understanding diurnal variations, produces a large amount of data that almost always needs to be reduced. The time required for this was underestimated for this project.
- Would have delayed the start of the project an additional three months.

Technology Transfer Tools:

- Air Sampling Hardware: An auto-GC was used for continuous sampling. An aethalometer was used to measure BC.
- Data Visualization: Maps of predicted vs. monitored concentrations were included for: Acetaldehyde, Benzene, Carbon Monoxide, Diesel Particulate Matter, Formaldehyde, Toluene, and Xylenes.

4.1.11 Cherokee Heights, OK (Project ID =11)

The Cherokee Nation Environmental Program (CNEP) conducted ambient air sampling in the community of Cherokee Heights, OK over an 18-month period, from September 2006 through March 2008, focusing on volatile organic compounds. Key project information is summarized in Table 4-11.

Table 4-11. Key Project Information for Cherokee Heights, OK

Site	Pollutants	Purpose	Project Goals
• Rural: Cherokee Heights (CNEP) • Suburban: Tulsa City (TSOK) • Urban: Tulsa City (TOOK) TUOK)	VOCs, Carbonyls, BTEX	Health Risk Assessment	• Monitor ambient air emissions and meteorological data in the Cherokee Heights community. • Determine the spatial and temporal characteristics of the air pollutants. • Integrate the VOC concentrations with emissions, meteorological and risk information for subsequent comparison with the nearby city of Tulsa, OK.

Results of the study are:

- All four sites had significant concentrations of acrolein, benzene, 1,3-butadiene, and carbon tetrachloride. In addition, tetrachloroethylene and *p*-dichlorobenzene were high at the three Tulsa sites, while acetonitrile was measured high at TSOK and TUOK.

- The highest daily average concentration of acrolein was found at CNEP. TOOK calculated the highest daily average concentration of benzene, while TSOK and TUOK calculated the highest average daily concentrations of acetonitrile.

- Acrolein, benzene, and carbon tetrachloride failed all of their HAP screening values at all four sites.

- Seasonal average concentrations of acrolein were consistently higher than the intermediate health benchmark risk factor for all four sites.

- At CNEP, carbon tetrachloride calculated the highest study chronic cancer risk, while acrolein exhibited the highest study noncancer risk.

- The highest toxicity-weighted emissions for cancer-causing pollutants in Mayes County were arsenic, hexavalent chromium, and benzene. In Tulsa County, the highest toxicity-weighted emissions for a cancer-causing pollutants were benzene, 1,3-butadiene, and lead.

- Acrolein had the highest toxicity-weighted emissions among the non-cancer pollutants for all four sites.

- Toxicity-weighted emissions analysis prioritized metals such as lead, cadmium, arsenic, and manganese are toxic pollutants affecting the Cherokee Heights area.

Action(s) Taken As A Result:

- Additional monitoring for metals was initiated at the end of this project and in order to respond to public concerns about industry in the area.

- Additional monitoring to prepare for the upcoming lead NAAQS

Lesson(s) Learned:

- Would have requested additional funds and negotiated a longer project timeline.

Technology Transfer Tools

- <u>Risk Communication:</u> The report compared concentrations with cancer and noncancer health benchmarks, and communicated results

4.1.12 Portland, OR (Project ID = 12)

The Oregon Air Toxics Program established a systematic risk-based process for identifying and reducing public health problems caused by air toxics in communities throughout the state. The program's primary approach was to identify toxic air contaminants of concern in an urban area, determine their sources, and develop strategies that will reduce exposure to the Portland community. Key project information is summarized below.

Table 4-12. Key Project Information for Portland, OR

Site	Pollutants	Purpose	Project Goals
• Inner City • High residential & industrial • Residential • Central business district • Suburban residential	Carbonyls, VOCs, PAHs, metals (PM_{10}), black carbon (BC), hexavalent chromium	Monitoring Modeling	• Measure ambient air toxics concentrations. • Characterize pollutant concentration variations across the urban airshed and in predicted problem areas. • Provide 2005 ambient air toxic data for modeling by EPA (ASEN) and ODEQ (CALPUFF, PATA). • Field test a continuous Pneumatic Focusing Gas Chromatograph (PFGC). • Estimate Black Carbon emissions from woodstoves using a continuous aethelometer.

Results of the study are:

- Monitoring results indicated that mobile sources are the primary source of air toxics in the Portland airshed and the concentrations are homogeneous.

- Ambient air VOC concentrations for some compounds of concern could not be accurately measured since they were below the maximum detection limit for all sites.

- The monitored annual averages compared to Oregon's established Ambient Benchmark Concentrations (ABC) showed that concentrations of arsenic, cadmium, and acetaldehyde were above the ABC at all sites. Benzene and PAH annual averages are suspected to be above the ABC.

- Higher concentrations of manganese and nickel were found at one site that is in the vicinity of a foundry and other metal working facilities.

- The presence of hexavalent chromium was found at the NW Portland site. The source is unknown since there are no chromium electroplaters in the vicinity.

- Many of the core VOC concentrations measured using the PFGC were below the maximum detection limit for this instrument. The PFGC was only at the North Portland site.

- Contamination of some of the VOC canister sampling hardware invalidated over 25% of Benzene concentration results.

- PAH annual average values are questionable because quality controls (holding times and surrogate recoveries) were not always within acceptable limits.

- At the time of the report, continuous aethelometer results were not available.

Action(s) Taken As A Result:

- Looking at all phases of air toxics through additional monitoring and emission inventory.

- Benzene content in gasoline was reduced.

- Local advisory committee was tasked with reducing emissions in the Portland area within 10 years.

Lesson(s) Learned:

- Sampling contamination from a faulty collection process resulted in 75% of the benzene results being invalid and caused delays in determining annual averages. In the future there will be scrutiny of analysis results within a shorter period as an improvement to the QC/QA procedures.

- Some issues with ODEQ laboratory were identified which should be corrected in their new facility.

Technology Transfer Tools:

- Air Sampling Hardware: Oregon DEQ field tested a Pneumatic Focusing Gas Chromatograph for continuous speciated VOC analysis at one location.

- Data Visualization: Previous air quality maps were developed under PATA to give community members a much better picture of concentration levels and gradients across the city.

4.1.13 Wilmington, DE (Project ID = 13)

The Delaware Air Quality Management Section (AQMS) was awarded additional funding for an ambient air monitoring study in Wilmington, Delaware as a means of enhancing previously collected data in 2003. The enhanced Delaware Air Toxics Assessment Study (E-DATAS) was conducted through collaborative partnerships with University of Delaware (U of D) and Duke University (Duke) research teams. The study focused on two monitoring strategies: fixed stationary and mobile. The fixed monitoring site was pre-existing from DATA 2003 to have slightly elevated ambient air toxins compared to the other fixed sites. For E-DATAS, a mobile unit was included for real-time measurements within the Wilmington area. Key project information is summarized in Table 4-13.

Table 4-13. Key Project Information for Wilmington, DE

Site	Pollutants	Purpose	Project Goals
• Mobile Unit	Hexavalent chromium, trivalent chromium, formaldehyde, ozone, PM (aerosol) 12 nm to	Methods development/ evaluation Community assessment	• Mobile Unit: Characterize industry within 10 mile radius of MLK to ID industrial sources of ambient aerosols. • MLK site: Characterize the seasonal ambient variability of ambient aerosols (50nm-770nm) using a Rapid Single-

	270 nm		particle Mass Spectrometer (RSMS-3) developed by the University of DE. • Utilize and integrate the federal- and state-run ambient measurements
• MLK Site	PM (aerosol) 50nm -770 nm, Metals, CO, NO_x		performed at MLK into EDATAS. • Develop long-term partnerships with the research community to provide data and to ensure the public's understanding of Delaware's air quality.

Results of the study are:

- In broad estimates, the Wilmington aerosol is characterized as follows:
  - Secondary aerosol of regional origin constitutes about 38% of PM_1.
  - Secondary aerosol of local origin constitutes about 27% of PM_1.
  - Biomass burning contributes about 14% of PM_1.

The following results were observed for the Martin Luther King (MLK) site:

- Wood and biomass burning impact the air quality at the MLK site.

- Multiple local industrial combustion processes to the east and southwest contribute to the MLK site signature.

- The MLK site is impacted by diesel vehicle exhaust by emissions from a nearby DART bus depot, and possibly from industrial plant combustion when the wind direction is eastward.

- The MLK site measurements have signatures from stack emissions where aliphatic amines have been added during the scrubbing process used to remove SO_2 from the effluent.

- Particle composition signatures associated with emissions from the Delaware City Refinery, CitiSteel, and the Delmarva Edgemoor Power Plant were detected in the ambient air sampled at the MLK site. Bag sampling at the CitiSteel site confirmed this source signature and association.

- Ambient aerosol particulates with local industrial emissions have characteristic concentration increases in the early morning, late evening, or both.

- Signatures from particles thought to be emitted from large ships were measured at the MLK site. Wind dependence (110°) indicates that the Port of Wilmington is a possible source for the MLK site ambient measurements.

The following results were observed for the Mobile site:

- Aerosol number concentration, hexavalent chromium, and $PM_{0.27}$ varied significantly by location.

- Formaldehyde and ozone concentrations exhibited lower variability than aerosol concentrations.

- Only formaldehyde concentrations followed seasonal trends: highest during the spring and summer and lowest in the winter.

- Comparisons of the mobile data to the federal/state-run network at the MLK site indicated that CO and NO_x concentrations measured at MLK do not correlate well with the mobile results for formaldehyde, $PM_{0.27}$, or hexavalent chromium.

- Both formaldehyde and $PM_{0.27}$ are well correlated with the MLK measures for PM_{10} and $PM_{2.5}$, which suggests that $PM_{0.27}$ and formaldehyde are influenced by long-range sources.

- Formaldehyde and $PM_{0.27}$ show a positive correlation with temperature, suggesting the photochemical activity.

Action(s) Taken As A Result:

- Additional funding was received to develop internal capabilities for measuring near real-time VOC measurements in the Wilmington

- There is potential for expansion of the DE branch's expertise to support other agencies in Region 3 with project planning or a workbook.

- Reduction in the public's exposure to air toxics is anticipated through better strategic planning and monitoring.

Lesson(s) Learned:

- If funding were available DE Air Surveillance Branch would use the Public Affairs Department to continue the outreach associated with this project.

- It may have been a good idea to negotiate a longer project period with EPA.

- Potential proprietary issues have arisen in the sampling technology that if known ahead of time, may have resulted in a different partnership

Technology Transfer Tools:

- <u>Statistical Tools:</u> A series of statistical tools were developed that can be transferred to a similar study.

- <u>Risk Communication:</u> The report compared concentrations with cancer and noncancer health benchmarks, and communicated results.

- <u>Air-Monitoring Equipment</u>: The instruments for chromium and formaldehyde measurements were specifically developed for this study. Ambient aerosols were characterized using a real time single particle mass spectrometer developed by the University of DE.

4.1.14 Austin-Round Rock, TX (Project ID = 14)

The Austin-Round Rock Toxics Study (ARTS) is an exploratory study of air toxics levels in the Austin-Round Rock area. The EPA grant awarded to the Capital Area Council of Governments (CACOG) provided for the acquisition of field sampling equipment to outfit five air toxics sampling sites and to operate the sampling equipment for one year. Key project information is summarized in Table 4-14.

Table 4-14. Key Project Information for Austin-Round Rock, TX

Site	Pollutants	Purpose	Project Goals
• Residential • Urban • South of Urban Center	VOCs, Carbonyls, PM_{10} metals, Hexavalent chromium	Health Risk Assessment	• Identify any ambient air toxics that might pose a significant health risk. • Assess cancer and non-cancer health risks of the ambient air toxics. • Establish a baseline for measurements. • Compare monitored results to model (NATA) predictions. • Compare the study's results to that of similar sized cities.

Results of the study are:

- Acrolein concentrations were significantly higher compared with most other U.S. cities. The source of the pollutant is unknown. Acrolein concentration levels were above the noncancer reference concentration (RfC) and exceeded the RfC by more than 100 times at every monitoring site.

- Low between-site variability for carbon tetrachloride, formaldehyde, and acetaldehyde suggested that the sources were either uniformly distributed or that the measured levels are highly impacted by background concentrations.

- BTEX Compounds exhibited two-fold variability between monitoring sites.

- Except for the high acrolein concentrations, ARTS core air toxics levels were approximately equal to or less than those cited for other U.S. cities.

- Poor agreement was found between monitored and NATA modeled predictions for acrolein, trichloroethylene, arsenic, and cadmium.

- Monitored-to-modeled concentrations of VOCs and carbonyls were in better agreement than those estimated for trace metal estimates.

- NATA total excess cancer risk estimates were in good agreement with the total excess risk estimates derived from ARTS measurements.

- HAPS displaying the highest cancer risk were carbon tetrachloride and benzene followed by 1,3-butadiene, and acetaldehyde.

- The ARTS measurement results were in good agreement with 1999 NATA based on air pollutant identification, air toxic concentration estimates, and total risk estimates.

Action(s) Taken As A Result:

- There will be a follow-on project using TCEQ funds to develop a methodology for acrolein sampling.

Lesson(s) Learned:

- If CAPCOG knew that the study was going to be only 1-year, they would have contracted out more of the work to ensure sampling, analysis, and data analysis errors and scope would be limited.

Technology Transfer Tools:

- Statistical Tools: A series of statistical tools were developed that can be transferred to a similar study.

- Risk Communication: The report compared concentrations with cancer and noncancer health benchmarks, and communicated results.

4.1.15 Spokane, WA (Project ID = 15)

In 2005, the community monitoring project was undertaken by Washington State University and the Laboratory for Atmospheric Research to provide airborne toxic measurements to characterize exposure levels, better understand temporal and spatial trends, and provide measurement data for air quality model evaluation. Key project information is summarized in Table 4-15.

Table 4-15. Key Project Information for Spokane, WA

Site	Pollutants	Purpose	Project Goals
• Urban Industrial • Mixed Purpose • Residential • Mobile Unit	VOCs, carbonyls, metals (PM_{10})	Health Risk Assessment	• Provide data to characterize human exposure levels to air toxics. • Investigate temporal and spatial trends of the air toxics. • Provide measurement data for air quality model AIRPACT. • Compare monitored results to modeled predictions. • Examine source-receptor relationships. • Assess exposure risk using EPA's HAPEM model.

Results of the study are:

- The average annual concentrations or core air toxics were similar to those reported in other U.S. cities.

- For VOCs, source-receptor relationship statistics indicated a common source for benzene and 1,3-butadiene at all sites. A similar relationship was found for acetaldehyde and formaldehyde.

- For metals, source-receptor relationship statistics indicated a common source for arsenic, cadmium, and lead. A similar relationship was found between chromium and nickel at one site.

- There is approximately a 50:50 mix of crustal and combustion sources in Spokane's particulate matter.

- Several pollutant "hot spots" were identified. Auto repair shops were sources for high concentrations of acetone and xylenes. A large source of styrene was recorded in the vicinity of Spokane's Industrial Park east of the city.

- Screening tests for cancer/non-cancer factors determined all core air toxics with the exception of chloroform, beryllium, and lead exceeded screening values.

- Modeled (HAPEM5) exposures using air quality data from each site determined benzene, 1,3-butadiene, carbon tetrachloride, tetrachloroethylene, trichloroethylene, acetaldehyde, formaldehyde, arsenic, chromium, and manganese exceeded the health screening value in Spokane neighborhoods.

- The air quality model AIRPACT overpredicts benzene and carbonyl concentrations as compared to measured values. For benzene, difference indicated a problem with the model's benzene emission inventories. For the carbonyl concentrations, the reason was thought to be unrealistically low boundary/initial conditions employed for acetaldehyde and formaldehyde in the model.

- Most air toxics exhibited elevated levels in the wintertime and lower ambient concentrations during the summer months with the following exceptions. Summertime concentrations were larger for the carbonyls due to more favorable secondary formation during this period of the year. Tetrachloroethylene exhibited sporadic peaks throughout the year while the other chlorinated species (carbon tetrachloride, chloroform, and trichloroethylene) remained low in all seasons.

Action(s) Taken As A Result:

- Monitoring data used to verify the effectiveness of previously implemented woodstoves program.

Lesson(s) Learned:

- Would have negotiated a longer project timeline

Technology Transfer Tools:

- <u>Statistical Tools:</u> A series of statistical tools were developed that can be transferred to a similar study.

- Risk Communication: The report compared concentrations with cancer and non-cancer health benchmarks, and communicated results.

- Air Sampling Hardware: A mobile unit equipped with a Proton Reaction Transfer Mass Spectrometer (PTR-MS) was used to locate emission sources of benzene, acetaldehyde, several low molecular weight oxygenated solvents and certain BTEX (toluene, xylenes, etc) species.

4.1.16 Warwick, RI (Project ID = 16)

In 2004, the Rhode Island Department of Environmental Management (RI DEM), Office of Air Resources, implemented a project to study air quality in neighborhoods abutting TF Green Airport, a medium hub airport located in Warwick, Rhode Island. RI DEM formed an advisory group that met throughout the planning, implementation, and data reduction stages of the study. The advisory group consisted of appointees from the Warwick Mayor's office, the Warwick City Council, the Concerned Airport Neighborhoods group, representatives from the US EPA, Rhode Island Department of Health (HEALTH) Air Pollution Laboratory, and RI DEM. The study was designed to address local concerns of Warwick residents and the Warwick City government about the impact of airport operations on local air quality. This concern was heightened by plans for an extension of the main runway and by an analysis of cancer incidence data that showed elevated lung cancer rates in several census tracts that are frequently downwind of the Airport. Key project information is summarized in Table 4-16.

Table 4-16. Key Project Information for Warwick, RI

Site	Pollutants	Purpose	Project Goals
TF Green Airport (5 sites)	VOCs, carbonyls, black carbon (BC), $PM_{2.5}$	Health Risk Assessment	• Measure air toxics concentrations in and around airport to determine exposure levels. • Determine spatial variability in neighborhoods. • Compare results to other in state sites. • Evaluate cancer/non-cancer risks and compare to HEALTH'S cancer incidence statistics. • Evaluate airport emissions impact on ambient air pollution. • Establish baseline concentrations that can be used to evaluate future air quality impacts of planned changes in airport operations. • Field test an Open Path Optical System near the airport.

Results of the study are:

- Maximum concentrations observed were substantially lower than the corresponding acute health benchmarks. Monitored results were also compared to 1999 NATA results.

- Yearly average VOC and carbonyl concentrations were substantially lower than the corresponding chronic non-cancer health benchmarks.

- At all monitoring sites, concentrations of formaldehyde, carbon tetrachloride, benzene, chloroform, acetaldehyde, 1,3-butadiene were above the corresponding cancer health benchmark of a risk greater than the one in one million. Tetrachloroethylene was also above the benchmark at two of the Warwick sites.

- The source for high concentrations of formaldehyde could not be identified. Benzene and 1,3-butadiene sources were associated with motor vehicle emissions, and the apparent sources for tetrachloroethylene were dry cleaning facilities. Chloroform and carbon tetrachloride were considered background pollutants.

- Elevated BC concentrations were influenced by meteorology and airport activity emissions, specifically from aircrafts.

- $PM_{2.5}$ levels tend to have a large regional component and to be less clearly influenced by local sources than BC levels. Wind direction did not show a significant influence of airport operations on ambient levels.

- Inconclusive evidence was found to support the theory that elevated pollutant levels were caused by sea breezes in coastal areas of Warwick.

Action(s) Taken As A Result:

- One law was modified, such that the airport is required to conduct long-term monitoring of certain pollutants. Monitoring began in 2008, and will continue until enough data can be collected to ascertain minimal air toxics exposure impacts from the airport.

- There are plans to extend the runway at the airport, and the data collected in this study are referenced during the public comment period.

- The results of this study, in conjunction with other factors, led to the impetus of phasing out diesel-powered ground support equipment (GSE) used by the airport.

- Department of Health is conducting a health assessment.

- Additional PAH was conducted by the airport, and formaldehyde concentrations were more closely scrutinized to identify potential emission sources.

Lesson(s) Learned:

- The Cerex Open-Path Optical System failed to produce any reliable data. The system was costly to maintain and the associated software was problematic. After seven months of attempts to collect the data, this portion of the study was terminated. In retrospect, a different open-path optical system should have been purchased.

- Add an additional site east of the airport (no site was placed in this region)

- Communicate results/progress to the community in a different fashion, maybe even by a different agency

Technology Transfer Tools:

- Risk Communication: The report compared concentrations with cancer and noncancer health benchmarks, and communicated results.

- Statistical Tools: A series of statistical tools were developed that can be transferred to a similar study.

- Air Sampling Hardware An open path Optical system was purchased.

- Public Outreach Initiatives: RI DEM formed an advisory group that met throughout the planning, implementation and data reduction stages of the study and that assisted with presentations of the data to the public. The advisory group consisted of appointees from the Warwick Mayor's office, the Warwick City Council, the Concerned Airport Neighborhoods group and representatives from the US EPA, HEALTH and RI DEM.

4.2 Second RFA Cycle Work Plan Summaries

The summaries for Projects 17-35 were prepared using information gleaned from the submitted Work Plans. No interviews were conducted for Projects 17-35. All submitted work plans for the second RFA Cycle are posted at http://www.epa.gov/ttn/amtic/20052006_CSATAM.html#awards.

4.2.1 Louisville, KY (Project ID = 17)

Previous monitoring studies identified 1,3-butadiene above the cancer and noncancer risk levels. The suspected primary point source is American Synthetic Rubber Co. (~50-60%). Other industry (~10%) and mobile sources (~20-30%) are the other source contributors. A final report has not been submitted to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Assess the risk of collected monitoring data (Fall 2001- present) to identify spatial/temporal trends.

- Investigate the rise in 1,3-butadiene. Concentrations by establishing four fenceline monitors around the rubber plant. Monitoring would include other air toxics/PM metals.

- Assess new monitoring analytical devices.

- Develop model to monitor relationship.

- Analyze and correlate speciated $PM_{2.5}$ results previously collected.

4.2.2 Jefferson County, AL (Project ID = 18)

Two sites were proposed to collect ambient monitoring data. Samples are to be sent to a third party laboratory for analysis. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Establish new monitoring program to assess the air quality in the Birmingham, AL area based on EPA-approved methods.
- Implement experimental roving monitoring component –continuous monitoring automated FTIR.
- Develop local air toxics emissions inventory.
- Modeling with UNMIX and PMF.
- Integrate existing air toxics data with collected data.

4.2.3 Nez Perce Tribe, ID (Project ID = 19)

Previous studies found that the Lewiston-Clarkston area had 12% more total cancers than expected relative to overall Idaho averages 1990. High chloroform concentrations were recorded during these studies. The focus of this community grant award was to measure sources in and around a paper mill at five monitoring sites. Pollutants measured included VOCs, carbonyls, and PM metals. A final report has not been submitted to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Quantify of a broad suite of air toxics species in the vicinity of a pulp and paper mill facility.
- Evaluate of the relative contributions of Potlatch emissions to the ambient levels of air toxics in the valley by species.
- Evaluate spatial patterns of air toxics concentrations.
- Modeling-dispersion.

4.2.4 Albuquerque, NM (Project ID = 20)

Pilot and NATA studies indicated the Albuquerque area population had high cancer risk from benzene (12%) according to EPA's Prioritized Chronic Dose-Response values for screening risk assessment. Specific source categories of concern for this study were in industrial, commercial, and warehousing regions. VOCs, PAHs, carbonyls, PM metals, Sulfur Dioxide (SO_2), CO, and NO_x were to be measured at three sites. A final report has not been submitted to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Develop HAP monitoring network.
- Measure ambient concentrations of HAP within specific community settings / geographic and demographic regions.
- Assess spatial variations in HAP concentrations.
- Quantify relative HAP contributions from local sources and long range transport.
- Determine the impact of meteorological conditions on diurnal, daily, and seasonal time scales.
- Assess adverse health impacts from exposure using risk assessment models.
- Create infrastructure within the Albuquerque Air Quality Division (AAQD) for future air toxics assessments.

4.2.5 State of Connecticut (Project ID = 21)

Wood smoke contributes 38% of the $PM_{2.5}$ emissions in Connecticut. As fuel prices have risen, so have the sales of woodstoves and outdoor wood furnaces (OWFs). OWFs are unregulated (i.e., no EPA certification) and are routinely being installed as primary residential heat sources on a year-round basis. This two-year project was intended to assess wood smoke contributions to $PM_{2.5}$ in Connecticut and to conduct monitoring and testing to characterize the emissions for an emerging source known as OWFs, outdoor wood boilers (OWBs), or hydronic heaters. Information obtained in this project regarding OWF testing will be valuable, not only to Connecticut, but also to other state and local agencies, as well as the U S EPA in assessing the impacts of OWFs to air quality and public health. Sampling was to occur at one core site and five satellite sites.

A final report has not been submitted to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Monitor wood smoke to better characterize the contribution of wood smoke to ambient $PM_{2.5.,}$
  - Characterize the impact of wood burning on $PM_{2.5}$ concentrations.
  - Assess the contribution of wood smoke to $PM_{2.5}$ during wintertime inversion events.
  - Assess emission inventory estimates.
  - Evaluate modeling results with monitoring data.
  - Determine control and reduction strategies to address non-attainment status.
  - Build upon new techniques that quantify $PM_{2.5}$ concentrations from wood smoke on a real-time basis.

- Monitor Outdoor Wood furnaces
  - Characterize the emissions from OWFs, a metric that we currently do not possess.
  - Assess the contribution of OWFs to ambient $PM_{2.5}$ levels.
  - Assess local impacts from these units.
  - Identify appropriate monitoring/testing techniques for OWFs.
  - Develop a testing protocol for field tests of these units.
  - Identify control and reduction strategies.

4.2.6 Houston, TX (Project ID = 22)

Among Houston's 45 monitoring sites, one site was chosen for this study because of high 1,3-butadiene concentrations. The focus of this study was to measure air toxics in the Houston Ship Channel using a mobile laboratory. A final report has not been submitted to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Purchase a mobile lab to identify hot spots and replace canisters.
- Measure VOC on site, especially 1,3-butadiene; measure low concentrations of VOC.

4.2.7 Treasure Valley, ID (Project ID = 23)

Grant funding was received to place six monitoring sites in the Treasure Valley airshed, which includes Ada and Canyon Counties in Idaho. Ada County, ID is in the 90th percentile for toxic cancer risk, and also experiences high ozone concentrations. Additionally, carbonyls and benzene have exceeded predicted values. The results of this data will be used for comparison with studies from Seattle, WA, Spokane, WA, and Portland, OR. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Perform health risk assessment.
- Use monitor data to support SMOKE/CMAQ, CALPUFF.
- Prepare risk reduction and NESHAP residual risk assessment.
- Assess reduction strategies by comparing to baseline measures.
- Assess spatial and temporal variability for entire airshed.

4.2.8 Indianapolis, IN (Project ID = 24)

This study focused on point source emissions of chromium and arsenic in the Indianapolis, IN area, which is a heavily industrialized region with high asthma and lung cancer. Pollutants to be measured include VOCs, metals, carbonyls, and hexavalent chromium. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Conduct air toxics monitoring.
- Collect additional emissions information from other sources to enhance inventories.
- Conduct HAP model to monitoring.
- Evaluate potential health impacts using RAIMI.
- Assess exposure and characterize health risks from HAP.

4.2.9 Port of Los Angeles, CA (Project ID = 25)

The focus of this study was to monitor polycyclic aromatic hydrocarbon (PAH) species from diesel emissions occurring at the Port of Los Angeles. PAHs are by-products of organic matter combustion. Four primary sites collected for PAHs and carbon black using an aethelometer. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Enhance Port-wide ambient air quality monitoring to include PAHs using real time PAH analyzers.
- Characterize emission sources and identify potential ambient air quality impacts from diesel exhaust particulates while conducting Port operations.

4.2.10 Reno, NV (Project ID = 26)

This study focused on atmospheric mercury speciation in urban and rural settings. Currently regulations are being applied for coal-fired utility mercury emissions, yet there is no system in place to effectively assess their impact locally and regionally and no means of assessing effectiveness of regulations. A minimum of two sites were to be situated to measure SO_x, NO_x, ozone, and mercury. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Develop a passive sampling system to collect and characterize total atmospheric mercury and reactive gaseous mercury (dry deposition).
- Develop ambient monitoring methods that can be applied to characterizing/quantifying atmospheric mercury speciation.
- Critically assess the sampler’s potential.
- Compare samplers to in house analytical results from same sources.

4.2.11 State of New Jersey (Project ID = 27)

This study focused on the development and optimization of a sampling and analytical method to measure hexavalent chromium in ambient air. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Develop a reliable sensitive sampling and analytical method for hexavalent chromium measurement by optimizing Ion Chromatography/Inductively Coupled Plasma-mass Spectrometry (IC/ICPMS) for chromium analysis lower than 0.083 ng/m^3.
- Characterize sampling and analytical artifacts.
- Characterize the effect of environmental conditions on hexavalent chromium stability during sampling.
- Evaluate under real world conditions.
- Determine total and water soluble hexavalent chromium.

4.2.12 Secaucus, NJ (Project ID = 28)

This study focused on characterizing emissions from the New Jersey Turnpike (NJTPK). The last characterization to occur at this site was in 2002, and the traffic has since increased substantially. A total of three monitoring sites were to be deployed measuring $PM_{2.5}$, PAHs, and trace metals. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Determine ambient concentration gradients of $PM_{2.5}$, associated PAH, trace metals from NJTPK vehicle emissions.
- Determine temporal and spatial profiles.
- Determine the relationships between particle-size and concentration of toxic trace elements.
- Establish relationships among toxic air pollutants derived at NJTPK.

4.2.13 Rochester, NY (Project ID = 29)

The focus of this study was to develop a baseline understanding of mercury concentrations occurring in New York. High levels of mercury have been observed in the Northeast U.S., primarily in lakes and rivers. There is also a need to comply with the Clean Air Monitoring Rule (CAMR), which requires electric utilities to meet initial mercury emission caps. In New York, sources have switched to sub-bituminous coal that contains higher percentage of elemental mercury than anthracite coal. Two monitoring sites were deployed to measure speciated mercury. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Track mercury reduction strategies for two source categories (waster combustors, coal fired electric utilities) in urban NY State. Rochester, NYC. Compare results to nationwide rural network.

- Measure elemental, oxidized species and report as ratio; most studies have been rural, not urban. Take baseline urban measures.

- Compare speciated mercury concentration to ozone, SO_x, and speciated $PM_{2.5}$ to evaluate effects of atmospheric reactions and decay rates versus expected.

4.2.14 Tonawanda, NY (Project ID = 30)

Tonawanda is an industrialized, urban community located just north of Buffalo. It is divided by major interstate highways and has industrial clusters of some of New York's largest point and area sources, including a coke production facility, several petroleum terminals, chemical bulk storage terminals, co-generation and electric generation facilities, and facilities manufacturing tires, specialty chemicals and pesticides, cellulose sponge, and DuPont Corian® (solid surfaces) and Tedlar® (polyvinyl fluoride) products. The New York State Department of Conservation (DEC) had been collaborating for at least two years with two citizens groups concerned with the effects of toxic air emissions and odors in the area, and the potential risk associated with exposure to hazardous air pollutants (HAPs). Prior sampling activities in 2004 showed high benzene concentrations. A subsequent study identified Tonawanda Coke Corporation as the primary source of benzene. A 2005 DEC study concluded there was no acute benzene health risk, but there was a need to assess chronic benzene risk. VOCs (including the BTEX compounds), carbonyls, and PM fine (PM2.5) were measured at four sites, and meteorology was monitored at 1 site. The air quality monitoring study was designed to generate data that can be used to evaluate air quality models and other risk assessment tools. Some of these tools have been used to predict community exposure and characterize the potential risk associated with exposures to hazardous air pollutants (HAPs) and fine particulate matter in the ambient air. A final report has not been submitted to EPA, as of June 2009. However, the following main project goals were identified in the QAPP:

- Generate a point, area and mobile source emission estimates for monitored HAPs in the Tonawanda area.

- Conduct ambient air monitoring of selected HAPs and fine particulate matter for one year to determine the overall air quality.

- Compare the ambient air monitoring results to modeled predictions (Residual Risk assessment for coke ovens, 1996 NATA, 1999 NATA, and RAIMI).

- Assess the relative contributions of various air pollution sources to the measured concentrations.

- Prepare a final report to summarize the data and explain the results of the various data analyses that were conducted.

- Present the ongoing and final results of the study to the community at public meetings to be held in the Tonawanda area.

4.2.15 San Diego, CA (Project ID = 31)

Limited air toxics monitoring have occurred in the San Diego Air Pollution Control District. Three sites were deployed in the District to measure VOCs, metals, carbonyls, hexavalent chromium, and elemental/organic carbon. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Supplement ongoing monitoring activities with capital improvements in order to measure industrial and mobile source related impacts at three additional sites.

- Hire a contractor to evaluate emission inventory for study against ambient toxics data for inconsistencies.

- Have contactor evaluate success of ISC3 model to monitored results.

- Collect ambient air toxics data from regions lacking health risk assessments and compare to existing risk assessments for Chula Vista and El Cahon.

4.2.16 St. Regis Mohawk Tribe, NY (Project ID = 32)

The St. Regis-Mohawk tribe is located near Massena, NY along the U.S./Canadian border. Concerns have arisen regarding air toxic exposure—primarily for benzene—from two industrialized sources (an aluminum processing plant and a foundry) that may be impacting nearby residents in the Akwesasne community. VOCs, including the BTEX compounds, were measured. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Assess impacts of BTEX and other air toxics on Akwesasne Community.

- Support health assessments.

- Evaluate air quality models.

- Develop baseline references for air toxics concentrations.

- Characterize non-ubiquitous air pollutants.

- Delineate local scale HAP concentration gradients.

4.2.17 Burlington, VT (Project ID = 33)

A community assessment grant was awarded to evaluate high predicted inhalation exposure values of benzene in Burlington, VT, some of which are highest in the U.S. As such, there is a need to evaluate and validate these predicted values. Sampling of VOCs, including the BTEX compounds, were planned at eight sites in Burlington, VT and four sites in nearby Manchester, NH. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Evaluate and improve the air-quality model that has been implemented for Burlington, VT.
- Obtain more spatially and temporally resolved air toxics monitoring data for Burlington, VT and Manchester, NH.
- Identify source signatures of major stationary and mobile emissions sources.
- Determine baseline concentration gradients to better assess actual population exposures.
- Identify and facilitate appropriate risk and source reduction strategies.
- Provide information that can be applied for air toxics characterization and risk reduction strategies in other similar communities.
- Evaluate, refine, and improve the air dispersion model to better assess long-term exposure to benzene and other similarly emitted toxic compounds in the greater Burlington area.
- Obtain information necessary to allow transfer of the refined modeling tool for use in other, similar urban communities.

4.2.18 Hopewell, VA (Project ID = 34)

NATA 1999 model results predicted high cancer risks for the Hopewell, VA area. In this study, three monitoring sites sampled for VOCs, carbonyls, trace metals, hexavalent chromium, carbon black, and PM_{10}. A final report has not been submitted for this to EPA, as of June 2009. However, the following project goals were identified in the submitted work plan:

- Establish baseline ambient air exposures for HAPS and help to identify "hotspots."
- Assist in development of residual risk standards.
- Characterize main poll by determining spatial concentration patterns.
- Assess the validity of NATA findings.
- Evaluate background PM diesel using black carbon data (Aethelometer).

4.2.19 Boulder County, CO (Project ID = 35)

NATA1996 and NATA1999 data presented air toxic risk from acetaldehyde and formaldehyde. In 2003, a short-term study focused on VOCs (including the BTEX compounds) and carbonyls. Early morning (6am-9am) concentrations of BTEX and other hydrocarbons were the same or higher in rural areas as n the city of Denver. However, afternoon hydrocarbon concentrations were three times higher in rural areas than Denver. A 2004 Denver study showed that modeled results under-predicted formaldehyde by a factor of three.

Five sites measuring VOCs, carbonyl compounds, and ozone were proposed for this current project. A final report was submitted to EPA in May 2009, and will be included in the next update of this report.. However, the following project goals were identified in the submitted work plan:

- Supplement previous studies that show high concentrations of acetaldehyde and formaldehyde.
- Evaluate spatial/ temporal variations at the urban/mountain interface.
- Evaluate and improve air quality exposure models.
- Compare monitor to model results.
- Evaluate health effects data.
- Develop a baseline reference for long term studies.

5.0 Key Findings

After reviewing and interviewing the Project Leads for the 16 completed projects and reviewing the 19 submitted work plans, some key findings were observed.

5.1 Study Pollutant(s)

Concerns about ambient exposure to "known" or "suspected" air toxics were the primary drivers in most of the awarded projects. As such, many of the awardees sampled for common suites of pollutants. Table 5-1 presents a summary of the pollutant types measured and/or studied. Of the 35 unique projects, 26 focused on speciated VOCs, such as the BTEX compounds. Carbonyl compounds and metals were also targeted in numerous studies (21 and 18, respectively). Among projects, the Paterson, NJ Study targeted the most pollutant types (eight). Most projects targeted four to six pollutant types. Data that have been submitted to EPA's Air Quality Subsystem (AQS) are also denoted in Table 5-1.

Table 5-1. Target Pollutant Types by Awarded Project

Project ID	Site/State	VOC/BTEX	Carbonyl	PAH	$PM/PM_{10}/PM_{2.5}$	Metals	Elemental Carbon	Organic Carbon	Black Carbon	Hexavalent Chromium	SO/SO_2	NO_x	CO	Ozone	Data Submitted to AQS?
1	Sun Valley, CA	x	x		x	x	x	x		x					N
2	Placer County, CA	x	x		x		x		x			x			N
3	Port of Tampa, FL	x	x		x	x			x						N
4	Allegheny County, PA	x	x	x	x				x						N
5	Paterson, NJ	x	x	x	x	x	x	x		x					N
6	Milwaukee, WI	x													N
7	Detroit, MI	x	x		x	x		x	x				x		P
8	Chicago, IL	x													N
9	Phoenix, AZ	x	x	x		x									N
10	Denver, CO	x	x						x				x	x	Y
11	Cherokee Heights, OK	x	x												Y
12	Portland, OR	x	x	x		x			x	x					Y
13	Wilmington, DE		x		x	x				x		x	x		N
14	Austin-Round Rock, TX	x	x			x				x					Y
15	Spokane, WA	x	x			x									Y
16	Warwick, RI	x	x		x				x						Y

N = No data uploaded into AQS
P = Partial data upload into AQS
Y = All data uploaded into AQS
= Project not completed

Table 5-1. Target Pollutant Types by Awarded Project (Continued)

Project ID	Site/State	VOC/BTEX	Carbonyl	PAH	$PM/PM_{10}/PM_{2.5}$	Metals	Elemental Carbon	Organic Carbon	Black Carbon	Hexavalent Chromium	SO/SO_2	NO_x	CO	Ozone	Data Submitted to AQS?
17	Louisville, KY	x			x	x									
18	Jefferson County, AL														
19	Nez Perce Tribe, ID	x	x			x									
20	Albuquerque, NM	x	x	x		x					x	x	x		
21	State of Connecticut				x										
22	Houston, TX	x													
23	Treasure Valley, ID														
24	Indianapolis, IN	x	x			x				x					
25	Port of Los Angeles, CA			x					x						
26	Reno, NV					x									
27	State of New Jersey									x					
28	NJ Turnpike/Secaucus,NJ			x	x	x									
29	Rochester, NY				x	x					x			x	
30	Tonawanda, NY	x	x		x										Y
31	San Diego, CA	x	x			x	x	x		x					
32	St. Regis Mohawk, NY	x													
33	Burlington, VT	x													
34	Hopewell, VA	x	x	x	x	x			x	x					
35	Boulder County, CO	x	x											x	
		26	**21**	**8**	**14**	**18**	**4**	**4**	**9**	**9**	**2**	**3**	**4**	**3**	**8**

N = No data uploaded into AQS
P = Partial data upload into AQS
Y = All data uploaded into AQS
[shaded box] = Project not completed

5.2 Significant Results and Lessons Learned

This section incorporates some of the significant results of each project along with some "lessons learned" that may be beneficial for current and future awardees. These "Significant Results and Lessons Learned" are presented in Table 5-2.

Table 5-2. Summary of Significant Results and Lessons Learned from the First RFA Cycle

Project ID	Site/State	Significant Results and Lesson Learned
1	Sun Valley, CA	*Significant Results:* • The "hot spot" source of hexavalent chromium was a plating facility that is no longer in operation. Monitoring was successful in determining that to be the only local source for hexavalent chromium. • PM_{10} concentrations followed predominant wind patterns and variations in PM_{10} were influenced by the abundance of crustal elements.

Table 5-2. Summary of Significant Results and Lessons Learned from the First RFA Cycle (Continued)

Project ID	Site/State	Significant Results and Lesson Learned
		Lesson Learned: • If the technology were available and economically feasible, more real-time measurements would be taken.
2	Placer County, CA	*Significant Results:* Summer 2006 VOC results showed that only the concentrations of acrolein, acetaldehyde, and formaldehyde were higher downwind of the UPRR Railyard, while acrylonitrile, chloroform, and toluene concentrations were higher upwind. Benzene concentrations were similar at both sites, suggesting a regional source. Upon review, the Technical Advisory Committee (TAC) unanimously concluded that these results are not very useful in quantifying the impact of the UPRR Railyard emissions on ambient air quality. Elemental and Organic analysis of ambient particulate samples collected by UC Davis from one pair of upwind/downwind sites (2005) indicate that the coarse soil around the UPRR Railyard is highly contaminated with petroleum products and three times richer in the most toxic components (e.g., benzo{a}pyrene) than exhaust from diesel trucks. Further, the soil contains anthropogenic metals (e.g., zinc and copper) at levels much higher than that of standard soils. *Lesson Learned:* • Monitoring would be focused during the hours where the wind direction was upwind and downwind of the railyard.
3	Port of Tampa, FL	*Significant Results:* • Comparisons of the fixed point monitors to the Open Path UV monitors were successful. The data demonstrated that the open path system was able to quantify ozone and sulfur dioxide for site evaluation purposes. *Lessons Learned* • The evaluation of different methods (CEREX UV and FTIR) of air toxic monitoring equipment was not as intercomparable as anticipated. • There were large differences in the detection limits and reporting levels of toxic data from different laboratories. A Region 4 workgroup has been established to evaluate and establish minimum detectable limits for analytical methods.
4	Allegheny County, PA	*Significant Results:* • Pollutants with concentrations greater than the national 75th percentile and appear to be strongly influenced by local emissions sources were: benzene, toluene, propionaldehyde, tetrachloroethylene, ethyl benzene, methylene chloride, styrene, 1,4-dichlorobenzene, trichloroethylene, and hydrogen sulfide. These results suggest there is a potential air emissions problem in southwest PA. • The major contributors of cancer risks at all monitoring sites were diesel PM, formaldehyde, benzene, and carbon tetrachloride. Formaldehyde and carbon tetrachloride were regionally distributed, thus limiting the site to site health risk variability. Trichloroethylene and 1,4-dichlorobenzene contributed substantial risks at the downtown site. Diesel PM is a large risk driver throughout the county but is substantially high downtown. • Monitored results were within a factor of 10 to NATA predicted concentrations. The NATA model appears to underpredict contributions from industrial sources and overpredict mobile contributions. The worst model performance was for chlorinated compounds *Lesson Learned:* • Would have negotiated a longer project timeline and would have worked more effectively with Allegheny County in identifying and setting up monitors in the downtown area.

Table 5-2. Summary of Significant Results and Lessons Learned from the First RFA Cycle (Continued)

Project ID	Site/State	Significant Results and Lesson Learned
5	Paterson, NJ	*Significant Results:* • The EOSHI extraction method for hexavalent chromium produced promising results. An additional study, the "Development and Optimization of a Sampling and Analytical Method to Measure Hexavalent Chromium in Ambient Air" is being conducted to further improve the method. The EOHSI analytical method for hexavalent chromium is being compared to the NATTS analytical method in a newly awarded USEPA grant. • Higher concentrations for elemental carbon, carbonyls, many elements and most PAHs were observed in the winter due to probably higher combustion-source emissions. Hexavalent chromium levels were higher in the summer probably due to photo-oxidation from all sites. *Lessons Learned:* • A detailed micro-scale emissions inventory should be completed before selecting analytes and monitoring locations. • A detailed emissions inventory requires site visits. Site visits provide an excellent opportunity for identifying risk reduction strategies, outreach, and education
6	Milwaukee, WI	*Significant Results:* • Benzene concentrations predicted by the RAIMI model were two orders of magnitude lower than the monitored results • PASM for short-term sampling and passive adsorbent tubes for longer timed measurements were successfully developed. *Lessons Learned:* None identified
7	Detroit, MI	*Significant Results:* • OC levels were elevated during daylight hours during the summer months indicating a strong influence of secondary OC at the site. *Lessons Learned:* • Enhanced security measures at the school sampling site would have prevented the loss of several months of speciated organic carbon data because of vandalism. Security measures have since been installed to prevent the event from re-occurring • The feasibility of using continuous formaldehyde samplers was found to be problematic in several ways. Two examples are: 1) Assuming the formaldehyde samplers could be operated in the field was erroneous. They should have been initially deployed the to Filley Street site and not tested until the permeation source was repaired; and 2) Monthly conference calls with the formaldehyde sampler vendor should have been initiated sooner. The vendor should have been notified upon receiving the shipment a list of required spare fittings that were missing
8	Chicago, IL	*Significant Results:* • BTEX concentrations near Chicago O'Hare Airport were 50% higher than those found at Northbrook or Chicago-Jardine sites probably due to expressway traffic and airport traffic. • Study results for comparing diffusion tube sampling method and conventional gas chromatograph monitoring yielded inconsistent results – additional study is needed. *Lesson Learned:* • A larger scope during the project using more sites and duplicative analysis would have enhanced the number of data points.

Table 5-2. Summary of Significant Results and Lessons Learned from the First RFA Cycle (Continued)

Project ID	Site/State	Significant Results and Lesson Learned
9	Phoenix, AZ	*Significant Results:* • Air toxics of concern were found to be : 1,3-butadiene, acetaldehyde, formaldehyde, chloroform, benzene, and tetrachloroethylene. *Lessons Learned:* • Low to non-detected urban air toxic concentrations need to be measured using more sensitive monitoring equipment. • Solicit additional funds for data analyses and risk analysis.
10	Denver, CO	*Significant Results:* • EPA monitoring siting guidelines for minimum distance requirements are not always applicable for community monitoring programs and should be relaxed in order to understand a particular source grouping. • EPA and the Federal Highway Administration should partner to include mobile source hot spot assessments as part of the community based air toxics monitoring program. • Continuous sampling via Auto-Gas Chromatograph (GC) was determined to be reliable, practical and feasible means of collecting and analyzing time-resolved data. *Lessons Learned:* None identified
11	Cherokee Heights, OK	*Significant Results:* • All four sites had significant concentrations of acrolein, benzene, 1,3-butadiene, and carbon tetrachloride. In addition, tetracholoroethylene and p-dichlorobenzene were found at three Tulsa sites and acetonitrile at two Tulsa sites. • To accurately determine the suspect concentrations of acetaldehyde found in the ambient air sampling canisters near the Cherokee Heights site, additional carbonyl monitoring following Compendium Method TO-11A is recommended. *Lesson Learned:* • Would have requested additional funds and negotiated a longer project timeline.
12	Portland, OR	*Significant Results:* • The monitored annual averages compared to Oregon's established Ambient Benchmark Concentrations (ABC) showed that concentrations of arsenic, cadmium, and acetaldehyde were above the ABC at all sites. • Ambient air VOC concentrations for some compounds of concern could not be accurately measures since they were below the maximum detection limit for all sites. *Lessons Learned:* • Sampling contamination from a faulty collection process resulted in 75% of benzene results to be invalid and caused delays in determining annual averages. In the future there will be scrutiny of analysis results within a shorter period as an improvement to the QC/QA procedures. • A better data analysis plan was needed.

Table 5-2. Summary of Significant Results and Lessons Learned from the First RFA Cycle (Continued)

Project ID	Site/State	Significant Results and Lesson Learned
13	Wilmington, DE	*Significant Results:* • Wilmington aerosol is characterized as follow; - Secondary aerosol of regional origin constitutes about 38% of PM - Secondary aerosol of local origin constitutes about 27% of PM - Biomass burning contributes about 14% of PM • Was able to determine some sources based on measured pollutant signatures *Lessons Learned:* • DE Air Surveillance Branch would use the Public Affairs Department for community outreach. • Would have negotiated a longer project timeline. • If the potential proprietary issues for sampling technology were known in advance, a different partnership would have been sought.
14	Austin-Round Rock, TX	*Significant Results:* • NATA modeled air emissions were compared to Austin-Round Rock Toxics Study (ARTS) measurements. Compounds for which the modeled-monitored agreements were comparatively poor include acrolein, trichloroethylene, arsenic and cadmium. Model to monitored results for VOC and carbonyl core compounds were found to be in better agreement than those of trace metal estimates • Good agreement was found between NATA total excess cancer risk estimates and the same estimates derived from ARTS measurements. *Lesson Learned:* • If CAPCOG knew that the study was going to be only 1-year, they would have contracted out more of the work to ensure sampling, analysis, and data analysis errors and scope would be limited.
15	Spokane, WA	*Significant Results:* • Benzene, 1,3-butadiene, carbon tetrachloride, tetrachloroethylene, trichloroethylene, acetaldehyde, formaldehyde, arsenic, chromium and manganese exceeded the health screening value in Spokane neighborhoods • Several pollutant "hot spots' were identified. Auto repair shops were sources for high concentrations of acetone and xylenes. A large source of styrene was recorded in the vicinity of Spokane's Industrial Park east of the city. *Lesson Learned:* • Would have negotiated a longer project timeline.
16	Warwick, RI	*Significant Results:* • At all monitoring sites, concentration of formaldehyde, carbon tetrachloride, benzene, chloroform, acetaldehyde, 1,3-butadiend were above the cancer health benchmark of 1 in a million risk. Tetrachloroethylene was above the benchmark at two sites in Warwick. *Lessons Learned:* • The Cerex Open-Path Optical System failed to produce any reliable data. The system was costly to maintain and the associated software was problematic. After seven months of attempts to collect the data, this portion of the study was terminated. In retrospect, a different open-path optical system should have been purchased. • In comparison to NATA99, monitored concentrations of benzene, 1,3-butadiene, toluene, xylenes were approximately one-half of the predicted concentrations. Monitored concentrations of carbon tetrachloride and chloroform were close to twice as high as those predicted. • Add an additional site east of the airport (no site was placed in this region). • Communicate results/progress to the community in a different fashion, maybe even by a different agency.

5.3 Technology Transfer Tools

A value-added benefit to the community toxics grants program is the availability of technology transfer tools that can be used in other communities. For example, other communities with significant railyard activity may benefit on data analysis tools and products developed from the Placer County Roseville Railyard study (Project ID = 2). Table 5-3 presents available technology transfer tools for the 16 projects with final reports. All of the submitted projects have Work Plans and Statistical tools that may be used in similar studies. Note that "Public Outreach Initiatives" was a tool in only seven of the 16 submitted reports.

Table 5-3. Summary of Technology Transfer Tools

Project ID	Site/State	Project Work Plan	Risk Communication	Statistical Tools	Air Sampling Hardware	Public Outreach Initiatives
1	Sun Valley, CA	x	x	x		x
2	Placer County, CA	x		x		
3	Port of Tampa, FL	x	x	x	x	x
4	Allegheny County, PA	x	x	x		
5	Paterson, NJ	x	x	x	x	x
6	Milwaukee, WI	x	x	x	x	
7	Detroit, MI	x		x	x	
8	Chicago, IL	x		x	x	
9	Phoenix, AZ	x	x	x		x
10	Denver, CO	x		x	x	
11	Cherokee Heights, OK	x	x	x		
12	Portland, OR	x			x	x
13	Wilmington, DE	x	x	x	x	x
14	Austin-Round Rock, TX	x	x	x		
15	Spokane, WA	x	x	x	x	
16	Warwick, RI	x	x	x	x	x
	Overall Total =	16	11	15	10	7

5.4 Anticipated Outcomes

As discussed in Section 2.3, EPA is interested in how each of these awarded projects provided positive short-term, intermediate-term, and long-term outcomes. Short-term outcomes typically occur near the end or at the end of the project, while intermediate-term outcomes are realized six to eight months after completion of a project. Long-term outcomes can be realized a year or two after the project is completed.

Significant short-term outcomes included: increased programmatic knowledge and staff capabilities concerning air toxics; evaluation of new sampling equipment; and identification of local sources of air toxics. Significant intermediate-term outcomes included: evaluation of permits/sources of interest using collected data; implementation of control devices or process changes at local emission sources; increased awareness of anti-idling measures; additional monitoring; and verify/enhance modeling activities. Significant long-term outcomes included expected reductions in emissions, ambient concentrations, and public exposure to risk for certain pollutants (e.g., benzene, diesel PM, coke oven emissions). Table 5-4 presents outcomes identified by the Project Leads during the interview process.

Table 5-4. Anticipated Outcomes

Outcome Type	Anticipated Outcomes
	Sun Valley, CA (Project ID = 1)
Short-term	• Knowledge of activities occurring at landfill, such as increased dump truck traffic. • Identified a chrome plater as a potential hot spot.
Intermediate-term	• The chrome plater moved out the area, but not necessarily because of this study. • Further validation of chrome plater influence on local air quality. AQMD plans to return to the site with the elevated hexavalent chromium readings, during the same time of year as when the elevated readings were made. The duration of this study will be for two months to see if levels have in fact been reduced.
Long-term	• This study was used to supplement a larger study called MATES-III. Information obtained from this project will be used as part of a strategy to reduce emissions and ambient concentrations, thereby reducing public exposure to air toxics.
	Placer County, CA (Project ID = 2)
Short-term	• First time an assessment was performed at a railyard. • Found differences between upwind and downwind concentrations.
Intermediate-term	• The railyard has voluntarily implemented a “hood project” and reduced idling time. • The city is hoping to develop a “greenbelt” around the railyard. Also, land near the railyard is being redeveloped from residential to commercial, which will reduce exposure to people.
Long-term	• Due to the “hood project” and reduced idling times, PCAPCD expects to see reductions in emissions, particularly from diesel PM. Public exposure to air toxics is anticipated to be reduced.
	Port of Tampa, FL (Project ID = 3)
Short-term	• Establishing a baseline understanding of Port source contributions. • Some identification of localized sources
Intermediate-term	• Data were used to evaluate a permit from a nearby crematory in Ybor City.
Long-term	• No anticipated long-term outcomes were identified.
	Allegheny County, PA (Project ID = 4)
Short-term	• Prioritized air toxics for Allegheny County. Also identified some hot spot areas on Neville Island.
Intermediate-term	• The ACHD is looking into the data more closely for regulatory consideration. Other things being evaluated include reviewing and strengthening anti-idling laws, as well as extending diesel retrofits to port authority buses. The data have also been used as a supplement in the county’s efforts to reduce emissions from a large coke manufacturing facility on Neville Island that had begun to take place through a consent decree.
Long-term	• Air toxics, particularly benzene, coke oven emissions, and diesel PM, are expected to decrease in Allegheny County through the coordinated efforts in the coke manufacturing facility cleanup/upgrade and in the diesel retrofits. These reductions in emissions should lead to reductions in concentrations and public health risk and exposure.

Table 5-4. Anticipated Outcomes (Continued)

Outcome Type	Anticipated Outcomes
	Paterson, NJ (Project ID = 5)
Short-term	• Increased institutional knowledge of emission sources through site visits, QA/QC of monitoring and data analysis, and sampling. • Able to field test the PAKS technology during the study. • Elevated levels of *p*-dichlorobenzene were observed.
Intermediate-term	• Distributed pamphlets targeting certain industries; provided awareness for anti-idling effects; conducted additional site visits.
Long-term	• Reduction in emissions is anticipated through anti-idling education. The anticipated long-term outcome will be reduced diesel PM concentrations and subsequent exposure and health risk.
	Milwaukee, WI (Project ID = 6)
Short-term	• Development of a new tool for air monitoring. • Observed unexpected uniform concentrations of benzene, as opposed to degradation.
Intermediate-term	• Data used to evaluate and validate modeling.
Long-term	• Knowledge gained will be used for emission reduction strategies.
	Detroit, MI (Project ID = 7)
Short-term	• Built capacity with two Trace CO samplers and one EC/OC. • Increased knowledge of sources contributing to residual $PM_{2.5}$ non attainment area. • Continuous formaldehyde sampler software was evaluated. • Estimation of the proportion of secondary/ primary organic carbon at Newberry and other sites by leveraging other data sets.
Intermediate-term	• Communication strategy to local community is being created. • Source apportionment activities to better understand spatial and temporal impacts. • Estimate primary and secondary organic carbon at Newberry School.
Long-term	• More emission controls could be required when Detroit Intermodal Freight Terminal (DIFT) is built. • Possible inclusion of $PM_{2.5}$ and toxics in environmental impact statements for projects similar to Detroit Intermodal Freight Terminal DIFT and / or DRIC. • Possible creation of emission controls for organic carbon emitted in areas upwind from the Detroit area. • Possible improvement of the continuous formaldehyde sampler design, field deployment and acquisition of ambient hourly formaldehyde concentrations. • Detroit attains the $PM_{2.5}$ NAAQS.
	Chicago, IL (Project ID = 8)
Short-term	• Able to establish a baseline of air toxic concentrations. Can be supplemented with an earlier data set to develop an urban profile for Chicago. • A risk screening tool was developed. • Found elevated concentrations around the airport.
Intermediate-term	• Illinois EPA negotiated with the Chicago Department of Aviation, the FAA, and the Airport Authority to add an air toxics monitoring site when expansion occurs. Additionally, Illinois EPA recommended that when O'Hare Airport expands, that the Environmental Impact Statement consider increases in air toxic emissions.
Long-term	• A significant emitter of air toxics (steel mill) has shut down in the Chicago area recently, and the monitoring data will be used to show the potential reduction in concentration and translated risk exposure.
	Phoenix, AZ (Project ID = 9)
Short-term	• Found that carbon tetrachloride and 1,3-butadiene concentrations were elevated. Elevated concentrations of some pollutants were found near a school in conjunction with idling of the school buses during pick-up time.
Intermediate-term	• This project, as well as other information, helped raised awareness of anti-idling for the school buses. Also, more school buses are undergoing diesel retrofit. Other emission sources in tribal lands are being examined as a result of this study, such as PM contributions from unpaved roads and agricultural burning. • DEQ continues to perform modeling.
Long-term	• Project data, as well as other information, will help with strategy development to reduce emissions.

Table 5-4. Anticipated Outcomes (Continued)

Outcome Type	Anticipated Outcomes
	Denver, CO (Project ID = 10)
Short-term	• Identified potential shortfalls in the local emission inventory. • Able to validate modeling hot spots areas with monitoring data. • Through this monitoring effort, the air toxics profile has improved when compared to monitoring data from a past study.
Intermediate-term	• Made people aware of anti-idling laws in Denver. • The schools agreed to follow the anti-idling laws. • There are plans for the Denver area for roadway expansions. Because of the increase in the confidence of modeling capabilities from this study, the local agency has more confidence when roadway expansions occur.
Long-term	• Emissions from idling school buses should decrease as the anti-idling law is more strictly adhered. Thus, it is anticipated that diesel PM concentrations and public exposure and health risk should decrease accordingly.
	Cherokee Heights, OK (Project ID = 11)
Short-term	• Established baseline concentrations for air toxics. Also, increased monitoring capabilities for the air organization, with a goal of sharing information and data with other tribes. • Measured elevated concentrations, but found them similar to the Tulsa area.
Intermediate-term	• The monitoring data were presented at a community meeting for citizens concerned about a nearby coal-fired power plant. • Additional monitoring for metals began at the end of this project.
Long-term	• None identified
	Portland, OR (Project ID = 12)
Short-term	• Increased understanding of the PFGC and aethelometer equipment. • Identified the transportation sector as an important source. Also identified localized sources contributing to air toxics risk. • Used the monitoring data to validate NATA results. Also used the data for trends comparisons to a similar study performed in 1999. • Identified the metal foundry as a localized source of hexavalent chromium.
Intermediate-term	• The benzene content in gasoline was reduced. • Additional modeling to be performed by Oregon DEQ.
Long-term	• As a result of this study, the local advisory committee was tasked with reducing emissions in the Portland area within 10 years.
	Wilmington, DE (Project ID = 13)
Short-term	• Increased confidence in modeling exercises that are being performed as part of the air toxics strategic planning of the DE Air Quality Management. • Enhanced team building of skills of the DE Air Quality Management Staff.
Intermediate-term	• A better understanding of the suite of sources that are impacting the air quality around the Wilmington monitoring site resulted in collection of emission signatures at different sources, such as for biomass burning and steel mills. These signatures can be used when comparing to ambient concentrations. • DE has released data summaries requested by concerned citizens about a nearby power plant.
Long-term	• Reduction in the public’s exposure to air toxics is anticipated through better strategic planning and modeling.
	Austin-Round Rock, TX (Project ID = 14)
Short-term	• Monitoring showed that concentrations in Austin were similar to other urban areas. • Acrolein concentrations were elevated; however, the high concentrations appeared to be due to the sampling method.
Intermediate-term	• Able to share monitoring equipment with a local university.
Long-term	• None identified

Table 5-4. Anticipated Outcomes (Continued)

Outcome Type	Anticipated Outcomes
	Spokane, WA (Project ID = 15)
Short-term	• First look at air toxics in the Spokane area; able to establish baseline of concentrations. • Through the monitoring, pollutants of interest were identified.
Intermediate-term	• The monitoring data were used to verify the effectiveness of previously implemented woodstoves program. Data were also used to compare to modeling results. • The data were also used by Northwest Airquest for modeling activities.
Long-term	• None identified.
	Warwick, RI (Project ID = 16)
Short-term	• Increased knowledge of toxics exposure at the airport.
Intermediate-term	• One law was modified, such that the airport is required to conduct long-term monitoring of certain pollutants. Monitoring began in 2008, and will continue until enough data can be collected to ascertain minimal air toxics exposure impacts from the airport. • There are plans to extend the runway at the airport, and the data collected in this study are referenced during the public comment period. • The results of this study, in conjunction with other factors, led to the impetus of phasing out diesel-powered ground support equipment (GSE) used by the airport.
Long-term	• Phasing-out of diesel powered GSEs. • Development of an airport black carbon emissions model using collected data.

5.5 Community Involvement

A key component to each of the awarded projects is the involvement of the local community. In most projects, community involvement was a key component prior to the initiation of the award or in the early planning stages. Involvement ranged from lodging complaints to being involved in the advisory committees. Many awardees held public workshops near the end of the project to communicate results. Table 5-5 presents public outreach initiatives taken by each of the awardees. Future grant awardees can review and implement these initiatives, where appropriate.

Table 5-5. Public Outreach Initiatives

Project ID	Site/State	Public Outreach Initiatives
1	Sun Valley, CA	• Established a working group consisting of concerned citizens, clergy, community organizers, and elected officials. • Discussed project during one of AQMD town hall meetings.
2	Placer County, CA	• In 2000, a neighborhood group called Placer County APCD (PCAPCD) expressed concern about potential impacts from a nearby railyard. PCAPCD contacted ARB for help. ARB performed a health assessment, and presented results in a workshop to the community. • Community leaders and PCAPCD staff were involved in meetings.
3	Port of Tampa, FL	• Public workshops were held after the project to present the data.
4	Allegheny County, PA	• The project developed through concerns raised by communities surrounding Neville Island, which is a highly industrialized location. Allegheny County met with various stakeholders, including community advisory panels and community groups prior to the project. At the end of the project, findings were presented to community groups.

Table 5-5. Public Outreach Initiatives (Continued)

Project ID	Site/State	Public Outreach Initiatives
5	Paterson, NJ	• Reached out to numerous local groups, including: New Jersey Clean Air Council, public school districts, school board, school nurses, the Paterson Environmental Revitalization Committee, ACORN, a Hispanic Center, a local health clinic, and a radio personality. • A Student Interactive Module (high school level) was also developed and used by some students.
6	Milwaukee, WI	• Although there was limited amount of community involvement, the Department of Health was part of the steering committee.
7	Detroit, MI	• Citizens of the community helped to get funding for this project after they expressed concern about the impact that the Detroit Intermodal Freight Terminal (DIFT) was having on the air quality. They wrote letters of support for the project. • Extensive data analysis/modeling and communication with the local groups were outside of the scope of work for this initial grant, due to the budget limitations. • Another CAMP grant that was awarded using FY'06 grant funds includes an updated assessment of risk and communicates findings to the community.
8	Chicago, IL	• The local community was not involved prior to or during the project. Interested community groups were contacted after the report was finalized.
9	Phoenix, AZ	• At the outset, tribal representatives were part of the project team. The Institute for Tribal Environmental Professionals (ITEP) was also brought in to help disseminate information.
10	Denver, CO	• Met regularly with the community prior to the award. When project was final, e-mail was sent to interested stakeholders about reviewing information.
11	Cherokee Heights, OK	• Involved the tribe via the Health Department. • Worked with EPA Region 6 on sharing the data. • Data were shared with elected officials.
12	Portland, OR	• Community helped with siting of monitors. • Public hearings were held to inform the public. • The Portland American Lung Association were also involved. The agency met with neighborhood groups and participated in meetings with residences.
13	Wilmington, DE	• Five community outreach campaigns were held to discuss the results of the ambient monitoring. The forum for each of the community meetings consisted of sessions focusing on each subject matter area, culminating with an All-Hands meeting at the end. • Newspaper, mailings, and television advertisements publicized the meetings to the public. • Discussed in the Annual Monitoring Network review, and as an agenda item during the open workshop that was held as part of the commenting period of the annual monitoring network review. • Wrote for a section in its Annual Air Quality Report regarding the details and findings of this project on two occasions.
14	Austin-Round Rock, TX	• Central Texas Clean Air Force was contacted. • Contacted local governments for involvement.
15	Spokane, WA	• Local Lung Association and neighborhood groups were contacted.
16	Warwick, RI	• Advisory committee formed with representatives from the community.

5.6 Project Contacts

Project contacts and responsible agency are presented in Table 5-6.

Table 5-6. Project Leads and Responsible Agency

Project ID	Site/State	Project Contact	Responsible Agency
1	Sun Valley, CA	Rudy Eden	South Coast Air Quality Management District
2	Placer County, CA	Yushuo Chang	Placer County Air Pollution Control District
3	Port of Tampa, FL	Thomas Tamanini	Hillsborough County Environmental Protection Division
4	Allegheny County, PA	Darrel Stern	Allegheny County Health Department
5	Paterson, NJ	Linda Bonano	New Jersey Department of Environmental Protection
6	Milwaukee, WI	Mark Allen	Wisconsin Division of Natural Resources
7	Detroit, MI	MaryAnn Heindorf	Michigan Department of Environmental Quality
8	Chicago, IL	Terry Sweitzer	Illinois Environmental Protection Agency
9	Phoenix, AZ	Steven Peplau	Arizona Department of Environmental Quality
10	Denver, CO	Gregg Thomas	City and County of Denver Department of Health
11	Cherokee Heights, OK	Ryan Callison	Cherokee Nation Environmental Program
12	Portland, OR	Jeff Smith	Oregon Department of Environmental Quality
13	Wilmington, DE	Joseph Martini	Delaware Department of Natural Resources and Environmental Control
14	Austin-Round Rock, TX	Bill Gill	Capitol Area Council Of Government
15	Spokane, WA	John Williamson	Washington Department of Ecology
16	Warwick, RI	Barbara Morin	Rhode Island Department of Environmental Management
17	Louisville, KY	Art Williams	Louisville-Jefferson County Metro Air Pollution Control District
18	Jefferson County, AL	Sam Bell	Jefferson County Department of Health
19	Nez Perce Tribe, ID	Julie Simpson	Nez Perce Tribe Environmental Restoration and Waste Management Program
20	Albuquerque, NM	V. Louis Jaramillo	City of Albuquerque Environmental Health Department
21	State of Connecticut	Peter Babich	Connecticut Department of Environmental Protection
22	Houston, TX	Wei-Yeong Wang	Houston Department of Health and Human Services
23	Treasure Valley, ID	Michael DuBois	Idaho Department of Environmental Quality
24	Indianapolis, IN	Brian Wolff	Indiana Department of Environmental Management
25	Port of Los Angeles, CA	Paul Johansen	City of LA Harbor Dept. of Environmental Management
26	Reno, NV	Coleen Cripps	Nevada Department of Environmental Protection
27	State of New Jersey	Linda Bonano	New Jersey Department of Environmental Protection
28	New Jersey Turnpike/ Secaucus, NJ	Francisco Artigas	Meadowlands Environmental Research Institute
29	Rochester, NY	Dirk Felton	NY State Department of Environmental Conservation
30	Tonawanda, NY	Tom Gentile	NY State Department of Environmental Conservation
31	San Diego, CA	Mahmood Hossain	San Diego Air Pollution Control District
32	St. Regis Mohawk, NY	Kenneth Jock	St. Regis-Mohawk Tribe Environmental Division
33	Burlington, VT	Heidi Hales	Vermont Department of Environmental Conservation
34	Hopewell, VA	James Dinh	Virginia Department of Environmental Quality
35	Boulder, CO	Michael Hannigan	University of Colorado

6.0 Conclusions

Community-Scale Monitoring Grants were awarded by EPA for 52 unique projects since 2004. In the first RFA cycle, 16 projects were selected for award from 49 proposals, while in the second RFA cycle, 19 projects were selected for award from 58 proposals. EPA recently awarded 17 projects during the third RFA cycle out of 60 eligible applications in 2008.

This report summarizes key elements of 16 completed projects awarded from the first RFA cycle by reviewing the final reports and conducting telephone follow-ups to fill in any information gaps. Project Work Plans for the 19 projects awarded from the second RFA cycle were also reviewed. Information from the projects awarded from the third RFA cycle will be described in a later summary report. The following questions were used to guide this report:

- What were the primary pollutants of concern for these awards? The primary targets were specific pollutants that exceeded NATA 1999 cancer and/or noncancer risks (e.g., benzene, formaldehyde, hexavalent chromium). In total, of the 35 unique projects, 26 focused on speciated VOCs (e.g., benzene). Carbonyl compounds and metals were also targeted in numerous studies (21 and 18, respectively).

- What were the primary emissions sources of concern for these awards? Sources of concern varied from large industrial sources, such as a pulp and paper mill, to nonroad activities occurring in a railyard. There was a large focus on sources affecting nearby population areas. EPA's NATA results were used as a viable screening tool by many state-, local, and tribal-agencies to help communities identify potential sources of risk.

- What is the transferability or applicability of outcomes to similar scenarios in different locations? Many of the completed projects developed technology transfer tools that can be used in other communities. All of the submitted projects have Work Plans and Statistical tools that may be used in similar studies. Technology transfer tool groups include: Submitted Work Plan, Risk Communication, Statistical Tools, Air Sampling Hardware, and Public Outreach Initiatives.

- What is the quality of the data generated under the Community Air Toxics Monitoring Program? Each of the completed projects developed QAPPs approved by EPA. The QAPPs contained Data Quality Objectives (precision, completeness, etc.) that were met by all the grantees, with very few exceptions.

- Were the selected Community Air Toxics Monitoring Projects successful? One measure of success is to review the stated project goals and compare them with the corresponding results. However, this type of analysis could be performed on only projects for which a final report has been submitted. To this end, of the 16 final reports reviewed, over 95% of the stated project goals were met. Additionally, a number of studies presented results above and beyond their stated goals. By these metrics, the sixteen Community Air Toxics Monitoring Projects that submitted final reports were successful. Conclusions on the success of the remaining 19 projects will be made in a later report.