School Air Toxics Monitoring Initiative

Overview and Lessons Learned

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School Air Toxics: Initial Charge

- Assess potentially elevated ambient air toxics levels at some of our nation's schools
- Schools selected:
  - Results of 2002 NATA
  - Results from 2008 USA Today Study (using 2005 TRI)
  - Recommendations from EPA regional offices, State and Local Agencies
  - 2 tribal schools
- Criteria School selection:
  - Near large industrial sources
  - Urban areas – near interstates or airports
  - Mix of large and small sources

Thank you!

We could not have accomplished this project without the assistance of the EPA Regions, and our State, Local, and Tribal partners.

Project Design

- Monitor for key pollutants for at least 60 days collecting minimum of 10 valid samples
- Collect meteorological data for at least 6 months if possible
- Analysis: evaluate air toxics levels at each site for short- and long-term exposures
- Determine next steps based on sample results

School Selection: Problems Identified

- Several databases w/ school information
- Risk calculation differences between NATA and RSEI model used by USA Today
  - NATA emphasis on cancer risk
  - RSEI higher weighting of non-cancer risk
  - Result – different key pollutants identified from each model
- 2002 NEI versus 2005 TRI data
  - Concerns with accuracy of some information
- State and local agencies identified
  - Schools – renamed, closed, moved or scheduled for demolition
  - Facilities closed or emission estimates inaccurate
  - Sources not included in inventories

During Monitoring Period at a School Individual SamplesReviewed

- Individual sample results reviewed in light of individual sample screening levels
  - Sample screening levels help us gauge potential for pollutant levels in air to raise health concerns for **short-term** exposures
- Findings above sample screening levels were considered more closely, with regard to
  - Sample QA/QC
  - Other results for that pollutant at that school (e.g., pattern of concentrations)
  - Information regarding potential sources of pollutant at school and variability
  - Information regarding circumstances associated with health effects, and type of health effects

Initial Monitoring: Problems Identified

- Some pollutants had high values relative to values typically monitored
  - Determined problem with VOC monitoring equipment timer
  - Evaluated data and developed criteria w/ NACAA input to validate/invalidate VOC data
- Additional evaluation pointed to problems specifically w/ method used for acrolein
  - Initiated study of canisters and methods used by different labs
  - Determined acrolein values could not be used for analysis in SAT reports
  - Evaluating how to improve acrolein methods
- Anemometer used:
  - Would get stuck – report no data
  - Might report exceptionally high winds on calm days
  - Lightening and storms might set off

Analysis At End of Monitoring Period at a School

- Considers several types of information, including:
  - Concentrations of air toxics monitored at school
  - Wind direction and speed measurements taken at the school
  - Information on nearby sources of air toxics
- Addresses key questions, such as
  - Was sampling conducted during time with potential to see evidence of key source(s)/pollutant(s)
    - Were samples taken on days when winds indicate potential for suspected source(s) to be contributing to air concentrations at the school?
    - Was source(s) operating on sampling days?
    - Any indication that monitoring period conditions are not similar to conditions expected over longer-term?

Analysis At End of Monitoring Period at a School – cont'd

- Addresses key questions, such as
  - Do monitored concentrations of key pollutants (or others) indicate levels of concern for health impacts related to *(short- or)* long-term exposures?
    - Concentrations of key pollutants
    - Concentrations of other pollutants monitored
    - Concentrations of multiple pollutants (key or other)

Analysis At End of Monitoring Period at a School

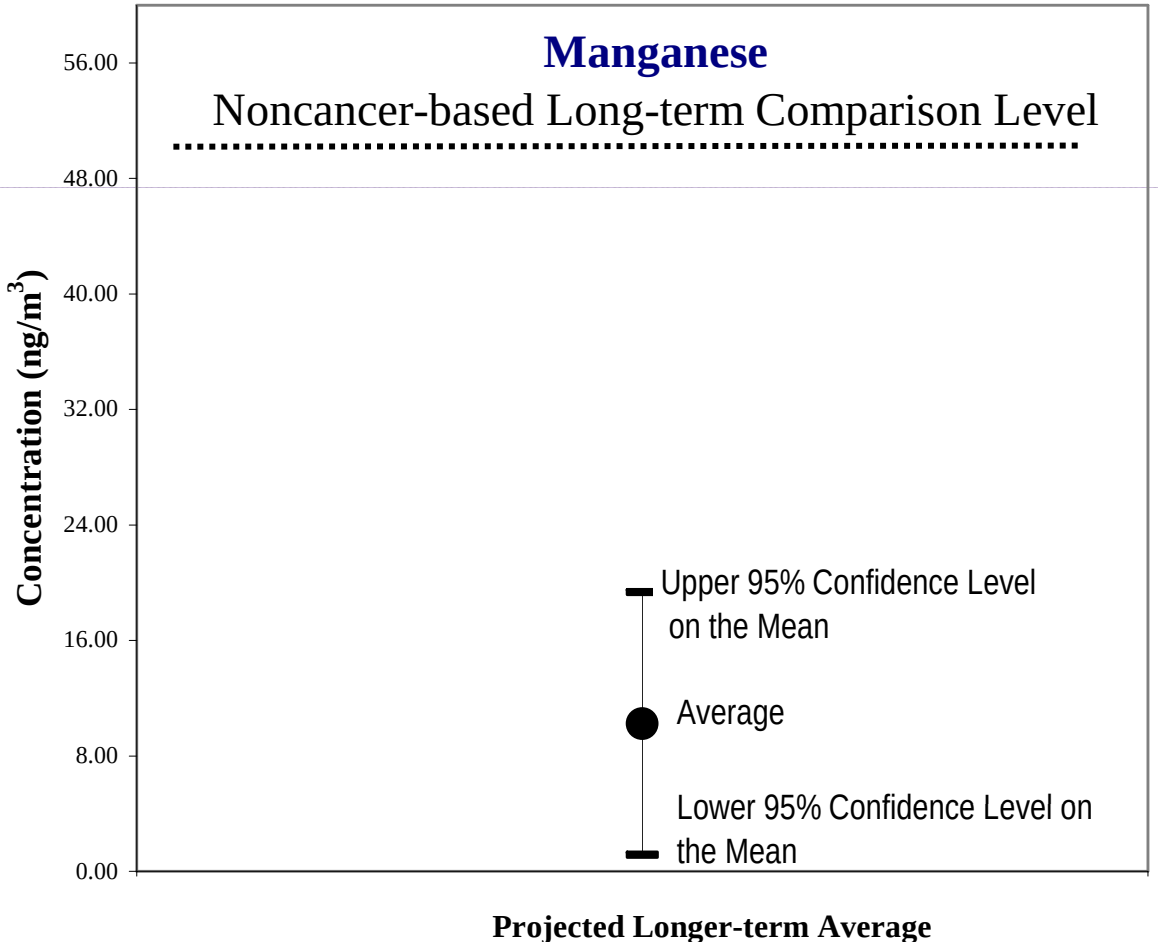
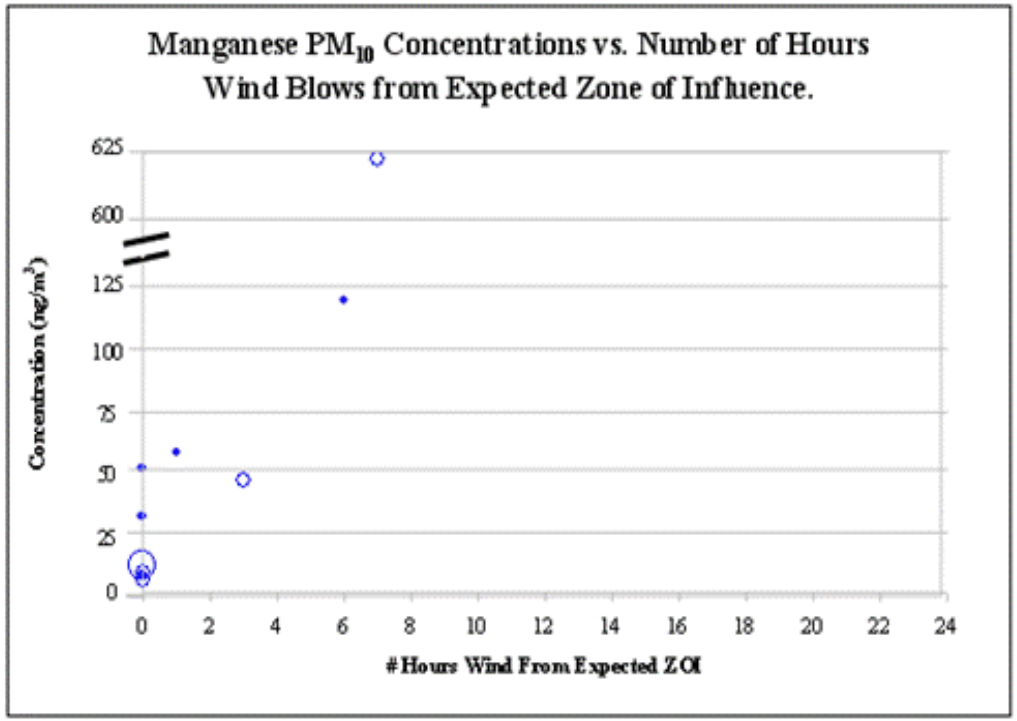
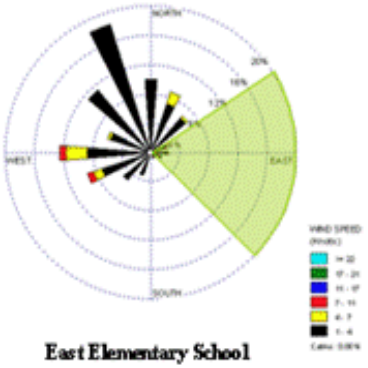
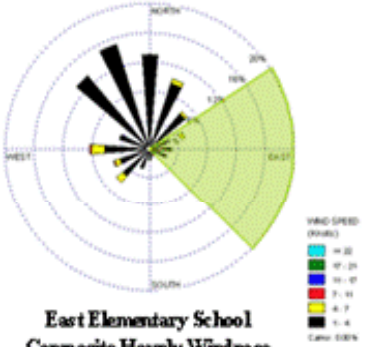


Figure 3. East Elementary School (East Liverpool, OH) Manganese PM_{10} Concentration and Wind Information.





East Elementary School
Composite Hourly Windrose
on Sample Days
(Beginning Aug 12-Oct 4, 2009)



East Elementary School
Composite Hourly Windrose
For Full Period
(Aug 12-Oct 4, 2009)

KEY

Pollutant: Manganese PM_{10}
Timeframe: August 12 - October 4, 2009

Note

Each symbol denotes a 24-hour collection of air for chemical analysis. The size of the symbol indicates the magnitude of the wind speed for that day (wind data shown in Table 2). The expected zone of source influence (ZOI) is a rough approximation of the range of directions from which winds carrying chemicals emitted by the key source may originate.

- Wind Speed: 0.1-2.5 mph
- Wind Speed: 2.5-5.0 mph
- Wind Speed: > 5.0 mph

Expected Zone of Source Influence

End of Monitoring Period at each School

Technical Report

- Describes analysis for individual school
- Includes key findings and recommendations for next steps, such as:
  - Monitoring does not need to be extended
  - Extend monitoring to better characterize pollutant concentrations in the community

Non-technical Summary

- Presented on EPA web site (www.epa.gov/schoolair)
- Findings and analysis from technical report summarized in non-technical language
  - Technical report itself also available from web site

Project Status

- Initial monitoring complete at all 65 schools
  - 63 schools in 22 states
  - 2 tribal schools
  - Final data release to web September 1, 2010
  - Over 73,000 data points processed; 1.47 million values form associated meteorological stations added to AQS data system
- Some schools slated for additional monitoring
  - Screening analysis indicated levels of concern which need further evaluation
  - Sources of interest were operating below normal capacity
  - Additional acrolein monitoring
- Additional monitoring ranges from repeat screening analysis to high-end, state-of-the-art continuous metals monitoring
- Final reports posted for 35 schools with rest to be completed summer 2011
- All reports and data will continue to be posted on the Schools website (www.epa.gov/schoolair)

SAT: Lessons Learned

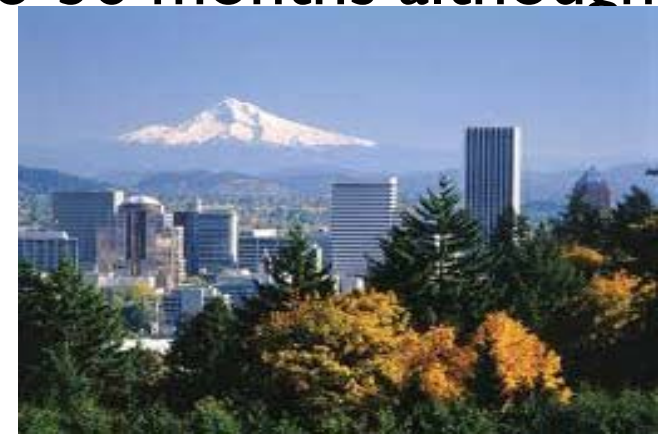
- Need better source specific information
  - Under CAA can not require states to collect air toxics information… *but state data is critical!*
  - As MACT rules revised requiring sources to submit emission information which may be used to improve inventories
- TRI data – Need better informed industry
  - TRI's primary use is community-right-to-know
  - Data used for other purposes – sometimes regulatory
  - Better education of industry about other potential uses
- If using models to inform, try to use most recent emission inventory
  - Over 60% of sources had significant emissions reductions from 2002-2008
    - 24-36% of sources had increase in emissions from 2002-2008
  - At least 12 facilities officially requested changes in 2002-2005 TRI data as a result of this project

SAT: Lessons Learned –cont'd

- Consistent application of monitoring methods and better methods
  - Working to improve method for acrolein
- The easiest place to monitor isn't always the best
  - Schools are representative of a population but may not best characterize the community
- Need good met data – met collection methods
- Need buy-in from partners
- Helpful to pilot the concept and work out the bugs before implementation
- Even what appears simple – will take longer than expected

What We are Learning from Community-Scale Grants

- Three Phases
  - 2003/2004: 17 projects funded (49 proposals)
  - 2005/2006: 19 projects funded (56 proposals)
  - 2007/2008: 19 projects funded (60 proposals)
- Awards from $50-500K
- Period of performance 18-36 months although many projects extended



Summary of CSATM Reports

- 55 projects have been funded with final reports for 35 projects
- All of the reports focused on different areas. Some with multiple objectives:
  - 19 focused on emissions evaluation; some studies also focused on emissions characterization
  - 15 performed method evaluation and development
  - 11 assessed health/risk to the community

Program Objectives

- Identify and define the extent of local scale HAP impacts
  - NATA primary tool used to prioritize pollutants of interest
- Proposals addressed one of three categories:
  - Community-scale monitoring
  - Methods development/evaluation
  - Analysis of existing data
- Several projects addressed more than one category

Community-scale Monitoring

- Supporting health effects assessments
- Evaluating and improving air quality models for exposure assessments
- Baseline analysis
- Characterizing specific pollutants of concern
- Developing profiles
- Characterizing specific emissions sources of concern
  - Chemical source profiles (or tracer species)
  - Emissions activity (diurnal, day-of-week, seasonal)
  - Spatial gradients (site-to-site differences)
  - Receptor modeling

Community-Scale Monitoring Additional Source Characterization

Community Monitoring Study	Sources Needing Additional Characterization
Warwick, RI	TF Green Airport
Delray, MI	Ambassador Bridge traffic, railyard, background
Tonawanda, NY	Background sources
Nez Perce, ID	Carbonyl sources, potential metals sources, chlorobenzene source
Detroit, MI	Rail terminal emissions, sources of chlorinated solvents, carbonyls, manganese
Sun Valley, CA	Chrome plating facility (Cr^{+6}) follow-up monitoring
Allegheny, PA	Downtown source of dichlorobenzene and trichloroethene; chlorinated compounds, substituted aromatics
Cherokee Heights, OK	Industrial metals and background concentrations
Indianapolis, IN	Industrial sources, background
Treasure Valley, ID	Wildfires and photochemical production, local solvents
Port of Los Angeles	Relative contribution of port to PAHs
New Jersey turnpike	Metals by particle size
St. Louis, MO	Nearby intermittent emitter

Community-Scale Monitoring Additional Source Characterization

Community Monitoring Study	Sources Needing Additional Characterization
Milwaukee, WI	Near-roadway BTEX
Phoenix, AZ (JATAP)	Near-roadway carbonyls at Greenwood
Chicago, IL	O'Hare Airport, steel mill, near-roadway gradients
Paterson, NJ	p-dichlorobenzene source; area and point sources for arsenic and chlorinated compounds
Port of Tampa, FL	Port of Tampa marine vessel DPM vs. highway DPM
Austin-Round Rock, TX (ARTS)	Source of high acrolein (photochemical?)
Portland, OR	Unknown Cr^{+6} source in NW Portland
Connecticut	Outdoor wood furnaces and aged wood smoke
Port of Los Angeles, CA	Port
Louisville, KY	Rubber plant
Placer County, CA (Roseville Railyard)	Railyard facility volatile organic compounds (VOCs)/carbonyls?

Methods Development/Evaluation

- Develop new methods for measurements of select priority HAPs
- Methods development critical for HAPs that:
  - Significantly contribute to national risk
  - Existing method detection limit higher than the cancer or non-cancer reference concentration
- Evaluate advanced HAP monitoring techniques that can become routine

Monitoring Methods That Might Be Implemented Elsewhere

Community Monitoring Study	Monitoring Methods That Might Be Implemented Elsewhere *(Limitations and Circumstances)*
Hopewell, VA	Aethalometer™ for BC *(surrogate for DPM)*
Denver, CO	Auto-GC (1-hr) for toxic VOCs useful in many studies
Warwick, RI	*Cerex open-path optical system was a failure*
Detroit, MI	*Continuous formaldehyde was not reliable for unattended operation*
Chicago, IL	Diffusion tube passive sampling *biased* relative to continuous sampler
Wilmington, DE	Formaldehyde and Cr^{+6} sampling *(potentially proprietary?)* AMS for particle-bound toxics source characterization. Some metals are identified. Expensive, but very useful for emissions characterization of PM.
Port of Tampa, FL	Open-path optical methods used for ozone and sulfur dioxide (SO_2); *criteria pollutants only?*
Paterson, NJ	Passive sampling method (PAKS) was *less effective* than TO-11 for carbonyls; EOSHI Cr^{+6} method is being evaluated further
Milwaukee, WI	Passive sample methodology for BTEX
Portland, OR	Pneumatic focusing GC detection limits too high to measure concentrations of interest
Spokane, WA	PTR-MS real-time concentrations of BTEX and acetaldehyde very useful for mobile monitoring hot spots and high time resolution measurements
St. Louis, MO	Xact Metals Monitor for semi-continuous metals measurements gave 2-hr resolution for metals measurements (near real-time). Very promising advance over 24-hr filter measurements.

Analysis of Existing Data

- Support S/L/T that have a lot of air toxics data and need support to interpret results.
- Increase grantees knowledge of analysis
- Support EPA's national data analysis trend effort
- Information from these projects has been included under Community-scale monitoring

Lessons Learned

- Many of the projects would have negotiated a longer project time period
  - Allow more time for the project to account for monitor siting and set-up issues
  - Consider data processing and analysis requirements (i.e., leave enough time and budget to finish job)
- Complete an emissions inventory, site visits, and screening modeling/monitoring before finalizing monitoring locations and targeting which air toxics to monitor.
- Ensure lab/method can provide the detection limits needed
  - If using more than one lab, would have performed a comparability study up front
- Would have worked with other agencies on public outreach and education – Get the right people together early
- Identified problems with portable monitors being evaluated – would have worked with manufacturers earlier in the process
- Better data analysis plan implemented sooner in process- would have asked for more funding and assistance with data analysis
- Would have more site visits to verify inventory information and develop reduction strategies

What EPA has learned

- Efforts have improved our overall knowledge of local air toxics issues – still more evaluation needed of projects completed
- Need to develop a mechanism for sharing results widely – webinars, conferences, training
- Grant competition scope needs a very clear purpose – this has improved over time
- Projects typically take longer than anticipated
- Follow-through needed to ensure that grant requirements are met
  - Final reports provided
  - Data entry into AQS
- Routine 24-hr, 1-in-6 day sample collection may not be as effective for characterizing emission sources because not as suitable for diurnal/day-of-week differences, meteorological analysis or receptor modeling

Next Steps

- Continue evaluating results from projects completed
- Webinar training this summer on - How to Create a Successful Air Toxics Monitoring Project
- Update summary report of projects with latest projects-http://www.epa.gov/ttn/amtic/local.html
- Suggestions?