Assessment of the National Air Toxics Trends Stations (NATTS) Network (DRAFT)

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Acknowledgments

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• NATTS Network Assessment Workgroup
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  – Stephanie McCarthy, Kentucky DEP
What is the NATTS Network?

- An ambient air monitoring network created to generate long-term, quality assured, standardized ambient air toxics data to:
  - Identify trends in air toxic concentrations
  - Evaluate the effectiveness of national hazardous air pollutant (HAP) reduction efforts
  - Ground truth air quality and human exposure models
  - Direct input into source-receptor models
  - Assess population exposure and background-level concentrations
How Does the NATTS Fit In?

- CAA amendments of 1990 - listed 189 HAPs to be controlled
- National-Scale Air Toxics Assessment (NATA) began in 1996 to evaluate air toxics and their potential health impacts
- Urban Air Toxics Strategy finalized in 1999 after Congress instructed EPA to develop a strategy for air toxics in urban areas.
  - Identified 33 air toxics presenting greatest threat to the public (“urban air toxics”)
  - Strategy states that ambient monitoring data necessary to understand the behavior of air toxics in the atmosphere after they are emitted - NATTS Network was developed
Why is an Assessment Necessary & Why Now?

• Review of the NATTS network required in the final draft of the *National Monitoring Strategy, Air Toxics Component*
  
  “Although the longevity of trends sites typically extends over a decade or more, the NATTS must be evaluated, and modified as needed, on 6-year intervals to assure continued relevancy, consistent with the procedures established under the national strategy”

• Although the Network is older than 6 years, many of the 23 original sites did not begin to fully sample the 16 initial core HAPs consistently until 2005
  
  Assessment covers data from 2003-2010
Project Timeline (How we got here)

Sep '11  |  Oct '11  |  Nov-Dec '11  |  Mar '12  |  May '12

- Workgroup is formed
- Preliminary work begins
- NATTS Operator calls
- Internal Draft (Version 1) sent to Workgroup
- Draft Version 2 released to Stakeholders
What is the Scope of the Draft Assessment?

• Goal is to determine the degree to which the NATTS Network objectives are being met

• Policy-relevant questions to be addressed using the assessment:
  – Is the network design appropriate/optimal to achieve the goals and objectives?
  – Are the NATTS goal and objectives still relevant?
  – Are the data collected adequate to meet the program goals?
  – What changes to the current network design would be appropriate to improve the NATTS
NATTS Sites & Years Established

NATTS Sites
- Rural (7)
- Urban (20)

NATTS - Year Established
- 2003
- 2004
- 2007
- 2008
- 2009
- 2010

The Hazard, KY, the Horicon, WI, and the Bronx, NY sites were relocated in 2008, 2009, and 2010, respectively.
### Minimum Required NATTS Analytes

**VOCs**
- Acrolein
- Benzene
- Chloroform
- 1,3-butadiene
- Vinyl Chloride
- Perchloroethylene
- Carbon Tetrachloride
- Trichloroethylene

**Carbonyls**
- Formaldehyde
- Acetaldehyde

**PM$_{10}$ Metals**
- Nickel compounds
- Arsenic compounds
- Cadmium compounds
- Manganese compounds
- Beryllium compounds
- Lead compounds

**PAHs**
- *Benzo(a)pyrene*
- *Naphthalene*

**TSP Hexavalent Chromium**

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1. Acrolein not included in data analysis due to data quality issues (canister cleaning & gas standards)
2. * Not an original Core HAP
Draft Network Assessment
Presentation Outline

• Overview of the Assessment Report structure
• Data quality requirements
• Scoring of NATTS data
• AQS reporting assessment
• Statistical overview of data (preliminary)
• Trends results (preliminary)
• Site operator interviews
• Observations, recommendations & future plans
What is in the Report?

• Detailed history of the Air Toxics and NATTS Program (Section 2)

• Detailed site information (Section 3)
  • Google Earth site maps
  • Site Descriptions
  • Site Characteristics (coordinates, population, average daily traffic, VMT, land use, location setting)
Example of Site Maps in Draft Network Assessment

Grand Junction, CO

Metals & hexavalent chromium monitors are at a separate, but adjacent, location due to space constraints.

Google Earth Image of Grand Junction NATTS Site

6/28/2012
What is in the Report? (cont.)

- NATTS Program requirements (Section 4)
  - NATTS pollutants, methods, MDLs
  - Method Quality Objectives (MQOs)
  - QA Program requirements (TSAs, IPAs, PTs, QAAR)
  - Workplan and QAPP requirements
  - AQS reporting requirements
  - Meteorological measurements information
What is in the Report? (cont.)

- Thorough assessment of reporting to AQS (Section 5):
  - NATTS POCs over time
  - Expected data that are missing from AQS
  - Reporting of:
    - Data quality information
    - Other HAPs w/assoc. methods
    - Non-HAPs w/assoc. methods
    - Criteria pollutants
    - Meteorological data
What is in the Report? (cont.)

• NATTS Site Operator Interviews (Section 6)
  • Equipment Survey (sampling and analytical) and age
  • Analytical laboratories over time
  • Operator comments
What is in the Report? (cont.)

- Data! Data! Data! (Section 7)
  - Additional datasets provided outside AQS

- Data Treatments

- Summary Statistics

- Inter-comparison of close proximity sites
What is in the Report? (cont.)

- MQO Scoring Procedure (Section 8)
  - A-rated, B-rated, Does Not Meet, and Not-rated
  - Common reasons why a pollutant dataset was “not suitable”
  - Identification of “trends suitable” pollutant datasets
What is in the Report? (cont.)

- Trends Calculations (Section 9)
  - Annual Averages by site and pollutant
  - 3-Year Blocked Averages by pollutant (to satisfy the Trends DQO)
  - 3-Year Rolling Averages by site and pollutant

- Observations and recommendations (Section 10)
What is in the Report? (cont.)

- Appendices
  - Concentration and precision data
  - Emission source maps, emission inventory data, and historical windrose profiles
What is in the Report? (cont.)

- Appendices (cont.)
  - Sampling and analytical equipment inventory
  - MQO Scoring tables by site and pollutant
  - Annual average and 3-year rolling averages by site and pollutant

- Combined – nearly 2,000 pages!
Data Quality Requirements

What are the data quality requirements?

How do the NATTS data compare to the data quality requirements?
What is the NATTS Network?

• An ambient air monitoring network created to generate long-term, quality assured, standardized ambient air toxics data to:
  – *Identify trends in air toxic concentrations*
  – Evaluate the effectiveness of national hazardous air pollutant (HAP) reduction efforts
  – Ground truth air quality and human exposure models
  – Direct input into source-receptor models
  – Assess population exposure and background-level concentrations
NATTS DQO

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error
\[
\bar{X} = \left( \frac{\bar{X}_{2005} + \bar{X}_{2006} + \bar{X}_{2007}}{3} \right)
\]

\[
\bar{Y} = \left( \frac{\bar{Y}_{2008} + \bar{Y}_{2009} + \bar{Y}_{2010}}{3} \right)
\]

\[
T = \left( \frac{\bar{Y} - \bar{X}}{\bar{X}} \right) \times 100
\]
DQO Development

- Directed by NACAA Monitoring Steering Committee in 2002 (was STAPPA/ALAPCO—US EPA Monitoring Steering Committee)
- Followed Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4
- Used data collected and analyzed by a10-city Pilot Monitoring Project
- Six high risk pollutants: Acrolein, arsenic, benzene, 1,3-butadiene, chromium, and formaldehyde
- Draft Report on Development of Data Quality Objectives for the National Air Toxics Trends Monitoring Network
MQOEs

- Completeness: \( \geq 85\% \) (1-in-6 day sampling)
- Precision: Collocated samples \( \leq 15\% \) CV
- Sensitivity: Target MDLs (based on health risk)
- Bias: Proficiency tests (PTs) \( \leq 25\% \) vs. true concentration
Pollutant dataset

The set of ambient air concentrations of one pollutant, at one site, for one calendar year

- Benzene concentrations at Phoenix for 2010
- Acetaldehyde concentrations at San Jose for 2006
- Arsenic concentrations at Grand Junction for 2008
NATTS data vs. MQOs

- Some pollutant datasets were *just outside* of the respective MQO
- Nearly all datasets had data for completeness and sensitivity (MDLs)
- Bias measurements (PT data) were available for 88% of the datasets (PT frequency varied)
- Precision measurements were available for 74% of the datasets (precision was not required)
MQO Scoring

1) Identifies pollutant datasets that are *just outside* of the MQO

2) Applies a weighting scheme to reflect how the MQOs applied during the assessment period
MQO Scoring

<table>
<thead>
<tr>
<th>MQO</th>
<th>A rated</th>
<th>B rated</th>
<th>Original weighting</th>
<th>Adjusted weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness</td>
<td>≥ 85%</td>
<td>75%-85%</td>
<td>25%</td>
<td>40%</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Ratio ≤ 1.00</td>
<td>Ratio 1.00-1.50</td>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>Bias</td>
<td>± 25%</td>
<td>± 25% to ± 35%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>Precision</td>
<td>± 15%</td>
<td>± 15% to ± 25%</td>
<td>25%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Benefits of MQO Scoring

1) Includes a larger number of pollutant datasets
2) Emphasizes the data in hand (completeness and sensitivity)
3) De-emphasizes data that were not required (precision) or that were not uniformly applied (precision and bias)
## Results of MQO Scoring

<table>
<thead>
<tr>
<th>Pollutant Group</th>
<th># Pollutant Datasets Scored</th>
<th>A-rated</th>
<th>B-rated</th>
<th>Does Not Meet MQO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>#A</td>
<td>%A</td>
<td>#B</td>
</tr>
<tr>
<td>VOCs</td>
<td>1,259</td>
<td>662</td>
<td>53%</td>
<td>190</td>
</tr>
<tr>
<td>Carbonyls</td>
<td>362</td>
<td>228</td>
<td>63%</td>
<td>59</td>
</tr>
<tr>
<td>PM$_{10}$ Metals</td>
<td>946</td>
<td>535</td>
<td>57%</td>
<td>284</td>
</tr>
<tr>
<td>Hex Chrome</td>
<td>128</td>
<td>94</td>
<td>73%</td>
<td>20</td>
</tr>
<tr>
<td>PAHs</td>
<td>132</td>
<td>113</td>
<td>86%</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,827</td>
<td>1,632</td>
<td>58%</td>
<td>560</td>
</tr>
</tbody>
</table>

2,192 pollutant datasets (78%) are suitable for assessing trends

6/28/2012
U.S. Environmental Protection Agency
Most Frequent Reasons That Pollutant Datasets Were Not Suitable

- High MDLs: 409
- Low Completeness: 129
- No MDL: 88
- VOC Invalidated: 49
- High Bias: 46
- High Precision: 44

6/28/2012 U.S. Environmental Protection Agency
### 2010 MDLs

<table>
<thead>
<tr>
<th>Meeting MDLs (all sites)</th>
<th>Not Meeting MDLs (# labs/# sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(a)pyrene</td>
<td>Acetaldehyde (1/1) Carbon tetrachloride (6/9)</td>
</tr>
<tr>
<td>Cr+6</td>
<td>Arsenic (4/6) Chloroform (2/3)</td>
</tr>
<tr>
<td>Lead</td>
<td>Benzene (5/8) Formaldehyde (5/7)</td>
</tr>
<tr>
<td>Manganese</td>
<td>Beryllium (2/2) Tetrachloroethylene (7/10)</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1,3-butadiene (6/10) Trichloroethylene (4/6)</td>
</tr>
<tr>
<td>Nickel</td>
<td>Cadmium (1/1) Vinyl chloride (7/10)</td>
</tr>
</tbody>
</table>
MDL Analysis – Manganese (PM$_{10}$) for 2010

NATTS Site

99th Percentile Concentration = 30.7 ng/m$^3$

5th Percentile Concentration = 0.85 ng/m$^3$
MDL Analysis – Formaldehyde for 2010

- Form aldehyde MDL = 0.08 μg/m³
- 95th Percentile Concentration = 7.37 μg/m³
- 5th Percentile Concentration = 0.55 μg/m³
MDL Analysis – Vinyl Chloride for 2010

- Vinyl Chloride MDL = 0.11 µg/m³
- 95th Percentile Concentration = 0.77 µg/m³
- 5th Percentile Concentration = 0.003 µg/m³

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From the Universe to Suitable Data

3,343 pollutant datasets were scheduled for collection
- 133 were not reported (but were expected)
- 149 were acrolein (not assessed)
- 214 were not rated (due to mid-year start/end)

2,827 pollutant datasets that were scored
- 635 did not meet the scoring criteria (not suitable for trends)

2,192 pollutant datasets met the scoring criteria (suitable for Trends)
Cliff Notes Summary

- EPA needs quality data to assess trends
- Measure that data quality with MQOs
- MQO data were not always available
- Workgroup developed a scoring system to identify data that are suitable for assessing trends
- 78% of the pollutant datasets are suitable
- High MDLs are the most common reason for unsuitable data
- EPA calculated trends using 2,827 suitable datasets
Data Assessment

Examined Through:
- AQS Data Reporting
- National Summary Statistics
- Inter-Site Comparison
- Annual Averages
- Three-Year Averages (Blocked and Rolling)
- Site Operator Interviews
AQS Data Reporting

Database Preparation:
- AQS Data Pull: December 2011
- 27 million records (RD and RP formats) pulled for NATTS Sites AQS Site IDs from 2003-2010
- Data stored in Microsoft SQL Server and Access
- Significant investment identifying applicable POCs:
  - EPA’s QAAR
  - NATTS Operating Agencies
  - EPA’s National Monitoring Program
AQS Data Reporting – Reported Datasets

Reporting Completeness:
- 95% of method-specific (VOC, carbonyls, etc.) were reported to AQS.
- EPA was able to obtain some additional datasets from NATTS Operating Agencies
- EPA received clarification on some of the missing datasets
Reporting Completeness (cont.)

<table>
<thead>
<tr>
<th>100% completeness</th>
<th>90-100% completeness</th>
<th>&lt;90% completeness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(a)pyrene</td>
<td>Acetaldehyde</td>
<td>Acrolein</td>
</tr>
<tr>
<td>Butadiene, 1,3-</td>
<td>Arsenic (PM$_{10}$)</td>
<td>Beryllium (PM$_{10}$)</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>Benzene</td>
<td>Hexavalent chromium</td>
</tr>
<tr>
<td>Chloroform</td>
<td>Formaldehyde</td>
<td>Cadmium (PM$_{10}$)</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Vinyl chloride</td>
<td>Lead (PM$_{10}$)</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td></td>
<td>Manganese (PM$_{10}$)</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td></td>
<td>Nickel (PM$_{10}$)</td>
</tr>
</tbody>
</table>
AQS Data Reporting – Sampling Consistent With National Calendar

- EPA prepares a national calendar annually
  - Consistent sampling days is useful in conducting spatial variability analysis

- Results:
  - Most sites did well to stick with the national calendar
  - Most sites made up samples within the quarter
  - Most sites reported voided samples that occurred on national sampling days.
### AQS Data Reporting – Data Quality Information

<table>
<thead>
<tr>
<th>Data Quality Information Metric</th>
<th># Sites Reporting in 2005</th>
<th># Sites Reporting in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under-MDL Reporting</td>
<td>19 / 23</td>
<td>27 / 28</td>
</tr>
<tr>
<td>ND Reporting</td>
<td>7 / 23</td>
<td>27 / 28</td>
</tr>
<tr>
<td>Null Data Code Reporting</td>
<td>21 / 23</td>
<td>26 / 28</td>
</tr>
<tr>
<td>Pollutant-Specific MDLs</td>
<td>19 / 23</td>
<td>28 / 28</td>
</tr>
<tr>
<td>Data Qualifier Reporting</td>
<td>11 / 23</td>
<td>28 / 28</td>
</tr>
<tr>
<td>Precision Data Reporting</td>
<td>18 / 23</td>
<td>26 / 28</td>
</tr>
</tbody>
</table>
### AQS Data Reporting – Engineering Units

<table>
<thead>
<tr>
<th>Pollutant Group</th>
<th>Primary Engineering Unit</th>
<th>Secondary Engineering Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonyls</td>
<td>ppbv (60%)</td>
<td>µg/m³ SC (26%)</td>
</tr>
<tr>
<td>Hexavalent chromium</td>
<td>ng/m³ SC (100%)</td>
<td>--</td>
</tr>
<tr>
<td>PAHs</td>
<td>ng/m³ SC (100%)</td>
<td>--</td>
</tr>
<tr>
<td>PM₁₀ Metals*</td>
<td>ng/m³ SC (64%)</td>
<td>µg/m³ SC (22%)</td>
</tr>
<tr>
<td>VOCs</td>
<td>ppbv (91%)</td>
<td>µg/m³ SC (9%)</td>
</tr>
</tbody>
</table>

*: local conditions (LC) reported 14% of data
## AQS Data Reporting – Additional Reporting

<table>
<thead>
<tr>
<th>Reporting Metric</th>
<th># Sites Reporting in 2005</th>
<th># Sites Reporting in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other HAP Reporting</td>
<td>23 / 23</td>
<td>28 / 28</td>
</tr>
<tr>
<td>Non-HAP Reporting</td>
<td>21 / 23</td>
<td>26 / 28</td>
</tr>
<tr>
<td>Criteria Air Pollutant Reporting</td>
<td>22 / 23</td>
<td>27 / 28</td>
</tr>
<tr>
<td>Meteorological Data Reporting</td>
<td>21 / 23</td>
<td>25 / 28</td>
</tr>
</tbody>
</table>
## Data Treatments

<table>
<thead>
<tr>
<th>Data</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary null or 0</td>
<td>Replaced with secondary, if available</td>
</tr>
<tr>
<td>Non-Detects</td>
<td>Replaced with 0 as a surrogate</td>
</tr>
<tr>
<td>½ MDL substitution</td>
<td>Identified records that were suspected as being ½ MDL. Replaced with 0</td>
</tr>
</tbody>
</table>
| Units conversion                  | **VOCs, Carbonyls** = µg/m³  
**PM$_{10}$ Metals, PAHs, Hexavalent Chromium** = ng/m³                                                                                   |
| Invalidated data                  | Three agencies invalidated large portions of data                                                                                         |
| Additional data                   | Three agencies provided data not in AQS                                                                                                 |
| Questionable data                 | Out-of-range data were identified, and the appropriate agency/lab was contacted.                                                          |
# NATTS Data Records Overview

<table>
<thead>
<tr>
<th>Year</th>
<th># Primary</th>
<th># Secondary</th>
<th># Replicates</th>
<th>Total for Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>7,829</td>
<td>1,182</td>
<td>361</td>
<td>9,372</td>
</tr>
<tr>
<td>2004</td>
<td>15,787</td>
<td>2,904</td>
<td>486</td>
<td>19,177</td>
</tr>
<tr>
<td>2005</td>
<td>19,115</td>
<td>3,544</td>
<td>1,030</td>
<td>23,689</td>
</tr>
<tr>
<td>2006</td>
<td>19,394</td>
<td>4,371</td>
<td>1,406</td>
<td>25,171</td>
</tr>
<tr>
<td>2007</td>
<td>23,219</td>
<td>6,356</td>
<td>2,538</td>
<td>32,113</td>
</tr>
<tr>
<td>2008</td>
<td>27,370</td>
<td>6,579</td>
<td>2,322</td>
<td>36,271</td>
</tr>
<tr>
<td>2009</td>
<td>29,501</td>
<td>7,783</td>
<td>2,409</td>
<td>39,693</td>
</tr>
<tr>
<td>2010</td>
<td>29,595</td>
<td>7,338</td>
<td>2,769</td>
<td>39,702</td>
</tr>
<tr>
<td>TOTAL</td>
<td>171,810</td>
<td>40,057</td>
<td>13,321</td>
<td>225,188</td>
</tr>
</tbody>
</table>
## National, and Urban/Rural Summary Statistics

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Units</th>
<th>Site Type</th>
<th># AQS Records</th>
<th>% Detections</th>
<th>Arithmetic Mean</th>
<th>5th</th>
<th>10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
<th>95th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>µg/m³</td>
<td>Urban</td>
<td>7,442</td>
<td>100%</td>
<td>1.88 ± 0.05</td>
<td>0.47</td>
<td>0.63</td>
<td>0.92</td>
<td>1.46</td>
<td>2.36</td>
<td>3.55</td>
<td>4.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,831</td>
<td>98%</td>
<td>1.57 ± 0.06</td>
<td>0.35</td>
<td>0.47</td>
<td>0.71</td>
<td>1.11</td>
<td>1.81</td>
<td>3.06</td>
<td>4.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>10,273</td>
<td>95%</td>
<td>1.79 ± 0.04</td>
<td>0.42</td>
<td>0.55</td>
<td>0.86</td>
<td>1.37</td>
<td>2.23</td>
<td>3.44</td>
<td>4.32</td>
</tr>
<tr>
<td>Acrylonitrile (PM₁₀)</td>
<td>ng/m³</td>
<td>Urban</td>
<td>6,693</td>
<td>88%</td>
<td>1.14 ± 0.08</td>
<td>ND³</td>
<td>ND³</td>
<td>0.32</td>
<td>0.63</td>
<td>1.13</td>
<td>2.20</td>
<td>3.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,817</td>
<td>88%</td>
<td>0.66 ± 0.04</td>
<td>ND³</td>
<td>ND³</td>
<td>0.17</td>
<td>0.43</td>
<td>0.68</td>
<td>1.16</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>9,510</td>
<td>88%</td>
<td>0.98 ± 0.08</td>
<td>ND³</td>
<td>ND³</td>
<td>0.27</td>
<td>0.55</td>
<td>1.01</td>
<td>1.59</td>
<td>2.86</td>
</tr>
<tr>
<td>Benzene</td>
<td>µg/m³</td>
<td>Urban</td>
<td>7,511</td>
<td>100%</td>
<td>1.14 ± 0.02</td>
<td>0.31</td>
<td>0.38</td>
<td>0.57</td>
<td>0.86</td>
<td>1.37</td>
<td>2.20</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,457</td>
<td>88%</td>
<td>0.84 ± 0.03</td>
<td>ND³</td>
<td>ND³</td>
<td>0.16</td>
<td>0.46</td>
<td>0.88</td>
<td>1.47</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>10,078</td>
<td>95%</td>
<td>1.01 ± 0.02</td>
<td>ND³</td>
<td>0.26</td>
<td>0.47</td>
<td>0.78</td>
<td>1.28</td>
<td>2.04</td>
<td>2.78</td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td>ng/m³</td>
<td>Urban</td>
<td>3,185</td>
<td>64%</td>
<td>0.123 ± 0.03</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.04</td>
<td>0.12</td>
<td>0.27</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>1,147</td>
<td>48%</td>
<td>0.956 ± 0.04</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.04</td>
<td>0.23</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>4,352</td>
<td>59%</td>
<td>0.113 ± 0.02</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.03</td>
<td>0.11</td>
<td>0.26</td>
<td>0.42</td>
</tr>
<tr>
<td>Beryllium (PM₁₀)</td>
<td>ng/m³</td>
<td>Urban</td>
<td>6,614</td>
<td>76%</td>
<td>0.109 ± 0.01</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.004</td>
<td>0.02</td>
<td>0.16</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,483</td>
<td>38%</td>
<td>0.038 ± 0.005</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.004</td>
<td>0.03</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>9,097</td>
<td>62%</td>
<td>0.090 ± 0.01</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.002</td>
<td>0.02</td>
<td>0.10</td>
<td>0.50</td>
</tr>
<tr>
<td>Butadiene, 1,3-</td>
<td>µg/m³</td>
<td>Urban</td>
<td>7,625</td>
<td>84%</td>
<td>0.129 ± 0.006</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.04</td>
<td>0.07</td>
<td>0.15</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,477</td>
<td>19%</td>
<td>0.011 ± 0.003</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.004</td>
<td>0.05</td>
<td>0.12</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>10,102</td>
<td>68%</td>
<td>0.100 ± 0.005</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.01</td>
<td>0.05</td>
<td>0.24</td>
<td>0.38</td>
</tr>
<tr>
<td>Cadmium</td>
<td>ng/m³</td>
<td>Urban</td>
<td>6,693</td>
<td>86%</td>
<td>0.28 ± 0.02</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.06</td>
<td>0.12</td>
<td>0.29</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,481</td>
<td>83%</td>
<td>0.13 ± 0.01</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.03</td>
<td>0.07</td>
<td>0.14</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>9,174</td>
<td>85%</td>
<td>0.24 ± 0.01</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.05</td>
<td>0.10</td>
<td>0.24</td>
<td>0.50</td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td>µg/m³</td>
<td>Urban</td>
<td>7,550</td>
<td>97%</td>
<td>0.387 ± 0.004</td>
<td>0.34</td>
<td>0.44</td>
<td>0.50</td>
<td>0.57</td>
<td>0.68</td>
<td>0.77</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>2,451</td>
<td>66%</td>
<td>0.368 ± 0.012</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.44</td>
<td>0.59</td>
<td>0.69</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All Sites</td>
<td>10,001</td>
<td>89%</td>
<td>0.334 ± 0.005</td>
<td>ND³</td>
<td>ND³</td>
<td>ND³</td>
<td>0.49</td>
<td>0.57</td>
<td>0.65</td>
<td>0.75</td>
</tr>
</tbody>
</table>
Summary Observations (2003-2010)

• Formaldehyde and acetaldehyde had the greatest number of detects (10,325 and 10,213, respectively). Greater than 90% detects for:
  – Acetaldehyde (99%)
  – Benzene (95%)
  – Formaldehyde (100%)
  – Lead (PM$_{10}$) (99%)
  – Manganese (PM$_{10}$) (99%)
  – Naphthalene (100%)
  – Nickel (PM$_{10}$) (92%)

• Vinyl chloride had the least number of detects (1,789)
Summary Observations (cont.)

- Detects by pollutant and site are examined

![Graph showing number of concentration records for Acetaldehyde]
Summary Observations (cont.)

- For all pollutants, except for vinyl chloride and formaldehyde, concentrations at urban sites were statistically significantly higher than rural sites.
- Assessment includes similar site-level information

Table D.2-2. Summary Statistics for Los Angeles, CA
Inter-comparison of Close Proximity Sites
Inter-comparison of Close Proximity Sites

<table>
<thead>
<tr>
<th>Paired Sites</th>
<th># Pollutants, no sig. diff.</th>
<th># Pollutants, sig. diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los-Angeles, CA – Rubidoux, CA</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Pinellas County, FL – Tampa, FL</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Providence, RI – Roxbury, MA</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Richmond, VA – Washington, DC</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>
Time Period Averaging - Annual

• Using the results from the MQO Scoring, annual averages were calculated for “suitable” datasets (2,192).
• Averaged detects and non-detects (substituted with 0).
• Confidence Interval at $\alpha = 0.05$
Time Period Averaging – 3-Year Blocked

- Procedure:
  - Only considered “suitable” pollutant datasets with all six years (2005-2010)
  - Averaged by pollutant and block
  - Calculated % difference between pollutant-blocks

3-Year Blocked Averages:
- Acetaldehyde Across 13 Sites
- Concentration (ug/m³)

3-Year Blocked Averages:
- Arsenic (PM₁₀) Across 8 Sites
- Concentration (µg/m³)

15.9% decrease in 3-year average concentrations
12.2% decrease in 3-year average concentrations
Time Period Averaging – 3-Year Blocked (cont.)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Pollutant Group</th>
<th>Number of Sites Used in Averaging</th>
<th>2005-2007</th>
<th>2008-2010</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>Carbonyl</td>
<td>13</td>
<td>1.93</td>
<td>1.62</td>
<td>-15.9%</td>
</tr>
<tr>
<td>Arsenic (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>8</td>
<td>0.89</td>
<td>0.78</td>
<td>-12.2%</td>
</tr>
<tr>
<td>Benzene</td>
<td>VOC</td>
<td>14</td>
<td>1.07</td>
<td>0.87</td>
<td>-18.2%</td>
</tr>
<tr>
<td>Beryllium (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>12</td>
<td>0.056</td>
<td>0.043</td>
<td>-22.2%</td>
</tr>
<tr>
<td>Butadiene, 1,3-</td>
<td>VOC</td>
<td>12</td>
<td>0.119</td>
<td>0.086</td>
<td>-28.3%</td>
</tr>
<tr>
<td>Cadmium (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>14</td>
<td>0.27</td>
<td>0.19</td>
<td>-28.6%</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>VOC</td>
<td>10</td>
<td>0.57</td>
<td>0.62</td>
<td>8.7%</td>
</tr>
<tr>
<td>Chloroform</td>
<td>VOC</td>
<td>15</td>
<td>0.21</td>
<td>0.24</td>
<td>16.5%</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Carbonyl</td>
<td>12</td>
<td>2.87</td>
<td>2.34</td>
<td>-18.6%</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>Hexavalent</td>
<td>12</td>
<td>0.026</td>
<td>0.016</td>
<td>-37.4%</td>
</tr>
<tr>
<td>Lead (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>12</td>
<td>4.63</td>
<td>3.02</td>
<td>-34.6%</td>
</tr>
<tr>
<td>Manganese (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>13</td>
<td>6.20</td>
<td>5.30</td>
<td>-14.6%</td>
</tr>
<tr>
<td>Nickel (PM$_{10}$)</td>
<td>PM$_{10}$ Metals</td>
<td>11</td>
<td>1.85</td>
<td>1.25</td>
<td>-32.4%</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>VOC</td>
<td>12</td>
<td>0.39</td>
<td>0.22</td>
<td>-42.6%</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>VOC</td>
<td>15</td>
<td>0.057</td>
<td>0.038</td>
<td>-33.5%</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>VOC</td>
<td>13</td>
<td>0.0029</td>
<td>0.0034</td>
<td>15.9%</td>
</tr>
</tbody>
</table>
Time Period Averaging – 3-Year Rolling Averages

• Procedure:
  – Averaged by site, pollutant, and “rolling” block
  – Allows for trends examination for more pollutant datasets (>1,200).
NATTS Site Operator Interviews

- 22 Interviews conducted over 4-week period
- 14-page survey sent to each operator (pre-filled as much as possible) prior to call:
  - Background Information
  - General Site Operations
  - Site Operations – TO-15 (VOCs)
  - Site Operations – TO-11A (carbonyls)
  - Site Operations – IO-3.5 (PM$_{10}$ metals)
  - Site Operations – Modified CARB039 (hexavalent chromium)
  - Site Operations – TO-13 (PAHs)

- Operators shared successes/challenges
NATTS Site Operator Interviews (cont.)

- **Equipment Surveys**

<table>
<thead>
<tr>
<th>Equipment Information</th>
<th>VOCs</th>
<th>Carbs</th>
<th>PM$_{10}$ Metals</th>
<th>Hex Chrome</th>
<th>PAHs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampler model and age</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Analytical instrumentation and age</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Preconcentrator unit and age</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standards preparation</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilution equipment and age</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canister cleaning equipment and age</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canister hot or cold cleaning</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraction technique used</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Extraction unit and age</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
NATTTS Site Operator Interviews (cont.)

- Survey completeness:
  - Most operators could provide information about equipment, age, and technique
  - Due to staffing turnover, some information could not be identified

- Equipment Age

<table>
<thead>
<tr>
<th>Equipment</th>
<th>% Older than 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samplers</td>
<td>~35-40%</td>
</tr>
<tr>
<td>Analytical</td>
<td>~20-25%</td>
</tr>
<tr>
<td>Preconcentrators</td>
<td>~18-20%</td>
</tr>
<tr>
<td>Standards Preparation</td>
<td>~32-45%</td>
</tr>
<tr>
<td>Canister Cleaning</td>
<td>~25-30%</td>
</tr>
<tr>
<td>Extraction-metals</td>
<td>~13-20%</td>
</tr>
<tr>
<td>Extraction-hex chrome</td>
<td>~0-10%</td>
</tr>
<tr>
<td>Extraction-PAHs</td>
<td>~0-5%</td>
</tr>
</tbody>
</table>
NATTS Site Operator Interviews (cont.)

• Operator Comments
  – Beneficial for the agency and EPA
  – Some concerns that were raised were corrected immediately
  – Grouped into:
    • Program Office
      – e.g., recommend setting aside resources for equipment replacement
    • Data Reporting
      – e.g., issues with uploading data to AQS
    • Logistical
      – e.g., difficulty picking up samples on weekends/holidays
    • Methods
      – e.g., recommend periodic review of sampling and analytical methods
    • Sampling:
      – e.g., some equipment is old, and needs to be replaced
    • Proficiency Testing
      – e.g., suggest that non-NATTS laboratories be involved in the NATTS PT Program
Observations & Recommendations

• DQO trends analysis indicates 13 pollutants decreasing and 3 increasing
  – Important to continue monitoring to determine if increase is due to lowering of MDLs (fewer substitutions of 0 for NDs), or is an actual trend

• High MDLs accounted for the majority of datasets that were excluded from trends analysis
  – NATTS participants should use report to determine if any data excluded from trends analysis and what can be done to prevent this in the future (e.g., working with labs to lower MDLs)

• Many data reporting issues were identified and resolved during careful review of data in AQS for use in the assessment
  – More frequent review of NATTS data by OAQPS & regional office

• Important for network to monitor pollutants with chronic health benchmark levels & NATA risk drivers
  – Continue encouraging reporting all monitoring data
Observations & Recommendations

• NATTs Proficiency Testing (PT) program has been extremely beneficial in improving laboratory performance
  – Increase proficiency testing samples to twice annually

• Many sites and laboratories operating sampling and analytical equipment purchased prior to 2001
  – Work with regional offices to re-task residual funds for equipment upgrades

• Some sampling and analysis methods approved for the NATTs program have not been revised in over 10 years
  – Refine sampling and analytical methods (e.g. TO methods)
Future Plans for Network Assessment

• Determine whether:
  – Sites should be added or removed
  – Required analytes should be added or removed
  – Determination of target MDLs should be modified
  – Program-level DQOs should be refined
  – MQOs should be refined
  – Current analytical and/or method precision calculations should be revised

• Use assessment findings to update NATTS TAD
Going Forward…

**Proposed Timeline:**

- Now through early June - conference calls with NACAA monitoring steering committee, regions & states to review document & address comments
- **June 18th - comments due from stakeholders**
- July 9th - comments incorporated & next draft completed

**Ongoing:**

- Weekly/bi-weekly meetings with NATTS workgroup to begin addressing addition/reduction of sites & pollutants, MDLs, DQOs & MQOs, etc.
- Reinitiate quarterly air toxics calls with regions & states to review document & other NATTS issues

*We are currently seeking S/L volunteers to join the NATTS Network Assessment Workgroup. If interested, please contact Beth Landis (landis.elizabeth@epa.gov)*

6/28/2012 U.S. Environmental Protection Agency
At this time our panel would be happy to address any questions regarding NATTS QA, the NATTS TAD & the Draft Network Assessment

Panel Participants

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