Description and Progress of ERTAC Rail

Michelle Bergin, PhD
GA EPD, ERTAC Rail Co-Chair

Matthew Harrell, IL EPA; Julie McDill, MARAMA; Mark Janssen, LADCO; Laurel Driver, US EPA, OAQPS; Robert Fronczak, Association of American Railroads; Rick Nath, CSX Transportation; and David Seep, BNSF Railway

U.S. Environmental Protection Agency’s
18th International Emission Inventory Conference
Baltimore, MD    April 15, 2009
# The ERTAC Rail Subcommittee

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Allan Ostrander</td>
<td>MI Dept. of Environ. Quality</td>
<td>Kevin McGarry</td>
<td>NY Dept. of Environ. Conserv.</td>
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<tr>
<td>Amanda Carter</td>
<td>AL Dept. of Environ. Manag.</td>
<td>Laurel Driver</td>
<td>US EPA OAQPS</td>
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<tr>
<td>Ashley Mixon</td>
<td>SC Dept. of Health and Environ. Control (SC DHEC)</td>
<td>Lisa Higgins</td>
<td>ME Dept. of Environ. Protection</td>
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<tr>
<td>Bob Wooten</td>
<td>NC Dept. of Environ. and Natural Resources</td>
<td>Mark Janssen</td>
<td>ERTAC/ Lake Michigan AirDirectors Consortium (LADCO)</td>
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<tr>
<td>Carla Bedenbaugh</td>
<td>SC DHEC</td>
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<td>IL Environ. Protection Agency</td>
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<td>Chad Wilbanks</td>
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<td>Mike Koerber</td>
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<td>Douglas Malchenson</td>
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<td>Pat Brewer</td>
<td>Visibility Improvement State and Tribal Association of the Southeast (VISTAS)/ASIP</td>
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<td>Eric Zalewsky</td>
<td>NY Dept. of Environ. Conserv.</td>
<td>Richard Dalebout</td>
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<td>Grant Hetherington</td>
<td>WI Dept. of Natural Resources</td>
<td>Sam Long</td>
<td>IL Environ. Protection Agency</td>
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<td>Jim Boylan</td>
<td>GA Environ. Protection Div.</td>
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<td>OH Environ. Protection Agency</td>
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**ERTAC Rail Subcommittee**
# Current ERTAC GIS and Data Workgroup

<table>
<thead>
<tr>
<th>Members</th>
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<td>Canadian Pacific Railway</td>
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<td>Mark Janssen</td>
<td>LADCO</td>
<td>Carl Akins</td>
<td>Kansas City Southern</td>
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<tr>
<td>Julie McDill and Patrick Davis</td>
<td>MARAMA</td>
<td>Erika Akkerman</td>
<td>Canadian National Railway</td>
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<td>Laurel Driver</td>
<td>US EPA OAQPS</td>
<td>M. John Germer, Lanny Schmid, and Paul Steege,</td>
<td>Union Pacific Railroad</td>
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<tr>
<td>Robert Fronczak</td>
<td>AAR</td>
<td>Brent Mason</td>
<td>Norfolk Southern Corp.</td>
</tr>
<tr>
<td>Rick Nath, Abby Clark, and Kelley Slettebo</td>
<td>CSX Transportation</td>
<td>Joanne Maxwell</td>
<td>Amtrak</td>
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What is ERTAC?

Eastern Regional Technical Advisory Committee

• Voluntary, technical organization comprised of state air quality agencies and RPOs east of the Mississippi.
• Coordinated by LADCO and executed by motivated state staff.

Goals and Principles

• Achieve consensus on preferred data sources and inventory methodologies.
• Promote consistency while respecting state-specific approaches.
• Focus on issues likely to have the biggest impact in air quality modeling.

⇒ Coordinate 2008 inventory development …
Priority ERTAC Projects

- Agricultural Ammonia
- Area Source Comparability
- Rail
- Marine
- Primary OC from Onroad
### Railroad Emissions of Interest

Largely from diesel combustion …

<table>
<thead>
<tr>
<th>Species</th>
<th>Resulting Pollutant(s)</th>
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<tbody>
<tr>
<td>NO\textsubscript{x}</td>
<td>Ozone, PM\textsubscript{2.5} (nitrate, OC), NO\textsubscript{x}</td>
</tr>
<tr>
<td>PM\textsubscript{2.5}</td>
<td>PM\textsubscript{2.5} (as elemental carbon)</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>PM\textsubscript{2.5} (to sulfate)</td>
</tr>
<tr>
<td>VOCs</td>
<td>Ozone, PM\textsubscript{2.5} (to organic carbon), Greenhouse Gases</td>
</tr>
<tr>
<td>CO, CO\textsubscript{2}</td>
<td>CO, Greenhouse Gases</td>
</tr>
<tr>
<td>Toxics</td>
<td>HAPs and Mobile Source Air Toxics (gas and particle phases)</td>
</tr>
<tr>
<td>Soil dust and metals</td>
<td>PM\textsubscript{2.5}, toxics</td>
</tr>
</tbody>
</table>

ERTAC Rail Subcommittee
Air Quality Issues of Concern

Counties exceeding an O₃ standard

Counties exceeding a PM₂.₅ standard

Emerging Issues: Toxics and Greenhouse Gases
Ex. GA Air Quality, Population, and Railroads

Red: PM$_{2.5}$ and ozone nonattainment
Purple: Ozone nonattainment
Green: 5 Urban Core Counties (Cobb, Fulton, Gwinnett, Dekalb, Clayton)
Dark Blue lines: Railroad tracks
Blue squares: population density
The Fire Station 8 monitor is located near the Inman and Tilford Railyards near downtown Atlanta, GA and consistently measures concentrations of PM2.5 approximately 2 $\mu$g/m$^3$ above other monitors in the urban core.
Benefits of Rail

- Cost effective freight services.
- Increased safety compared with trucks.
- Reduce highway congestion (a typical train is equivalent to approximately 280 trucks).
- Three or more times more fuel efficient than trucks.
- Currently produces less emissions compared with moving similar tons of freight by truck.

Need for Better Information

Air quality management tools such as photochemical, dispersion, and receptor modeling rely heavily on emissions estimates. Railroad-related emissions estimates are highly uncertain. While considered to be only about 1-2% of total emissions, estimates indicate that the levels are significant in certain areas. Emissions can be over- or under-estimated.

Table 3-5. Comparison of 2002 NYS NEI with NYS Survey-Based NOx Emissions (tpy)

<table>
<thead>
<tr>
<th>Description</th>
<th>NEI</th>
<th>Survey</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I Line Haul</td>
<td>10,520</td>
<td>17,939</td>
<td>7,419</td>
<td>70.5%</td>
</tr>
<tr>
<td>Class II/III Line Haul</td>
<td>9</td>
<td>1,046</td>
<td>1,037</td>
<td>11522.2%</td>
</tr>
<tr>
<td>Line Haul Passenger (Amtrak)</td>
<td>521</td>
<td>1,914</td>
<td>1,393</td>
<td>267.4%</td>
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<tr>
<td>Line Haul Commuter</td>
<td>85</td>
<td>4,055</td>
<td>3,970</td>
<td>4670.6%</td>
</tr>
<tr>
<td>Yard Locomotive&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2,979</td>
<td>102</td>
<td>(2,877)</td>
<td>(96.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>14,115</td>
<td>25,055</td>
<td>10,942</td>
<td>77.5%</td>
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</table>

<sup>a</sup>In many cases data was not provided on yard locomotives especially for Class I Line Haul rail lines, and as a result these emissions are included in the estimate of total class I line Haul emissions.
ERTAC Rail Kick-off

- Established objectives.
- Inventoried skills and in-kind resources.
- Established websites and data transfer paths.
- Reviewed current state rail inventories, inventory development techniques, and available data.
- Determined desired methodologies and data (and backup plans).
- Established workgroups and team leaders.
- Contacted railroad industry representatives.
ERTAC Rail Objectives


2. Develop a projection methodology to estimate future year emissions.

Secondary objective: Develop a longer-term methodology in cooperation with the railroad community so that future inventories will require less effort for both agencies and railroad companies and will be more accurate where needed.
Class I rail accounts for ~80% of total fuel use and 70% of miles operated.

There are about 550 Class II and III Railroads combined.
Locomotives

- **Line-Haul** ~ 4500+ HP, 40+ years, between cities and states.
- **Switchers** up to ~3000 HP for use in railyards (higher for ‘road’ units used for short distances), generally retired line-haul locomotives, older and high emitting.

Each of these categories are represented by a single duty-cycle and corresponding set of emission factors averaged over the fleets of all carriers nationwide.

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ERTAC Rail Subcommittee
Current Inventory Methods and Data

Class I Line-haul
- Systemwide annual fuel use and tonnage by carrier.
- Single national industry-averaged set of emission factors.
- Little to no spatial or temporal apportionment of activity.

Class I Switchers
- Single national industry-averaged set of emission factors and annual fuel use per switcher (82k gal/year).
- No consistent data source for location of railyards or number of switchers in general use.

Class II/III, Commuter, and Passenger Rail generally neglected.

ERTAC Rail Subcommittee
# ERTAC Rail Workgroups and Leads

<table>
<thead>
<tr>
<th>Workgroup</th>
<th>Lead 1</th>
<th>Organization</th>
</tr>
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<tbody>
<tr>
<td>ERTAC Technical Lead</td>
<td>Mark Janssen</td>
<td>LADCO</td>
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<td>Julie McDill</td>
<td>MARAMA</td>
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<td>Class I Line-Haul and GIS</td>
<td>Matthew Harrell</td>
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<td>Railyards</td>
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<td>Stacy Allen</td>
<td>MO DNR</td>
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<tr>
<td>GIS/Data Collaborative Workgroup</td>
<td>Matt, Michelle, Julie, Mark, and Laurel</td>
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</tr>
<tr>
<td>Websites</td>
<td>William Nichols</td>
<td>OH EPA</td>
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Class 1 Line-Haul Information

- Need link-level tonnage
- At least per carrier Emission Factors
- Fuel Use – better spatial/temporal allocation?
- Consider temporal patterns
  (e.g. 12 vs. 24 hr activity, week, seasonal)
- Neglect grade, speeds, duty-cycles

(Calculations are available in this presentation’s associated conference proceedings paper.)
ERTAC Rail Subcommittee

Line-Haul Characterization

FRA Traffic Density - 2006

Seeking access to business-confidential data set compiled by the Federal Railroad Administration and Class I Railroads with link-level Gross Tons carried. The approximately 30% of shared track will be apportioned equally between carriers.

ERTAC Rail Subcommittee
Rail Yard Information

• Location and extent of yards.
• Number and mix of the normal operating switcher fleet (for more representative emission factors and fuel use estimates).
• Fuel consumption estimates (either per fleet-avg switcher (most likely) or for specific large yards).
• Normal/average schedules of operation.
• Other possibilities: GTM throughput, main yard activities such as classification, intermodal transfers, maintenance, and repair.

We will first focus on yards in nonattainment areas with more than about 5-10 switchers (threshold to be determined).
Rail Yards

There are significant gaps in the areas we have been able to evaluate. (FRA Draft Rail Yard Location Dataset)
Early ERTAC/Class I discussion points …

• Are the methodologies we are pursuing reasonable?
• Can datasets be made available to ERTAC in support inventory development? Or, can ERTAC support inventory development headed by the railroad community?
• Is the collaborative development of a regional/national level emissions inventory a reasonable goal?
• What are the major concerns/barriers regarding potential collaboration on this effort? How can we address them?
• Is there a point of contact or resource we can reach for questions/interpretations/etc.?

Specific
• Please consider allowing ERTAC access to the FRM GTM Dataset and providing information on yard locations and number of switchers.
Benefits of an improved rail inventory in addition to support of public health protection

- Reduce the burden of responding to disparate emissions information requests and support better inventories.
- Support the SmartWay Transport Partnership goals and demonstrate progress.
- Establish credibility in comparisons of greenhouse gas impacts and other ‘green’ endeavors.
- Quantification of potential emissions reductions for cooperative funding of advanced technologies (e.g. Genset switchers under the CMAQ or DERA programs) and of reductions due to ongoing improvements.
- Identification of potential efficiency gains in operations.

ERTAC Rail Subcommittee
AAR/Class I participation to date …

- Voiced support for the effort and participated in discussions to solidify methodologies and explore data availability.
- Requested a national rather than regional scale approach.
- Largely permitting access to the FRA link-level activity data set (not completed yet).
- Appointed representatives to a GIS/Data workgroup tasked with collection and compilation of line-haul and railyard data.
- Aiding in determining if temporal variation is significant enough to warrant quantification.
- Collaboratively developed alternative to exact allocation of shared track emissions.
- Discussing threshold # of switchers/characteristics of railyards for inclusion in the 2008 inventory.
Other Inventory Categories

- **Class II/III Railroads**
  - Drafted data needs and potential inventory development methods.
  - Contacted and ‘met’ with Class II/III industry organization (ASLRRA).
  - Will contact larger Class II/III companies to discuss approaches and data needs.
  - No consistent data set appears available, may use combination of solicitation and surrogates.

- **Commuter/Passenger Rail**
  - No progress to date (small component for most states, may neglect).
We welcome any input and participation …
Thank you!

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