

The background features a large, semi-transparent watermark of the Georgia Environmental Protection Division logo. The logo is circular and contains the text "DEPARTMENT OF NATURAL RESOURCES" at the top, "ENVIRONMENTAL PROTECTION DIVISION" around the bottom, and "1776" at the bottom center. In the center of the logo is a depiction of a classical building with columns and a figure standing in front of it. The text "WISDOM JUSTICE MODERATION" is written across the building.

# **Assessing Localized PM<sub>2.5</sub> Impacts through AERMOD Modeling for Attainment**

***Pete Courtney, P.E.***

***Georgia EPD – Air Protection Branch***

**Region 4 Regulatory Modelers Workshop  
March 28<sup>th</sup>, 2007**



# Purpose of Study

Assuming appropriate emission rates and source-defining parameters, dispersion modeling can be used to simulate the contributions of individual sources, or groups of sources, to individual ambient air quality monitors, as well as to a grid of hypothetical model receptors (locations at which concentrations are calculated by the model).

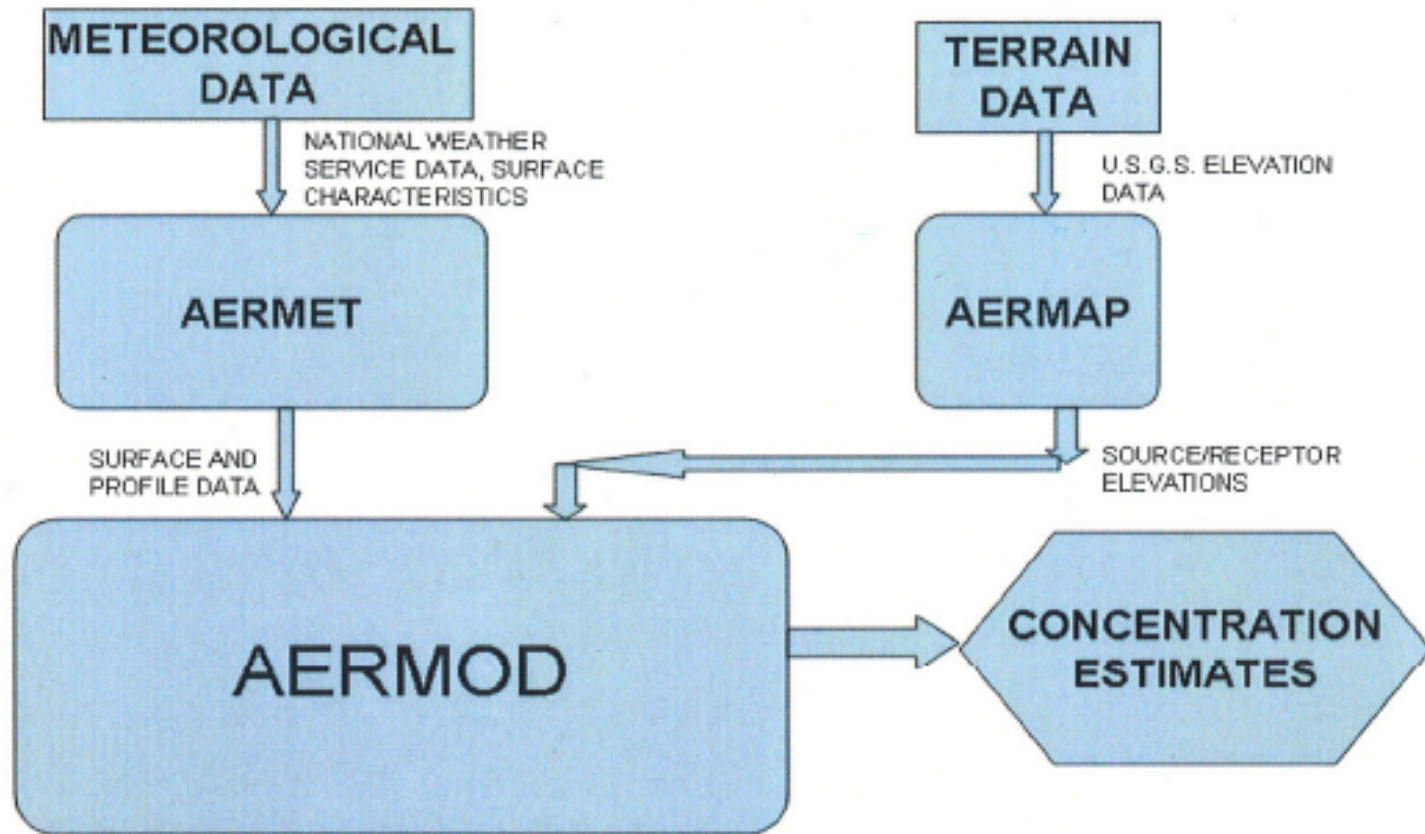


# The AERMOD Model

- Developed By EPA Contractors under the Joint Supervision of the American Meteorological Society and EPAs as the Primary Regulatory Dispersion MODEl
- Promulgated as the Preferred Model as of December 9, 2006
- EPA has developed draft final guidance for Hot Spot PM<sub>2.5</sub> Modeling using the AERMOD model

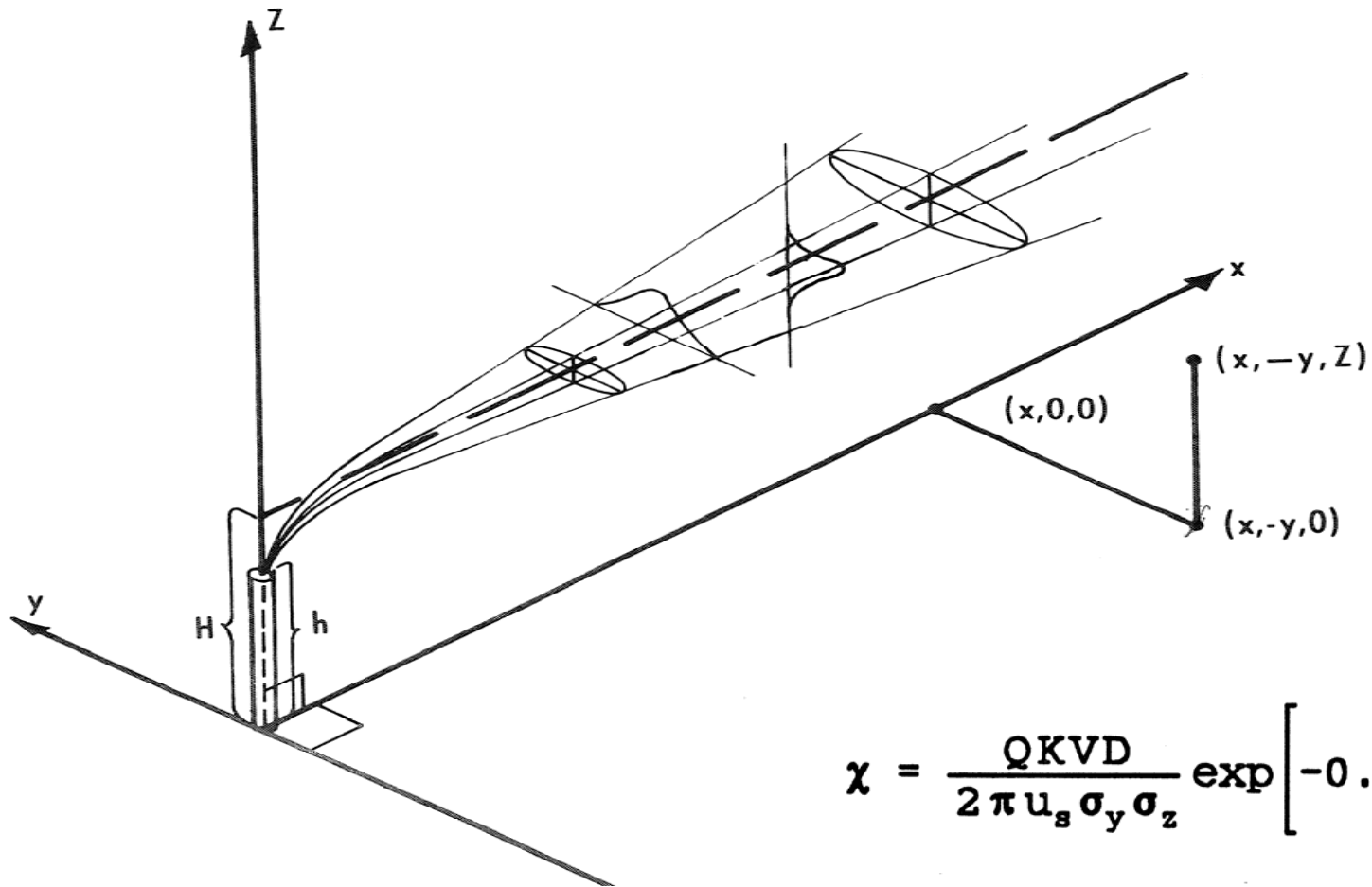


# AERMOD Modeling System





# Gaussian Plume



$$\chi = \frac{QKVD}{2\pi u_s \sigma_y \sigma_z} \exp\left[-0.5\left(\frac{y}{\sigma_y}\right)^2\right]$$



# Model Assumptions

- Started with Norfolk Southern's estimate of yard-engine emissions operating in Inman Yard
  - Doubled to account for local NS line-haul emissions
  - Doubled and located at adjacent CSX' Tilford Yard
- Preliminary flat plane terrain
- The year modeled, 2002, was selected at random
- Five-hundred meter receptor resolution is adequate
- Hartsfield meteorology is representative

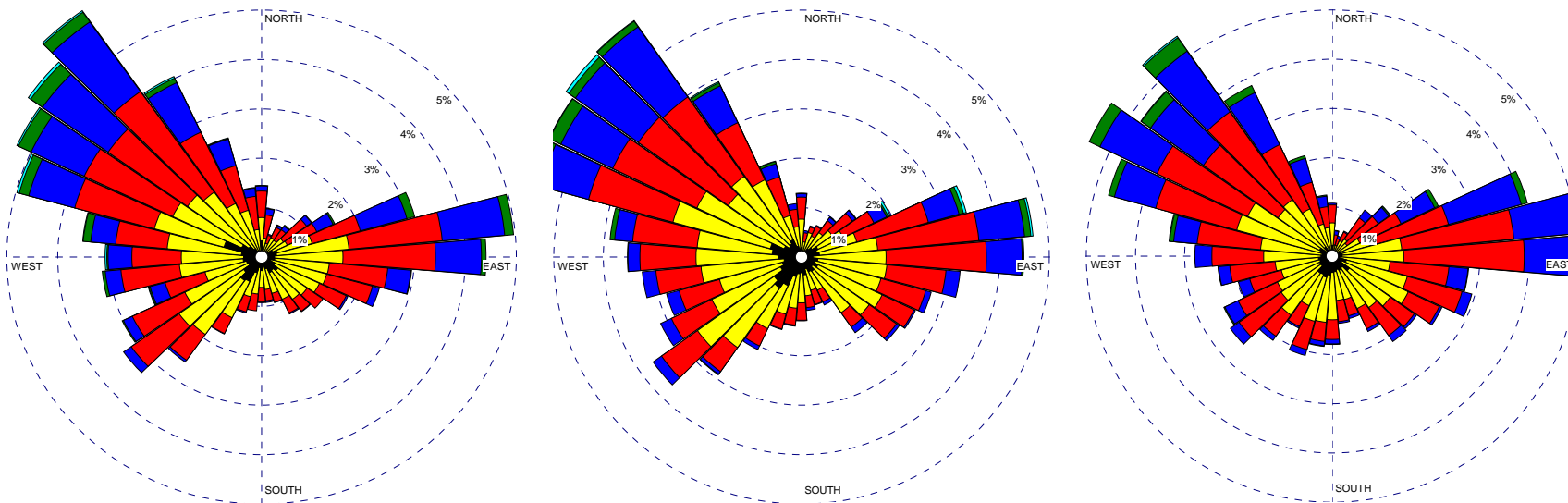


# Model Domain

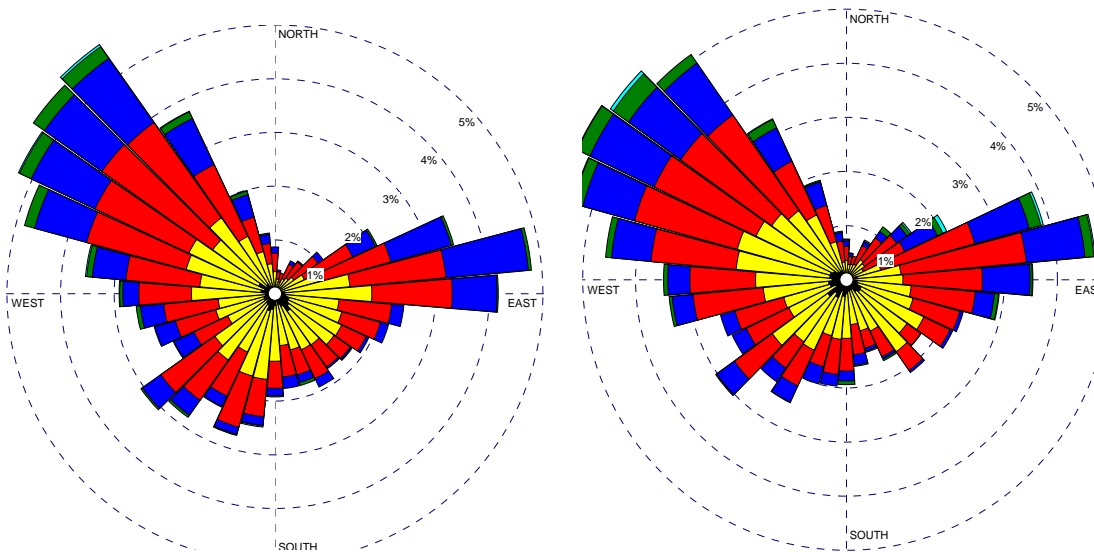




# Model Meteorology



Hartsfield  
Airport Winds:  
2000, 2001, 2002  
2003, 2004



WIND SPEED  
(Knots)

- ≥ 22
- 17 - 21
- 11 - 17
- 7 - 11
- 4 - 7
- 1 - 4

Calms: 7.06%



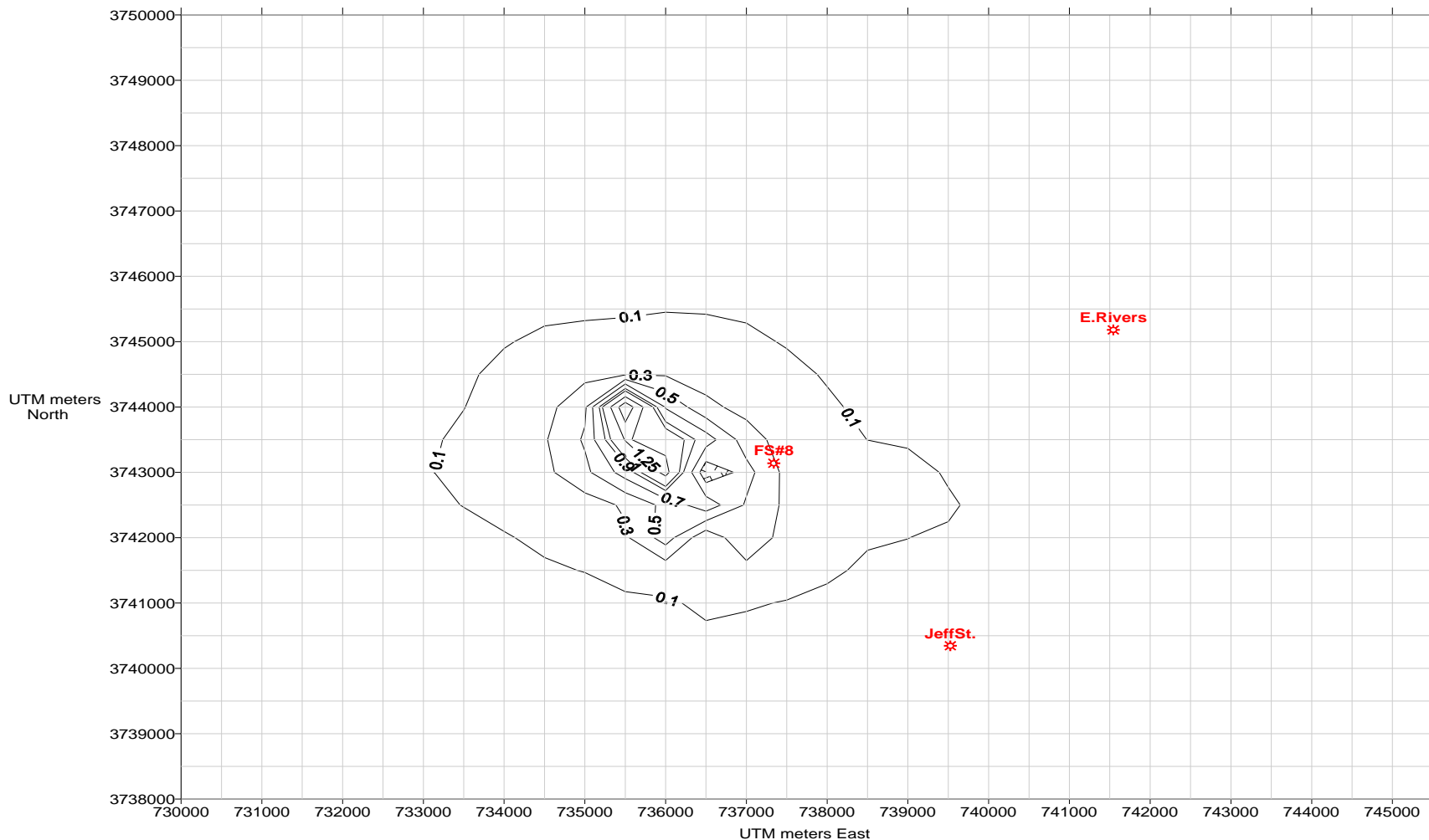
# Preliminary Annual Modeling Methodology

- Each of the railyards was divided into two volume emission sources, located approximately on the appropriate railyard site.
- Annual average modeling was conducted throughout 2002.



# Initial Model PM<sub>2.5</sub> Annual Concentrations: 2002

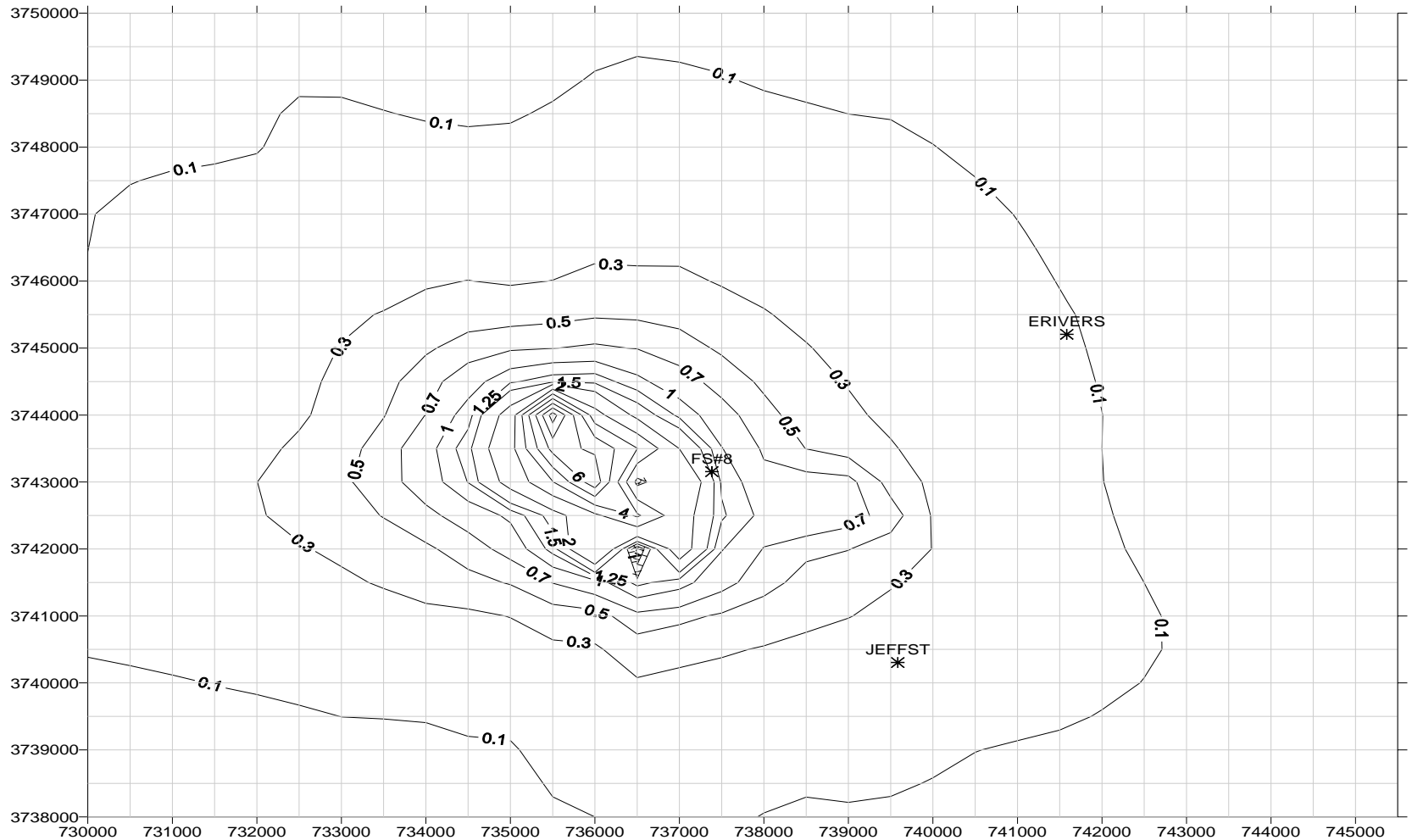
Original Annual Model - 2002 - Railyard/line Emissions





# Revised Model PM<sub>2.5</sub> Annual Concentrations: 2002

Annual (2002) Average PMF Concentrations from Modeled Emissions of Inman, Tilford, and Howells Yards Contoured Isoleths in Micrograms PMF per Cubic Meter of Air





# Comparison to Observations

- Initial model shows an annual average  $\text{PM}_{2.5}$  concentration of  $0.3 \mu\text{g}/\text{m}^3$  at Fire Station # 8
- Revised model (emission rates times 5) shows an annual average  $\text{PM}_{2.5}$  concentration of  $1.5 \mu\text{g}/\text{m}^3$  at Fire Station # 8
  - Revised model indicates a  $1.4 \mu\text{g}/\text{m}^3$  concentration difference over E. Rivers (similar to observations)



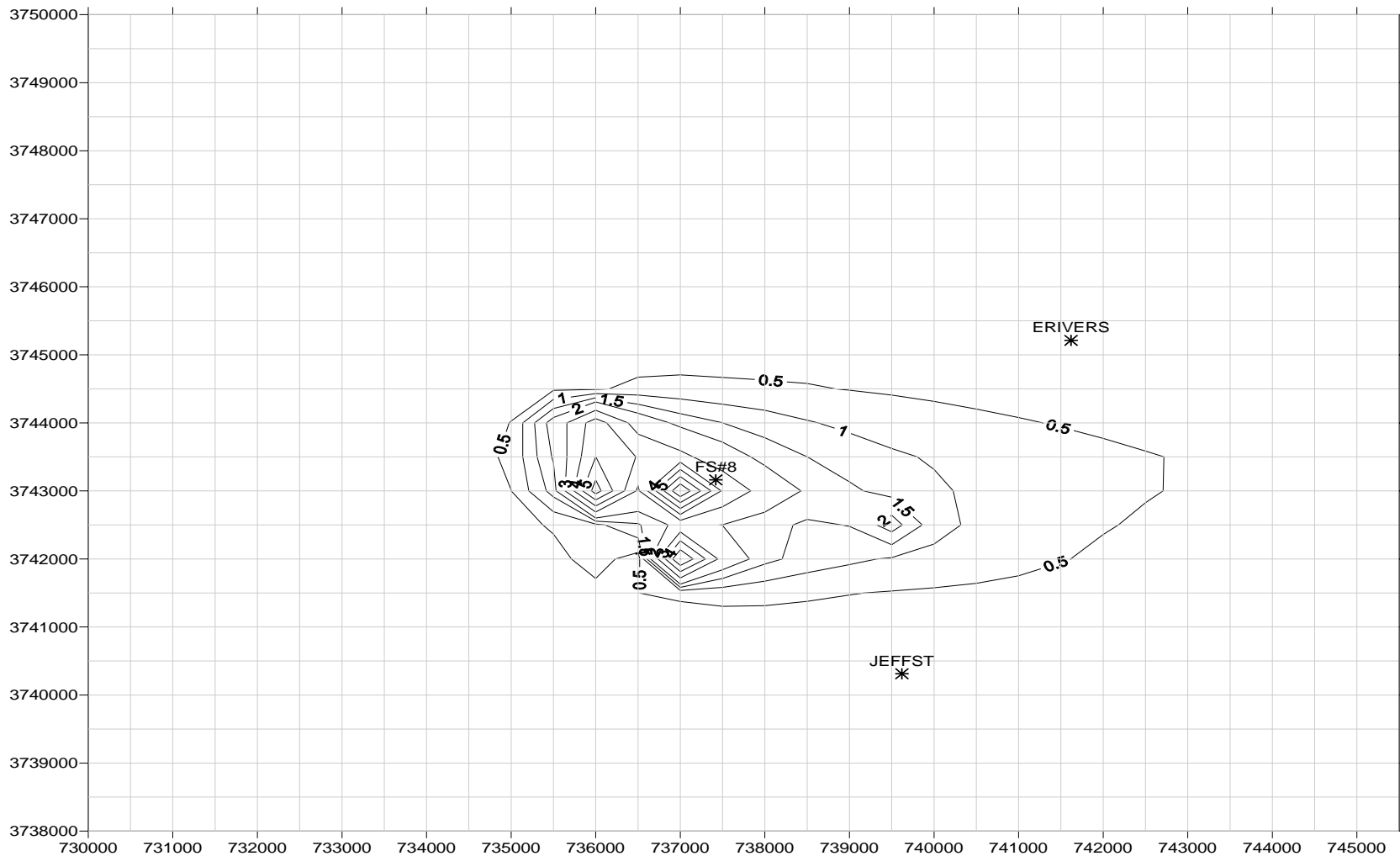
# Preliminary 24-hour Modeling Methodology

- Modeling was conducted for the day in 2002 when the Fire Station 8 monitored concentration showed the greatest positive difference between the average of the other two monitors.
- Modeling was conducted for the day in 2002 when the Fire Station 8 monitored concentration showed the greatest negative difference between the average of the other two monitors.



# Modeled PM<sub>2.5</sub> 24-Hr Concentrations: Case A

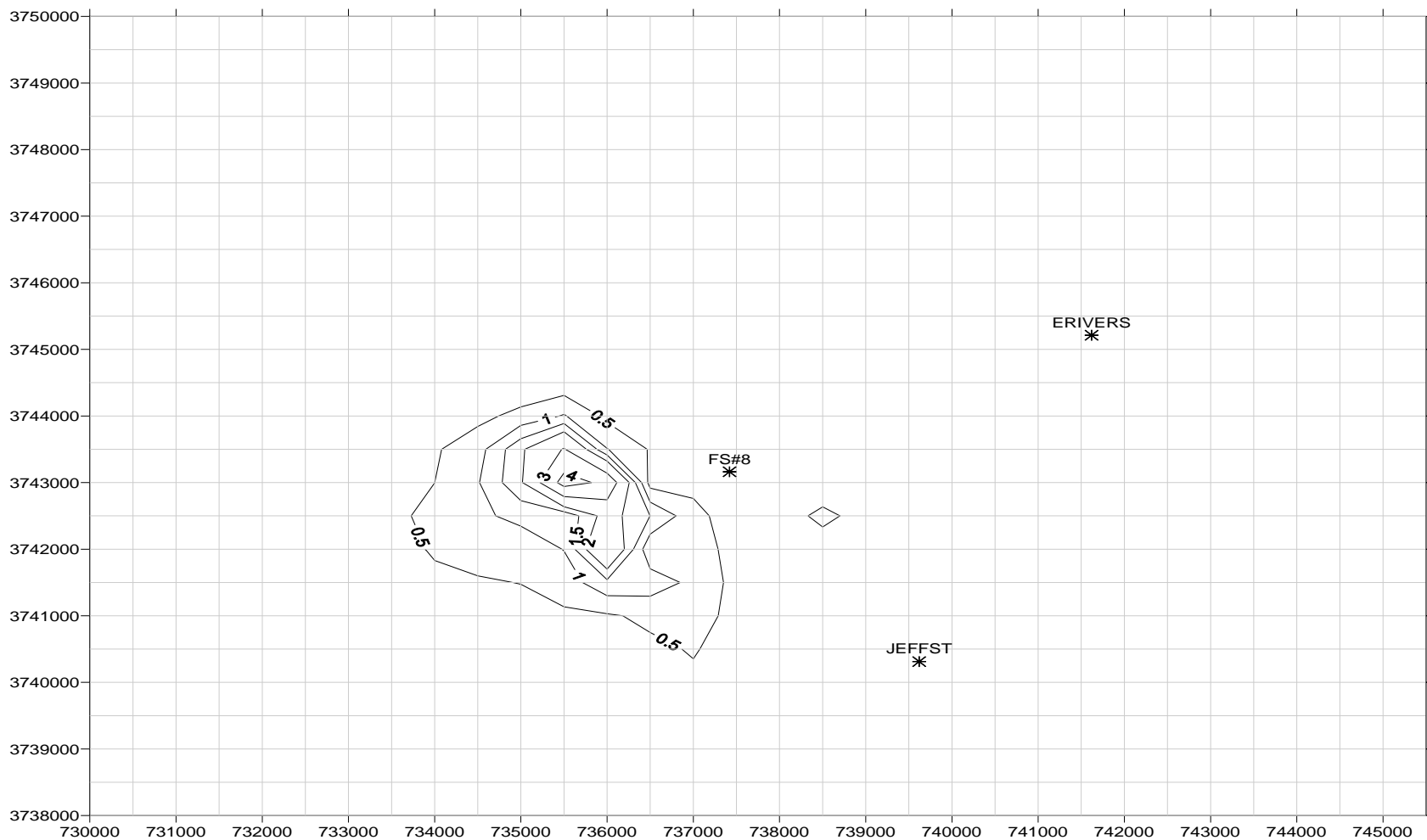
Date in 2002 (12/16/02) on which FS8 >> (ERivers+JSt)/2  
Contoured Isoleths in Micrograms PMF per Cubic Meter of Air





# Modeled PM<sub>2.5</sub> 24-Hr Concentrations: Case B

Date in 2002 (4/26/02) on which FS8 << (ERivers+JSt)/2  
Contoured Isopleths in Micrograms PMF per Cubic Meter of Air





# Preliminary Modeling Results

- Indicate the railyard PM<sub>2.5</sub> emissions may contribute between 0.3 and 1.5 microgram per cubic meter to the annual average monitored concentrations at Fire Station #8
- Indicate that, on days with appropriate wind speeds and directions, the railyard PM<sub>2.5</sub> may contribute up to 3.5 µg/m<sup>3</sup> more to the 24-hr average concentration at Fire Station #8 than at the E. Rivers or Jeff St. monitors



# Potential Modeling Refinements

- Add terrain to receptor coordinates
- Refine modeled emission rates with input from local sources
- Model 2001-2005 meteorological data, check for modeled vs monitored differences in other years
- Refine model source characterizations (add point and area emission sources)
- Include additional non-railroad sources



# Additional Potential Local Sources

- Diesel Traffic sources along Marietta Boulevard
- Local crushed stone quarry
- Georgia Power's Plant McDonough EGU
- Local asphalt and concrete batch plants

# Contact Information

*Pete Courtney, P.E.*

*Georgia Dept. of Natural Resources*

*4244 International Parkway, Suite 120*

*Atlanta, GA 30354*

*[peter\\_courtney@dnr.state.ga.us](mailto:peter_courtney@dnr.state.ga.us)*

*404-363-7095*