

Dispersion Modeling and Historic Monitoring Data Analysis for Fulton County

Technical Support for Lead Nonattainment Area Boundary Determination

August 2009

As a result of the recent enactment of a more-stringent National Ambient Air Quality Standard for lead, a single monitor in Fulton County which shows compliance under the previous standard, now will show non-compliance under the new standard if it continues to exhibit readings similar to those of the recent past. Ohio is required to propose a suggested non-attainment area boundary indicative of the area where violations occur, which is defined as the region over which there may occur an airborne concentration greater than 0.15 microgram per cubic meter (ug/m^3), expressed as a rolling three-month average.

The technique of spatial interpolation of monitored data is inapplicable in this situation, due to the presence of only one monitor in the area. Therefore, a hybrid approach was followed, involving the use of the AERMOD dispersion model in conjunction with historic monitoring data. The model is used to generate reasonable concentration gradients through the study area, while the monitor data is used to generate an actual/modeled concentration ratio that can serve as a "correction factor" for adjustment of any apparent systematic tendency of the model to over, or under, predict monitor values. The Krige algorithm is used for spatial interpolation of modeled concentrations and drawing of isopleths. Because a value of 0.145 rounds upwards to 0.15, a concentration of 0.145 ug/m^3 (after application of the actual/modeled correction factor) is to be taken as the bounding isopleth.

The following monitor is included in the analysis:

Lead monitoring site in Fulton Co. (zone 16; base plane NAD83)

<u>Site name</u>	<u>AQS number</u>	<u>probe height</u>	<u>latitude</u> ¹	<u>longitude</u>	<u>easting</u>	<u>northing</u>
Bunting Bearing	39-051-0001	3.	41.57598	-83.99571	4607059	750467

The historic data for this site shows the highest average to be 0.567 ug/m^3 for the three-month period ending on January, 2008. Modeling of all known lead sources in the

¹ Note: the latitude and longitude are corrected in this analysis. AQS identifies the latitude and longitude as 41.575278 and -83.996389' however, upon further review it was found to be slightly mis-located from its actual location.

county was conducted with AERMOD. Below is a list of all lead sources along with the modeled values:

Fulton County Lead Sources

Longitude	Latitude	Facility Name	2005 NEI Emissions (tpy)	TRI2005 TRI Emissions (tpy)	Maximum Modeled Value (tpy)
-84.0377	41.57077	NORTHSTAR BLUESCOPE STEEL, LLC	0.2545	0.2545	0.2545
-84.1417	41.55333	MULTI-CAST CORP	0.03	0.0766	0.0766
-83.9975	41.57508	SAUDER WOODWORKING COGENERATION FACILITY	0.0003	0.048	0.048
-84.2942	41.51237	BUNTING BEARINGS LLC	0.0035	0.0035	0.54

Additional details for these facilities can be found in Appendix A.

The release points of the Bunting Bearing Corporation in the town of Delta are located within a couple of hundred meters of the monitor in question, and are believed to be predominantly responsible for the elevated readings. All the sources at the Bunting Bearings facility were modeled individually. The sources parameters modeled are identical to those modeled in the individual facility lead modeling submitted to U.S. EPA as part of Ohio's proposed lead monitoring network plan². Building downwash from the Bunting Bearings facility was included in the modeling.

Multi-Cast Corporation, Northstar Bluescope Steel and Sauder Woodworking Cogeneration facilities were modeled as single point sources using the emissions identified in the table above. Stack information from lead sources provided to Ohio EPA by the Northstar Bluescope Steel facility were averaged to create a single lead emission source. Stack information from lead sources provided to Ohio EPA by the Sauder

² <http://www.epa.state.oh.us/dapc/ams/plans/OhioLeadMonitoring.pdf>

Woodworking Cogeneration facility were also averaged to create a single lead emission source; however, the stack height itself for the lead source was not provided; therefore, a conservative stack height for similar sources at the facility was used. Stack information from lead sources for the Multi-Cast facility was not provided to the Ohio EPA. The averaged source parameters for Bunting Bearing facility were used for the Multi-Cast facility because it was determined they were the most conservative.

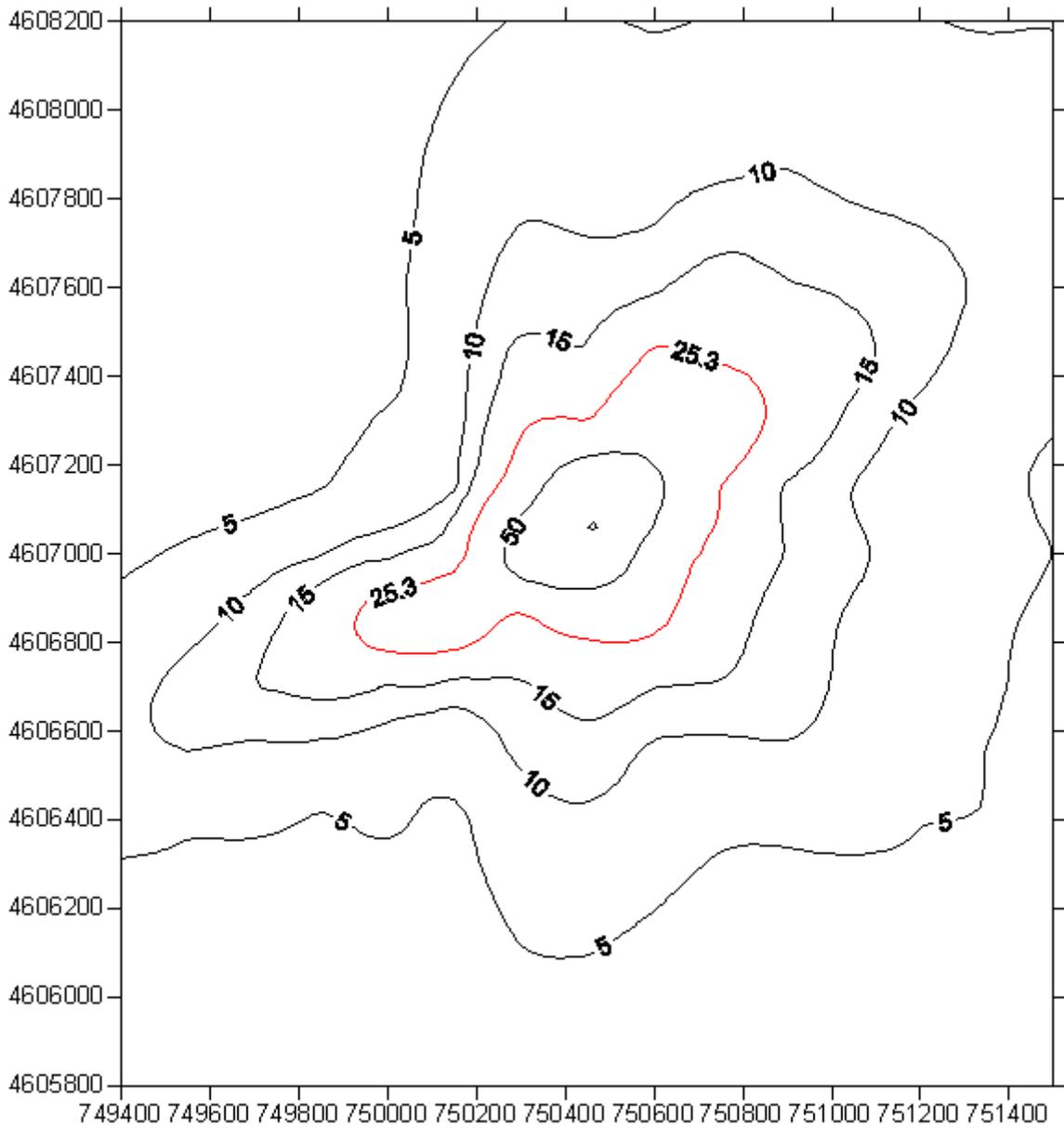
Surface data from Toledo, Ohio (National Weather Service Site 94830) and Upper Air data from Flint, Michigan (National Weather Service Site 14826) were determined to be representative of Fulton County. AERSURFACE was run using one sector and four seasons.

A total of 255 receptors, with 150 meters spacing, were modeled. One receptor was removed from the receptor grid because it was located on a Bunting Bearing building. A discrete receptor was added at the monitor location. A background concentration was not added to the modeled concentration because all surrounding sources were included in the modeling.

Most of the sources were located in zone 16, while a few were located in zone 17. All source UTMs were converted to zone 16 using the US Army Corps of Engineers Corpscon program.

The lead post processor results showed the highest modeled concentration at the location of the monitor to be 0.09897 ug/m^3 while historic actual monitor data has shown values as high as 0.567 ug/m^3 .

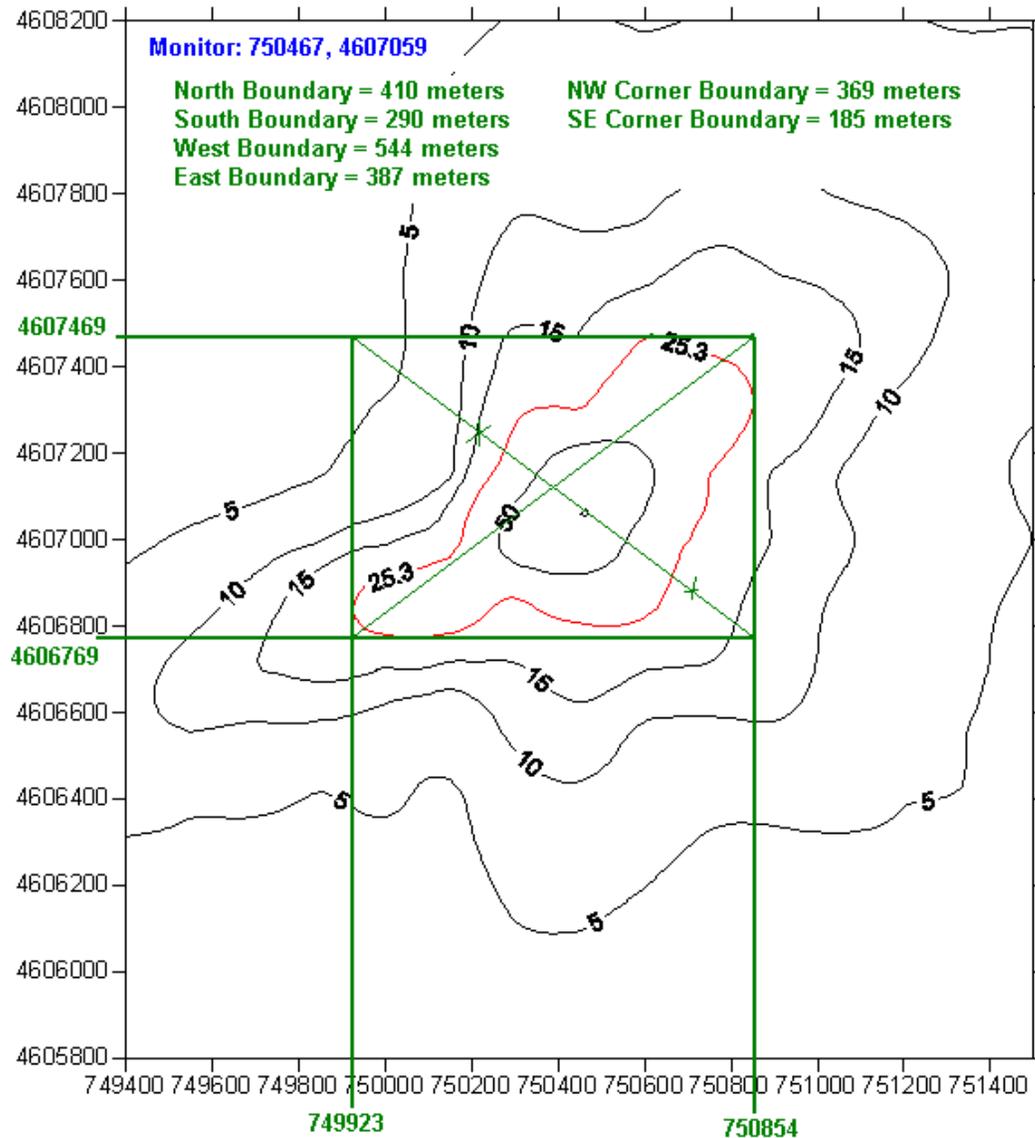
In order to establish an appropriate nonattainment boundary that is conservative for this area it was necessary to correct for the discrepancy between the modeled monitor value and the worst case historical actual monitor value. A monitor/model correction ratio was computed to be $0.567/0.09897 = 5.729$, and the bounding isopleth of the non-attainment area then becomes $145/5.729 = 25.31 \text{ nanograms/m}^3$, as shown on the plot below, generated with the help of Golden Software Surfer 8, using default settings for the Krige algorithm:



Kriged isopleths of highest (non-concurrent) 3-month rolling average modeled lead concentrations in Fulton County nanogram per cubic meter

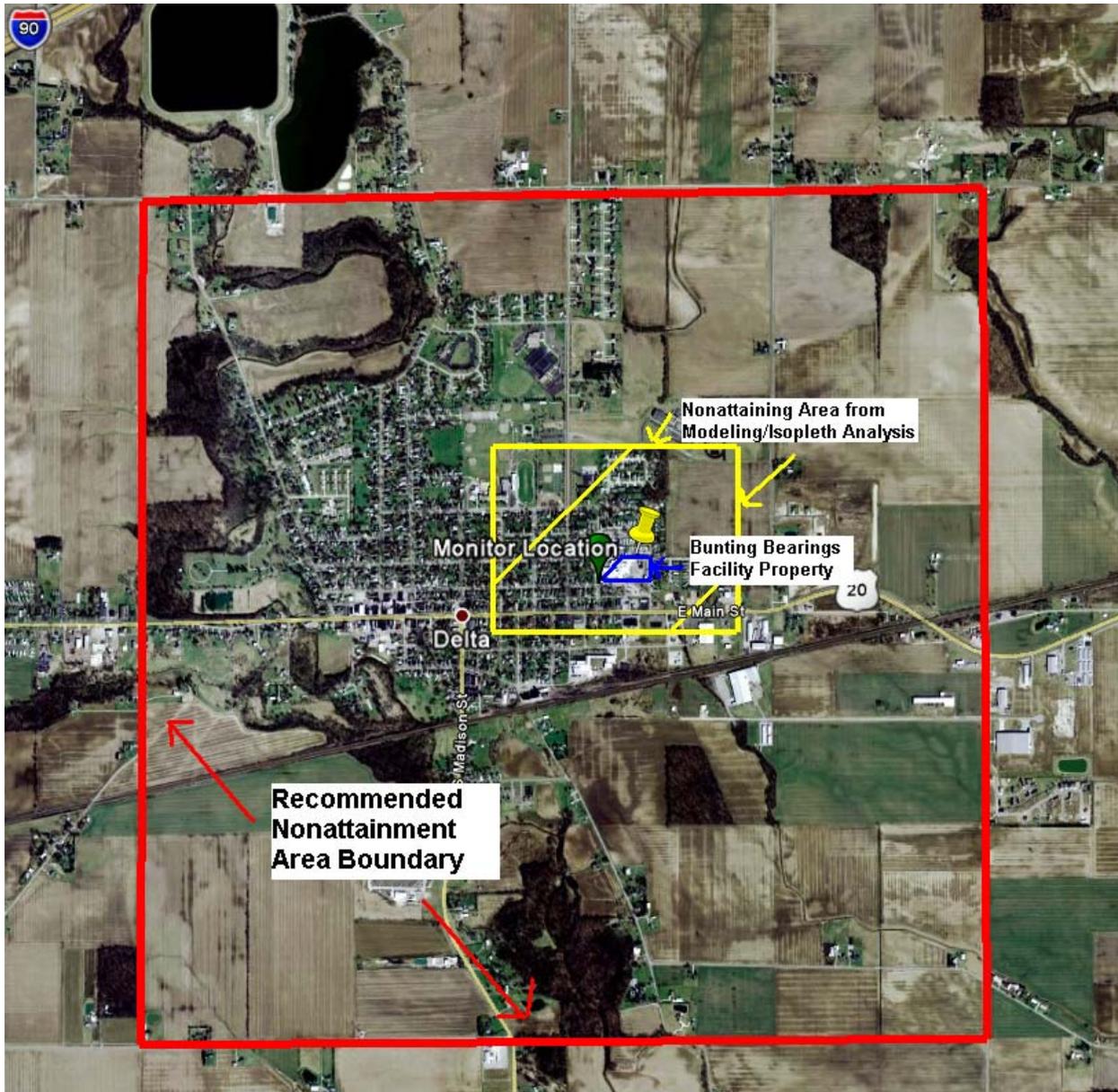
As depicted below, the outer north, south, east and west boundary edges of the 25.31 nanogram/m³ isopleth were used to calculate the distance, in meters, from the violating monitor location. In addition, a similar computation was conducted to find the point at the northwest and southeast corners tangent to the same isopleths of concern.

Kriged isopleths of highest (non-concurrent) 3-month rolling average modeled lead concentrations in Fulton County
nanogram per cubic meter



The image shows a west-east asymmetry, with the bounds of the enclosed area extending about 410 meters to the north and 290 meters to the south while it extends 544 meters to the west and 387 meters to the east.

These distances from the Krigé plot were then overlaid on a map of the area to help define an appropriate boundary that would conservatively encompass an area where violations could occur, as depicted below:



As can be seen above, the recommended nonattainment boundary is very conservative in encompassing the 25.3 nanogram/m³ boundary. This boundary was selected by viewing Fulton County township and township-section boundaries. The following township sections demark the boundary for recommendation:

York Township – Sections 12 and 13

Swan Creek Township – Sections 7 and 18

As depicted in the township section map below:

