

## Muncie, Indiana Technical Support Document

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### *Definition of important terms used in this document:*

- 1) **Designated “unclassifiable”** – an area where EPA could not determine if there was a violation of the 2008 lead NAAQS or a contribution to a violation in a nearby area, because there was insufficient air quality data for both 2006-2008 and 2007-2009 and where additional monitoring data for 2010 could not result in a different designation.
- 2) **Designated “attainment”** – an area which EPA has determined, based on the most recent 3 years of certified air quality data from 2006-2008 or 2007-2009, has no violations of the 2008 lead NAAQS during 36 consecutive valid 3-month site means; and which EPA has further determined does not contribute to a violation of the 2008 lead NAAQS in a nearby area and that additional monitoring data from 2010 could not result in a different designation.
- 3) **Designated “nonattainment” area** – an area which EPA has determined, based on a State recommendation and/or on the technical analysis included in this document, has a violation of the 2008 lead NAAQS during the most recent 3 consecutive years of quality-assured, certified air quality data.
- 4) **Prior nonattainment area** – an area that is currently designated as nonattainment or maintenance for the 1978 lead NAAQS (including both current nonattainment areas and maintenance areas).
- 5) **Recommended nonattainment area** – an area a State or Tribe has recommended to EPA be designated as nonattainment.
- 6) **Violating monitor** – an ambient air monitor whose design value exceeds 0.15 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). As described in Appendix R of part 50, a violation can be based on either Pb-TSP or Pb-PM10 data and only 3 months of data are necessary to produce a valid violating design value.
- 7) **1978 lead NAAQS** –  $1.5 \mu\text{g}/\text{m}^3$ , National Ambient Air Quality Standard for lead promulgated in 1978. Based on Pb-TSP indicator and averaged over a calendar quarter.
- 8) **2008 lead NAAQS** –  $0.15 \mu\text{g}/\text{m}^3$ , National Ambient Air Quality Standard for lead promulgated in 2008. Based on Pb-TSP indicator and a 3-month rolling average. Pb-PM10 data may be used in limited instances, including to show nonattainment.

**INDIANA**  
**Area Designations For the**  
**2008 Lead National Ambient Air Quality Standards**

*EPA has revised the level of the primary (health-based) standard from 1.5 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) to 0.15  $\mu\text{g}/\text{m}^3$  measured as total suspended particles (TSP). EPA has revised the secondary (welfare-based) standard to be identical in all respects to the primary standard.*

**Pursuant to section 107(d) of the Clean Air Act, EPA must designate as “nonattainment” those areas that violate the NAAQS and those nearby areas that contribute to violations.** The table below identifies the partial county in Indiana that EPA intends to designate “nonattainment” for the 2008 lead National Ambient Air Quality Standard (2008 lead NAAQS).

Area (listed alphabetically)	Indiana Recommended Nonattainment Counties	EPA’s Designated Nonattainment Counties	Nonattainment Area for 1978 Lead NAAQS
Muncie	Delaware (partial)	Delaware (partial)	NA

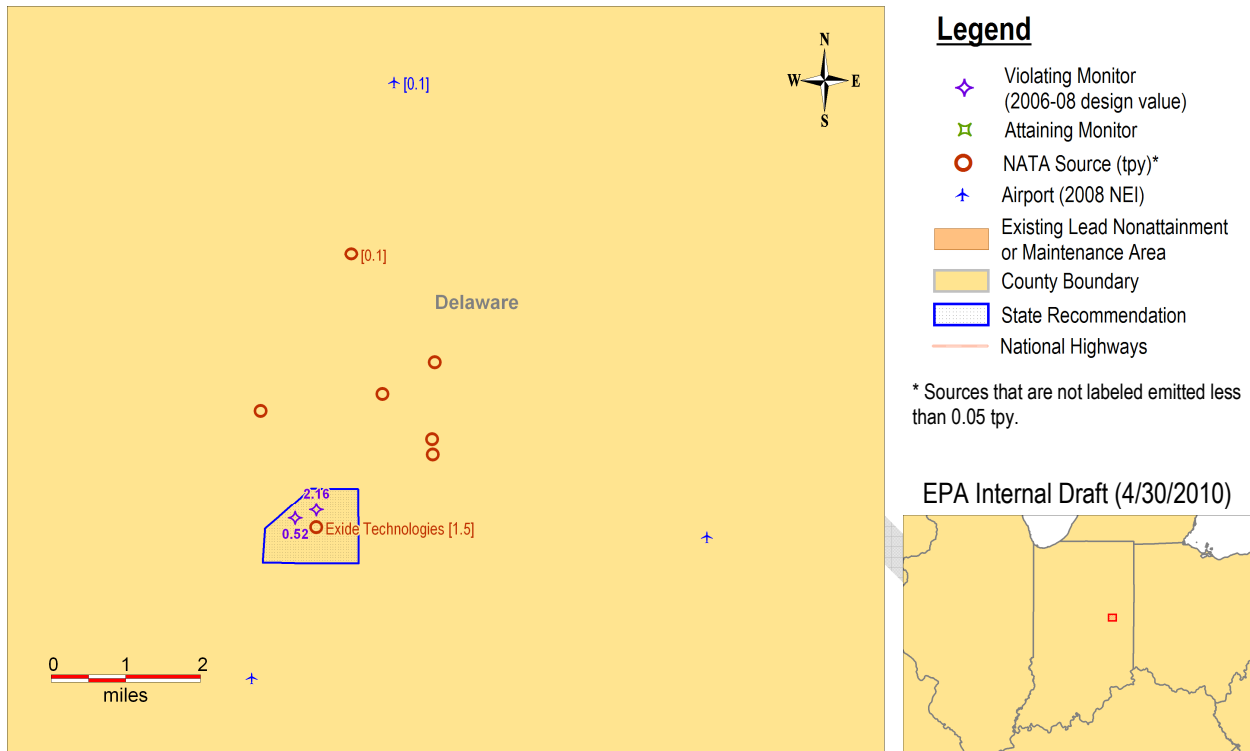
**Table 1: Indiana Nonattainment Area for the 2008 Lead NAAQS**

**Technical Analysis for Muncie**

**Introduction**

This technical analysis for Muncie identifies the partial county with a monitor that violates the 2008 lead NAAQS and evaluates nearby counties for contributions to lead concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following factors recommended in previous EPA guidance:

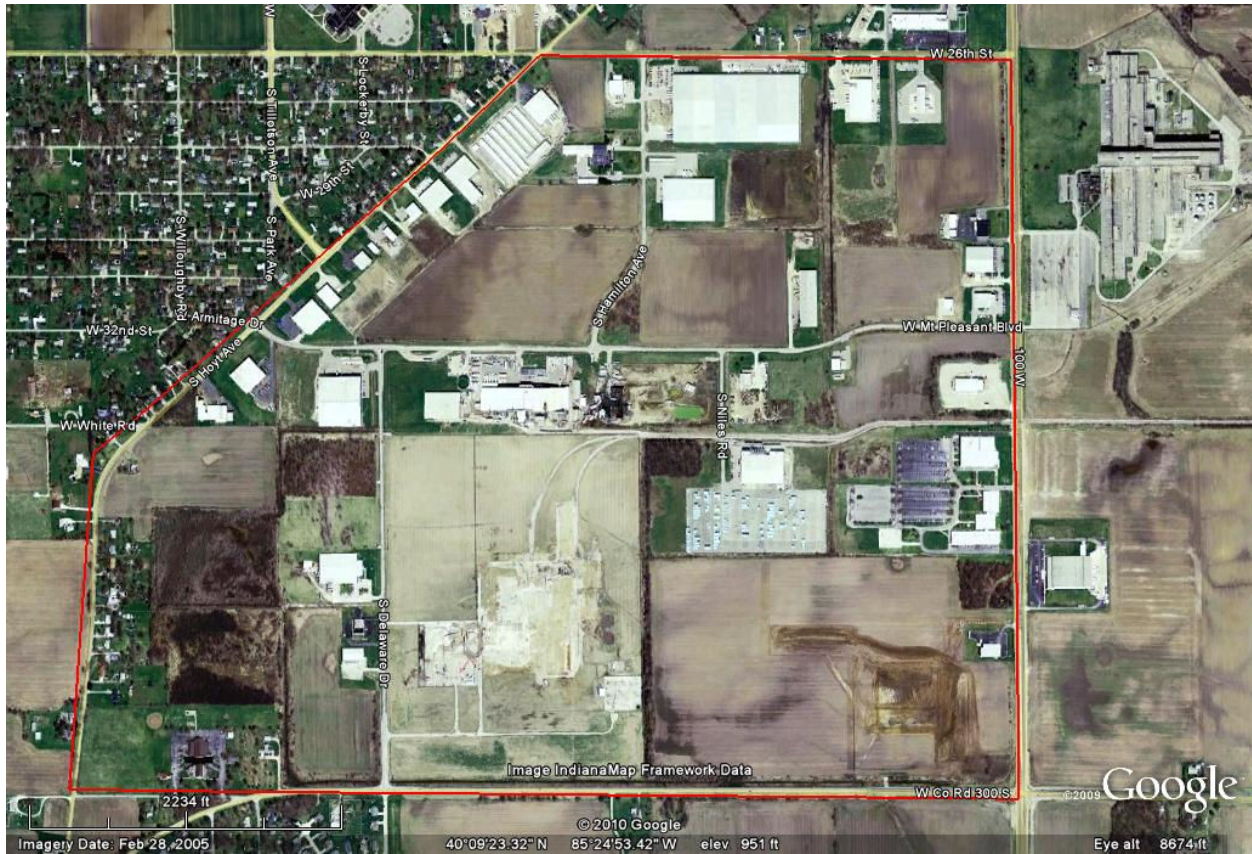
- Air quality in potentially included versus excluded areas;
- Emissions and emissions-related data in areas potentially included versus excluded from the nonattainment area, including population data, growth rates, patterns, and emissions controls;
- Meteorology (weather/transport patterns);
- Geography/topography (mountain ranges or other air basin boundaries);
- Jurisdictional boundaries (e.g., counties, air districts, reservations, etc.); and
- Any other relevant information submitted to or collected by EPA (e.g., modeling where done appropriately).



**Figure 1: Muncie, Indiana State Recommended Nonattainment Area (Office of Air Quality Planning and Standards - OAQPS)**

Figure 1 is a map of the area analyzed showing the locations and design values of air quality monitors in the area, and the counties surrounding any violating air quality monitors. Source data is also labeled in Figure 1 with the following guidelines: if the source emitted 0.5 or more tons, the symbol, name of the facility, and emissions are labeled; if the source emitted 0.1 - 0.5 tons, only the symbol and emissions are labeled; and if the source emitted less than 0.05 tons, only the symbol is shown.<sup>1</sup> Emissions in Muncie and the surrounding areas will be discussed in the section addressing emissions in Delaware County. The location of the detailed area in relation to the remainder of the State is shown in the bottom right corner of the figure.

<sup>1</sup> Emissions greater than 0.05 tpy round up to 0.1 tpy, and they are marked with the symbol and the emissions value.



**Figure 2: Muncie, Indiana State Recommended Nonattainment Area (OAQPS and Google Earth)**

Figure 2 shows the State recommended nonattainment area boundary for Muncie, Indiana. The boundary is shown with the red outline, and encompasses the following: W. 26th St./Hines Rd. to the north, Cowan Rd. to the east, W. Fuson Rd. to the south, and S. Hoyt Ave. to the west.

In October 2009, Indiana recommended that a portion of Delaware County be designated as nonattainment for the 2008 lead NAAQS based on air quality data from 2006-2008. Their recommendation was based on data from Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitors located in the State. Thomas Easterly, Commissioner of the Indiana Department of Environmental Management (IDEM), submitted the State's recommendation to EPA in a letter dated October 7, 2009.

Based on EPA's technical analysis described below, EPA is intending to designate portions of Delaware County in Indiana as nonattainment for the 2008 lead NAAQS as part of the Muncie nonattainment area based upon currently available information. This county is listed above in Table 1.

## Detailed Assessment

### *Air Quality Data*

This factor considers the Lead design values (in  $\mu\text{g}/\text{m}^3$ ) for air quality monitors in Delaware County in Muncie and the surrounding area based on data for the 2006-2008 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 2008 lead NAAQS are met at a monitoring site when the identified design value is valid and less than or equal to  $0.15 \mu\text{g}/\text{m}^3$ . A design value is only valid if minimum data completeness criteria are met. A lead design value that meets the NAAQS is generally considered valid if it encompasses 36 consecutive valid 3-month site means (specifically for a 3-year calendar period and the 2 previous months). For this purpose, a 3-month site mean is valid if valid data were obtained for at least 75 percent of the scheduled monitoring days in the 3-month period. A lead design value that does not meet the NAAQS is considered valid if at least one 3-month mean that meets the same 75 percent requirement is above the NAAQS. That is, a site does not have to monitor for 3 full calendar years in order to have a valid violating design value; a site could monitor just 3 months and still produce a valid (violating) design value.

The 2008 lead NAAQS design values for Delaware County in Muncie and the surrounding area are shown in Table 2.

County	State Recommended Nonattainment?	Monitor Name	Monitor Air Quality System ID	Monitor Location	Lead Design Value, 2006-2008 ( $\mu\text{g}/\text{m}^3$ )	Lead Design Value, 2007-2009 ( $\mu\text{g}/\text{m}^3$ )
<b>Delaware, Indiana</b>	<b>Yes</b>	<b>Muncie East</b>	<b>180350009</b>	<b>2601 W. Mt Pleasant Blvd.</b>	<b>2.14</b>	<b>2.14</b>
Delaware, Indiana	Yes	Muncie West	180350008	2601 W. Mt Pleasant Blvd.	0.52	0.52

Monitor in bold has the highest 2006-2008 and 2007-2009 design value in the respective county

**Table 2: Muncie, Indiana and Surrounding Areas Air Quality Data**

Delaware County shows a violation of the 2008 lead NAAQS. Therefore some area in this county and possibly additional areas in surrounding counties must be designated nonattainment. The absence of a violating monitor alone is not a sufficient reason to eliminate nearby counties as candidates for nonattainment status. Each area has been evaluated based on the weight of evidence of these factors and other relevant information.

According to EPA's monitor locator,<sup>2</sup> the monitor located at 2601 W. Mt Pleasant Blvd. (AQS ID 180350009) has an objective of determining the highest concentration for lead. This monitor is in very close proximity to Exide Technologies, as is the monitor associated with AQS ID 180350008; both monitors are operated by Exide Technologies. The location of these monitors will be discussed in the section addressing emissions for Delaware County.

<sup>2</sup> <http://www.epa.gov/air/data/geosel.html>.

***Emissions and Emissions-Related Data***

Evidence of lead emissions sources surrounding a violating monitor are an important factor for determining whether a nearby area is contributing to a monitored violation. For this factor, EPA evaluated county level emission data for lead and population data.

Emissions

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 2, which is the most up-to-date version of the national inventory available when these data were compiled for the designations process in 2009. See <http://www.epa.gov/ttnchie1/net/2005inventory.html>. EPA recognizes that for certain counties, emissions may have changed since 2005. For example, certain large sources of emissions in or near this area may have installed emission controls or otherwise significantly reduced emissions since 2005. Some States provided updated information on emissions and emission controls in their comments to EPA. Indiana provided 2007 emissions inventory data for Delaware County in their submittal, which will also be considered in this analysis. These emissions data are provided in Table 3 and Table 4, respectively, below.

Table 3 shows total emissions of lead given in tons per year (tpy) for violating and potentially contributing counties in and around Muncie and sources emitting (or anticipate to contribute) 0.1 ton per year of lead or greater according to the 2005 NEI. The county that is part of the Muncie nonattainment area for the 2008 lead NAAQS is shown in **boldface**.

There are approximately 20,000 airport facilities in the U.S. at which leaded aviation gasoline is consumed. To evaluate the potential impact of emissions at and near these facilities, EPA recommends that States use the draft 2008 NEI. These data are provided in Table 5, and contain the facilities emitting (or anticipate to contribute) 0.1 ton per year or more of lead according to the draft 2008 NEI.

County	Facility in State Recommended Nonattainment Area?	Facility Name	2005 NEI (tpy)	Location	City
<b>Delaware County, Indiana</b>	Yes	Exide Technologies	1.5	2601 W. Mt Pleasant Blvd.	Muncie
		Delaware County Total Lead Emissions	1.6*		

**Table 3: Muncie, Indiana and Surrounding Areas Lead Emissions for Stationary Sources**

\* Total lead emissions for Delaware County were calculated by adding the 2005 NEI data for facilities not using leaded aviation gas (stationary sources) to the 2008 Draft NEI data for facilities using aviation gas. Sources with emissions below 0.1 tpy were included in this final calculation.

County	Facility in State Recommended Nonattainment?	Facility Name	2007 State EI (tpy)	Location Address	City
Delaware County	Yes	Exide Technologies	.81	2601 W. Mt Pleasant Blvd.	Muncie
Delaware County	No	Ball State University	.03	2000 W. University Ave.	Muncie

**Table 4: Muncie, Indiana and Surrounding Areas 2007 Lead Emissions for Stationary Sources (IDEM)**

City	Facility Name	Type	2008 Draft NEI (tpy)	Distance to NA area (km)
Muncie	Delaware County Johnson Field	Airport	0.1	8.7

**Table 5: Muncie, Indiana and Surrounding Areas Lead Emissions for Leaded Aviation Gas Facilities**

There is a facility using leaded aviation gasoline in the Muncie area that has a 2008 Draft NEI value of at, or greater, than 0.1 tpy. This facility is listed above in Table 5.



**Figure 3: Exide Technologies Lead Monitor Locations**

According to the 2005 NEI and the 2007 State Emissions Inventory, Exide Technologies is the only stationary source in Delaware County that has emissions of at least 0.1 tpy, and is the predominant source of lead emissions in the county. The monitor locations were derived from an air dispersion modeling map provided by IDEM, and the last four digits of the AQS ID have been included in the map. The Exide Technologies main facility is located just east of the Muncie West monitor, and is depicted by the star. The distance from the center of the facility to the Muncie West monitor is approximately 0.2 miles, and the distance to the Muncie East monitor is approximately 0.4 miles.

Using 1.6 tons per year as the total lead emissions for Delaware County (refer to Table 3), EPA observes that the emissions from Exide Technologies account for 93.8 percent of all lead emissions in the county. Using the 2007 inventory data that IDEM provided in conjunction with 2008 Draft NEI data for all airport facilities using leaded aviation gas, the percentage of emissions from Exide Technologies in Delaware County is approximately 80 percent. Both sets of lead emissions calculations for Delaware County indicate that the largest emitter of lead in the county is Exide Technologies. In conjunction with the monitored elevated concentrations of lead, the nonattainment area should encompass at least the Exide Technologies facility in its entirety.

The monitoring network for Lead in Delaware County changed slightly in 2010: IDEM commenced operation of a monitor at the same location of the Muncie East site, and Exide Technologies ceased operation of the Muncie West monitor. Additionally, 3 new source oriented sites in Indiana were operational as of January 2010: Mittal Steel – IN Harbor West (Lake County), USS Gary Works (Lake County), and ISG Burns Harbor LLC (Porter County).

Population Data, Growth Rates, and Patterns

Table 6 shows the 2008 population for each county in the area being evaluated, as well as the population density for each county in that area. These data help assess the extent to which the concentration of human activities in the area and concentration of population-oriented commercial development may indicate emissions-based activity contributing to elevated ambient lead levels. This may include ambient lead contributions from activities that would disturb lead that has been deposited on the ground or on other surfaces. Re-entrainment of historically deposited lead is not reflected in the emissions inventory.

County	State Recommended Nonattainment?	2008 Population	2008 Population Density (pop/sq mi)	Population Change 2000-2008	Population % Change 2000-2008
Delaware, Indiana	Yes	114,685	290	-4,049	-3

**Table 6: Population Data for Delaware County, Indiana**

[Source of data: U.S. Census Bureau estimates for 2008 (<http://www.census.gov/popest/datasets.html>) and estimation of the area of U.S. counties]

EPA has considered the population growth rate for this area and does not believe that it affects the boundary recommendation.



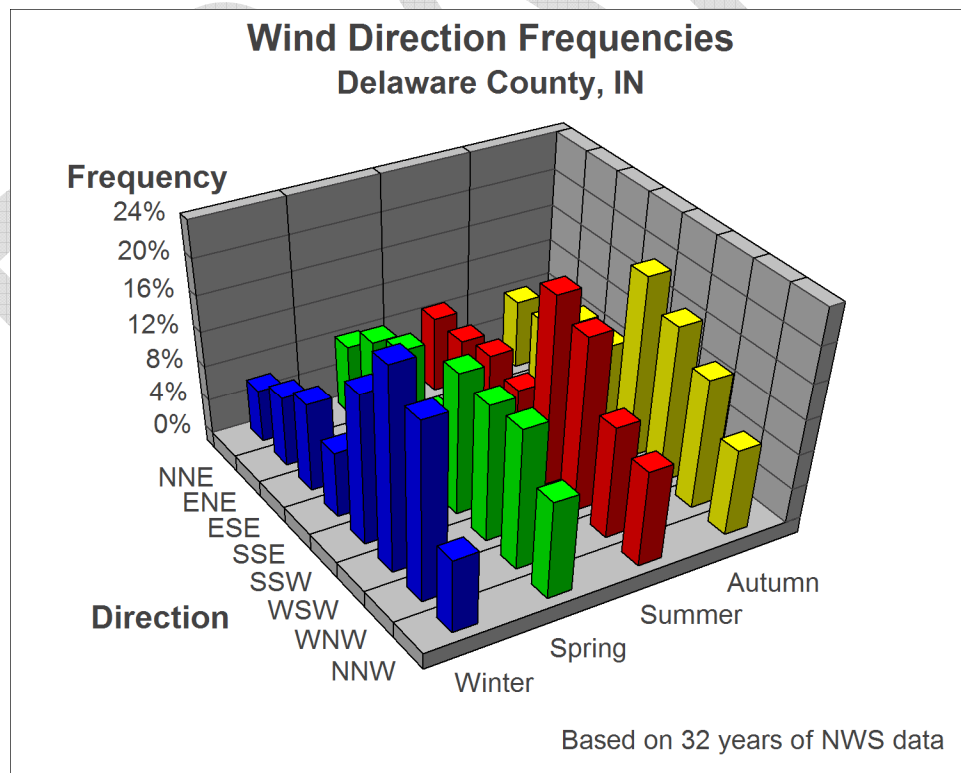
## Emissions Controls

Under this factor, the existing level of control of emission sources is taken into consideration. The emissions data used by EPA in this technical analysis and provided in Table 3 represent emissions levels taking into account any control strategies implemented in Muncie before 2005 on stationary sources. EPA has received additional information on emissions reductions resulting from controls put into place since 2005.

In their submittal, IDEM observed that Exide Technologies has implemented several steps to reduce lead emissions at the facility to help ensure future compliance with the 2008 lead NAAQS. Exide Technologies also took corrective action following a fire in the facility's rotary dryer in June 2008 to prevent future recurrences. The 2007 State emissions inventory data for Exide Technologies is slightly more than half of the 2005 NEI data for the same facility.

### ***Meteorology (weather/transport patterns)***

For this factor, EPA considered data from National Weather Service instruments and other meteorological monitoring sites in the area. Historical wind direction frequencies collected between 1960 and 1992 are included in Figure 4 and Table 7. These data may provide evidence of the potential for lead emissions sources located upwind of a violating monitor to contribute to ambient lead levels at the violation location.



**Figure 4: Historical Wind Direction Frequencies for Delaware County, Indiana**

Figure 4 is a 3-dimensional bar chart that shows the wind frequencies in 8 directions for the 4 seasons. These data are taken from 1960-1992 Solar and Meteorological Surface Observation Network information issued jointly by the U.S. Department of Commerce: National Climatic Data Center and the U.S. Department of Energy: National Renewable Energy Laboratory. The chart frequencies reflect the directions from which the winds come.

<b>Delaware Wind Frequencies</b>	
Frequency as a %	Seasonal Wind Directions
6.03	WINWINDFNNE
8.04	WINWINDFENE
10.12	WINWINDFESE
7.54	WINWINDFSSE
17.00	WINWINDFSSW
22.75	WINWINDFWSW
20.08	WINWINDFNNW
8.44	WINWINDFNNE
8.17	SPRWINDFNNE
11.40	SPRWINDFENE
13.15	SPRWINDFESE
8.61	SPRWINDFSSE
16.12	SPRWINDFSSW
15.51	SPRWINDFWSW
15.93	SPRWINDFNNW
11.11	SPRWINDFNNE
8.72	SUMWINDFNNE
8.58	SUMWINDFENE
9.59	SUMWINDFESE
8.33	SUMWINDFSSE
21.54	SUMWINDFSSW
19.65	SUMWINDFWSW
12.66	SUMWINDFNNW
10.93	SUMWINDFNNE
7.88	AUTWINDFNNE
7.88	AUTWINDFENE
10.62	AUTWINDFESE
10.45	AUTWINDFSSE
20.72	AUTWINDFSSW
17.88	AUTWINDFWSW
14.78	AUTWINDFNNW
9.80	AUTWINDFNNE

**Table 7: Historical Wind Frequency Data as Percents for Delaware County, Indiana**

As shown in Figure 4 and Table 7, the period with the highest wind frequency occurs in the winter months, with winds blowing from the west southwest. With the consistently strong representation of winds from a variation of the west in all seasons, special care must be made when determining the nonattainment boundary to the east of the violating monitor.

### ***Geography/topography (mountain ranges or other air basin boundaries)***

The geography/topography analysis evaluates the physical features of the land that might have an effect on the air shed and, therefore, on the distribution of lead over Muncie and the surrounding area.

The Muncie area does not have any geographical or topographical barriers significantly limiting air pollution transport within its air shed. Therefore, this factor did not play a significant role in determining the nonattainment boundary.

### ***Jurisdictional boundaries***

Existing jurisdictional boundaries may be helpful in articulating a boundary for purposes of nonattainment designations, and for purposes of carrying out the governmental responsibilities of planning for attainment of the lead NAAQS and implementing control measures. These existing boundaries may include an existing nonattainment or maintenance area boundary, a county or township boundary, a metropolitan area boundary, an air management district, or an urban planning boundary established for coordinating business development or transportation activities.

In EPA's August 21, 2009 guidance memorandum, "Area Designations for the 2008 revised Lead National Ambient Air Quality Standard," EPA reiterated that the presumptive boundary for each nonattainment area should be the county containing the violating monitor. This concept was first introduced in the guidance for the 1978 lead NAAQS designations, and is described in the 1992 General Preamble (57 FR 13549). This same presumptive boundary guidance was addressed most recently in the final rulemaking for the 2008 lead NAAQS (73 FR 66964). EPA observed, however, that States have the flexibility in their recommendations to deviate from the presumptive county boundary to portions of the county containing the violating monitor, stating that any "nonattainment area boundaries that deviate from presumptive county boundaries should be supported by an assessment of several factors..." all of which have been discussed already in this document, except for jurisdictional boundaries.

For the Muncie area, there are several jurisdictional boundaries that can be considered. Delaware County is part of the Muncie metropolitan statistical area, and the Delaware-Muncie Metropolitan Plan Commission is responsible for air quality planning within the area that has been recommended as nonattainment for the 2008 lead NAAQS. As a result, air quality planning efforts to address the impending lead nonattainment area in Muncie should not be problematic; it should be noted that the final rulemaking for the 2008 lead NAAQS (73 FR 66964) specifically addressed transportation conformity by stating, "In light of the elimination of lead additives from gasoline, transportation conformity does not apply to the Lead NAAQS." Lastly, IDEM has recommended that the nonattainment area be defined by well-known and major roads which are: W. 26th St./Hines Rd. to the north, Cowan Rd. to the east, W. Fuson Rd. to the south, and S. Hoyt Ave. to the west.

### Other Relevant Information

EPA received additional relevant information from Indiana for establishing the nonattainment area boundary for Muncie. This information will be discussed below.

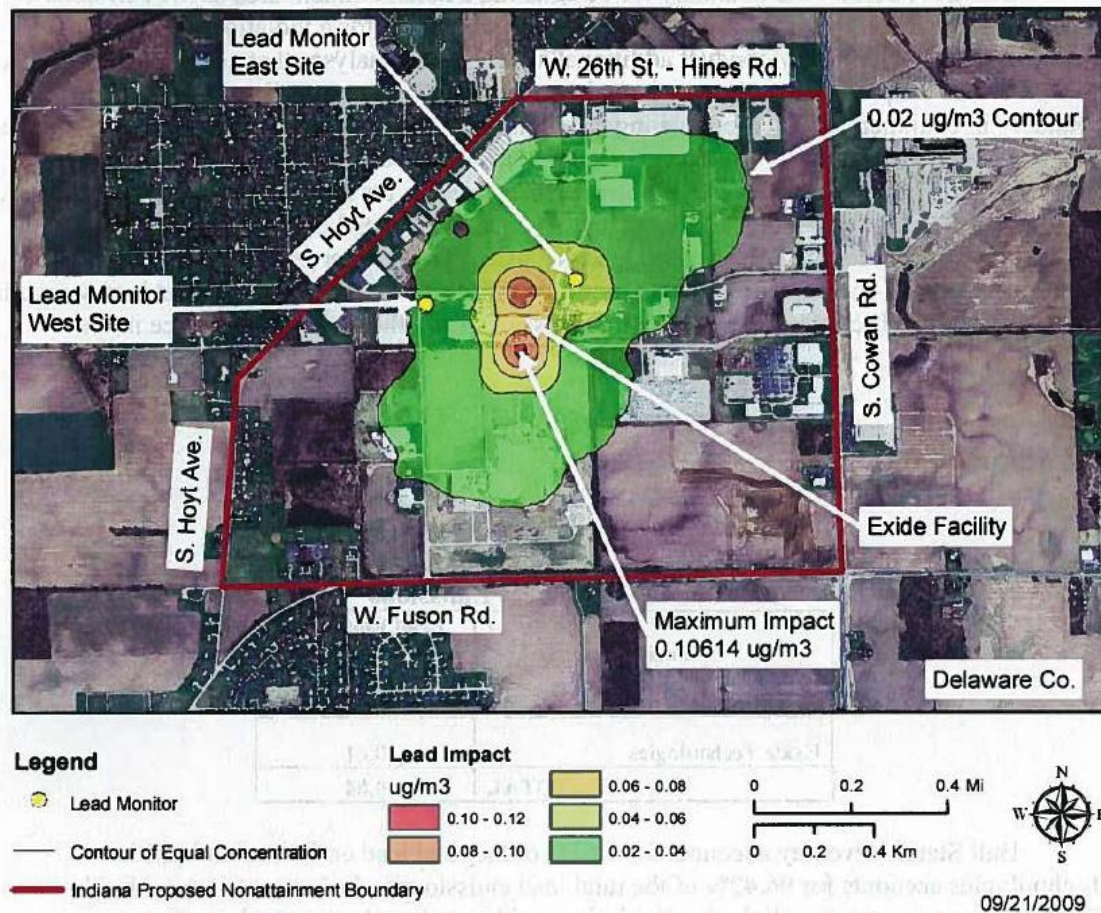


Figure 5: Air Dispersion Modeling for Exide Technologies (IDEM)

Exide Technologies' largest sources of lead emissions are a reverberatory and blast furnace stack (over 100' tall) and a battery crusher and breaker stack (approximately 70' tall). These 2 stacks account for nearly 98 percent of the facility's total lead emissions. The modeling results shown in Figure 5 as provided by IDEM identify that the maximum impact and contour of lead emissions from Exide Technologies is 0.10614  $\mu\text{g}/\text{m}^3$ . Actual 2007 TRI emission numbers from the State and 1992 meteorology were used to construct the model. Re-entrainment of dust was not factored into IDEM's modeling. No other information about the modeling analysis was provided in IDEM's submittal.

## **Conclusion**

After considering the factors described above, EPA has determined that it is appropriate to include the portion of the county listed in Table 1 in the Muncie nonattainment area for the 2008 lead NAAQS.

The air quality monitor in Delaware County shows a violation of the 2008 lead NAAQS, based on 2006-2008 and 2007-2009 air quality data. Exide Technologies is located in the city of Muncie, and with no other major lead emitters in the Muncie area, EPA finds it appropriate to designate portions of Delaware County surrounding Exide Technologies as nonattainment for the 2008 lead NAAQS.

However, EPA is expanding the recommended boundaries provided by IDEM. Based on the air dispersion modeling in Figure 5, the Muncie West monitor (AQS ID 180350008) is within a contour that envelops a highest monthly average concentration of 0.02 to 0.04  $\mu\text{g}/\text{m}^3$ . Historical monitoring data at the site contradicts these values; the mean of all 3-month rolling averages between January 2006 and December 2008 (34 values total) is 0.21  $\mu\text{g}/\text{m}^3$ , the lowest 3-month rolling average during this time period was 0.07  $\mu\text{g}/\text{m}^3$ , and the highest 3-month rolling average was 0.52  $\mu\text{g}/\text{m}^3$ . EPA concludes that the modeling provided by IDEM is under-predicting the impacts on air quality from lead emissions.

Based on the discrepancy between the historical monitored values at the Muncie West site and the modeled values, expanding the nonattainment boundary to capture all likely impacts above the NAAQS is necessary. The best technical judgment at this point relies on a combination of IDEM's modeling and historical wind data. As seen in Table 7, the wind frequencies from the north northeast and east northeast are similar to the frequencies from the east southeast and south southeast. The distance between the point of maximum impact and the southwest corner of the State recommended nonattainment area is approximately 0.80 miles.

As the wind frequencies from the north northeast and east northeast are similar to the frequencies from the east southeast and south southeast, the same principle can be applied to the northwest corner of the northwest corner. The resulting nonattainment area is shown below in Figure 6. It comprises of IDEM's recommended nonattainment area boundary plus the area encompassed by W. 26<sup>th</sup> St. to the north and the vertical "extension" of S. Hoyt Ave. to the west. The eastern edge of Victory Temple's driveway was used to construct the vertical line until it "merges" with S. Hoyt Ave. just south of W. White Rd. Based on the consideration of all the relevant and available information, as described above, EPA believes that the boundaries described herein encompass the entire area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the 2008 lead NAAQS.

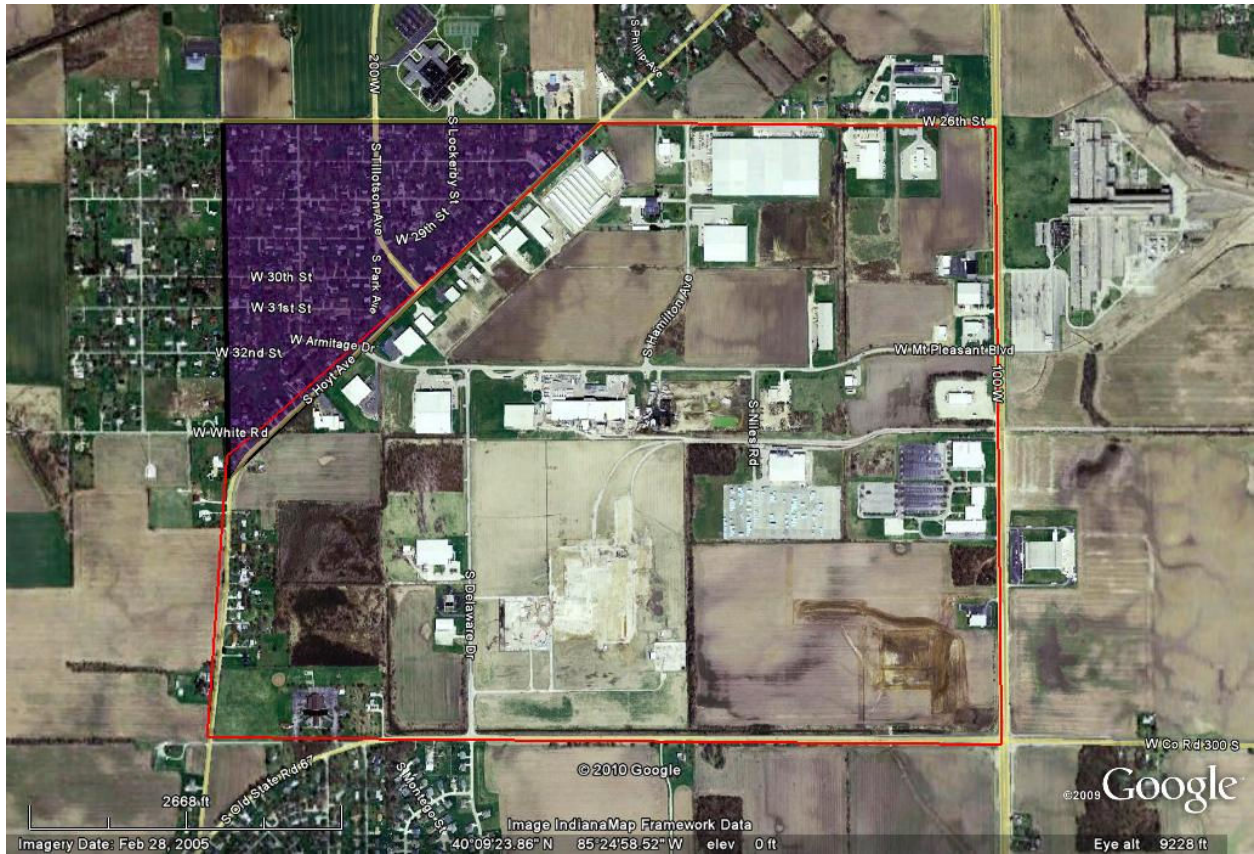


Figure 6: Muncie, Indiana Revised Nonattainment Area

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