Missouri State Implementation Plan Revision

2008 Lead (Pb)
National Ambient Air Quality Standard (NAAQS)
Compliance Plan
–
Exide Technologies-Canon Hollow Facility

Adoption
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Prepared for the
Missouri Air Conservation Commission

Missouri Department of Natural Resources
Division of Environmental Quality
Air Pollution Control Program
Jefferson City, Missouri

Project # 2008-Lead-3C Exide

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1. PURPOSE

As required by Section 110(a) of the federal Clean Air Act Amendments of 1990 (CAA), Missouri's State Implementation Plan (SIP) must ensure attainment and maintenance of all National Ambient Air Quality Standards (NAAQS). The Missouri Department of Natural Resources' Air Pollution Control Program (Air Program) is amending and strengthening the Missouri SIP to address violations of the 2008 Lead NAAQS measured at the Forest City monitoring site in Northwest Missouri. This site is located near the Exide Technologies-Canon Hollow plant, a secondary lead smelter which recycles lead from lead-acid automobile batteries.

This SIP revision contains a demonstration of NAAQS compliance through air dispersion modeling and a consent judgment detailing control projects, record keeping, new work practices, provisions for public access preclusion to non-ambient areas, as well as a contingency measure plan in case lead NAAQS violations continue. Furthermore, a margin of safety was built into the entire attainment modeling analysis by using conservative assumptions in the establishment of an ambient background concentration and the fact that emissions were modeled as being worst-case rather than typical facility operating conditions.

After this proposed SIP revision undergoes the appropriate requisite public participation procedures to include 30-day public notice and comment period, public hearing and adoption before the Missouri Air Conservation Commission, the Air Program intends to submit this plan to the U.S. Environmental Protection Agency (EPA) for inclusion into the Missouri State Implementation plan at 40 CFR §52.1320.

2. BACKGROUND AND AIR QUALITY MONITORING

The Clean Air Act requires the EPA to establish NAAQS for lead and five other criteria air pollutants impacting public health and the environment. The other criteria pollutants are ozone, particulate matter (including PM_{10} and $PM_{2.5}$), nitrogen dioxide, carbon monoxide, and sulfur dioxide. The CAA also requires EPA to periodically review the standards and the latest scientific information to ensure they provide adequate health and environmental protection, and to update those standards as necessary.

Lead is a metal found naturally in the environment, as well as in manufactured products. The major sources of lead emissions have historically been motor vehicles and industrial sources. As a result of the permanent phase-out of leaded gasoline and other national and state regulations, airborne lead concentrations have decreased in the U.S. by 94 percent between 1980 and 2007. Industrial processes are now the major source of airborne lead emissions, including lead smelters, waste incinerators, utilities, and lead-acid battery manufacturers.

While lead emissions have been greatly reduced nationwide, scientific evidence about the impact of lead on health has expanded dramatically since the U.S. Environmental Protection Agency (EPA) first issued a lead standard in 1978. Lead can be emitted into the air in the form of particles small enough to stay suspended in the air. Lead emitted into the air can be inhaled directly or ingested after it settles onto surfaces or soils. Once in the body, lead is rapidly absorbed into the bloodstream and accumulates in the bones. Lead exposure is associated with

several health effects that have an adverse impact on the cardiovascular system, central nervous system, kidneys, and immune system.

Children are more susceptible to the damaging effects of airborne lead than adults because they breathe in more air per minute, typically spend more time outdoors, and exhibit greater hand-to-mouth activity than adults. Children are also more vulnerable to the health effects of lead because their minds and bodies are developing rapidly.

For information on lead as a criteria pollutant, including more details on the NAAQS revision, the health effects of lead and other useful links, please see the Air Program's airborne lead webpage: http://www.dnr.mo.gov/env/apcp/airbornelead.htm.

On October 15, 2008, EPA established a new lead NAAQS of 0.15 micrograms per cubic meter ($\mu g/m^3$), measured as a rolling three-month average [73 *Federal Register* 66964; November 12, 2008]. This new lead standard is 10 times more stringent than the previous 1978 standard of 1.5 µg/m3 based on a quarterly average.

The Missouri Department of Natural Resources' (department) conducted monitoring of airborne lead concentrations near the Schuylkill Metals facility (now the Exide-Canon Hollow facility) under the 1978 NAAQS from 1990 to 2000. Based on air monitoring data originally reported by the department and retrieved from the EPA's Air Quality System (AQS), that standard was violated only once, in 1994.

EPA promulgated the regulations necessary to implement the 2008 standard at the same time that they revised the standard. These regulations required the state to operate a monitoring station near facilities estimated to emit 1.0 tons of lead per year. The monitor provisions were later modified to require monitoring near facilities that are estimated to emit 0.5 or more ton of lead per year [75 FR 81126].

On May 19, 2011, EPA proposed revisions to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Secondary Lead Smelters. In supporting documentation for this proposal, lead emissions from the Exide-Canon Hollow facility were estimated to be greater than 0.5 ton per year [76 FR 29031]. Therefore, the department resumed airborne lead monitoring near the Exide facility at a site called Forest City, Exide Levee. **Figure 1** shows the location of this monitoring site and the Exide facility on an aerial photograph. For more details on the recent upgrade to Missouri's Air Quality monitoring network at Forest City see the 2011 monitoring network plan at: http://dnr.mo.gov/env/apcp/docs/2011monitoringnetwork.pdf

Monitoring was begun using a sampler that collects airborne particulate matter smaller than 10 micrometers aerodynamic diameter (PM_{10}) on March 1, 2012 on an every-sixth-day schedule. On August 1, 2012, monitoring was begun at the same location on the same schedule with a total suspended particulate matter (TSP) sampler, as known as a hi-volume sampler. The PM_{10} lead concentration can be used to show violation of the standard, but the TSP lead concentration is most directly comparable to the NAAQS, and only the TSP lead concentration can be used to show attainment of the standard. Compliance with the lead standard is based on averaging the

every-sixth-day monitored concentrations of lead the ambient air over a 3-month period and comparing that average to 0.15 $\mu g/m^3$ [40 CFR 50.16(a)]. Since this is done on a three-month rolling basis, there is a concentration value to be compared to the standard generated every month.

Three-month rolling average airborne lead concentrations resulting from this monitoring through April 30, 2014 are listed in **Table 1** and shown in **Figure 2**. The TSP lead concentration was at or below the level of the standard for two (overlapping) 3-month periods– December 2012 through March 2013 (0.151 $\mu g/m^3$ would meet the standard, because it rounds to 0.15) and for the four most recent (overlapping) 3-month periods for which data are available, November 2013 through April 2014. The PM_{10} lead concentrations show violations of the standard except for three (overlapping) periods from November 2012 through March 2013 and the three most recent (overlapping) 3-month periods from December 2013 through March 2014. PM_{10} monitoring at this site was discontinued at the end of March 2014.

Monitoring with the TSP sampler at this location will need to continue at least until the site achieves three years of continuous compliant data, because three years of monitoring results at or below the level of the standard are required to show attainment [40 CFR 50.16(b)].

Missouri's most recent monitoring network plan may be found at http://dnr.mo.gov/env/apcp/monitoring/monitoringnetworkplan.pdf .

A map of the statewide lead monitoring network along with the state's current lead Air Quality data and analysis may be found at: http://dnr.mo.gov/env/apcp/docs/leadmonitordata.pdf .

Subsequently, on November 6, 2012, the Air Program hosted a meeting with Exide staff, their environmental consultant– ENVIRON, and EPA Region VII staff for the purpose of coordinating the development of this compliance plan to address the measured violation of the Lead NAAQS. Since that initial meeting there have been numerous and regularly-scheduled conference calls, meetings and discussions culminating in this robust compliance plan that demonstrates attainment and maintenance of the 2008 lead NAAQS in the vicinity of Forest City, Missouri through air dispersion modeling. This plan was developed with the consensus and cooperation of the Air Program, Exide Technologies, EPA Region VII and the Missouri Attorney General.

Concurrent to the development of this plan, the Exide Technology-Canon Hollow facility (Exide) installed, and is operating, new air pollution control equipment to comply with the provisions of the revised Secondary Lead Smelting NESHAP, promulgated on January 5, 2012 [77 FR 556]. These federal control requirements, also known as the Maximum Achievable Control Technology (MACT) are found at 40 CFR 63 Subpart X and include fully enclosing all lead process operations and achieving a negative pressure differential to these lead process buildings through baghouse-filtered ventilation. For this purpose, Exide constructed two new baghouses (Negative Pressure #1 & #2 with associated stacks and a 40-foot stack for the Acid Demister. Pursuant to the MACT, these projects were completed and operating by January 6, 2014.

In addition to the revised MACT, other requirements of this plan, such as plant truck traffic restrictions to limit fugitive lead dust on the roadways and stack emission limitations, will be enforced through the court-lodged consent judgment among the department, the Missouri Attorney General, and Exide Technologies.

Lastly, though an attachment to this plan, Exide voluntarily agrees to collect complete, accurate onsite weather data for trend analysis or in case an additional air dispersion modeling analysis becomes necessary. (For this plan, air dispersion modeling used meteorological data obtained from the nearby Brenner, Nebraska airfield because no onsite meteorological existed during the development of this plan.)

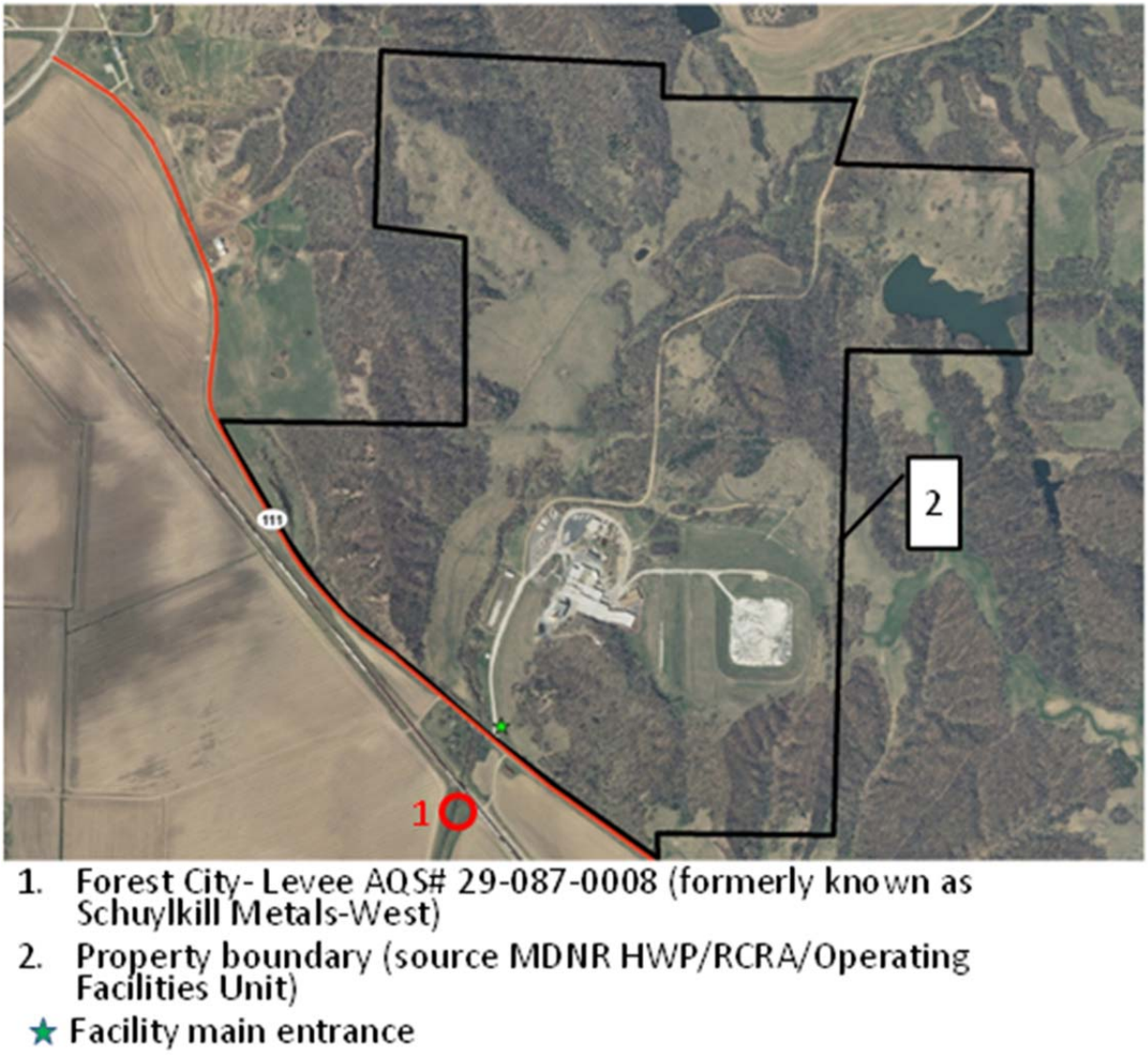


Figure 1. Aerial photograph of the Exide-Canon Hollow facility and surrounding area, showing the facility boundary and the location of the Forest City, Exide Levee monitoring site.

Table 1. 3-month rolling average lead concentrations (μg/m^3) measured at the Forest City, Exide Levee site. **Note:** 3-month averages are calculated from monthly averages of concentrations originally reported by the department and retrieved from the EPA's Air Quality System (AQS), except for the February-March-April 2014 average, which uses preliminary data for April.

3-Month Period	**PM_{10}**	**TSP**
March-May 2012	0.285	
April-June 2012	0.252	
May-July 2012	0.341	
June-August 2012	0.438	
July-September 2012	0.674	
August-October 2012	0.543	0.993
September-November 2012	0.396	0.634
October-December 2012	0.158	0.270
November 2012-January 2013	0.100	0.193
December 2012-February 2013	0.073	0.151
January-March 2013	0.070	0.116
February-April 2013	0.196	0.362
March-May 2013	0.496	0.680
April-June 2013	0.521	0.725
May-July 2013	0.492	0.612
June-August 2013	0.250	0.379
July-September 2013	0.332	0.541
August-October 2013	0.346	0.547
September-November 2013	0.368	0.572
October-December 2013	0.215	0.299
November 2013-January 2014	0.095	0.150
December 2013-February 2014	0.021	0.063
January-March 2014	0.019	0.054
February-April 2014		0.053

Source: Missouri Department of Natural Resources' Environmental Services Program - Air Quality Monitoring Section (as reported to EPA's *Air Quality System* (AQS)).

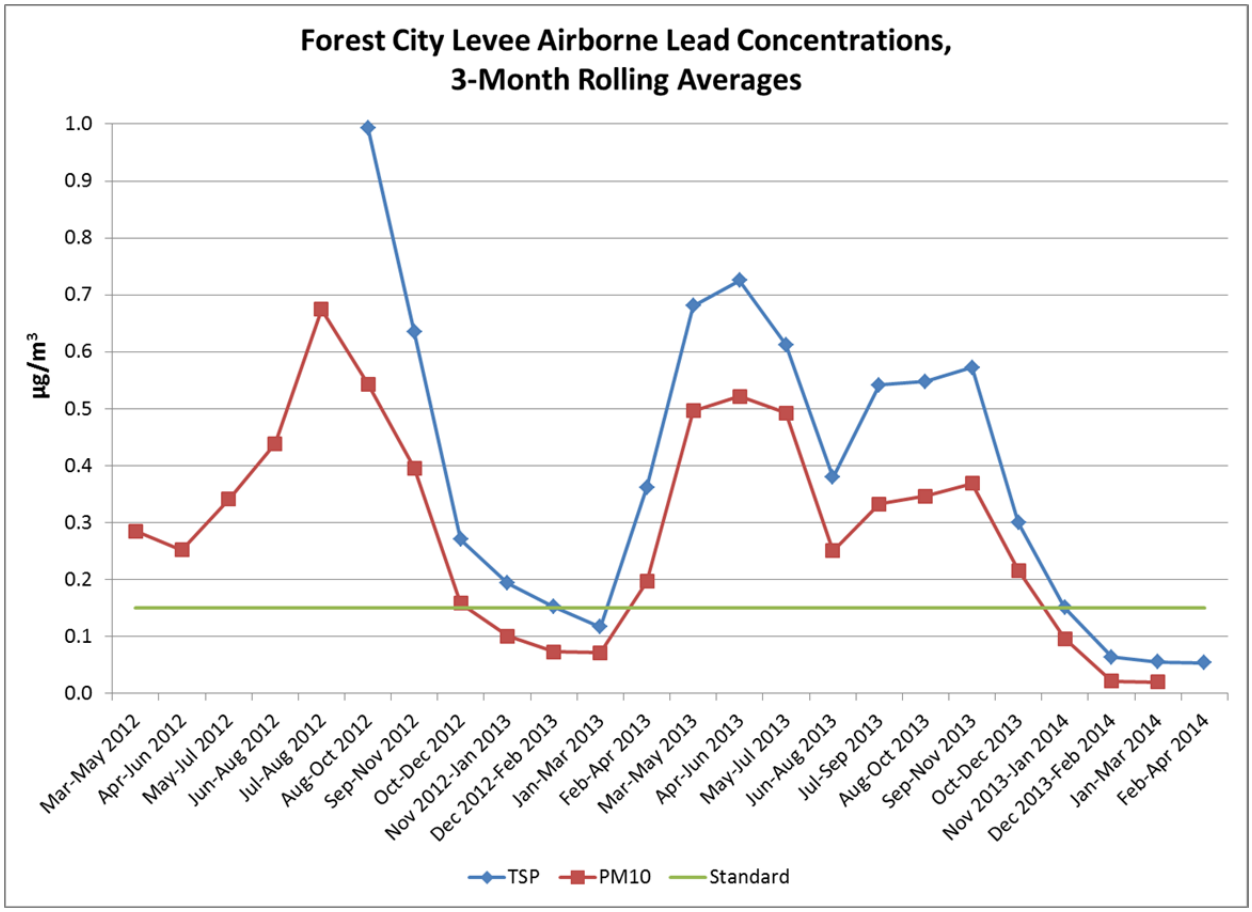


Figure 2. Time series graphs of 3-month rolling average lead concentrations measured at the Forest City, Exide Levee site.

3. EMISSIONS INVENTORY

The Air Program creates air emission inventories for criteria pollutants and hazardous air pollutants to meet federal reporting requirements under EPA's Air Emissions Reporting Rule to provide data that supports the functions of the Air Program, including SIP inventory needs. The lead emission inventory includes anthropogenic emissions from point source facilities like industrial plants, mobile source emissions from aircraft, and nonpoint sources of emissions where many small sources are estimated at the county level. Point source facility emissions are reported directly by permitted sources in Missouri, while nonpoint and mobile source emissions are estimated using EPA guidelines and state-specific data.

For the purposes of this plan, the area of interest is Holt County Missouri, the county encompassing Exide Technologies. The emission inventory data presented is only for lead emissions. A single point source drives the lead inventory for the area, but other smaller (nonpoint) sources are also described for completeness. Nonpoint sources are too numerous to inventory at the individual source level; nonpoint lead sources include aviation gasoline distribution and human cremation. Mobile sources of lead emissions are also considered

including piston-driven aircraft, commercial marine vessels, and diesel locomotives. Both the nonpoint and mobile source inventory included below are for all of Holt County.

Large emitters with Part 70 (P70) operating permits, such as Exide Technologies, submit their emissions inventory annually. The 2012 emission inventory year corresponds to the start of the current air quality sampling effort at the Forest City levee monitoring site as well as the most recent year at the commencement of this plan's development. Nonpoint and mobile source emissions are from the 2011 National Emissions Inventory (NEI), a dataset prepared triennially through state, tribal, and EPA cooperation. Exide Technologies submitted their 2012 inventory data to the state of Missouri, and that data was quality assured prior to forwarding to EPA for further review. The 2012 lead emission totals for Exide Technologies are 5.0045 tons per year. There are no other point sources in the county that have reported lead emissions to the Emissions Inventory Unit. **Table 2** below shows the emissions inventory information for Exide Technologies and the reported lead emissions for 2010, 2011, and 2012.

Table 2 – Point Source Facility Inventory in Holt County

	2012	2011	2010
Exide Lead Emissions (tons per year)	5.0045[a]	0.0146	0.1801

[a] Emission reporting includes fugitive emissions from smelting, kettle, and casting processes in 2012. These areas were unreported in prior years, and they do not constitute an increase in emissions or activity, or a decrease in control.

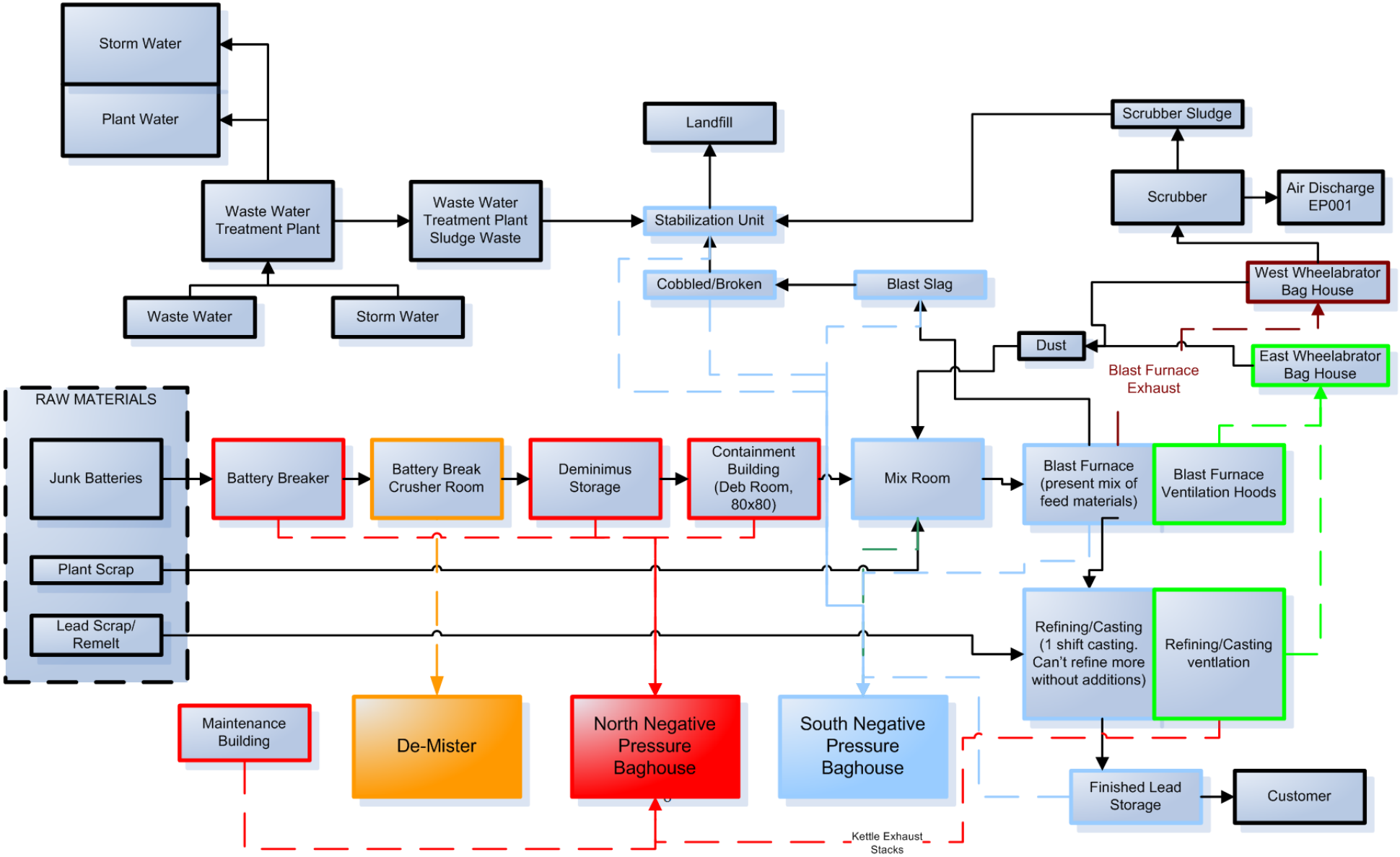
4. CONTROL STRATEGY

The process at the Exide Technologies–Canon Hollow facility near Forest City, MO is typical of secondary lead smelters. Secondary lead smelters perform three basic unit operations: battery breaking, smelting, and refining (includes alloying and casting). Battery breaking is accomplished by crushing or cutting junk batteries into pieces. The plastic, spent acid, and lead-bearing materials are then separated. Lead-bearing materials are then processed in the blast furnace. Molten lead from this furnace is further processed in refinery kettles and subsequently cast into molds for use in new car battery manufacturing. **Figure 3** is a process flow diagram of the Exide plant including the new controls added as a result of the revised Secondary lead MACT and this plan.

Figure 3

Canon Hollow Process Flow Diagram

Canon Hollow Recycling Facility



There are three types of emission sources at secondary lead facilities. This plan proposes controls at each of these emissions points---process sources, process fugitive sources, and fugitive dust sources.

1. Process sources include lead emission from process stacks. Dust filtration systems called baghouses are used to control process emissions
2. Process fugitive sources of lead emissions are characterized by the uncaptured portion of lead particulate matter that are generated by lead smelting processes but might otherwise escape from going up the stack. Controls for process fugitives include process hoods (local exhaust ventilation), and baghouse filtered hygiene ventilation of the process building to negative pressure.
3. Examples of Fugitive dust sources include uncaptured lead escaping a process building and lead dust kicked up by truck traffic on haul routes and wind-blown re-entrainment. Total enclosure of the process buildings and work practices such as haul route sweeping and truck frequency restrictions help control fugitive dust sources.

4.1 MACT Controls

The development of this plan coincides with the implementation of the revised Secondary Lead Smelting NESHAP or MACT Subpart X promulgated on January 5, 2012 [77 FR 556] and effective on January 6, 2014. The majority of the emission reductions used to demonstrate compliance with the 2008 lead standard result from this federal regulation. The revised MACT is used to control lead as an air toxic or hazardous air pollutant (HAP), while this plan was developed to demonstrate compliance with the standards for lead as a criteria pollutant. The MACT regulation is designed to control emissions of all HAPs from secondary smelters including arsenic, mercury, dioxin and furans.

According to EPA, the revised secondary lead MACT will cut lead and arsenic emissions by 68 percent from their previous levels. Some of the provisions of the revised MACT that are used by this plan to demonstrate compliance with the lead NAAQS include–

- Requiring facilities to fully enclose all operations within a building and vent emissions through a controlled stack;
- Ventilating lead process buildings to a control device and maintaining a negative differential pressure of at least 0.013 millimeters of Mercury (mm Hg);
- Lowering the emissions limit for lead to 0.2 mg/dry standard cubic meter (dscm) from 2.0 mg/dscm;
- Establishing a fugitive dust control plan and implementing comprehensive work practices to reduce fugitive lead emissions.

Pursuant to the MACT, Exide has complied with these requirements by January 6, 2014 through a capital improvement and construction campaign that includes the following projects:

- Improvements to lead process building enclosures;
- Construction of two new baghouses, each with a flow capacity of approximately 315,000 cubic feet per minute -

1. Negative Pressure Baghouse #1 to improve refinery ventilation *
2. Negative Pressure Baghouse #2 to improve lead process building hygiene ventilation **;

- Construct a stack for the Acid Demister with a minimum height of 40 feet.

[**Note**: *During the development of this plan, the naming convention for the newly-constructed baghouses had changed. * - Negative Pressure Baghouse #1 may have been referred to as South Baghouse due to its location, or, in the Baghouse SOP manual of Appendix B, it is called West Baghouse #2 because it provides negative pressure ventilation to the West side of the process buildings. ** - Negative Pressure Baghouse #2 is called North Baghouse in the Baghouse SOP manual of Appendix B.]*

The work practices requirements of the MACT regulation include a Fugitive Dust Control & Baghouse Operation plan enforced via a Standard Operating Procedure (SOP) manual. Exide developed a fugitive dust control plan and submitted the SOP manual to the Air Program by the deadline of January 5, 2013. The Air Program approved the plan on August 19, 2013. The SOP includes work practices and plant-specific controls for fugitive dust on the plant roadways, material storage/transportation, operation and maintenance of the Baghouses, housekeeping within the process buildings and recordkeeping to name just a few. Exide's *Standard Operating Procedures Manual for Fugitive Dust Sources* & *Standard Operating Procedures Manual for Baghouses* (along with the department's approval letter) are attached to this plan for reference as **Appendix B**.

A specific example of a work practice to be maintained by Exide pursuant to the Fugitive Dust SOP is found on page 2 of the manual. Exide must clean all in-plant roadways and parking lots by wet washing or vacuum sweeping at least twice daily between 7:00 am and 7:00 pm. Attachment A of the SOP manual is a map of the plant campus showing the corresponding areas to be cleaned. To further reduce lead fugitive being kicked up by vehicle traffic, a 5 mile per hour speed limit is enforced on all plant roadways.

Moreover, pursuant to 40 CFR 63.548 of the Secondary Lead Smelting NESHAP, Exide shall operate at all times according to the Baghouse SOP of Appendix B that describes in detail procedures for inspection, maintenance, bag leak detection and corrective action plans for all baghouses that are used to control process, process fugitive or fugitive dust emissions from any applicable source including those used to control emissions from building ventilation.

4.2 Non-MACT Controls

In addition to the reductions to be achieved by the MACT, two other control measures not found in the MACT were also used in this attainment demo: Stack Emission Limits and Truck Traffic Restrictions. For this plan, the workgroup has chosen to make these two control measures enforceable through a Consent Judgment to be lodged with the court. This Consent Judgment was developed in conjunction with this plan and is included in this plan as **Appendix A**. The enforceable provisions for these lead emission reductions may be found in Paragraph V.7. *Required Practices and Procedures* of the Consent Judgment in Appendix A. The installation, operation and schedule for the control projects (including the MACT-related ones) are outlined in Paragraph V. 6. of the Consent Judgment. The parties to the Consent Judgment are the

department, the Missouri Attorney General and Exide technologies. The parties shall sign and be bound by the Consent Judgment once it has been adopted by the Missouri Air Conservation Commission after appropriate opportunities has been made by the public or any interested parties during the 37-day public hearing and comment process as discussed in chapter 7 of this document.

The MACT prescribes a plant-wide stack emission limitation of below 0.20 milligrams of lead per dry standard cubic meter. This is an aggregate flow-weighted average concentration of all the lead process stacks at the facility. To translate this aggregated average limit into a worst-case impact for modeling purposes, each stack was assigned an individual limit in pounds per hour (lb/hr).

For this compliance plan, Exide agrees to limit emissions from each of their stacks/emission points at the rate (in lb/hr) shown in Paragraph V.7.E. of the Consent Judgment and **Table 3** below. These were the maximum emission rates used to model attainment and employ a margin of safety through their conservative estimation. Enforcement of these emission limits shall be through regular stack tests in the same manner and schedule required by the revised secondary lead smelter MACT.

Table 3 – Stack Emission Limits

Emission Point	Control Device	Emission Source / Description	Emission Rate (lb/hr)
AD	Acid Demister (CD007)	Battery Break Crusher Room	0.024
EP01	Wheelabrator Air Pollution Control System	Blast Furnace, Refinery & Casting Process Hoods	0.322
BH01	Negative Pressure Baghouse #1 (CD005)	Blast Furnace, Refinery & Casting Bldg. Neg. Pressure	0.236
BH02	Negative Pressure Baghouse #2 (CD006)	Other Building Negative Pressure	0.196

Similarly, to further reduce fugitive dust emissions and to demonstrate attainment of the lead standard, Exide agrees to limit truck traffic, frequency and hours of operation on the plant roads to the schedules outlined in Table 4 below [Paragraph V.7.F. of the Consent Judgment]. For

more information on truck haul route emissions, see paragraph 5.3.3 *Area Sources* of this document.

Table 4 – Truck Traffic Restrictions: Frequency and Hours of Operations

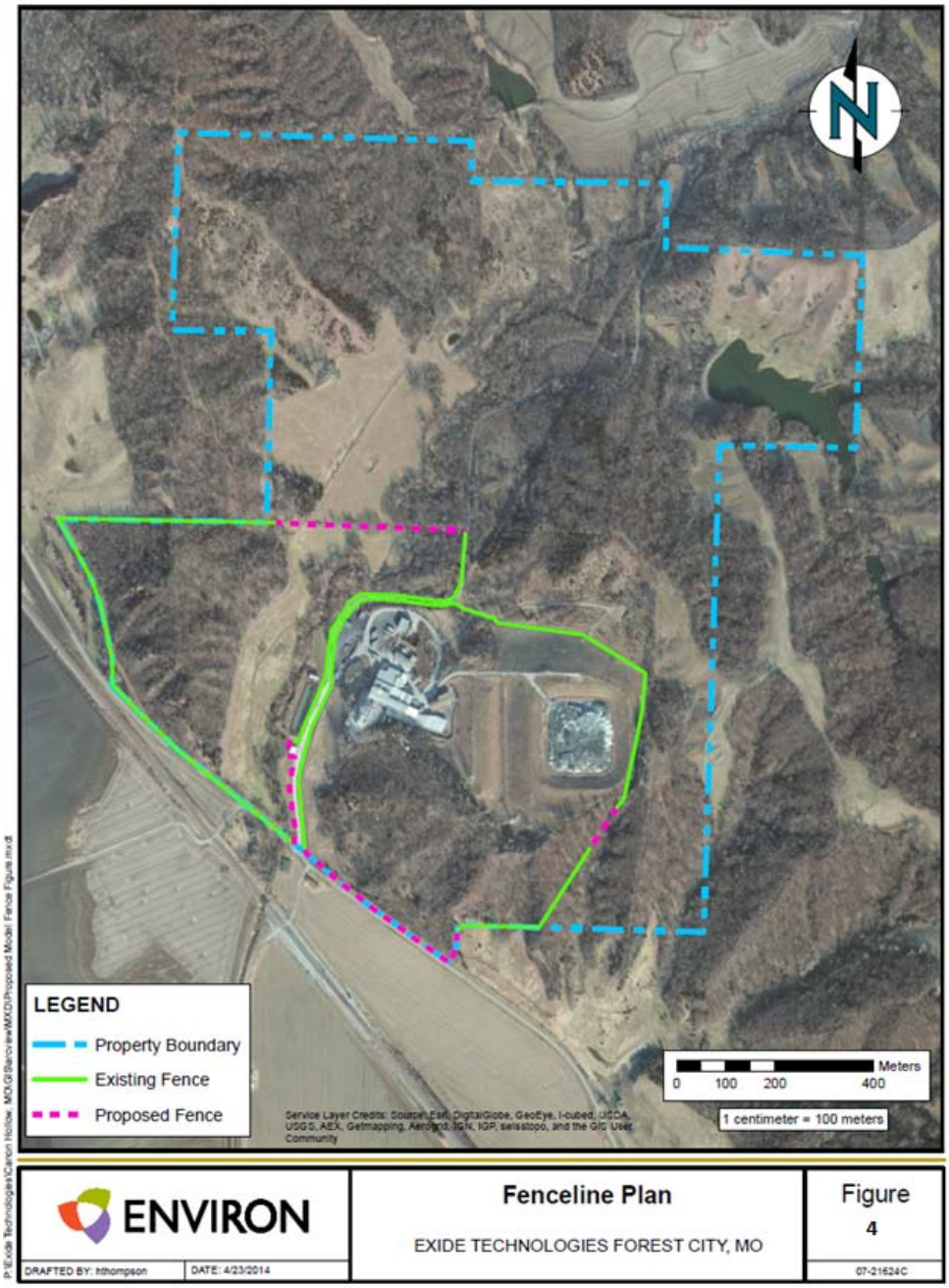
Group	Route Description	Total Trips Per Month	Unrestricted Trips Per Month*
A	Cores/Scrap	368	0
	Industrials		
B	Furnace Coke	87	4
	Lime (bulk)		
	Furnace Fluxes		
C	Trash	61	3
	Acid (bulk)		
	Plastic Chips		
D	Cement (bulk)	22	1
	Oxygen (liquid)		
E	Lead Products	260	13
F	Slag Mix to Landfill	217	11
G	Service	26	1
Total		**1040**	**34**

*Note: Restricted trips only use the haul roads 12 hours per day (7AM-7PM). Unrestricted trips use the haul roads 24 hours per day.

The previous secondary lead smelting NESHAP promulgated in 1999, called for total enclosures of lead process buildings or the operation of local exhaust ventilation process hoods (LEV's). The new secondary lead smelting NESHAP revised as of 2012 requires both total building enclosures and negative pressure differential filtered-ventilation. It no longer specifies the operation of LEV's. Nevertheless, to optimize the capture, containment and control of lead-bearing particles in the lead process buildings, Exide agrees, through this plan, to operate LEV's at the following emission units when the units are operating: (1) Blast Furnace charging, (2) Furnace lead and slag tapping, and (3) refinery kettles. [Paragraph 7.C. of the Consent Judgment]

Section 5 of this document on Air Dispersion Modeling demonstrates that the control strategy mentioned above reduces emissions sufficiently to attain and maintain the 2008 lead standard in all areas of ambient air. The maximum modeled concentration of lead in the ambient air (including background concentration) is 0.1498 $\mu g/m^3$ at a model receptor site located about 600 yards northwest of the lead process buildings on the Exide property. Figure 1 above shows Exide's property boundary at the Canon Hollow facility. Air is considered to be ambient even within a facility's property boundaries if public access has not been sufficiently precluded. Exide has chosen a smaller area than their property boundary to be considered non-ambient. Pursuant to Paragraph V.7.D. of the Consent Judgment, Exide shall maintain fencing or otherwise preclude public access on two perimeters or quadrants within their grounds. One

quadrant is west of Canon Hollow Road and north of Highway (HWY) 111 to a line about midway through their property. The other quadrant extends east of Canon Hollow Road and North of HWY 111 to surround their active processing plant campus, parking lots and hazardous waste landfill site. **Figure 4** shows the two public access preclusion zones to be maintained. The existing fencing is in green while and the new fencing to be built is highlighted in purple. This map and a list of "fenceline" coordinates with 10-meter spacing are attached to the Consent Judgment. 10-meter spacing is appropriate because it represents the approximate distance between hypothetical "fence posts" that may later be used to define a fenceline. Any change to the fencelines that would allow public access to these two preclusion zones will require a SIP revision as well as a new modeled attainment demonstration.



5. AIR DISPERSION MODELING

The lead-specific State Implementation Plan (SIP) regulations found at 40 CFR 51.117 (entitled "Additional provisions for lead") require the use of dispersion modeling for the demonstration of attainment. Air quality dispersion modeling is a computer simulation that predicts air quality concentrations from various types of emission sources. For pollutants emitted through a stack, it considers the emission rate, stack height, stack diameter, and stack gas temperature and velocity, as well as the effect of nearby buildings and terrain. Other emission sources like vehicle traffic or wind erosion from storage piles are represented as 2-dimensional area sources or 3-dimensional volume sources.

Air quality dispersion models use meteorological data such as temperature, wind direction, and wind speed to calculate concentrations for selected modeling receptor grids. Five years of National Weather Service (NWS) meteorological data is typically used for air quality modeling according to 40 CFR 51 Appendix W [*Guideline on Air Quality Models*]. In some cases one or more year(s) of on-site meteorological data is used.

Model results are compared to ambient air standards to determine if they meet state and federal requirements. Sometimes results are used to help site ambient air monitors or they may be input into human health risk assessments or ecological risk assessments.

Typically, in a SIP modeling exercise, two dispersion modeling analyses are used. One is used to verify the accuracy of the modeled inputs by comparing the monitored data to the modeled results (base case). The second analysis examines the effectiveness of the proposed emission controls (future case) necessary to demonstrate attainment. In order to conduct a base case model, emissions, monitoring and meteorological data must all be representative, concurrent and correlative. For this plan, a representative corresponding period of matching data sets for establishing a base case scenario did not exist.

At the start of the development of this plan in late 2012, no on-site meteorological data was available. Also, at this time, there were only a couple months of NAAQS-comparable monitoring data available. (For more information see chapter 2 *Background and Air Quality Monitoring).* So that compliance with the lead air quality standard may be achieved as expeditiously as possible, the Air Program moved forward with the plan using meteorological data from a representative National Weather Service site despite its potential limitations due to terrain differences. Exide has agreed to conduct on-site meteorological monitoring for trend analysis or in case future air dispersion modeling should become necessary. The on-site meteorological station became operational in early 2014. (See also section 5.6 *Meteorological Data Set).* Lastly, Exide started process changes and construction projects related to the newly revised secondary lead MACT control measures that changed the facility's "baseline." Consequently, there was an inability to establish concurrent and correlative model inputs necessary for a base case evaluation. The decision to move forward with the plan without a base case modeling analysis was made in coordination with EPA Region VII staff.

The Air Program is confident that all lead sources have been appropriately identified and characterized in the model because this plan uses the same source accounting analysis utilized by

the State in other recent SIP revisions for similar lead smelting facilities and by the EPA in their recent MACT lead residual risk assessment.

The following section is based on Exide's modeling report (attached to this plan as Appendix D) that was prepared by ENVIRON International Corporation (ENVIRON). The Air Program completed its own independent modeling analysis and verification study and concurs with the results.

5.1 Model Selection and Settings

Modeling procedures used in this attainment demonstration follow current air quality modeling guidelines as contained in 40 CFR 51 Appendix W. The EPA's recommended dispersion model for addressing lead is the AMS/EPA Regulatory Model (AERMOD). AERMOD can predict the concentration distribution of pollutants from surface and elevated releases located within simple or complex terrain. The model allows for the input of multiple sources, terrain elevations, structure effects, various grid receptors, wet and dry depletion calculations, urban or rural terrain, and averaging period ranging from one hour to one year. The latest available version of AERMOD (13350), was used in this attainment demonstration, as well as its pre- and post-processors: AERMAP, AERMET, BPIPPRM, and LEADPOST.

This analysis was conducted using AERMOD with all regulatory defaults. The following regulatory default modeling control options were included:

- adjusting stack heights for stack-tip downwash,
- using upper-bound concentration estimates for sources influenced by building downwash from super-squat buildings,
- incorporating the effects of elevated terrain,
- employing the calms processing routine, and
- employing the missing data processing routine

5.2 Modeled Pollutants and Averaging Periods

The only pollutant that was modeled is lead (CAS Number: 7439-92-1). Calculation of chemical concentrations for use in demonstrating attainment of the 2008 Lead NAAQS (EPA 2008b) requires the selection of appropriate concentration averaging times. To demonstrate agreement with the 2008 Lead NAAQS, the Air Program and ENVIRON executed the AERMOD model and generated POST files using a monthly averaging period. These POST files were processed through the EPA's LEADPOST (Version 12114) FORTRAN based computer program to generate consecutive three-month rolling averages for comparison against the lead NAAQS.

5.3 Modeled Sources and Their Release Parameters

This modeling analysis included the following lead emitting sources and their associated control devices at the Exide facility: the blast furnace exhaust is routed to the west Wheelabrator baghouse. The blast furnace and refining/casting ventilation hoods are routed to the east Wheelabrator baghouse. Both west and east baghouses share one stack (EP01) and it is called the Wheelabrator air pollution control system. Refining/Casting ventilations, Battery Breaker

area, Deminimis Storage area, Containment Building, Maintenance Building are routed to the Negative Pressure Baghouse #2, one of the newly constructed baghouses (CD006). Some of the Blast Furnace and Refining/Casting areas are routed to the other newly-constructed baghouse, Negative Pressure Baghouse #1 (CD005). Other areas that are controlled by the acid demister baghouse (CD007) are the Stabilization Unit, Blast Slag, and Mixing areas. The battery break/crushing area is routed to CD007. The source identifiers for the point sources used in this AERMOD modeling were chosen based on the designations used by the facility. Process fugitives and haul roads emissions were modeled as volume and area sources respectively. No other emission sources besides Exide were modeled. Any other small mobile or nonpoint sources of lead are contributors to background concentration which is discussed in section 5.9 of this document. The following sections describe the how the emission rates and model parameters were determined for each type of source.

5.3.1 Point Sources Emissions and Release Parameters

In order to demonstrate ambient impacts less than the 2008 Lead NAAQS (0.15 $\mu g/m^3$) and all relevant federal New Source Performance Standard (NSPS) and NESHAP standards applicable to the sources involved, the Wheelabrator Air Pollution Control System was modeled based on a lead concentration of 1 milligram per dry standard cubic meter (mg/dscm), and the other point sources were modeled based on 0.2 mg/dscm, with exception of Negative Pressure Baghouse # 2 (CD005) which was modeled based on 0.17 mg/dscm. The emission rate for the Wheelabrator Air Pollution Control System is the maximum allowed for any one source under the NESHAP. It is higher than the most recent stack test emission rate in order to ensure that normal operational variations would not create conditions where the lead NAAQS is exceeded. The emission rates for the two negative pressure baghouses and the acid demister were set in accordance with the facility wide, flow weighted average lead emission limit set in the NESHAP for secondary lead smelters; however, the actual emission rates from these sources are expected to be less than the modeled values. The emission rate for each source is calculated in **Table 5**. All of the stacks were modeled as vertical point sources with unrestricted flow. **Table 6** includes a list of the point source inputs that were included in this modeling exercise. **Figure 5** shows the location of all point sources within the facility. The modeled stack velocities for the two new baghouses (CD005 and CD006) are corresponding to conservatively assumed flow rates that still achieve the negative pressure requirements of §63.544(c)(1) of 40 CFR 63 Subpart X; however, the emission rates for those two sources were conservatively modeled assuming 100 percent flow.

Table 5- Point Source Emissions Calculations

Emission Point/ID	Description	Emission Source	Air Flow			Capacity	Modeled Lead Concentration	Modeled Lead Emission Rate	
			acfm	m^3/s	dscfm	%	mg/dscm	lb/hr	g/s
AD	Acid Demister	Battery Break Crusher Room	32000	15.10	0	100%	0.20	0.024	3.02E-03
WBH	Wheelabrator Air Pollution Control System	Blast Furnace, Refining /Casting Process Hoods	83160	39.25	86074	100%	1.00	0.322	4.06E-02
BH01	Negative Pressure Baghouse 1	Blast Furnace, Refining/Casting bldg. Neg. Pressure	315000	148.66	0	100%	0.20	0.236	2.97E-02

BH02	Negative Pressure Baghouse 2	Other Building Negative Pressure	315000	148.66	0	100%	0.17	0.196	2.53E-02

Table 6- Point Source Inputs to AERMOD

Source ID	Description	X-Coordinate (m)	Y-Coordinate (m)	Base Elevation (m)	Stack Height Above Grade (m)	Stack Temp. (K)[a]	Stack Velocity (m/s)	Stack Diameter (m)
AD	Acid Demister	309533.77	4433697.58	279.81	12.19	0	15.40	1.12
WBH	Wheelabrator Air Pollution Control System	309412.20	4433607.01	285.92	39.00	326.11	14.94	1.83
BH01	Negative Pressure Baghouse 1	309383.71	4433596.53	286.05	27.89	299.82	18.19	2.79
BH02	Negative Pressure Baghouse 2	309556.87	4433717.66	280.26	25.45	299.82	18.19	2.79

[a] The Acid Demister stack is assumed to be at ambient temperature. The input file contains a value of 0 for this source parameter. AERMOD will apply the hourly ambient temperature to the stack

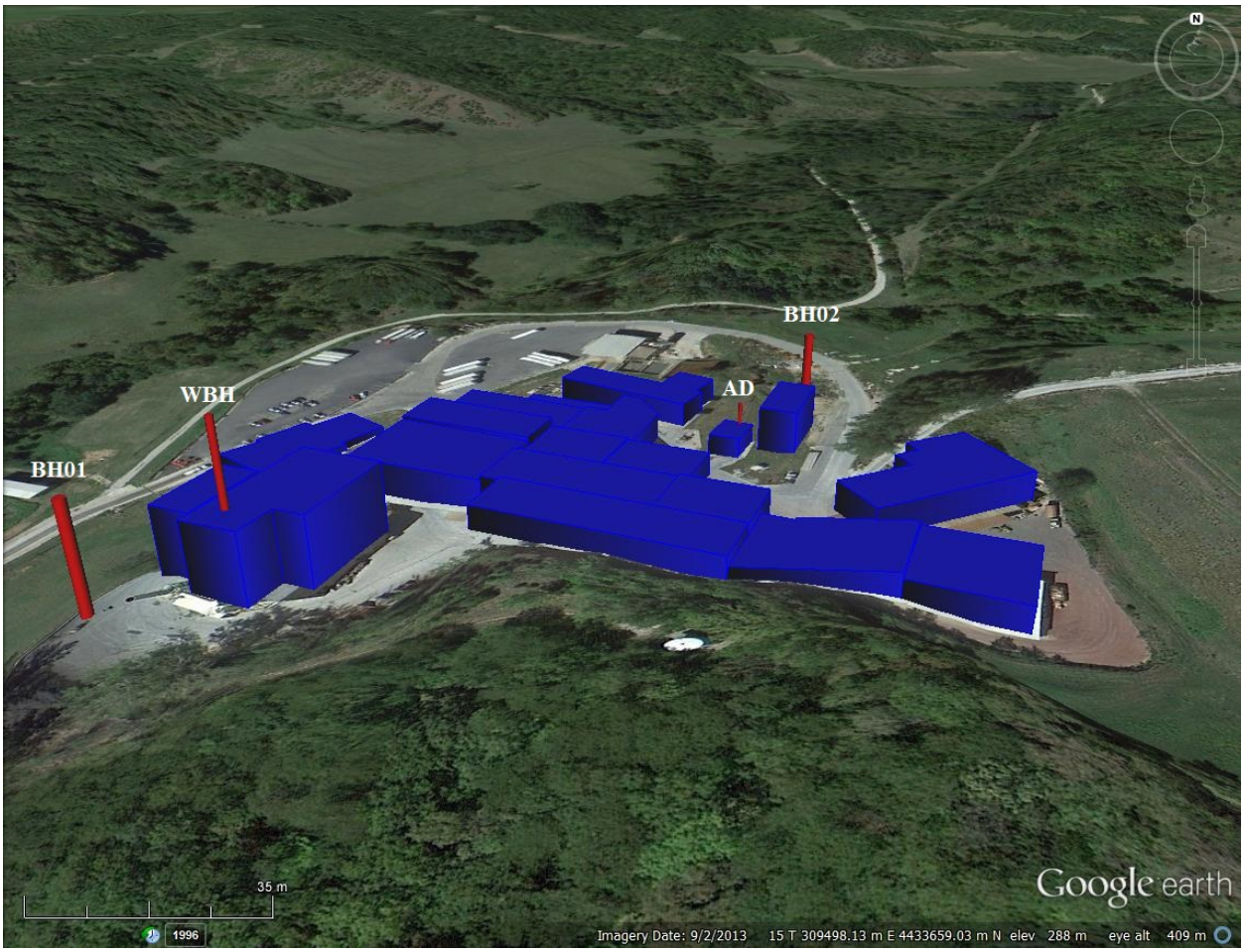


Figure 5- Point Emission Sources within Exide

5.3.2 Volume Sources

The source group designated FUG was included to represent process fugitive emissions from the furnace, refining, and casting that may escape through openings in the facility buildings. §63.544(c)(1) of 40 CFR 63 Subpart X requires continuous ventilation of the total enclosure to ensure negative pressure values of at least 0.007 inches of water column. Assuming a worst case scenario with all external equipment doors open at the same time, the facility's future negative pressure total enclosure design will achieve the minimum of 0.007 inches water column. However, measures will be put in place to ensure that under normal operating conditions, all exterior doors will not be open at the same time, and the facility will exceed the minimum of 0.007 inches of water as explained below.

Additionally, Exide will implement design and housekeeping provisions that go beyond the NESHAP requirements; these provisions include equipment door designs that minimize building inflow and the use of local exhaust ventilation (LEV) hoods. Service vehicle or equipment door openings will be equipped with airlocks, speed doors, dock seals, metal roll up doors, or other controls to minimize changes in differential pressure or building inflow during occasional but necessary traffic. Exide intends to keep all doors closed during normal operation barring the protection of employee welfare. Exide will continue to operate and maintain LEV's at the Blast Furnace (both charging and tapping) and at the refinery kettles to reduce process fugitive

emissions after installation of the new baghouses. EPA's Secondary Lead Smelting Background Information Document for Proposed Standards (EPA 1994, page D-58) suggests that the capture efficiency of local exhaust ventilation hoods is 95%. Exide used 95% building capture efficiency in this modeling exercise. The effect of the local exhaust ventilation hoods and the negative pressure total enclosure reduced the fugitive emissions from this source group to less than 31.33 lb/yr. **Table 7** shows the calculation of the process fugitive emissions, both before and after the installation of the total enclosure negative pressure ventilation system. The emission rate in **Table 7** was divided evenly across all of the modeled volume sources in the source group FUG.

The fugitive process emissions were characterized as volume sources with square area footprints. It was assumed that fugitive emissions that may escape the building will escape from open equipment doors to the manufacturing area; therefore, those equipment doors were represented as volume sources in the model (**Figure 6**). The height and width of each door were used to calculate the initial lateral dimension and the initial vertical dimension for each volume source. Per EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (EPA 2004), the initial lateral dimension was set as the length of the square area footprint divided by 4.3, and the initial vertical dimension was set as the doorway height divided by 2.15. **Table 8** includes a listing of the fugitive volume sources and their parameters for input into AERMOD.

Table 7- Process Fugitive Emissions (Controlled)

Source	AP-42 Factor (lb/ton)	Process Rate (tons/yr)	Uncontrolled Emissions (lb/yr)	Hood % Capture	Current Fugitive (lb/yr)	Bldg % Capture	Controlled Emissions (lb/yr)	Controlled Emissions (g/s)
Furnace	0.2	58,400	11,680	95	584	95	29.2	4.20E-04
Refining	0.0006	58,400	35.04	95	1.752	95	0.0876	1.26E-06
Casting	0.0007	58,400	40.88	0	40.88	95	2.044	2.94E-05
Sum					**627**		**31.33**	**4.51E-04**

Table 8- Volume Source Inputs to AERMOD

Source ID	Description	X-Coordinate (m)	Y-Coordinate (m)	Elevation (m)[a]	Emission Rate (g/s)[b]	Release Height (m)	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)
FUG1	Exterior Door A	309430.36	4433662.71	277.37	3.00E-05	2.13	0.99	1.98
FUG2	Exterior Door B	309440.73	4433686.63	277.37	3.00E-05	2.34	1.13	2.17
FUG3	Exterior Door C	309456.82	4433712.77	276.15	3.00E-05	2.06	0.99	1.91
FUG4	Exterior Door D	309463.59	4433709.70	276.15	3.00E-05	2.06	0.99	1.91
FUG5	Exterior Door J	309442.14	4433645.06	284.99	3.00E-05	1.37	0.85	1.28
FUG6	Exterior Door K	309451.30	4433641.13	284.99	3.00E-05	0.30	0.28	0.28
FUG7	Exterior Door N	309461.54	4433623.08	284.99	3.00E-05	2.44	0.99	2.27
FUG8	Exterior Door Q	309531.32	4433620.90	283.77	3.00E-05	1.52	0.64	1.42
FUG9	Exterior Door R	309534.39	4433619.63	283.77	3.00E-05	1.52	0.64	1.42

FUG10	Exterior Door S	309539.79	4433619.21	283.77	3.00E-05	2.44	1.17	2.27
FUG11	Exterior Door W	309590.17	4433606.81	284.38	3.00E-05	2.13	1.49	1.98
FUG12	Exterior Door X	309513.01	4433642.07	282.24	3.00E-05	2.13	0.85	1.98
FUG13	Exterior Door Y	309503.07	4433666.52	282.24	3.00E-05	2.13	1.35	1.98
FUG14	Exterior Door Z	309506.92	4433685.97	277.06	3.00E-05	2.13	1.35	1.98
FUG15	Exterior Door AA	309506.24	4433701.76	277.06	3.00E-05	2.13	1.13	1.98

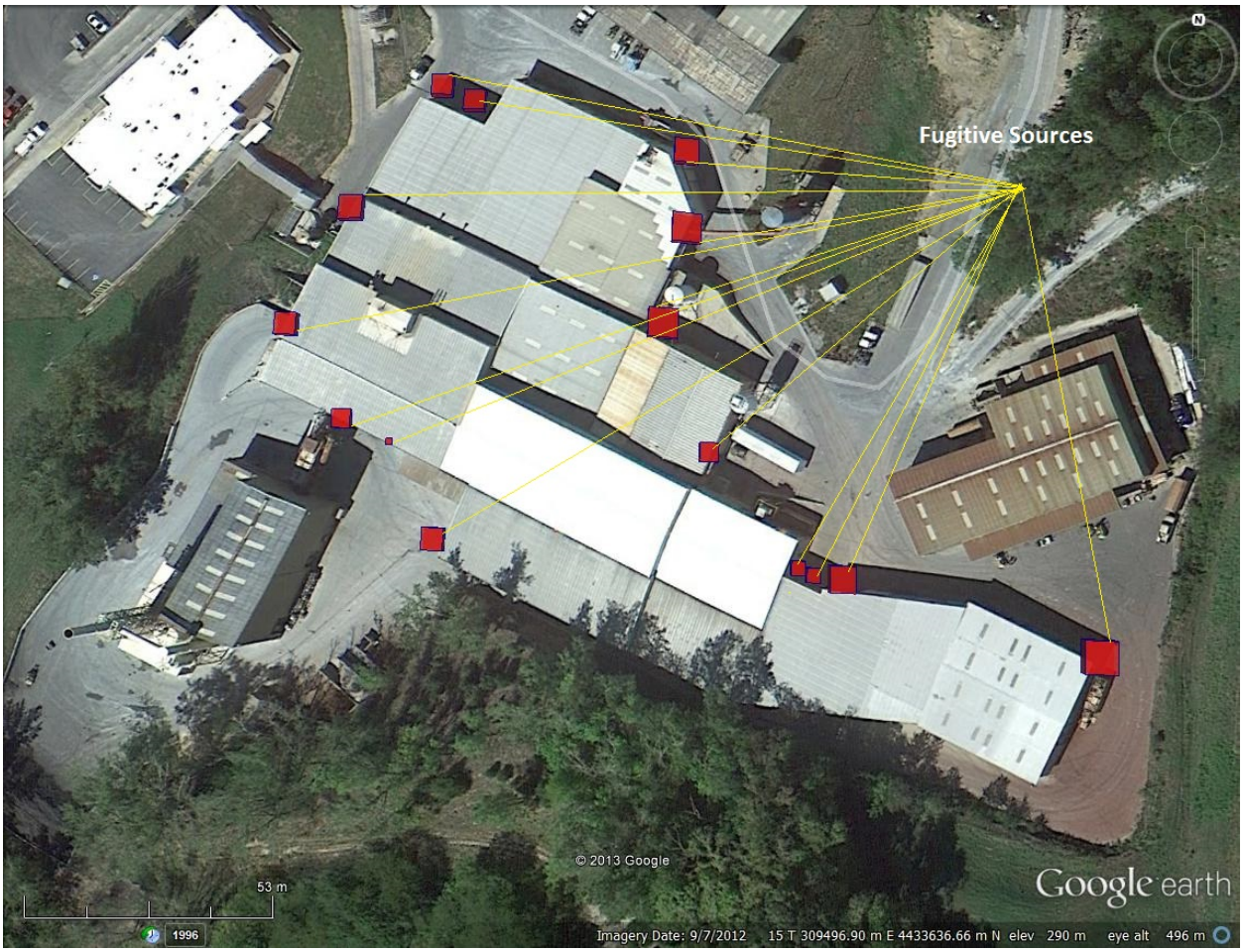


Figure 6- Volume Sources Locations

5.3.3 Area Sources

In addition to the fugitive process emissions, fugitive emissions due to re-entrainment of surface dust from traffic were taken into account in the model. Semi-trailers, roll-offs, dump trucks, loaders, and forklifts regularly drive on the facility roads and contribute to these fugitive emissions. Vehicular fugitive emissions were modeled as ground level area sources with input parameters calculated according to the guidance provided in the EPA's Haul Road Workgroup Final Report (March 2, 2012). All of the haul roads were assumed to be 8-meters wide and have two lanes; therefore the width of each area source was set to 14 meters (six meters plus the road width). The other release parameters of each area source (release height, initial vertical dimension, etc.) were calculated based on the fleet average vehicle height for each road segment. The approximate dimensions of the vehicles and corresponding area sources that were included

in the model are in **Table 9**. Traffic patterns for each vehicle type were split into equal width rectangles to represent the area sources (**Figure 7**). A description of the traffic patterns including the vehicle type, number of trips, frequency of trips, and hours of day are in **Table 10**. **Table 11** includes a list of the haul road area sources and their release parameters that were included in the modeling.

Table 9- Area Source Parameters for Haul Roads

Parameter	Approximate Vehicle and Plume Dimensions (meters)				
	Semi-Trailer	**Roll-Off**	**Dump Truck**	**Loader**	**Forklift**
Vehicle Height[a]	4.11	3.66	3.44	3.81	2.13
Vehicle Width[a]	2.59	3.05	2.87	2.46	1.16
Top of Plume Height[b]	7.00	6.22	5.86	6.48	3.63
Release Height[b]	3.50	3.11	2.93	3.24	1.81
Plume Width[b]	8.59	9.05	8.87	8.46	7.16
Sigma Z[b]	3.25	2.89	2.72	3.01	1.69

[a] Approximate average dimensions of the vehicles at the facility.
[b] Determined by using the Recommended Area Source Configuration from EPA's Haul Road Workgroup Final Report (March 2, 2012)

Table 10- Haul Road Vehicle Trips

Route No.	Route Description	Vehicle Type	% Restricted Trips*	Time of Day	Weekly Restricted Trips	Monthly Restricted Trips	Monthly Unrestricted Trips
1	Cores/Scrap	Semi-Trailer	100%	7AM - 7PM	60	303	0
2	Industrials	Semi-Trailer	100%	7AM - 7PM	12	65	0
3	Furnace Coke	Semi-Trailer	95%	7AM - 7PM	4	16	1
4	Lime (bulk)	Semi-Trailer	95%	7AM - 7PM	3	16	1
5	Trash	Roll-Off	95%	7AM - 7PM	4	21	1
6	Cement (bulk)	Semi-Trailer	95%	7AM - 7PM	2	12	1
7	Acid (bulk)	Semi-Trailer	95%	7AM - 7PM	6	25	1
8	Oxygen (liquid)	Semi-Trailer	95%	7AM - 7PM	2	8	0
9	Furnace Fluxes	Semi-Trailer	95%	7AM - 7PM	3	49	3
10	Lead Products	Semi-Trailer	95%	7AM - 7PM	50	247	13
11	Plastic Chips	Semi-Trailer	95%	7AM - 7PM	3	12	1
12	Slag Mix *to* Landfill	Dump Truck	95%	7AM - 7PM	50	206	11
13	Service	Loader & Forklift	95%	7AM - 3PM	3	25	1

*Note: Restricted trips only use the haul roads 12 hours per day (7AM-7PM). Unrestricted trips use the roads 24 hours per day.

Table 11- Area Source Inputs to AERMOD

Source ID	X-Coordinate (m)	Y-Coordinate (m)	Elevation (m)	Width (m)	Length (m)	Emission Rate (g/sm^2)	Release Height (m)	Initial Vertical Dimension (m)
HR01	308867.94	4433711.35	261.65	14.00	41.14	4.17E-08	3.49	3.24
HR02	308899.51	4433668.52	262.41	14.00	42.47	4.17E-08	3.49	3.24
HR03	308937.53	4433628.71	264.06	14.00	43.21	4.17E-08	3.49	3.24
HR04	308975.06	4433587.93	263.93	14.00	206.26	4.17E-08	3.49	3.24
HR05	309281.6	4433339.76	265.86	14.00	95.96	4.17E-08	3.49	3.24
HR06	309281.11	4433339.87	265.86	14.00	38.97	4.63E-09	3.49	3.24
HR07	309317.97	4433304.43	266.13	14.00	58.96	4.63E-09	3.49	3.24
HR08	309377.52	4433256.5	266.09	14.00	199.68	4.63E-09	3.49	3.24
HR09	309283.97	4433382.58	264.79	14.00	29.56	4.63E-08	3.49	3.24
HR10	309284.12	4433379.92	264.92	14.00	65.40	4.63E-08	3.49	3.24
HR11	309274.78	4433464.7	266.49	14.00	25.97	4.63E-08	3.49	3.24
HR12	309273.72	4433499.08	267.29	14.00	67.38	4.63E-08	3.49	3.24
HR13	309305.08	4433579.75	269.78	14.00	86.72	4.63E-08	3.49	3.24
HR14	309343.89	4433687.11	270.15	14.00	81.32	4.63E-08	3.49	3.24
HR15	309413.82	4433762.09	273.66	14.00	46.57	3.09E-08	3.49	3.24
HR16	309432.13	4433826.13	272.86	14.00	14.14	2.99E-08	3.48	3.24
HR17	309506.25	4433837.19	275.15	14.00	44.96	2.99E-08	3.48	3.24
HR18	309547.76	4433813.41	278.18	14.00	36.57	2.99E-08	3.48	3.24
HR19	309576.12	4433770.76	280.75	14.00	39.22	2.99E-08	3.48	3.24
HR20	309581.79	4433737.45	283.11	14.00	24.55	2.99E-08	3.48	3.24
HR21	309503.12	4433702.86	279.51	14.00	66.58	3.95E-08	3.29	3.06
HR22	309536.87	4433651.1	284.34	14.00	72.37	2.99E-08	3.48	3.24
HR23	309543.5	4433622.24	286.62	14.00	41.67	8.80E-09	3.50	3.25
HR24	309590.63	4433616.33	287.77	14.00	32.16	5.03E-09	3.50	3.25
HR25	309582.83	4433575.11	290.10	14.00	98.01	5.03E-09	3.50	3.25
HR26	309458.58	4433615.02	294.24	14.00	21.77	5.03E-09	3.50	3.25
HR27	309459.87	4433622.87	291.78	14.00	59.89	5.03E-09	3.50	3.25
HR28	309391.87	4433571.98	284.86	14.00	15.34	5.03E-09	3.50	3.25
HR29	309539.21	4433633.23	285.79	14.00	12.83	1.82E-08	3.42	3.18
HR30	309535.81	4433646.71	284.72	14.00	16.20	2.01E-09	3.25	3.03
HR31	309522.27	4433672.42	282.84	14.00	15.22	1.51E-09	3.50	3.25
HR32	309465.16	4433744.97	276.15	14.00	46.50	7.55E-10	3.50	3.25
HR33	309460.09	4433734.84	276.79	14.00	17.67	1.51E-08	3.50	3.25
HR34	309423.8	4433747.03	274.57	14.00	30.81	1.63E-08	3.50	3.25
HR35	309435.83	4433692.24	280.15	14.00	38.44	5.03E-10	3.50	3.25
HR36	309426.1	4433753.19	274.50	14.00	47.61	1.98E-09	3.50	3.25
HR37	309469.11	4433798.59	274.23	14.00	28.20	1.98E-09	3.50	3.25
HR38	309449.29	4433823.61	273.33	14.00	26.47	1.98E-09	3.50	3.25

HR39	309420.76	4433779.42	273.85	14.00	37.33	1.98E-09	3.50	3.25
HR40	309392.53	4433796.56	271.71	14.00	34.07	1.98E-09	3.50	3.25
HR41	309552.33	4433650.9	284.32	14.00	56.52	9.02E-09	2.93	2.72
HR42	309603.08	4433707.57	287.03	14.00	112.40	9.02E-09	2.93	2.72
HR43	309754.81	4433705.47	303.86	14.00	66.95	9.02E-09	2.93	2.72
HR44	309800.32	4433635.98	316.15	14.00	73.32	2.84E-08	2.93	2.72
HR45	309810.05	4433640.74	312.60	14.00	20.39	2.84E-08	2.93	2.72
HR46	309828.96	4433628	315.06	14.00	19.37	2.84E-08	2.93	2.72
HR47	309815.46	4433582.8	324.27	14.00	31.31	2.84E-08	2.93	2.72
HR48	309809.59	4433544.49	324.93	14.00	60.58	2.84E-08	2.93	2.72
HR49	309893.22	4433563.73	310.58	14.00	34.57	2.84E-08	2.93	2.72
HR50	309863.34	4433563.38	319.40	14.00	31.32	2.84E-08	2.93	2.72
HR51	309846.04	4433608.26	315.84	14.00	34.73	2.84E-08	2.93	2.72
HR52	309801.33	4433542.37	323.67	14.00	27.23	2.84E-08	2.93	2.72
HR53	309821.14	4433503.98	326.79	14.00	62.34	2.84E-08	2.93	2.72
HR54	309903.4	4433530.83	314.54	14.00	18.71	2.84E-08	2.93	2.72

Traffic fugitive emissions were quantified using the Paved Roads section of Chapter 13.2.1 from AP-42 (EPA 2011). The equations in AP-42 require site specific data including the fleet average vehicle weight, vehicle kilometers traveled, and a silt loading value for paved roads. The site-specific silt and lead content sampling have recently been completed for a similar Exide facility in Vernon, California which is currently totally enclosed, consistent with the pending NESHAP. These parameters were used in the AP-42 equations to estimate the future traffic fugitive emissions on paved roads at the Canon Hollow facility when the enclosure project is completed. Exide conducted site-specific sampling for silt loading and lead content on the landfill at the Canon Hollow facility to estimate the emissions from dump trucks driving on the landfill. There was no evaluation of windblown lead emissions from the landfill since the Exide-Canon Hollow's landfill is comprised throughout of a concrete-like substance that stabilizes and fixates the lead-bearing material contained within, preventing the surface from creating dust to be picked up by the wind. Furthermore, the tires of all trucks are washed before exiting the landfill to prevent track-out.

The version of the equation used for Exide's future truck traffic fugitive emissions calculations takes precipitation into account by applying a corresponding correction term. This equation yields total suspended particulate (TSP) emission factors in grams per vehicle kilometer traveled (g/VKT) for each vehicle type and road surface as shown in **Table 12**.

Table 12- Paved Roads Emission Factor Equation for Daily Basis[a]

$$E_{ext} = k(sL)^{0.91} \times W^{1.02}](1 - \frac{P}{4N})$$

Variable	Description	Value		Units
		Roads	Landfill	

k	particle size multiplier for particle size range and units of interest	3.23		g/VKT[b]
sL[c]	road surface silt loading	0.23	327	g/m^2
W	average weight of the vehicles traveling the road	24.30[c]	19.50[d]	ton
P[e]	number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period	103.9		day
N	number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly)	365		day
E_{ext}	annual average particulate matter (TSP or PM-30) emission factor	20.40	12056.33	g/VKT
% Pb	lead content	4.70	0.02	

a Equation 2 from AP42, Fifth Edition, Volume I, Chapter 13, Section 13.2.1: Paved Roads (http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf)
b VKT = Vehicle kilometers traveled
c,d Values were provided by ENVIRON and take into account truck weight by type
e Based on weather data collected from the Brenner Field Airport, in Falls City, Nebraska, from 1981 to 2010, for the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center.
Source: http://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/station-inventories/prcp-inventory.txt

The TSP emission factor for HR01 haul road, for example, was multiplied by the path length and number of passes per year in the future facility configuration to estimate annual emissions of TSP. The percentage of particulate measured to be lead is then used to estimate the annual lead emissions from each roadway segment. The lead emission rates were then divided by the area of each area source for input to AERMOD. The lead emissions from each area source were distributed throughout the hours of the day based on the fraction of traffic through each road segment that occurs during restricted hours (7 AM – 7 PM) or unrestricted hours (24 hours per day) using the Hour of Day (HROFDY) emissions scaling factor in AERMOD (Table 8 of the Modeling Report). An example of these scaling factors that were used for HR01 is:

```
SO EMISFACT  HR01     HROFDY  0.027  0.027  0.027  0.027  0.027  0.027  0.027
SO EMISFACT  HR01     HROFDY  1.973  1.973  1.973  1.973  1.973  1.973  1.973
SO EMISFACT  HR01     HROFDY  1.973  1.973  1.973  1.973  1.973  0.027  0.027
SO EMISFACT  HR01     HROFDY  0.027  0.027  0.027
```

$$Pb\ Emissions\ \left(\frac{g}{sm^2}\right) = E_{ext}\ \left(\frac{g}{VKT}\right) X \left(\frac{VKT}{hr}\right) X \left(\frac{1hr}{60min}\right) X \left(\frac{1min}{60s}\right) X \left(\frac{1}{area\ (m^2)}\right) X\ \%Pb$$

E_{ext} (g/VKT) = 20.40
VKT/hr = 8.99E-02 for HR01
min/hr = 60
seconds/min = 60
Area (m^2) = 575.91
%Pb = 4.70% lead content on paved road

HR01 Pb Emissions = 20.40 X 8.99E-02 X 1/60 X 1/60 X 1/575.91 X 0.047 = 4.18E-08

Figure 7- Modeled Area Sources (Haul Roads)

5.4 Terrain Data

Terrain elevations were incorporated into the model using version 11103 of AERMAP, AERMOD's terrain preprocessor, as per EPA guidance (2009). Terrain elevation data for the entire modeling domain were extracted from 1/3-arc second National Elevation Data (NED) files with a resolution of approximately 10 meters. These NED files were obtained from the U.S. Geological Survey's Seamless Data Server (http://seamless.usgs.gov). AERMAP was configured to assign elevations for all roadway volume sources and receptors in the modeling domain. Because the terrain varies across the facility, elevations of buildings (**Table 13 & Figure 8**) and other sources above mean sea level were assigned based on data provided by Exide's own surveying.

Table 13- Buildings Heights and Their Base Elevations

AERMOD Building ID	Description	Building Base Elevation (meters)[a]	Building Height Above Grade (feet)[a]	Building Height (meters)[a]
B01	Storage Area	284.38	22	6.71
B02	New Battery Storage	284.38	27	8.23
B03	Air Pollution System	284.99	60	18.29
B04	Main Office	271.27	12	3.66
B05	Shops	276.15	24	7.32
B06	Battery Recycling Area	282.24	21	6.40
B07	Smelting/Casting Area	277.37	35	10.67
B08	Charge Floor	284.99	30	9.14
B09	Slag Product Work Area	282.24	21	6.40
B10	Plate Storage Area, Battery Breaking, Misc.	284.99	25	7.62
B11	Furnace/Refinery	284.99	21	6.40
B12	Dock Entry Building	283.77	23	7.01
B13	Battery Storage	283.77	27	8.23
B14	Stabilization Area, Slag Treatment, Slag Storage	277.06	25	7.62
B15	Reagent Building	276.15	25	7.62
B16	Finished Goods	276.15	25	7.62
B17	North Baghouse (BH-2)	282.24	43	13.11
B18	Demister Building	279.81	20	6.10
B19	South Baghouse (BH-1)	285.90	60	18.29

a Building heights and base elevations provided by Exide.

Figure 8- Exide's Buildings

5.5 Building Downwash

Building downwash algorithms incorporated into AERMOD account for the plume dispersion effects of the aerodynamic wakes and eddies produced by buildings and structures. The Building Profile Input Program - Plume Rise Model Enhancements (BPIPPRM) model (incorporated into AERMOD) is used to determine the direction-specific building downwash parameters. Buildings on Exide property including the new two baghouses structures (**Figure 5**) were placed into the model then the BPIPPRM program (Version 04274) was executed on the point sources.

5.6 Meteorological Data Set

No quality-assured on-site meteorological data was available during the development of this plan. The air dispersion modeling described in this section uses surface met data from the Brenner Field Airport (KFNB) near Falls City, Nebraska about 22 miles west of the Exide-Canon Hollow facility. For off-site met data, generally five years' worth of complete data is used. As little as one year's worth of data may be appropriate if quality-assured on-site met data is available. To this end, Exide has agreed to aid the State's air quality analysis efforts by installing a 10-meter met tower at the Forest City levee monitoring site and operating the met station under a Quality Assurance Project Plan (QAPP). That agreement is attached to this

document as **Appendix C**. The Exide meteorological station became operational in about April 2014. This met data will be used for trend data and for any future air dispersion modeling, should it become necessary.

AERMOD requires a meteorological input file to characterize the transport and dispersion of pollutants in the atmosphere. Surface and upper air meteorological data inputs as well as surface parameter data describing the land use and surface characteristics near the site were first processed using AERMET, the meteorological preprocessor to AERMOD. The output files generated by AERMET are the meteorological input files required by AERMOD. Details of AERMET and AERMOD meteorological data needs are described in EPA guidance documents (EPA 2004a, 2004b).

Based on EPA modeling guidance, it is preferable that one year or more, up to five years, of on-site meteorological data be used in the dispersion modeling exercise (40 CFR Part 51 Appendix W (November 2005)). EPA's Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA 2000) describes the criteria that should be considered when siting meteorological instruments for modeling purposes. Typically, wind instruments should be placed on a boom that is located at least two meters away from an open lattice ten-meter tower in an area that is free from obstructions. The placement of wind instruments on buildings, cooling towers or stacks should be avoided due to the potential for downwash influences. The effect on the wind speed and direction can be significant and can result in non-representative, poor quality data. If an instrument is placed on a building, the probe would have to be clear of any wake zones that are present and should be representative of the conditions that are occurring at the point of release (minimum of ten meters). Due to the fact that Exide's meteorological station is located on a roof of a building, it was determined that data collected by it is not appropriate for a SIP attainment demonstration modeling evaluation, and the collection of one year of on-site meteorological data is not feasible at this time. Instead, meteorological data collected at a representative airport was used for the SIP modeling analysis.

The Air Program evaluated three airports' meteorological data (Kansas City International Airport, Rosecrans Memorial Airport, and Brenner Field located near Falls City, Nebraska) to determine which data most closely represent conditions at the facility. These airports were selected due to their proximity to Exide. Other airports, located farther away, have weather patterns which were deemed different from that of the facility.

By taking into account the distance from the site and comparing the surface roughness, albedo, and Bowen ratio at each airport to those parameters at the site, the Air Program determined that the characteristics of the Brenner Field Airport station (KFNB), in Nebraska, most closely resembles those at Exide. Therefore, Brenner meteorological data was used in this modeling exercise. The Airport Selection Analysis may be found in **Appendix E**. Wind speed, wind direction, ambient temperature, atmospheric pressure, and cloud cover data were chosen from KFNB the five years from 2007 to 2011 as the most representative available data for use in the air dispersion analysis of the Exide facility.

The 2007 to 2011 surface data for KFNB were prepared using TD-3505 surface data and TD-6805 AERMINUTE data. The data were processed using the AERMET meteorological data

processor (version 13350). Upper air data for the period of 2007 to 2011 was selected by the Air Program from the Topeka, KS Airport station (KTOP). KTOP was chosen based on its proximity to both Brenner Field and the facility.

5.7 Receptors

With exception of the path of Canon Hollow Road, ground-level lead concentrations located inside the facility boundaries were excluded from the impact assessment because the general public does not have ready access to the Exide property. The Exide property within the fenced perimeter was considered on-site for purposes of determining the property line as recommended by the Air Program and EPA. Ground level receptors along the property line and Canon Hollow Road were placed at 10-meter and 25-meter spacing intervals respectively (**Figure 9**). All denoted property boundaries will be fenced to preclude public access. It should be noted that Exide has elected to use these zones of public access preclusions as the ambient air/receptor boundaries instead of the property boundary outlined in **Figure 1**.

In addition to the fence line receptors, a Cartesian grid of receptors with 50-m spacing extending from the fence line to approximately 250-m beyond the fence line was utilized. Receptors with 100-m spacing were extended from approximately 250 m to 500 m beyond the fence line. Lastly, a receptor grid with 200-m spacing was extended from approximately 500 m to 1000 m beyond the fence line. Additional 10-m grid spacing was utilized around the area of highest concentration (**Figure 11**). In addition to the aforementioned fence line and gridded discrete receptors, one ground-level, discrete receptor was placed at the approximate location of the ambient lead monitor, located southwest of the site (UTMx = 309221, UTMy = 4433181). All receptor elevations and Hill Height Scales were assigned by AERMAP (Version 11103) using NED 1/3 Arc Second resolution elevation data from USGS's Seamless Data Server. Refer to ENVIRON's modeling report (**Appendix D**) for additional aerial photos of the receptors and property boundary.

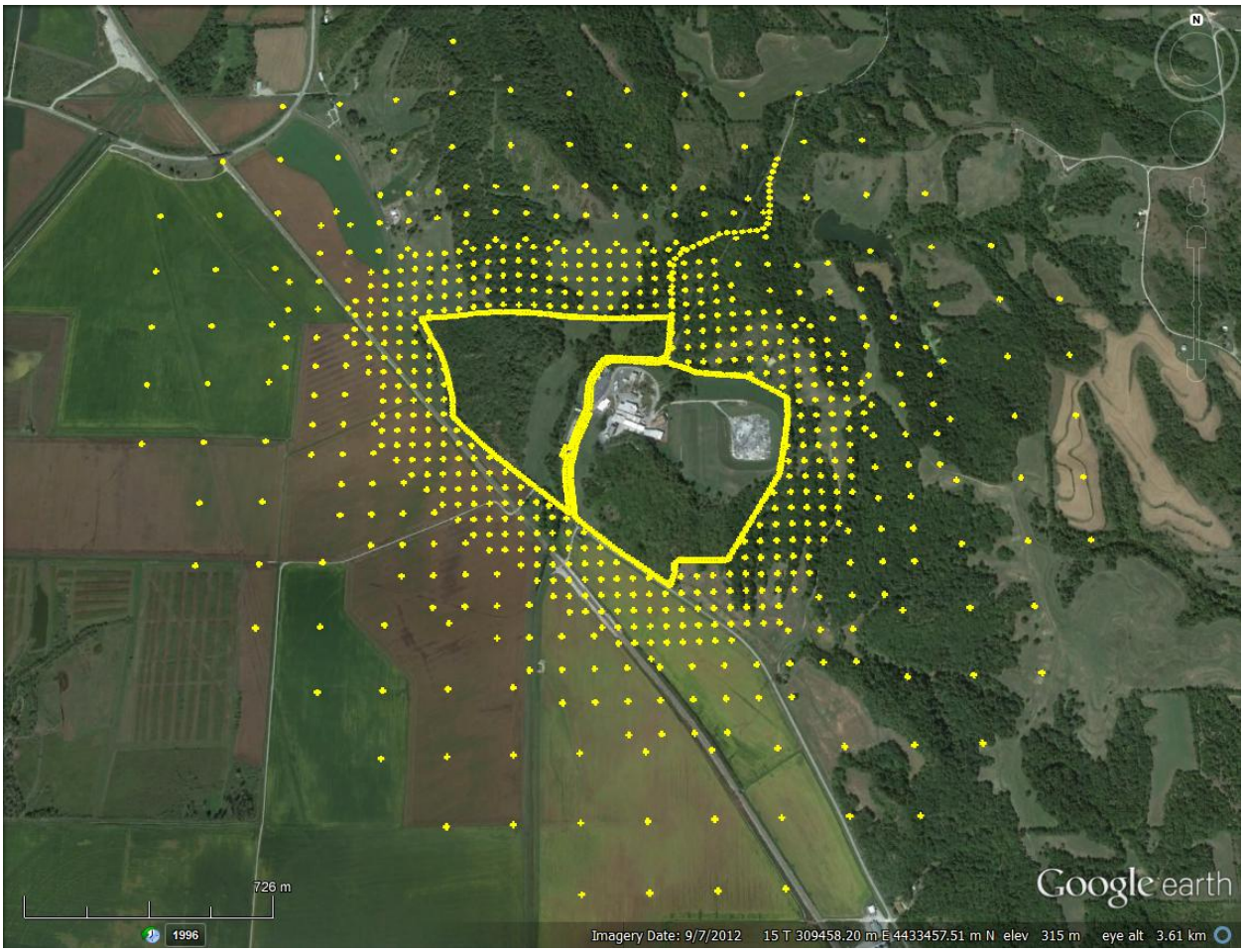


Figure 9- Exide's Modeling Receptors

5.8 Model Input, Output, and Results

All AERMOD model system input and impact output files are included in **Appendix F**. The input files include background concentration for all receptors 24 hours and monthly lead concentrations. The monthly lead concentrations were post-processed using LEADPOST program.

5.9 Background Lead Concentration

Per EPA's *Guideline on Air Quality Models* [40 CFR 51 Appendix W] background concentrations must be considered when determining compliance with the NAAQS. Background concentrations include impacts attributable to natural sources, nearby sources (excluding the dominant source(s)), and unidentified sources. This calculated background concentration includes all sources of lead not already explicitly included in the model. However, the assumption that emissions from the plant do not contribute to background concentrations is not entirely correct. Contributors to the background concentration are distant sources of lead, which may have originally derived from the plant, mobile and nonpoint sources, or naturally occurring lead in the atmosphere. Nonpoint and mobile sources from the 2011 NEI were reviewed. The data indicates that 2011 nonpoint and mobile sources combined make up approximately 0.08%

of the point source emissions total in 2012, and as such are not included in the modeling exercise as discreet sources but may influence the background concentration.

In general, the background value is calculated by averaging the monitored concentrations at one or more monitoring sites outside the area of immediate dominant source impact and on days when the predominant wind direction was not blowing from the dominant source to the monitor(s). In this case all monitored days were reviewed to identify days with no measured one-hour average wind direction coming from the facility. This was accomplished by excluding days when any one-hour wind average was from the Exide property to the Forest City levee monitoring site. The monitor was examined in conjunction with an acceptable wind fan and the concentrations were averaged on days with no predominant winds from the facility. The resultant concentration from all the monitors in the evaluation is the background concentration for the area.

Ambient monitoring for lead near the Exide Technologies-Canon Hollow facility began in May 2012 for low-volume lead-in-PM10 sampling (Pb-PM10) and in August 2012 for hi-volume lead-in-TSP sampling (Pb-TSP). The Air Program calculated Exide's background concentration by averaging the hi-volume ambient monitoring data near the facility on days in which the monitor was upwind of the facility and there was a minimum of 2 m/s wind speed to preclude the inclusion of calm conditions. The monitor would be upwind of the facility on days in which there were no one-hour wind averages blowing from the facility toward the monitor. Therefore, monitored values that included corresponding winds from the 90 degree sector upwind of the monitor location were excluded from consideration as a representative background value (40 CFR 51 Appendix W Section 8.2.2(b)). Winds from this sector were defined as those between 350 degrees and 80 degrees, where zero degree was defined as true north. However, this sector included days with high concentrations that were suspected to be coming from the facility. These days with their corresponding concentrations are 09/18/2012 (1.33 $\mu g/m^3$), 10/06/2012 (0.8 $\mu g/m^3$) and 12/17/2012 ($\mu g/m^3$). The resulting calculated background concentration from this sector was 0.195 $\mu g/m^3$ which is higher than the lead NAAQS.

To reduce Exide's influence on the monitor during this background concentration analysis, the Air Program evaluated the sector from 300 degrees to 80 degrees (**Figure 10**). This excluded HWY 11 and Canon Hollow road from consideration in the background, which required these emission sources to be included in the model. In addition, HWY 111 along the facility fence and Canon Hollow Road section leading to the facility's gate were modeled as area sources to make sure any dust blown by truck traffic in these two roads is accounted for in the overall lead concentration from the facility. **Figure 10** shows ambient monitor, the facility, and the proposed wind directions to exclude from the background calculation.

Six concentrations resulted from this sector as shown in **Table 14**. The average of these six concentrations, 0.023 $\mu g/m^3$, is the background concentration.

Table 14- TSP Monitoring Data for Days Exide had no Contribution

Date	**11/17/2012**	**01/4/2013**	**02/09/2013**	**06/21/2013**	**08/20/2013**	**08/26/2013**	**Average**
Concentration	0.021	0.020	0.016	0.034	0.027	0.019	0.023

The estimation of background is conservative and provides a margin of safety when combined with the modeled maximum receptor concentration. The conservative nature for this method of background determination is due to the potential for some double-accounting: the background inclusion zones are very generous and could also include non-predominant periods of winds from the direction of the facility or modeled sources within the hourly averaging period. In other words, the chosen hourly wind averages do not eliminate all wind directions and influences from the plant to the monitor.

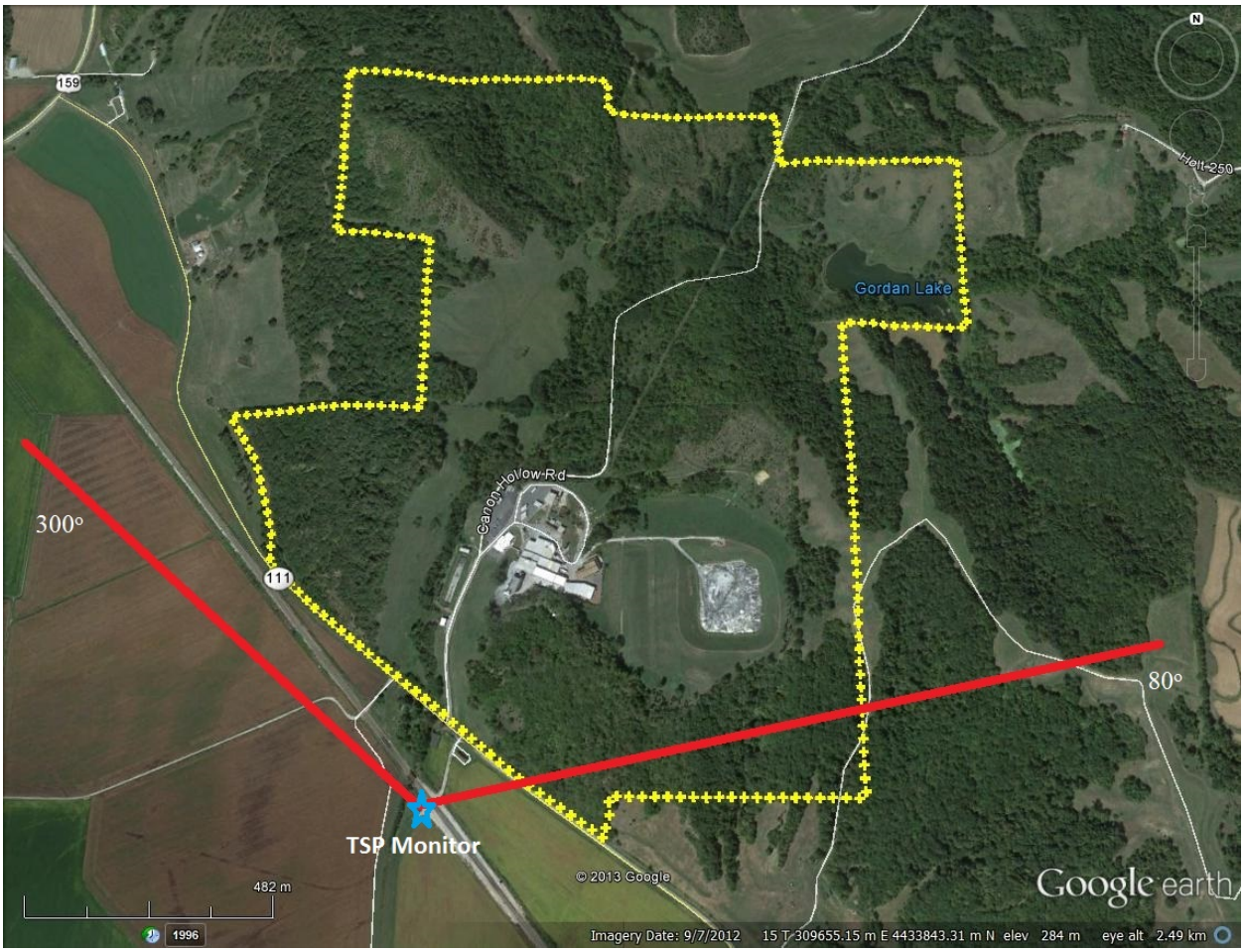


Figure 10- Exclusion Zone for Calculating Background Concentration

5.10 Post Processing in LEADPOST

The averaging period chosen for this model was monthly as recommended by EPA (2009d) for use with EPA's LEADPOST software program. The POST files were processed through the LEADPOST program to calculate three month average lead concentrations for each receptor location. The software created output text files corresponding to total receptor average concentrations across all source groups (a Source Group ALL was created to represent facility-wide emissions).

5.11 Description of Modeling Results

The LEADPOST output file of modeled maximum three month rolling average lead concentrations for all source groups were added to the background concentration (that was determined according to the steps described in section 5.8 of this document), to determine the cumulative impact at each receptor. **Table 15** shows the maximum impacted receptor located northwest of the facility with a concentration of 0.1498 μg/m^3. No receptors violated the lead NAAQS as shown in the table. **Figures 11 and 12** show the location of the highest impacted receptor and the lead concentrations contour plot around Exide, respectively.

Table 15- Maximum 3-Month Average Lead Concentration

X-Coordinate (m)	Y-Coordinate (m)	Modeled Concentration (μg/m^3)	Background Concentration (μg/m^3)	Total Concentration (μg/m^3)	NAAQS for Lead (μg/m^3)
309169.66	4434082.50	0.126837	0.023	0.149837	0.15

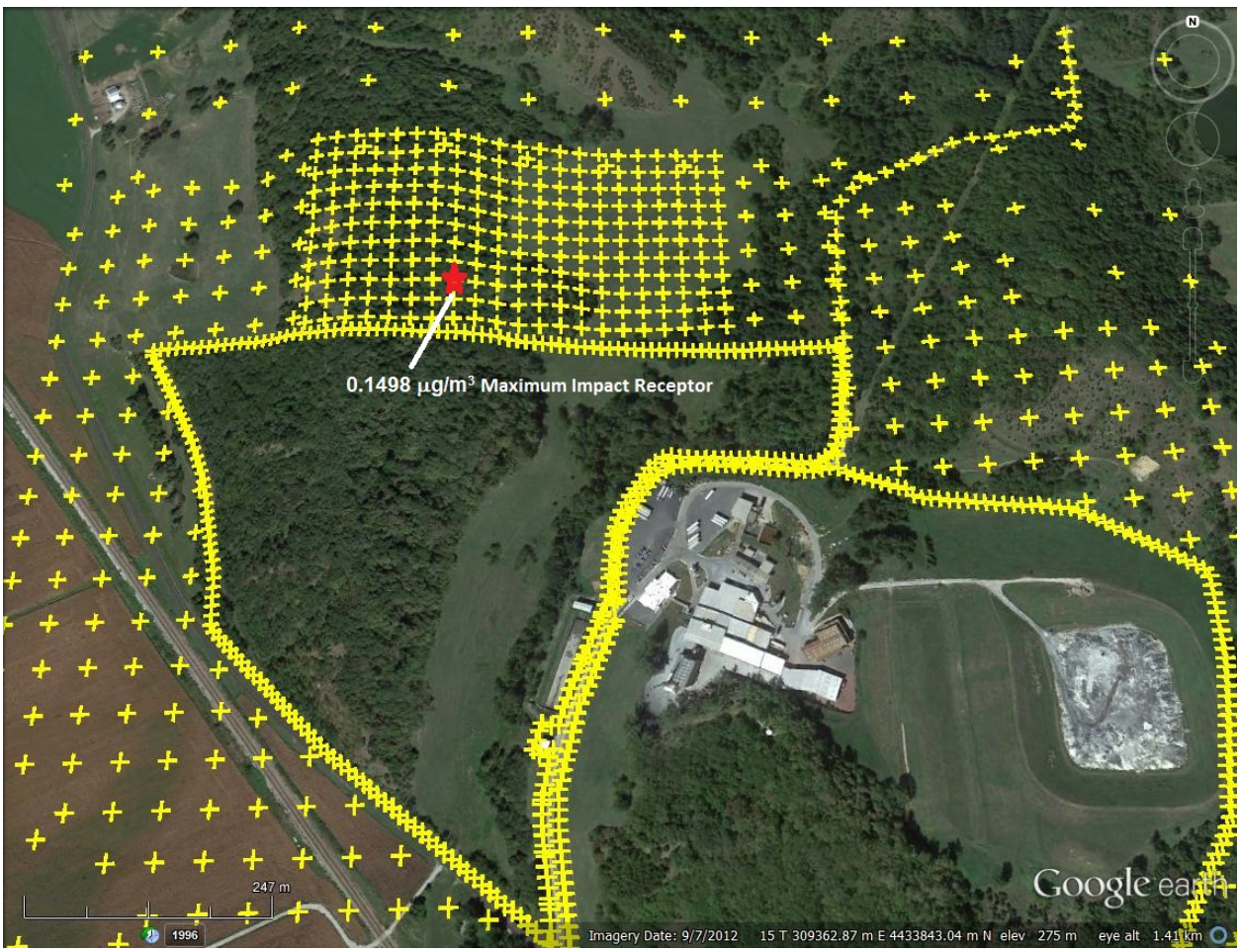


Figure 11- Location of Maximum Modeled Concentration Receptor

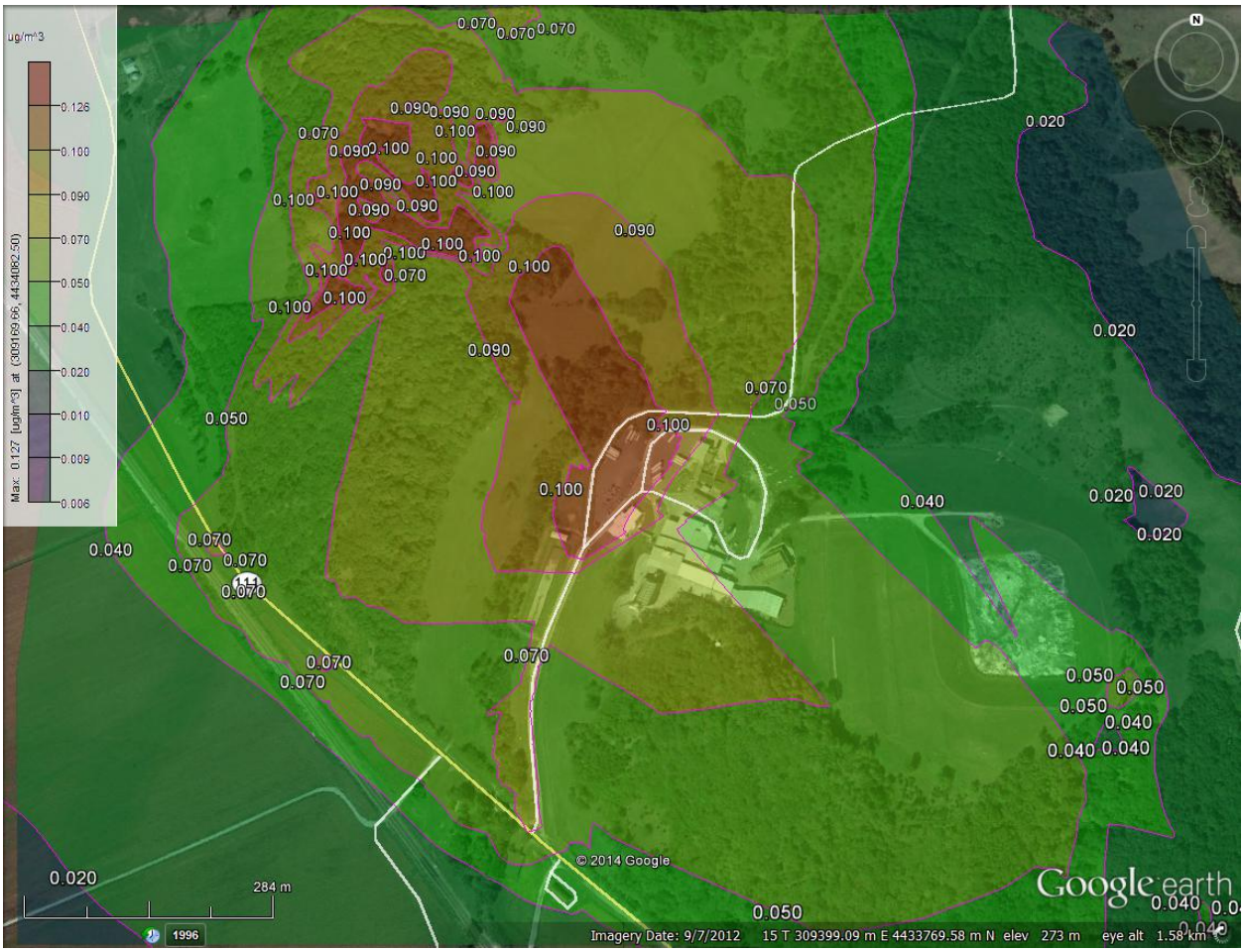


Figure 12- Contour Plot of Lead Concentrations around Exide

6. CONTINGENCY MEASURES

As part of this plan, a contingency strategy has been developed that will be implemented in the event that the area has failed to attain and maintain the 2008 Lead NAAQS 180 days after the effective date of the Consent Judgment and the implementation of the new control measures. The contingency plan is detailed in Paragraph V. 9. of the Consent Judgment (**Appendix A**). The department shall notify Exide of any violations of the NAAQS and to start implementation of any necessary contingency measures.

The contingency measure strategy consists of two parts. The first part is a measure that may be implemented immediately after any rolling three-month average violates the 2008 lead standard. The second part is a study to identify likely causes contributing to the violation followed by implementation of a proposed action plan of the most effective control measures.

Immediately after notification that the lead air quality monitoring results for the Forest City area show a violation of the 0.15 $\mu g/m^3$ three-month rolling average lead standard, Exide shall increase the in-plant road cleaning to 10 hours each working day. Currently, plant roadways and parking lots are cleaned with wet wash or vacuum cleaning at least twice a day between 7 am

and 7 pm [Exide Fugitive Dust Source SOP Manual, pg. 2, **Appendix B**]. The implementation of this contingency measure is expected to prevent the re-entrainment of at least 7 pounds of lead dust per year into the air. Exide may cease this increased road cleaning schedule only after a more effective replacement control measure has been identified and implemented as a result of the fugitive dust control study in the second phase of the contingency strategy as outlined below.

There are few other remaining effective lead emission reduction techniques to be used as contingencies remaining at this facility. The limited control options that were still available form the basis of the main control strategy used to demonstrate attainment within this plan. Therefore, the second phase of this plan's contingency strategy involves a study or review of best practices and best available technologies at facilities with similar fugitive emissions control challenges. The purpose of this contingency project is to help pinpoint the source of the errant fugitive emissions and to implement the identified measures in the future (if needed) as close as possible to the time the contingency measure triggering event occurs. This project's concept is the same as the contingency project adopted as part of the EPA-approved 2007 Herculaneum Lead SIP revision. Missouri asserts that a comprehensive evaluation of all known lead emissions sources has already been accomplished and that sufficient levels of controls will be implemented by the control measures section of this plan to attain the lead standard. However, any ongoing violations of the NAAQS (triggering this contingency measure) would indicate that another evaluation of fugitive emissions would be needed. This contingency project will allow additional strategies to be identified to meet the 2008 lead standard in light of the new conditions created after the implementation of all required controls as part of this attainment demonstration.

Furthermore, the Consent Judgment allows for the submission of additional new contingency measures when other contingency measures (identified by the fugitive control study contingency project) have been exhausted.

7. PUBLIC PARTICIPATION

In accordance with Section 110(a)(2) of the CAA, the Missouri Air Conservation Commission is required to hold a public hearing prior to adoption of this plan and the subsequent submittal to the EPA. The department will notify the public and other interested parties of an upcoming public hearing and comment period thirty (30) days prior to holding such hearing for this SIP revision as follows:

- Notice of availability of the SIP revision was posted on the Department of Natural Resources' Air Pollution Control Program website on July 28, 2014: http://www.dnr.mo.gov/env/apcp/stateplanrevisions.htm
- The public hearing was held on August 28, 2014 beginning at 9:00 a.m. at the Elm Street Conference Center, in Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, MO 65101.
- The public comment period for the plan opened when it was posted on the Department of Natural Resources' Air Pollution Control Program website on July 28, 2014, and closed on September 4, 2014, seven days after the public hearing.

8. CONCLUSION

The department hereby asserts that the State has met its CAA Section 110 obligations to attain and maintain the 2008 Lead NAAQS in all areas of the State (not designated as nonattainment) including, specifically through this plan, the area in the vicinity of Forest City, MO. The nearby Exide Technologies–Canon Hollow secondary lead smelting facility has added emission controls pursuant to the Secondary Lead Smelting NESHAP [40 CFR 63 Subpart X revised as of January 5, 2012] and in conjunction with this plan, has agreed, through a court-lodged consent judgment, to additional emission reductions to include emission limitations and work practices. These control strategies combine to demonstrate attainment of the 2008 Lead NAAQS in the area though air dispersion modeling included in this plan. Furthermore, this plan contains a contingency strategy to act as a backstop in case of a continued NAAQS violation after implementation of the control measures.