COMMONWEALTH OF
PUERTO RICO
Environmental Quality Board

PUERTO RICO ENVIRONMENTAL QUALITY BOARD
AIR QUALITY AREA

Revision to the Lead Infrastructure SIP Requirements for the Arecibo Lead Nonattainment Area

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EQB
ENVIRONMENTAL QUALITY BOARD
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ACRONYMS

AQA:	Air Quality Area
AQS:	Air Quality System
ASR:	Automotive-Shredder Residue
BACT:	Best available control technology
CAA:	Clean Air Act
CO:	Carbon monoxide
CRF:	Code of Federal Regulations
EPA:	Environmental Protection Agency
EQB:	Environmental Quality Board
FCE:	Full Compliance Evaluation
FRM:	Federal Reference Method
GPS:	Geographic Position System
HHV:	Higher Heating Value
H_2SO_4:	Sulfuric acid mist
LAER:	Lowest achievable emission rate
LHV:	Lowest Heating Value
MACT:	Maximum Available Control Technology
MMBtu:	Million British thermal unit
MSW:	Municipal solid waste
NAAQS:	National Ambient Air Quality Standards
NANSR:	Non-attainment New Source Review
NESHAP:	National Emission Standards for Hazardous Air Pollutants
NO_x:	Nitrogen oxides
NSPS:	New Sources Performance Standards
NSR:	New Source Review
Pb:	Lead
PCE:	Partial Compliance Evaluation
PM:	Particulate matter
PR:	Puerto Rico
PREPA:	Puerto Rico Energy Power Authority
PREQB:	Puerto Rico Environmental Quality Board
PREPPA:	Puerto Rico Environmental Public Policy Act
PSD:	Prevention of Significant Deterioration
PUWW:	Processed Urban Wood Waste
RCAP:	Regulation for the Control of Atmospheric Pollution
SIP:	State Implementation Plan
SLAMS:	State and Local Air Monitoring Stations
SO_2:	Sulfur dioxide

TBRCI: The Battery Recycling Company, Inc.
TDF: Tire-Derived Fuel
VOC: Volatile organic compounds

EXECUTIVE SUMMARY

On November 22, 2011 (76 FR 72097) the United States Environmental Protection Agency (EPA) notified the designation of the 2008 National Ambient, Air Quality Standards (NAAQS) for lead. The area designation for Puerto Rico are as follows: Nonattainment for a 4 km radius around The Battery Recycling Company Inc. (TBRC), in the Municipality of Arecibo, and unclassified/attainment for the rest of the rest of state. These designations was effective on December 31, 2011. For areas designated as nonattainment, states must develop a State Implementation Plan that meets the requirements of Section 172(c) Clean Air Act (CAA). Paragraphs 172(c) and 172(a)(2) establish the requirements for the implementation of reasonably available control measures in order to achieve compliance as soon as practicable but no later than 5 years after the nonattainment designation (i.e. December 31, 2016).

In this plan, the Puerto Rico Environmental Quality Board (PREQB) will demonstrate attainment with the 2008 lead NAAQS for lead through the implementation and enforcement of control measures for the existing lead emitting sources. The strategies to ensure compliance include limitations and operating restrictions that are set forth into the permits issued by the PREQB. The permits issued contain specific process limitations and restrictions based on the National Emissions Standards for Hazardous Air Pollutants from Secondary Lead Smelting (40 CFR, Part 63, Subpart X), any applicable National Emissions Standards for Hazardous Air Pollutants (NESHAP), New Sources Performance Standards (NSPS) and/or and reasonably available control Technologies (RACT).

Ambient air monitoring in the designated nonattainment Arecibo area is used to demonstrate that the implementation of the control measures, at the existing sources keep lead emissions below the 2008 NAAQS for lead. This SIP revision is submitted according to the requirements established in Sections 172(b) and (c) of the (CAA).

LEGAL AUTHORITY

The Puerto Rico Environmental Public Policy Act (Law No. 9 of June 18, 1970 as revoked by Law is 416 of September 22, 2004, as amended) et. Seq., established an administrative agency known as the Puerto Rico Environmental Quality Board of the Commonwealth of Puerto Rico, herein after referred as the PREQB. By means of the after mentioned Act, the government environmental affairs of the Commonwealth of Puerto Rico have been centered in the PREQB. The PREPPA empower the PREQB with very broad power which range from the establishment of a state-wide environmental policy through its rule making powers to functional operations which encompass among other duties, the actual implementation of the Puerto Rico Environmental Public Policy Act (PREPPA), the issuance of cease and desist orders, the power to hold quasi-judicial hearings, and review and assessment of Government programs and activities, in light of the PREPPA.

The PREPPA confers to the PREQB all the legal authority to execute the SIP required by the Clean Air Act, as amended. The legal authority granted by the PREPPA is currently and immediately available to the PREQB which is directly responsible for the development and implementation of the SIP.

The CAA, section 110(a)(2)(E) requires the state to demonstrate its authority under state law to carry out the implementation of the SIP. The elements that demonstrate the state legal authority are set forth here, followed in each case by references to local statutory sections under Title II of PREPPA.

1. Authority to *adopt emissions standards and limitations and any other measures necessary for attainment and maintenance of national (ambient air quality) standards. – [Sections 9.B.3.e., 9.B.5., and 9.B.13.]*
2. Authority to *enforce applicable laws, regulations, and standards, and seek injunctive relief. – [Sections 9.B.1.e., 9.B.5., and 9.B.13.]*
3. Authority to *abate pollutants emissions on an emergency basis to prevent substantial endangerment to the health of persons. – [Section 9.A.7.]*
4. Authority to *prevent constructions, modifications, or operation of any stationary source in any location where emissions from such source will prevent the attainment or maintenance of national ambient air quality standards (NAAQS). – [Sections 9.A.3., 9.B.13]*
5. Authority to *obtain information necessary to determine whether air pollution sources are in compliance with applicable law, regulations, and standards, including authority to require recordkeeping and to make inspections and conduct test of air pollution sources. – [Sections 9.A.4. and 9.A.10.]*

6. Authority to *require owners or operators of stationary sources to install, maintain, and use emission monitoring devices and to make periodic reports to the State on the nature and amounts of emissions from such stationary sources; also authority for the State to make such data available to the public as reported and as correlated with any applicable emissions standards or limitations. – [Sections 9.B.3. and 9.B.13.]*

The PREQB has promulgated rules implementing statutory authority to meet the requirements of both the CAA and PREPPA. These regulations are compiled on the Regulation for the Control of Atmospheric Pollution of July 26, 1995, as amended. The RCAP was developed to establish standards and requirements for the control of atmospheric pollution.

I. Introduction and Background

Lead can be found in all parts of our environment – the air, the soil, the water, and even inside our homes. Lead can also be emitted into the environment from industrial sources and contaminated sites, such as former lead smelters.

Lead is one of the six criteria air pollutants identified as being particularly harmful to humans and the environment. Exposure can cause a range of adverse health effects, most notably on children. This is why reducing levels of lead pollution is an important part of are EPA's commitment to a clean, healthy environment, and the reason why PREQB work together with EPA in order to attain that commitment.

Federal and state regulatory standards have helped to reduce or eliminate the amount of lead in air, drinking water, soil, consumer products, food, and occupational settings. In particular, NAAQS have been developed for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution and sulfur dioxide. The CAA requires EPA to set primary standards at a level judged to be a "requisite to protect the public health with an adequate margin of safety," and establish secondary standards that are a requisite to protect public welfare from "any known or anticipated effects associated with the pollutant in the ambient air," including effects on crops, vegetation, wildlife, buildings and national monuments, and visibility.

On October 15, 2008, the EPA substantially strengthened the NAAQS for lead. The new standard of 0.15 micrograms per cubic meter ($\mu g/m^3$), measured as a rolling three-month average, is at least 10 times more stringent than the previous standard of $1.5\mu g/m^3$ measured as a quarterly average and will improve health protection for at-risk groups, especially children. To provide increased protection against lead-related environmental and other welfare effects, the EPA adjusted review the secondary lead NAAQS to be identical to the revised primary standard. The EPA determined that the pre-existing ambient lead monitoring network was inadequate for determining whether many areas were meeting the revised lead standards.

On December 27, 2010, EPA also established new criteria for sitting ambient lead monitors and new data collection requirements on, to better assess compliance with the 2008 Lead NAAQS (75 FR 81126).

Sections 110 (a)(1)(2) of the CAA, (hereafter referred to as the (SIP) requirements), compel states to submit an implementation plan to the EPA Administrator that provides and demonstrates their states ability to implement, maintain, and enforce each NAAQS. Section 110(a)(1) of the Clean Air Act addresses the timing

requirement for the submissions of any SIP revisions. Section 110(a)(2) lists the required elements for a state needs to demonstrate its authority to implementing the plan. Several elements in 110(a)(2) specifically address the need for states to demonstrate the ability to implement, maintain, and enforce the air quality standards. These elements are compiled and submitted in what is referred as a SIP, but are not limited to: air quality monitoring, data analysis, and reporting; enforcement; resources; consultation; emergency procedures; and issues related to transport.

On October 10, 2012, a public hearing was conducted to adopt the Lead Infrastructure SIP Requirements of Clean Air Act Section 110(a)(2) for Puerto Rico. The infrastructure SIP was approved by Resolution R-12-22-13 dated December 21, 2012 and submitted to EPA on February 27, 2013.

As part of the implementation of the new air monitoring requirements, in January 2010 a new source oriented Federal Reference Method (FRM) monitor was established at Arecibo, near (TBRCI). On June 2010, the new lead NAAQS were exceeded in accordance with the data captured by this new lead monitor.

The PREQB developed air dispersion models in order to analyze the fate and transport of lead as an air pollutant in the Arecibo Municipality. The preliminary modeling results indicate that the primary source causing the high lead concentration is TBRCI. The contribution of other lead emission sources in the area was insignificant. The refined modeling using only the lead emissions from TBRCI showed that the source was the major contributor to the high monitoring concentration.

After discussion with EPA and the analysis of all the lead emission sources of lead that could impact the Arecibo Municipality, on June 2011 EPA designated a 4 kilometers radius around TBRCI as non-attainment for the lead rolling 3-month average NAAQS (see Figure #1) and all other areas of Puerto Rico as unclassified/attainment.

For areas designated nonattainment, states must develop a SIP that meets the requirements of the CAA. The requirements of section 191(a) of the CAA require a revised SIP with attainment demonstration within eighteen months after the effective date of a nonattainment area designation. Because the expanded lead monitoring network provided additional data for consideration, the EPA is completing the lead designations in two rounds. In the first round, established on November 16, 2010, the EPA designated some areas as nonattainment based on data from the pre-2010 monitoring network. For all other areas, the EPA extended the deadline for designations by up to one year so that data from the newly deployed monitors could

be considered in making appropriate designation decisions. In our case, PREQB shall comply with the second round time frame, in which the attainment SIPs are expected to be due June 30, 2013. Moreover, areas are required to attain the revised Lead standard as expeditiously and practicable possible but no later than 5 years from the date the nonattainment designation became effective. The attainment date for the second round is expected to be December 31, 2016.

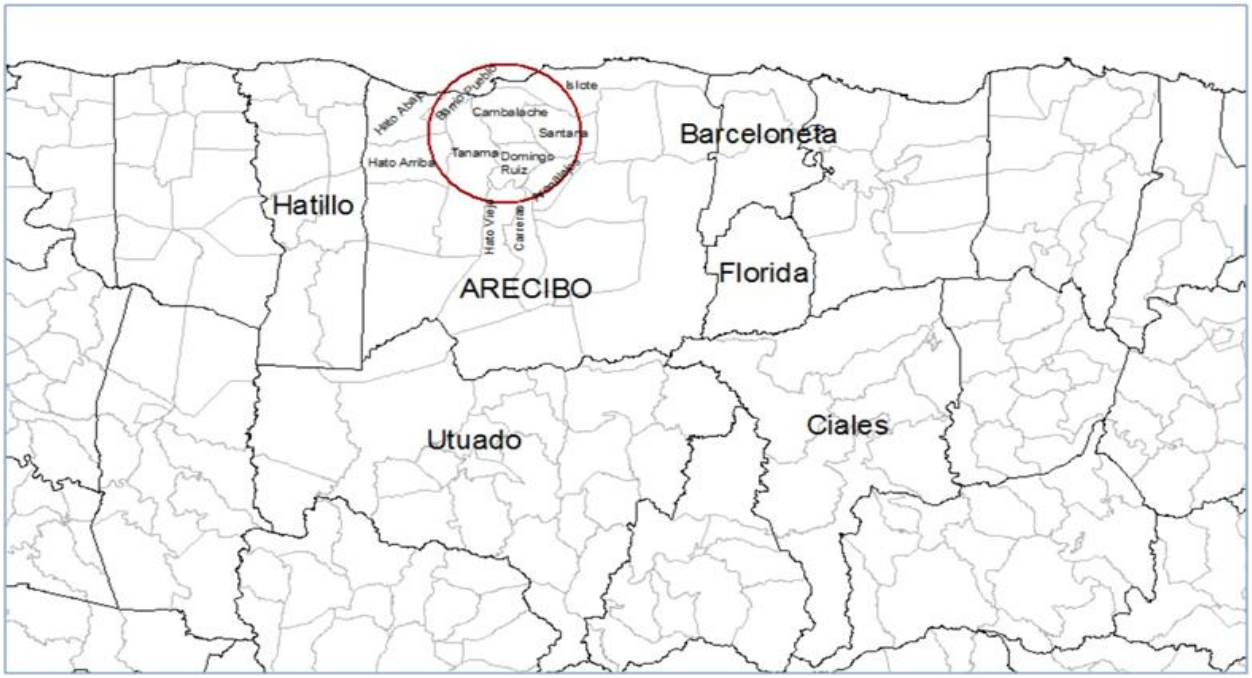


Figure #1: Arecibo Lead Impact Area

As part of this SIP to ensure attainment, PREQB prepared a new modeling plan for Arecibo that includes the facilities that emit lead in Arecibo such as Safetech Corporation and PREPA Cambalache using the year 2011 as on emission inventory baseline year. Energy Answers is planning to build a renewable energy plant nearby Battery Recycling and their potential lead emissions were included in the attainment model. The air quality model is the AERMOD in atmospheric dispersion modeling systems which is currently EPA'S preferred model for air quality modeling studies.

The projected emission inventory includes all the control measures that PREQB require to TBRCI as a permit condition. The control measures that PREQB required to this facility are the enclosure of the main process building, use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility.

This SIP revision is submitted to provide and demonstrate that PREQB has ability to implement, maintain, and enforce each national ambient air quality standards including the 2008 lead NAAQS.

A. Lead and health effects

The effects of lead are the same whether it enters the body through breathing or swallowing. The main target for lead toxicity is the nervous system, both in adults and children. Some tests that measure functions of the nervous system have established that long-term exposure of adults to lead at work has resulted in decreased performance. Lead exposure may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people. Lead exposure may also cause anemia. At high levels of exposure, lead can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production (ATSDR, 2007).

II. Enforceable Emission Limitations and Other Control Measures

Include enforceable emission limitations and other control measures, means, or techniques (including economic incentives such as fees, marketable permits, and auctions of emissions rights), as well as schedules and timetables for compliance according to the requirements of CAA, section 110(a)(2)(A).

The PREQB RCAP has rules to implement and enforce the NAAQS and other air quality standards. These rules include formal systematic procedures for construction and operation permits that will meet the federal requirements. The following sections of the (RCAP) contain rules relevant to these specific federal requirements:

Part I: General provisions

Rule 103 – Establish dispositions that allows the PREQB to require an air emission source the following, as it seems necessary to control air pollutants:

- Installation, operation and maintenance of air monitoring equipment,
- Provide equipment appurtenances for sampling fuel and air emissions,
- Sample ambient air quality,
- Perform fuel analyses, establish and maintenance of records,
- Submit periodic reports,
- Provides PREQB representative right to entry any premise and access to records.

Rule 103 –Establish test methods to demonstrate compliance with the RCAP emission limitations.

Rule 107 – In case of air pollution episode this rule is designed to prevent the excessive buildup of air pollutants, thereby preventing the occurrence of an emergency.

Rule 108 – Provides the PREQB dispositions to required air pollution control equipment or control measures to reduce air pollutant emissions or demonstrate compliance of such control equipment with applicable rules and regulations.

Rule 113 – Provide the PREQB the necessary provisions to close a source that has been found not in compliance with the applicable rules and regulations

Part II: Approval and permits
Establish permits requirements to construct and operate an air pollutant emission source in Puerto Rico.

Rule 201 – Establish requirements to conduct a location approval of a major source or major modification. Requirements include, but is not limited to the following:

- Air Quality review,
- Land use and planning,
- Effect on nearby ecological sensitive areas, and
- Review of emissions and NAAQS compliance demonstration.

Rule 202 – Establish PREQB requirements for the preparation of air quality impact analysis.

Rule 203 – Require air emissions sources to obtain a construction permit prior to start the construction of the source. The rule also requires that demonstration the source complies with all applicable rule and regulations prior to obtain a construction permit.

Rule 204 – Establish requirements to obtain an operation permit prior to the commence of operation of the source. As part of the permit application the source must demonstrate compliance with all applicable rules and regulations.

Rule 205 – Provides time table for compliance of air emission with new rules and regulations. Also provides dispositions to prepare compliance plans.

Part IV: Prohibitions
Rule 401 – Require sources to comply with applicable rules and regulations.

Part V: Fees
Establish permit fees requirements, transfer of permit ownership dispositions. Also include excess emission fees and test fees.

Part VI: Operations Permits Rules for Title V Sources
Establish provisions to obtain Title V operation permits. This part includes, but is not limited to the following:

- Describe permit application requirements,
- PREQB actions over a permit application,
- Title V permit content,

- Recordkeeping requirements
- Monitoring requirements
- Require compliance with applicable emission limitation requirements,
- Reporting requirements,
- Emission trading dispositions and
- Compliance requirements.

Any new and/or existing air emission source within the lead nonattainment area must obtain a permit to construct or permit to operate an emission source as required by Rules 203 and 204 of the RCAP, as applicable. The location or construction of any new major stationary source, or major modification or significant source of lead shall obtain a location approval from the Board prior to the construction of the source, in accordance with Rule 201 of RCAP. An ambient air quality impact analysis as part of the application for location approval (Rule 201 (D) of RCAP) is required for any proposed major source, major modification, or significant source of lead located in or significantly impacting a nonattainment area to demonstrate they do not cause or contribute significantly to air pollution violation of the 2008 lead NAAQS or exceed any other NAAQS. Also, such sources shall submit a Non attainment New Source Review (NANSR) or a Prevention of Significant Deterioration (PSD) permit application to EPA Region 2, since they are the permitting authority for the after mentioned preconstruction permit programs.

For the location approval, paragraph 203(B) of the RCAP establishes the following:

(B) Standards for granting a permit to construct.

A permit to construct or modify a source shall be granted only if the applicant demonstrates the following to the satisfaction of the Board:

(1) The source shall be able to comply with all applicable rules and regulations.

(2) In the case of a major stationary source, or major modification or significant source, the applicant must hold a valid location approval;

(3) In the event that the source will be affecting an emission offset, the owner or operator has:

(a) surrendered any valid permit to construct or operate the source affecting the offset;

(b) propose a revision to a valid permit to construct, or proposed a compliance plan to achieve the required emission offset; and the Board has approved said revision or accepted such a compliance plan for said purpose, as part of a location approval.

(4) Air pollutant emissions from the source will be limited in accordance with

applicable rules and regulations.
(5) Any agreement or certification intended to restrict the maximum capacity, the maximum annual hours of operation, an emission rate, or a percentage of sulfur content in fuels to a value lower than that allowed by applicable rules and regulations is legally binding prior to the issuance of the permit to construct and is included as an enforceable condition therein.
(6) That no adverse air quality impact would occur from the construction or operation of said source or modification, whenever:

(a) The owner or operator of the proposed source or modification has subscribed to a legally binding document which stipulates the type or amount of materials to be burned or processed by such a source, or which limits the annual hours of operation; or
(b) Such demonstration has been requested by the Board as part of the permit application.

(7) The requirements of this rule applicable to each major stationary source of PM10 shall also apply to each PM10 precursor for which the source is major, except that such requirements shall not apply where the EPA Administrator and the Board determines that such sources of PM10 precursors do not significantly contribute to PM10 levels which exceed the PM10 ambient standards.

Where applicable rules and regulations are defined in the RCAP as:

All rules and regulations promulgated under the Environmental Public Policy Act (Law No.9, June 18, 1970, as amended) and the "Clean Air Act" for the control of atmospheric pollution, including but not limited to:

(1) All requirements established by these regulations or any other applicable laws or regulations of the Commonwealth of Puerto Rico;
(2) The "Standards of Performance of New Stationary Sources" (40 CFR Part 60);
(3) The "National Emission Standards for Hazardous Air Pollutants" (40 CFR Part 61);
(4) Any other requirements established by the government of the United States under the Clean Air Act as amended;
(5) Any other requirement established by the EQB to insure the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS).

According to the dispersion model results, the major contributor to the lead NAAQS violations is TBRCI. The facility is a minor source of emissions but is subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Secondary Lead Smelting,40 Code of Federal Regulations (CFR) Part 63, Subpart X, also known as Maximum Available Control Technology (MACT) for secondary lead smelters.

This regulation requires sources to submit a Title V application (Section 63.51(c) of 40 CFR). The Title V application must be submitted in accordance with Part VI of the Regulation for the Control of Atmospheric Pollution (RCAP). The provisions of the Subpart X apply to The Battery Recycling Company, Inc. for being secondary lead smelters and operate a reverberatory, rotary furnace and refining kettles. The facility is also affected by the New Source Performance Standard (NSPS) for Secondary Lead Smelters (40 CFR Part 60, Subpart L) for operating a reverberatory furnace that commences construction or modification after June 11, 1973.

On January 5, 2012 EPA published the revised the NESHP for Secondary Lead Smelters (77FR556). The revised standard requires the implementation of new emission standards and require control for fugitive emissions. The compliance date for the new limit was January 6, 2014.

III. Reasonable Further Progress (RFP)

The CAA section 172(c)(2) requires nonattainment areas SIP to include reasonable further progress (RFP) provisions. As stated in EPA's final lead rule for the 2008 Lead NAAQS (73 FR 67039), effective January 12, 2009, RFP is satisfied by the strict adherence to an ambitious compliance schedule which is expected to periodically yield significant emission reductions or linear progress when appropriate. In addition, PREQB does not intend to relax any control measures already implemented at TBRCI. To determine the RFP for lead, at a minimum, controls must be implemented expeditiously and accurate estimate of emissions reductions that will be achieved by controls measures should be quantified.

Para TBRCI, the potential emissions in 2011 were 1.2 ton/yr. These potential emissions are the same for subsequent years until the end of year 2013. With the implementation of the NESHAP for Secondary Lead Smelters the potential emission of the source will decrease to 0.3353 ton/yr with the installation of the required control measures. The projected emission for 2016 is 0.3353 ton/yr (Figure #2). This reduction is achievable if TBRCI meets the permit requirements, especially the control measures that include fugitive emission control using total enclosure of the process building, and stringent standards operating procedures for the control of fugitive dust (containing lead bearing material) according to MACT and NSPS applicable requirements.

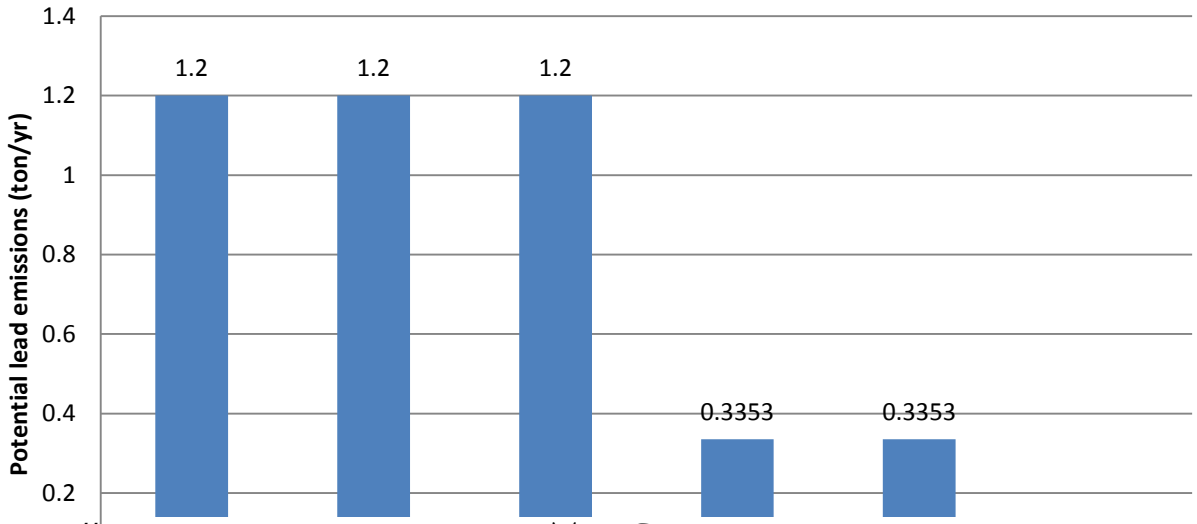


Figure # 2: Emissions reductions for TBRCI

The following table will summary the lead emission standard established by the NESHAP and the construction permit issued to TBRCI:

Emission Unit	Description	Control/emission limit	Applicable Requirement
EU1 and EU7	Lead Smelting Oven #1 and 2	Baghouse	Construction Permit PFE-RA-07-0104-0018-I-II-C]-
		0.2 mg/dscf	40 CFR 63.543(a) Construction Permit PFE-RA-07-0104-0018-I-II-C
EU2 - EU6 and EU8 – EU11	Refining kettles	Baghouse	Construction Permit PFE-RA-07-0104-0018-I-II-C]-
EU12 and EU13	Main Building Fugitive and Slag building	Total Enclosure	40 CFR 63.544(a) Construction Permit PFE-RA-07-0104-0018-I-II-C
EU-14	All other fugitive	Include, but is not limited to: cleaning, paving, maintenance and material handling among others	40 CFR 63.545(a) Construction Permit PFE-RA-07-0104-0018-I-II-C

IV. Emission Sources Inventory

Lead is a naturally occurring metal found in small amounts in rock and soil. Lead has been used industrially in the production of gasoline, ceramic products, paints, metal alloys, batteries, and solder. In the past, automotive sources were the major contributors of lead emissions to the atmosphere. After leaded motor vehicle fuels were phased out in 1995, the contribution of air emissions of lead from the transportation sector, and particularly the automotive sector, greatly declined. Today, industrial processes, primarily metals processing, account for a large portion of lead emissions to the atmosphere and the highest levels of airborne lead are usually found near industrial operations that process materials containing lead, such as smelters (U.S. EPA, 2003).

Sources of lead from stationary sources are mainly from larger industrial sources including but not limited to, metals processing, particularly primary and secondary lead smelters. Lead can also be emitted from sources, industrial, commercial, and institutional boilers; waste incinerators; glass manufacturing; refineries, and cement manufacturing.

In order to evaluate the emissions in the Arecibo nonattainment area, and develop the strategy to achieve compliance with the NAAQS, the PREQB prepared the baseline emission inventory baseline based on emission during year 2011. The municipalities in the baseline emission inventory are: Barceloneta, Ciales, Florida, Hatillo and Utuado. (See Figure 3).

An emissions projection inventory with the lead emissions 2016 was used in the attainment modeling study. Potential lead emissions were used. The emissions projection inventory 2016 include the lead emissions of TBRCI and the background sources. Figure 3 shows the industries in the emissions projection inventory 2016.

The facilities that emit lead in Arecibo are TBRCI, Safetech Corporation, ANJ Airport and PREPA Cambalache. Energy Answers is planning to build a renewable energy plant nearby.

Figure #3: Arecibo Lead SIP, Industry and Municipality Map

Two lead emission inventories were prepared. The 2011 Baseline Emission Inventory and the Emissions Projection Inventory 2016. The emissions projection inventory 2016 was used in the multi-source modeling scenario. See modeling protocol. Lead potential emissions or permit allowable rates were used in the emissions projection inventory. The emission inventory data are in the Appendixes.

A. The Battery Recycling Company, Inc.

TBRCI is located in Cambalache Ward, PR-2 km 72.2 in Arecibo. This facility is dedicated to the recycling of lead batteries for the production of lead of different specifications. TBRCI processes 145.21 tons per day of used lead batteries. Secondary lead is smelted at a rate of 83.04 tons per day. The furnaces product is placed in refining kettles to produce refined lead. TBRCI operation is 24 hour per day, 7 days per week for 12 months per year, or approximately 8,760 hours per year. Process emissions from the kilns and each of the nine kettles are discharged to the atmosphere through two control devices. Emissions from the fuel combustion of the kilns are also discharged through the control device. The emissions from the fuel combustion at each of the nine kettles are discharged to the atmosphere through separate stacks. This facility is a minor source of emissions.

The Battery Recycling in Arecibo has lead emissions over 0.5 tons/yr. In June 2010 a source oriented air quality monitor installed by PREQB near this industry, captured a lead concentration that exceeded the new standard of 0.15 ug/m^3. The area was declared as non-attainment for the new lead standard in 2011.

The projected emission inventory has all the control measures established in federally enforceable requirements and the construction permit issued to TBRCI. The control measures that PREQB required TBRCI were the enclosure of the main process building, use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility.

The potential emissions of lead were submitted by TBRC as part of the source minor construction permit process and reviewed by the Air Toxics Division. In order to have more accurate coordinates for dispersion modeling, a site-visit along with PREQB geographic information system (GIS) personnel was conducted in order to take the coordinates and dimensions of the facility buildings and emission points.

TBRCI has three types of lead emission points the stack, the fugitive emissions from the main process building and the fugitive emissions due to the material handling and transport across the facility property.

As previously stated, TBRCI is a minor source of emissions but is subject to the Secondary Lead Smelting NESHAP (40 CFR Part 63, Subpart X) and the NSPS for Secondary Lead Smelters (40 CFR Part 60, Subpart L).

B. Safetech Corporation

Safetech Corporation is located at Lot #30, Santana Industrial Park, Arecibo, P.R. This facility is dedicated to the collection, temporary storage and disposal by incineration of commercial and industrial non-hazardous solid wastes.

Safetech Corporation installed and operates a thermal oxidizer Ducons Incinerator Model. The actual hourly oxidation rate is 1,000 pounds for hour, 24 hr/day, 6.46 day/week, approximate 4,032 tons / year of solid waste, type 0 and or 1. They are currently using propane as the auxiliary fuel at a rate of 21 gallons per hour. The fuel takes a maximum content of sulfur of 0.000167 per cent as a weight. The incinerator operates 8,064 hours per year.

C. Puerto Rico Energy Power Authority (PREPA) Cambalache

PREPA Cambalache consists of three simple cycle diesel turbines with a capacity of 898 MMBtu/hr HHV and 847 MMBtu/hr LHV, each one. PREPA Cambalache operates at two levels: at base load (898 MMBtu/hr HHV and 847 MMBtu/hr LHV) and at spinning rapid reserve load (616 MMBtu/hr HHV and 581 MMBtu/hr LHV). Part of the generated heat is recovered from the production of steam that is injected to the turbines to control the nitrogen oxide emissions (NOx). The facilities include a

system of unloading, transference and storage of diesel in three tanks of 4.2 million gallons, each one.

PREPA Cambalache is subject to the Regulations for the Control of Atmospheric Pollution, the New Source Performance Standards for Stationary Gas Turbines (40 CFR Part 60 Subpart GG) and the Prevention of Significant Deterioration of Air Quality Standards for NOx, SO_2 (sulfur dioxide), sulfuric acid mist (H_2SO_4), carbon monoxide (CO), particulate matter (PM), particulate matter with a diameter of 10 micrometers or less (PM_{10}) and volatile organic compounds (VOC). The applicable requirements specific to all emission units are included in Section V of the Title V permit.

PREPA-Cambalache is a major source for criteria pollutants because it has the potential to emit more than 100 tons/year of PM_{10}, SO_2, NO_x, CO and VOC. It is also a major source for hazardous air pollutants because it has the potential to emit more than 10 tons/year of nickel and formaldehyde and 25 ton/year of a combination of hazardous air pollutants.

D. Energy Answers

On August 11, 2011, Energy Answers submitted a construction permit application and location approval to construct a municipal solid waste incinerator with energy recovery, also known as wastes to energy (WTE), at Bo. Cambalache, Road #2, km 72.8. The proposed locations was the location of the former Global Fibers Paper facility. Energy Answers, proposed the installation of two boilers, which will use municipal solid waste (MSW) as primary fuel. In addition, the facility requested the capacity to use Automotive-Shredder Residue (ASR), Tire-Derived Fuel (TDF) and Processed Urban Wood Waste (PUWW) as supplementary fuel, according to the permit application. The main emission source will consist of two municipal waste combustion units.

Energy Answers prepared an air quality impact analysis as part of its location approval and construction permit applications (Rules 201 and 203 of RCAP). According to the permit application, the lead emissions from the source do will not exceed the significant levels for modeling. However, given the lead sensitivity of the area, the PREQB required as part of the permit application that the facility to include the air quality impact of lead emissions from the WTE. The evaluation of the air quality impact indicate that the lead emissions from the proposed source do not have a significant air quality impact.

Energy Answers is subject to pre-construction requirements under the Prevention of Significant Deterioration (PSD), 40 CFR, Part 52.21. The EPA issue the final PSD permit on April 10, 2014. If approved, the PREQB construction permit will include the PSD permit conditions and all other applicable requirements and emission limits such as the Standards of Performance for Municipal Solid Waste Incinerators, 40 CFR Part 60 Subpart Eb; Standards of Performance for Electric Utility Steam Generating Units, 40 CFR Part 60, Subpart Da; Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, 40 CFR Part 60, Subpart IIII; and the National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, 40 CFR Part 63, Subpart ZZZZ.

Appendixes A and B contain the 2011 Baseline emission inventory and the Emission Projections Inventory 2011-2016 for Arecibo Lead SIP.

V. Air Quality Monitoring, Compilation, Data Analysis, and Reporting

PREQB review annually the air monitoring network plan and make it available for public participation. After the public participation period, comments are reviewed and incorporated, if necessary and the final plan is submitted to EPA for final approval as required by 40 CFR, Part 58. This Air Monitoring Network Plan meets the requirements of 40 CFR 58.10(a) (1). The purpose of this plan is to provide for the establishment and maintenance of an air quality monitoring system in Puerto Rico that consists of a network of SLAMS sites.

The new standard rule requires a source oriented monitor in all areas where the lead emissions are equal or more than 0.5 tons/yr. As part of the new air quality standard for lead, PREQB operates two (2) lead (Pb) sites in the air-monitoring network for Arecibo. All Pb samplers are operated on a year-round basis and the measurements are sent quarterly to the EPA Air Quality System (AQS). The State and Local Air Monitoring Stations Pb sites use federal reference method monitors. The two sites located at Arecibo are 72-013-0001, and 72-013-0002 (requested by EPA) and are used to demonstrate compliance with the 2008 lead NAAQS. Figure #4 shows the location of the monitors.

Figure #4: Lead monitors locations in Arecibo

Puerto Rico's legal authority to monitor ambient air quality is found in Law 416 for September 22, 2004, Article 9(A) Section (4), et seq.

VI. Permits for new and modified major stationary sources

The location or construction of any new major stationary source, or major modification, or significant source shall obtain a location approval from the PREQB Governing Board, prior to their construction in accordance with Rule 201 of RCAP. The Board shall notify the public of the location approval application. An application for location approval shall include information about alternative sites, size, production, processes, and environmental control techniques that demonstrate that benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its location, construction, or modification. It shall also include an application for a permit to construct. The source shall submit a PSD applicability or non-applicability determination or NANSR to the EPA, which is the permitting authority for the PSD Program in Puerto Rico. As part of a Memorandum of Understanding signed between PREQB and EPA, PREQB will not issue a construction permit for a major source if EPA has not made a PSD applicability determination and has not issue the PSD pre-construction permit. PSD permit conditions must be included as part of PREQB construction air permit.

The requirements for location approval are in this Rule 201. Rule 201 also requires that emission sources locating in or significantly impacting a nonattainment area have to be limited by means of the lowest achievable emission rate (LAER) for the relevant criteria pollutant. For emissions sources located in attainment areas, air pollutants emissions from the new major source, major modification, or significant source have to be limited by means of the best available control technology (BACT).

As part of the location approval, PREQB review construction permit application in accordance with Rule 203(A)(2) of the RCAP. The Board may impose any reasonable conditions upon the issuance of a permit to construct in order to guarantee the emission limitations of any applicable standard for the source or to comply with NAAQS. The location approval require a public review process with the construction permit draft, therefore all construction permit conditions are federally enforceable.

VII. Enforcement and Stationary Source Permits

The PREQB RCAP established rules governing the enforcement of control measures, including attainment plans and permitting programs that regulate construction and modification of stationary sources. Additionally, EPA Region 2 is responsible for the PSD and Non attainment NSR permitting program that contains requirements for sources of air pollutants in Puerto Rico. The sources affected by PSD and Non Attainment NSR Program are subject to the Federal Implementation Plan PSD requirements in 40 CFR section 52.21.

The following parts of the RCAP contain rules relevant for these federal requirements:

Part I: General Provisions

Rule103: Source Monitoring, Record Keeping, Reporting, Sampling and Testing Methods;
Rule 105: Malfunction;
Rule 106: Test Method;
Rule 107: Air Pollution Emergencies;
Rule 108: Air Pollution Control Equipment;
Rule 109: Notice of Violation;
Rule 111: Applications, Hearings, Public Notice;
Rule 112: Compliance Determination/Certification;
Rule 115: Punishment;
Rule 119: Derogation;

Part II: Approval and Permits

Rule 201: Location Approval;
Rule 202: Air Quality Impact Analysis;
Rule 203: Permit to Construct a Source;
Rule 204: Permit to Operate a Source;
Rule 207: Continuing Responsibility for Compliance,

Part IV: Prohibitions,

Part V: Fees

Rule 501: Permit Fees;
Rule 502: Excess Emissions Fees;
Rule 503: Test Fees;
Rule 504: Modification, and

Part VI: Operations Permits Rules for Title V Sources.

On March 23, 1990, the PREQB received the delegation of several NSPS and NESHAP. The delegation of the NSPS standards are codified in 40 CFR, Part 60 section 60.4(b)(FF)(1). The delegation of the NESHAP standards are codified under 40 CFR Part 61, section 60.4(b)(BBB). Full approval of the state operating programs required under Title V of the CAA and 40 CFR, Part 70, and the delegation of the promulgated Section 112[1] standards and programs was effective on March 27, 1996[2] (62 FR7073).

Enforcement is conducted at any stationary source affected by the PREPP[3], the RCAP and the can once an enforcement action is initiated, the PREPPA authorizes PREQB to initiate and carry out until its resolution, any administrative or judicial action, to enforce the provisions of PREPPA or any regulation adopted[4].

PREQB conduct Full Compliance Evaluations (FCE) and/or a Partial Compliance Evaluations (PCE), inspections, investigations, and request for information (RFI) to determine compliance with the PREPPA, the CAA, the RCAP, and/or the permit

[1] Include all standards under Part 63, and the Risk Management Program of Part 68 of 40 CFR.
[2] As promulgated in the Federal Register, Vol. 61, No 38; Monday, February 26, 1996.
[3] Law #416, from September 22, 2004.
[4] Article 9, paragraph 5 of PR EPPA

conditions of any stationary emission source. The enforcement is conducted in accordance with the Enforcement Guidance for Air Emissions Sources.

TRBCI applied and obtained a Title V operating permit shield (PFE-TV-3341-07-1005-1692), which covers the operations of one furnace of 5 cubic meters (m^3) capacity and five refining kettles. This permit shield was issued on December 29, 2008. This facility has emission limitations in accordance with the MACT, NSPS and RCAP that are included in the original construction permit PFE-RA-07-0104-0018-I-II-C, issued on September 24, 2008.

PREQB issued a modification to the mentioned construction permit to include a new furnace with a capacity 10 cubic meters (m^3) and four additional refining kettles for this kiln containing emissions limitation in accordance with the MACT, NSPS and RCAP. The control measures include fugitive emission control using total enclosure of the process building, and stringent standards operating procedures for the control of fugitive dust (containing lead bearing material) according to MACT.

VIII. Interstate Transport

The PREQB hereby certifies that our emissions do not contribute to lead nonattainment in another state or interfere with maintenance of the NAAQS in another state. Puerto Rico is not located within the continental United States. There are no adjacent or nearby states or territories which have lead nonattainment areas.
In addition, the physical properties of Pb prevent Pb emissions from experiencing the same travel or formation phenomena as $PM_{2.5}$ or ozone. More specifically, there is a sharp decrease in Pb concentrations, at least in the coarse fraction, as the distance from Pb source increases.

IX. Stationary Source Emissions Monitoring and Reporting

In general, the monitoring and reporting requirements for stationary sources depends on applicable federal standards including General Provisions in existing NSPS and amended MACT and on the RCAP, as amended.

Rule 103 of the RCAP provides the authority to require monitoring for air pollutants as part of its emission sources permit program. Certain emission sources are required to submit annual emission inventories and periodic reporting of emissions, providing data that is used in air quality modeling to help the PREQB prepare its SIP revisions. Emissions data are available at reasonable times for public review.

PREQB may require the owner or operator of any source to install, operate, and maintain monitoring equipment; provide the necessary equipment and appurtenances for the sampling of fuels and emissions; sample ambient air quality; perform fuel analyses; establish and maintain records required to demonstrate compliance; and prepare periodic reports as the PREQB shall deem necessary. In order to demonstrate compliance with air emission limits, the PREQB may, at a minimum, require the owner or operator of the source, at his own expense, to sample emissions from each stack or provide an equivalent alternative method, to monitor air emissions discharged to the atmosphere.

The following parts of the RCAP contain rules relevant to these federal requirements:

Part I: General Provisions

Rule103: Source Monitoring, record keeping, reporting, sampling and testing Methods
Rule 104: Emission data Available for Public Participation
Rule 106: Test Methods
Rule 108: Air Pollution Control Equipment
Rule 109: Notice of Violation
Rule 111: Applications, Hearings, Public Notice
Rule 112: Compliance Determination/Certification)

Part II: Approval and Permits

Rule 201: Location Approval
Rule 202: Air Limits Impact Analysis
Rule 203: Permit to Construct a Source

The Battery Recycling Co. is required by the Secondary Lead MACT to measure process emissions using yearly performance test(to determine lead compounds emission limitation), process fugitive emission sources by ensuring differential pressure in the process building, and fugitive dust emissions according to standard operating procedures manual, which includes measures to control dust sources. All monitoring data shall be included as part of the required yearly performance test report, the annual compliance certification, and periodic reporting required by applicable reporting requirements. The facility shall retain records of all required monitoring data and support information for a period of 5 years from the date of the monitoring sample, measurement, report, or application. TBRCI shall retain at the facility, the copies of all the records of required monitoring information including the following: the date, place as defined in the permit, and time of sampling or measurements; the date(s) analyses were performed; the company or entity that

performed the analyses; the analytical techniques or methods used; the results of such analyses; and the operating conditions as existing at the time of sampling or measurement.

X. Contingency Measures

Section 172(c)(9) of CAA requires that state implementation plans include specific contingency measures to be undertaken if the area fails to make reasonable further progress or to attain the 2008 lead NAAQS by the attainment date of December 31, 2016.

Upon determination by EPA that the area has failed to achieve, or maintain RFP, or attain the lead NAAQS by the statutory attainment date, these contingency measures will take effect without further action by the State or the Administrator. The EPA interprets this provision to allow states to meet this requirement with control measures that have already been implemented but are not needed for attainment, and to allow for "minimal action" to be necessary prior to implementation of the measures see (73 FR 66964, at 67039). It should also contain trigger mechanisms with a specific schedule for implementation. The amount of reductions yielded by implementation of contingency measures should be quantified, and for a five-year plan, the measures should reduce emissions by 20 percent of the total amount needed for attainment. Under certain circumstances, this amount may be derived by reference to reductions in ambient air concentrations (2008 lead NAAQS Implementation Q&A, July 8, 2011, EPA).

The emission inventory and dispersion models results identify TBRCI as the facility responsible for the violations to the NAAQS. Other facilities in the inventory has insignificant impact. Therefore a source specific contingency plan is required. Article 9(a)(7) of PREPA provides the authority to order persons causing or contributing to a condition which harms the environment and natural resources or which poses an imminent danger for the public health and safety, to immediately diminish or discontinue their actions. Also, Article 9(a)(8) of PREPA provides the authority to issue orders to do or forbear or to cease and desist so as to take the preventive or control measures that, in its judgment, are necessary to achieve the purposes of this Act and the regulations promulgated thereunder.

The following contingency measures will be implemented individually or in any combination if the 2008 lead NAAQS are not achieved by the attainment date of December 31, 2016.

I. After 6 months of the due date for the implementation of the control measures, and annually after that, the PREQB will conduct a compliance evaluation to ensure that the required controls are implemented. If the control are not implemented the PREQB will issue a Notice of Violation (NOV) according to Rule 109 of the RCAP.

   a. Within 3 months after the NOV, if the source does not show do not show progress or fails to implement the emission controls, under Article 9(a)(8) of the PREPPA, through a legal process the PREQB will order the facility to take control measures established in it construction permit and the federal regulation.

   b. As provided by Section 9(a)(12), if the facility fails to comply with the Order, the PREQB will resort to the court or Puerto Rico or United State of America in order to request the enforcement of any resolution or decision issued requiring immediate action to respond to an environmental emergency, and any remedy requested by the Board, through any civil action.

II. If the NAAQS violation persist within the first year of the implementation of the control measures, as measured by the FRM monitor, the PREQB will verify that contingency Item I was accomplished, if so:

   a. After the dispersion model analysis the PREQB, as provided by Section 9(a)(8) of the PREPPA, will issue order to reduce emissions to the amount that the dispersion model projection demonstrates compliance with NAAQS. As part of the order the facility must develop a compliance plan that will include reduction lead emission reductions in the facility. The plan could include, but is not limited to the following:
      i. Emission reductions,
      ii. Additional total enclosure,
      iii. Modification of lead control devices,
      iv. Limitations in the operation of the source such a reduction in production or limitation in use of the oven and refining kettles.
      v. Limit the raw material that is loaded to the oven.
      vi. Increase frequency of cleaning plant roadway and paved areas, battery storage areas.
      vii. Review material handling procedures.

   b. The compliance plan will be reviewed and approved by the PREQB.

c. Conduct and investigation with EPA to identify other sources not included in inventory

III. After the implementation of the contingency Items I and II, if attainment is not achieved, as provided by Rule 113 of RCAP and Section 9(a)(7) of PREPPA, the PREQB will issue an order to immediately discontinue their operation.

Also, PREQB may declare an air pollution alert, warning or emergency, and will determine that such condition requires immediate action for the protection of the health of human beings. The Board will order persons causing or contributing to the atmospheric pollution to reduce their emissions in order to eliminate such condition, or to immediately discontinue the emission of pollutants. In addition, the PREQB also maintains air pollution information in a form readily available to the public on the PREQB Website (http://www.jca.gobierno.pr).

The following parts of RCAP contain rules relevant for this federal notification requirement under air emergencies: Part I: General Provisions, Rule 107: Air Pollution Emergencies.

XI. Air Quality Modeling and Reporting

PREQB has the authority to perform air modeling analyses to demonstrate attainment and to meet the NAAQS as required under the CAA. Inherent to this obligation is the authority for PR. Air quality modeling data is submitted as part of Puerto Rico's relevant SIP submissions and through federal grant commitments. PREQB have the technical and human resources to conduct air quality modeling in order to assess the effect on ambient air quality of relevant pollutants emissions, and can provide relevant data as part of the permitting and NAAQS implementation process. PREQB already prepared the air quality modeling for the lead designation for Puerto Rico. This modeling was approved by the EPA's modeling personnel.

In January of 2010 a new source oriented lead air quality monitor was establish at Arecibo as part of the new air quality standard for lead of 0.15µg/m^3. According with the data capture by this new lead monitor on June of 2010, the new NAAQS was exceeded. On June of 2011, EPA designated the Arecibo area as non-attainment for the lead rolling 3-month average NAAQS.

The preliminary modeling results indicate that the primary source causing the high lead concentration is TBRCI. The contribution of other lead emission sources in the area was insignificant. The multi-source modeling showed that TBRCI has the major contribution to the high monitoring concentration.

As part of this SIP to ensure attainment, PREQB prepared a multi-source modeling plan for Arecibo that includes the facilities that emit lead in the area such as TBRCI, PREPA Cambalache and other background sources included in the emission projections inventory 2016. Energy Answers is planning to build a renewable energy plant nearby Battery Recycling and their potential lead emissions were included in the attainment model. The air quality model is AERMOD and this is the current preferred EPA model for air quality modeling studies.

The emission projections inventory has all the control measures that PREQB required TBRCI as a permit condition. The control measures that PREQB required TBRCI are: the enclosure of the main process building, use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility.

XII. Major Stationary Source Permitting Fees

The PREQB assesses annual fees that are sufficient to cover the Puerto Rico major source permit program costs. The PREQB shall ensure that any fee required by this chapter will be used solely for permit program costs. When a source applies for a modification, administrative change or minor modification to the Title V permit, the source will pay per tonnage. The Governing Board of PREQB has issued several Resolutions (R-97-47-1; R-03-13-23; RI-06-02; R-06-17-8) that provides for the annual payment of actual emissions based on a fixed rate by tonnage.

The following parts of the RCAP contain rules relevant for these federal requirements: Part VI: Operations Permits Rules for Title V Sources, Rule 610: Fee Determination and Certification. This Part VI of the RCAP was approved by EPA on February 26, 1996 (62 FR7073).

XIII. References

Clean Air Act, *State implementation plans for national primary and secondary ambient air quality standards*, Title 42, Chapter 85, Subchapter I, Part A, section 7410.

Puerto Rico Environmental Public Policy Act, Law 416, September 22, 2004.

Regulation for the Control of Atmospheric Pollution, Environmental Quality Board, July 26, 1995.

Clean Air Act Final Full Approval of Operating Permits Program: The Commonwealth of Puerto Rico, Environmental Protection Agency (EPA), February 26, 1996, and 62FR7073.

U.S. EPA. 2003. National air quality and emissions trends report—2003 special studies edition. EPA/454/R-03/005. Research Triangle Park, NC. http://www.epa.gov/air/airtrends/aqtrnd03/

Guidance for the Infrastructure State Implementation Plan (SIP) Elements Required Under Section 110(a)(1) and 110(a)(2) for the 2008 lead (Pb) National Ambient Air Quality Standard (NAAQS). U.S. EPA, October 14, 2011.

Toxicological Profile for Lead. Agency for Toxic Substances and Disease Registry (ATSDR), August 2007

Memorandum 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers. EPA. July 8, 2011.

APPENDIX A: 2011 Baseline Emission Inventory for Arecibo Lead SIP

BASELINE EMISSION INVENTORY 2011 FOR ARECIBO LEAD SIP

The Appendix A-1 presents the Baseline Emission Inventory 2011 (BEI2011) for the Arecibo Lead SIP. In June 2010 a source oriented air quality monitor, capture a lead concentration over the new standard of 0.15 ug/m^3. The PREQB Air Quality Area create a group to attend the permits, emissions controls measures and prepare the revision to the State Implementation Plan of the non-attainment area according to the new lead standard.

The BEI2011 includes potential and annual actual lead emissions of the facilities in Arecibo, Barceloneta, Ciales, Florida, Hatillo and Utuado municipalities. The 2011 actual annual emissions were calculated using the industry Rule 410 reports. In the case that Rule 410 reports were not available, the unit maximum capacity or permit limit was used to calculate the emissions. The potential emissions were calculated using the maximum capacity or the permit limit. The BEI2011 also includes lead emissions from area, nonroad and onroad sources. These emissions were submitted by EPA. The industries included in the BEI2011 are presented in the Table 1.

The emission factors used in the BEI2011 were from AP-42 and from the facility permits. Emission factors, calculating data and references used for the emissions calculation is provided in the Appendix A-1. The ANJ airport emissions are from EPA EIS/NEI System. The Battery Recycling lead emissions and the data used for calculating it was submitted by the industry and reviewed by the PREQB Permit Division. Figure 1 shows the map of the BEI2011 facilities.

Table 1: Arecibo Lead SIP, Facilities in the Baseline Emission Inventory 2011

Industry	Municipality	Classification	Potential Lead Emissions Tons/yr	Actual Lead Emissions Tons/yr
PREPA Cambalache	Arecibo	Title V	0.17	0.011
Battery Recycling	Arecibo	Title V	1.21	-
Safetech Corporation	Arecibo	Title V	0.009	0.009
Eaton	Arecibo	Synthetic Minor	0.0075	6.20e-5
ANJ Airport	Arecibo	-	-	0.00364
Abbott	Barceloneta	Title V	0.012	0.0088
Pfizer Pharmaceuticals LLC	Barceloneta	Synthetic Minor	0.0035	0.001

Merck Sharp & Dohme	Barceloneta	Title V	0.018	0.00037
Total	-	-	**1.43**	**0.03387**

Figure 1: 2011 Baseline Emission Inventory Facilities, Arecibo Lead SIP

The following tables present the BEI2011 data. Table 2 has the facilities and their potential and actual lead emissions. The Tables 3, 4 and 5 present the lead emissions for area, onroad and nonroad emissions sources, provided by EPA. The emissions calculation procedure for the facility emission inventory and related data is presented in the Appendix A-1.

Table 2: Baseline Emission Inventory 2011 for Arecibo Lead SIP

BASELINE EMISSION INVENTORY 2011 FOR ARECIBO LEAD SIP

Abbott Laboratories

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler 101	Road 2, Km 59, Barceloneta/PO BOX 278 BARCELONETA, PR 00617	Barceloneta	325412	10200501		756337	2039253	-	-	0.000758	0.00022	60.3504	0.762	11.31722	415.3722
Boiler 102				10200501	EU8-P2	756337	2039253	-	-	0.000758	0.00093	60.3504	0.762	11.31722	415.3722
Cogeneration Unit				10100401	EU9-P1	756885	2039967	-	-	0.007517	0.006558	53.34	1.8288	24.9936	449.8167
Boiler 1				10200501						0.000855	6.46E-05				
				10200401	EU10-P1	756993	2039914	-	-	0.000209	0.000968	24.384	0.9144	10.0584	433.15
Boiler 4				10100501						0.000855	0.000158				
				10200401	EU11-P2	756993	2039914	-	-	0.000209	0	24.384	0.9144	13.42034	425.3722
Boiler 6				10100501						0.000855	0				
				10200401	EU11-P3	756999	2039878	-	-	0.000209	0	24.384	0.762	16.48663	416.4833
									Total	**0.012**	**0.0088**				

Merck-Sharp & Dohme, Puerto Rico Branch

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler A, Serial: 02968	ROAD 2 KM 56.7 BARCELONETA/PO BOX 601 BARCELONETA	Barceloneta	325412	10200401						0.001029					
				10100501	EP-BOILER 1	759030	2039239	-	-	-	0.000199	27.5	0.91	16.2	450
Boiler B, Serial: 06256				10200401						0.001029					
				10100501	EP-BOILER 1	759030	2039239	-	-	-		27.5	0.91	16.2	450
Boiler C, Serial: 04043				10200401						0.001029					
				10100501	EP-BOILER 2	759029	2039229	-	-	-	0.000168	27.5	0.91	16.2	450
Boiler Cleaver Brook CB				10100501	EP-BOILER 2	759029	2039229	-	-	0.000476		27.432	1.2192	22.86	449.8167
Co-Generation Turbine, Serial: 83-06				10100501	EP-COGEN 1	759007	2039228	-	-	0.011287	1.14E-05	22.9	1.22	19.8	470
Rotary Kiln Incinerator				50300113						0.00069					
				50300113						0.002135					
				50300113	EP-RKI 1	759402	2039008	Wet & Collision Scrubber	99	0.000281		27.5	0.91	9.2	390
Solvent Incinerator				50300113	EP-SOLV 1	759126	2039002	Caustic Wet Scrubber	-	0.000195		14.48	0.36	12.29	361
Thermal Oxidation Units (2)				10100501	TOU	759129	2039148	Scrubber	95	0.000532		6.096	0.4064	18.288	1255.372
									Total	**0.018**	**0.00037**				

Pfizer Pharmaceuticals LLC (Barceloneta)

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
HRSG Cogeneration Unit (CU01)	Road 140, Km 64.4, Barceloneta/PO BOX 11247 BARCELONETA, PR 00617	Barceloneta	325412	10100501	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183		57.912	1.0668	7.9248	422.0389
5 Electric Generation Engines				20200102	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.001045	57.912	0.762	15.5448	422.0389
Package Boiler (CU02)				10100501	PT02	756618	2039949	-	-	0.001183	0	57.912	1.0668	7.9248	422.0389
									Total	**0.0035**	**0.00105**				

PREPA Cambalache

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Gas Turbine 1	Road 681, Km 0.5, Arecibo/PO BOX 364267 SAN JUAN, PR 00936-4267	Arecibo	221112	20100101	1s	742887	2043963	-	-	0.055065	0.001753	30.48	4.7	34.4	654
Gas Turbine 2				20100101	2s	742907	2043974	-	-	0.055065	0.006958	30.48	4.7	34.4	654
Gas Turbine 3				20100101	3s	742917	2043994	-	-	0.055065	0.003103	30.48	4.7	34.4	654
									Total	**0.17**	**0.011**				

Table 2: Baseline Emission Inventory 2011 for Arecibo Lead SIP (Continued)

BASELINE EMISSION INVENTORY 2011 FOR ARECIBO LEAD SIP															
Battery Recycling															
Emission Unit	**Address Physical/Postal**	**Municipality**	**NAICS**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**		**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
						East	**North**			**Allowable**	**Actual**				
Lead Smelting Furnace, 5.0 m^3 (EU-1)	Road 2, Km 72.2, Cambalache Ward/PO BOX 1016 Arecibo, PR 00613-1016	Arecibo	331419	30301002	EP-1										
5 Molten Lead Refining Kettles Burners (EU2-6)				30400426	EP2-6	743546	2042005	Baghouse	99.5	0.59	-	20.6	1.58115	9.58	351.8
Main Building Fugitive Emissions					1	743541	2041976	-	-	0.35	-	-	-	-	-
Material Transport and Handling					2	743386	2042067	Water Sprinklers, Sweeper Machine	30	0.27	-	-	-	-	-
									Total	**1.21**	-				
Eaton (Cutler-Hammer Electrical Company)															
Emission Unit	**Address Physical/Postal**	**Municipality**	**NAICS**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**		**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
						East	**North**			**Allowable**	**Actual**				
Boiler 1	PO Box 709 Arecibo, PR 00613-0709/Road 2, Km 67.6, Santana Industrial Park, Arecibo	Arecibo	335311	10300501	Eaton1	746475	2041401	-	-	0.000376	4.3E-05	11.5824	0.4572	14.6304	802.5944
Boiler 2				10300501	Eaton2	746475	2041401	-	-	0.000376	2.0E-05	11.5824	0.4572	14.6304	802.5944
									Total	**0.00075**	**6.20E-05**				
Safetech Corporation															
Emission Unit	**Address Physical/Postal**	**Municipality**	**NAICS**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**		**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
						East	**North**			**Allowable**	**Actual**				
Ducon Incinerator, HC96-10P Model Two Chambers	PO Box 140909 Arecibo, PR 00634/Lote 30, Santana Industrial Park, Arecibo	Arecibo	562211	50100103	Ducon	746938	2042285	Wet Scrubber	98	0.009	0.009	27.4	1.2	29.6	1276
									Total	**0.009**	**0.009**				
Antonio Nery Juarbe Airport															
Emission Unit	**Address Physical/Postal**	**Municipality**	**NAICS**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**		**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
						East	**North**			**Allowable**	**Actual**				
Airport	1079 Santana Arecibo, PR 00612-6614	Arecibo	48811		ANJ	785844	2041395	-	-	-	0.00364	-	-	-	-
									Total	-	**0.00364**				

Table 3: 2011 Baseline Emission Inventory for the Arecibo SIP. Lead Emissions for Area Sources.

Area Source	SCC	Emisions (ton/yr)
Human Cremation	2810060100	0.00012

[a]Emisiones provided by EPA.

APPENDIX A-1: Facility Emission Calculations for Baseline Emission Inventory

Facility Lead Emissions Calculations

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10200501

Unit: Boiler 101

Model Id: EU 8 - P2

Emission Factor Reference: AP-42, Chapter 1.3, Tables 1.3-10 & 1.3-11
Fuel oil Heat Content from emission Permit

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
2011 = NO.2	5933200 Btu/hr	x	9 lb/10^{12} Btu	x	7416 hrs/yr / 2000 lb/ton	x	(1 – 0.0) = 1.98e-4 ton/yr
Kerosene	92.46 gal/hr	x	1.51e-3 lb/1000 gal	x	456 hrs/yr / 2000 lb/ton	x	(1 – 0) = 3.18e-5 ton/yr

Comments:
Fuel oil NO 2 = 140,000 Btu/gal , Ef = 9 lb/10^{12} Btu
Kerosene = 1.51e-3 lb/1000 gal
2011 actual fuel NO.2 = 42.38 gal/hr , 7416 hrs/yr
2011 actual fuel Kerosene = 92.46 gal/hr , 456 /hrs/yr

= 42.38 gal/hr x 140,000 Btu/gal = 5933200 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10200501

Unit: Boiler 1&2

Model Id: EU8-P1

Emission Factor Reference: AP-42, chapter 1.3, tables 1.3-10 & 1.3-11
fuel oil Heat content from our emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 NO2 =	5560800 Btu/hr	x 9 lb/10^{12} Btu	x 4872 hrs/yr / 2000 lb/ton	x (1 − 0.0) = 1.22e-4 ton/yr
Kerosene	196.12 gal/hr	x 1.51e-3 lb/1000 gal	x 5472 hrs/yr / 2000 lb/ton	x (1−0) = 8.1e-4 ton/yr

Comments:
Fuel oil NO2 = 140,000 Btu/gal, EF = 9 lb/10^{12} Btu
Kerosene ⇒ EF = 1.51e-3 lb/1000 gal
2011 NO.2 Actual rate = 39.72 gal/hr, 4872 hrs/yr
2011 Kerosene actual rate = 196.12 gal/hr, 5472 hrs/yr

39.72 gal/hr x 140,000 Btu/gal = 5560800 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10100401

Unit: Cogeneration Unit

Model Id: EU9 - P1

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-11

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 =	1005.29 gal/hr	x 1.51e-3 lb/1000 gal	x 8640 hrs/yr / 2000 lb/ton	x (1 – 0.0) = 6.5e-3 ton/yr

Comments:
NO.6 Ef = 1.51 e-3 lb/1000 gal
2011 NO.6 Actual rate = 1005.29 gal/hr, 8640 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10200501, 10200401

Unit: Boiler 1

Model Id: EU10-P1

Emission Factor Reference: AP-42, chapter 1.3 Tables 1.3-10 & 1.3-11
fuel oil Heat content from air emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 = NO.2	2524200 Btu/hr	X 9 lb/10^{12} Btu	X 5688 hrs/yr / 2000 lb/ton	X (1 − 0.0) = $6.46e^{-5}$ ton/yr
NO.6	168.57 gal/hr	X $1.51e^{-3}$ lb/1000 gal	X 7608 hrs/yr / 2000 lb/ton	X (1−0) = $9.68e^{-4}$ ton/yr

Comments:
NO6 Ef = $1.51e^{-3}$ lb/1000 gal
NO.2 = 140,000 Btu/gal, Ef = 9 lb/10^{12} Btu
2011 actual NO.6 rate = 168.57 gal/hr, 7608 hrs/yr
2011 actual NO.2 rate = 18.03 gal/hr, 5688 hrs/yr
= 18.03 gal/hr × 140,000 Btu/gal = 2524200 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: AES-A

SCC: 10200501

Unit: Boiler 4

Model Id: EU11-P2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, Fuel oil Heat Content from our emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 =	$4548600 \frac{Btu}{hr}$	x $9 lb/10^{12} Btu$	x $\frac{7704 hrs/yr}{2000 lb/ton}$	x $(1 - 0.0)$ = $1.58e^{-4} \frac{ton}{yr}$

Comments:
NO2 = 140,000 Btu/gal, Ef = 9 lb/10^{12} Btu
2011 Actual emission rate = 32.49 gal/hr, 7704 hrs/yr
= 32.49 gal/hr x 140,000 Btu/gal
= 4548600 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Merck

SCC: 10100501

Unit: Boiler A

Model Id: EP-BOILER 1

Emission Factor Reference: AP-42, Chapter 1.3, table 1.3-10, Heat Content of fuel oil from all emission permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 =	508 1400 Btu/hr	x 9 lb/10^{12} Btu	x 8688 hrs/yr / 2000 lb/ton x	(1 – 0.0) = 1.98e-4 ton/yr

Comments:
Kerosene EF = 9 lb/10^{12} Btu, 135,000 Btu/gal
2011 actual fuel rate = 37.64 gal/hr, 8688 hrs/yr
= 37.64 gal/hr x 135,000 Btu/gal = 508 1400 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 10100501

Unit: Boiler C

Model Id: EP-Boiler 2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10 Heat Content from air emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 =	$470\,8800 \frac{Btu}{hr}$	x $9 lb/10^{12} Btu$	x $\frac{7944 hrs/yr}{2000 \frac{lb}{ton}}$ x	(1 – 0.0) = $1.68e^{-4} \frac{ton}{yr}$

Comments:

Kerosene Ef = 9 lb/10^{12} Btu, 135,000 Btu/gal

2011 actual fuel rate = 34.88 gal/hr, 7944 hrs/yr

= 34.88 gal/hr x 135,000 Btu/gal

= 470 8800 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MEREK

SCC: 10100501

Unit: Cogeneration Unit

Model Id: EP-COGEN

Emission Factor Reference: Air Permit

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
2011 =	60.00 gal/hr	x	7.8e-3 lb/1000 gal	x	48 hrs/yr / 2000 lb/ton	x	(1 – 0.0) = 1.14e-5 ton/yr

Comments:
Kerosene EF = 7.80e-3 lb/1000 gal
2011 Kerosene fuel rate = 60.00 gal/hr, 48 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Pfizer Barceloneta

SCC: 10100501

Unit: HRSG COGENERATION

Model Id: PT01

Emission Factor Reference: AP-42, Chapter 1.3, table 1.3-10, fuel oil
Heat Content from air emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 =	26591600 Btu/hr	X 9 lb/10^{12} Btu	X 8736 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 1.04-e-3 ton/yr

Comments:
2011 NO.2 fuel Rate = 189.94 gal/hr, 8736 hrs/yr
EF = 9 lb/10^{12} Btu

189.94 gal/hr x 140,000 Btu/gal = 26591600 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: DREPA GAMBALECHE

SCC: 20100101

Unit: Gas Turbine 1, 2, 3

Model Id: 1S, 2S, 3S

Emission Factor Reference: AP-42, Chapter 3.1, Table 3.1-2a, Fuel oil Head Content from our emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 = (1S)	417.50 MMBtu/hr	X 1.4e-5 lb/MMBtu	X 600 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 1.75e-3 ton/yr
(2S)	517.61 MMBtu/hr	× 1.4e-5 lb/MMBtu	× 1920 hrs/yr / 2000 lb/ton	= 6.95e-3 ton/yr
(3S)	429.55	× 1.4e-5 lb/MMBtu	× 1032 hrs/yr / 2000 lb/ton	= 3.7 e-3 ton/yr

Comments:

2011 NO. 2 fuel rate = 2911 gal/hr, 600 hrs/yr (1S)
2011 NO 2 fuel rate = 3609 gal/hr, 1920 hrs/yr (2S)
2011 NO. 2 fuel rate = 2995 gal/hr, 1032 hrs/yr (3S)
Lf = 1.40e-5 lb/MMBtu, 143,424 Btu/gal
= 2911 gal/hr × 143424 Btu/gal / 1e6 Btu/MMBtu = 417.50 MMBtu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Eaton

SCC: 10300501

Unit: Boiler 1 & 2

Model Id: EATON 1, EATON 2

Emission Factor Reference: AP-42, chapter 1.3, table 1.3-10, fuel oil
Heat content from air emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2011 = EATON1	1444500 $\frac{Btu}{hr}$	X 9 lb/10^{12} Btu	X $\frac{6552\ hrs/yr}{2000\ lb/ton}$	X (1 − 0.0) = $4.2e^{-5}\ \frac{Ton}{yr}$
EATON2	1593000 $\frac{Btu}{hr}$	× 9 lb/10^{12} Btu	X $\frac{2712\ hrs/yr}{2000\ lb/ton}$	× (1−0) = 1.95 $\frac{ton}{yr}$

Comments:

2011 No.2 fuel Rate EATON 1 = 10.7 gal/hr, 6552 hrs/yr
2011 No.2 fuel Rate EATON 2 = 11.8 gal/hr, 2712 hrs/yr
No 2 = 135,000 Btu/gal, Ef = 9 lb/10^{12} Btu

EATON1 = 10.7 gal/hr × 135,000 Btu/gal = 1444500 Btu/hr

EATON2 = 11.8 gal/hr × 135,000 Btu/gal = 1593000 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Safetech

SCC: 50100103

Unit: Ducon Incineration

Model Id: Ducon

Emission Factor Reference: AP-42, Chapter 2.1, table 2.1-8

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
2011 =	0.5 tons/hr	X	2.01e-1 lb/ton	X	8604 hrs/hr / 2000 lb/ton	X	(1 – 0.98 = 0.009 ton/yr

Comments:

Ef = 2.01e-1 lb/ton
Raw Material = 0.5 tons/hr
hrs/yr 8604

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10200501

Unit: Boiler 101 & Boiler 102

Model Id: EU 8-82

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, Fuel oil heat content from our emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	19 222000 Btu/hr	x 9 lb/10^{12} Btu	x 8760 hrs/yr / 2000 lb/ton	x (1 – 0.0) = 7.5e-4 ton/yr

Comments:
No. 2 fuel Rate - 137.3 gal/hr, 140,000 Btu/gal, EF = 9 lb/10^{12} Btu, 8760 hrs/yr
= 137.3 gal/hr x 140,000 Btu/gal = 19 222000 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10100401

Unit: Cogeneration Unit

Model Id: EU9-P1

Emission Factor Reference: AP-42, Chapter 1.3, table 1.3-11, fuel oil Head Content from an emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	1200 gal/hr	x $1.51e^{-3}$ lb / 1000 gal	x 8294 hrs/yr / 2000 lb/ton	x (1 − 0.0) = $7.51e^{-3}$ ton/yr

Comments:
No. 6 potential fuel rate = 1200 gal/hr, 145,000 Btu/gal, Ef = $1.51e^{-3}$ lb / 1000 gal, 8294 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Abbott

SCC: 10200501, 10200401

Unit: Boils 1, 4, 6

Model Id: EU-10-P1, EU11-P2, EU11-P3

Emission Factor Reference: AP-42, Chapter 1.3, Tables 1.3-10, 1.3-11
fuel oil lead content from air emission permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emission				
2011 = NO.2	21700000 Btu/hr	x 9 lb/10^12 Btu	x 8760 hrs/yr / 2000 lb/ton	x (1 − 0.0) = 8.5e^-4 ton/yr
NO.6	31.6 gal/hr	x 1.51e^-3 lb/1000 gal	x 8760 hrs/yr / 2000 lb/ton	x (1−0) = 2.0e^-4 ton/yr

Comments:

2011 Potential Fuel Rate NO.6 = 31.6 gal/hr, NO.2 = 155 gal/hr
Ef NO.6 = 1.51 e^-3
Ef NO.2 = 9 lb/10^12 Btu, 140000 Btu/gal } 8760 hr/yr

= 155 gal/hr x 140,000 gal/hr = 21700000 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Merck

SCC: 10200401

Unit: Boiler A, B, C

Model Id: EP-BOILER 1, EP-BOILER 2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-11

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	155.5 gal/hr	X $1.51e^{-3}$ lb / 1000 gal	X 8760 hrs/yr / 2000 lb / ton	X (1 – 0.0) = $1.02e^{-3}$ ton / yr

Comments:
2011 fuel Rate No.6 = 155.5 gal/hr, Ef = $1.51e^{-3}$ lb/1000gal, 8760 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 10100501

Unit: Cogeneration Unit

Model Id: EP_COGEN

Emission Factor Reference: Air Permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	330 gal/hr	x $7.8e^{-3}$ lb/1000 gal	x 8760 hrs/yr / 2000 lb/ton	x (1 – 0.0) = 0.011 ton/yr

Comments:
2011 Kerosene Rate = 330 gal/hr, 8760 hrs/yr
Ef = 7.80 e^{-3} lb/1000 gal

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 10100501

Unit: Boiler CB

Model Id: EP-B01 & 2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10. Fuel oil Heat Content from an emission period

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	$12082500 \frac{Btu}{hr}$	x $9 \, lb/10^{12} Btu$	x $\frac{8760 \, hr/yr}{2000 \, lb/ton}$	x $(1 - 0.0) = 4.7 \times 10^{-4} \frac{ton}{yr}$

Comments:

2011 Kerosene Rate = 89.5 gal/hr, 135,000 Btu/gal, 8760 hrs/yr
Ef = 9 lb/10^{12} Btu

= 89.5 gal/hr x 135,000 Btu/gal = 12082500 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 50300113

Unit: Rotary Kiln Incinerator

Model Id: EP-RKI1

Emission Factor Reference: Our Permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emission				
2011 = SW	2.5 ton/hr	X 0.000063 lb/ton X	8760 hrs/yr / 2000 lb/ton X	(1 − 0.0) = 6.8 e-4 ton/yr
LW	0.375 ton/hr	0.0013 lb/ton	8760 hrs/yr / 2000 lb/ton	× (1-0) = 2.1 e-3 ton/yr
Kerosene	53.4 gal/hr	0.0012 lb/1000 gal	8760 hrs/yr / 2000 lb/ton	× (1-0) = 2.8 e-4 ton/yr

Comments:
Solid Waste – 2.5 ton/hr, Ef = 0.000063 lb/ton
Liquid Waste – 0.375 ton/hr, Ef = 0.0013 lb/ton
Kerosene – 53.40 gal/hr, Ef = 0.0012 lb/1000 gal
} 8760 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 50300113

Unit: Solvent Incineration

Model Id: EP-SOIV 1

Emission Factor Reference: Our Permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	37.03 gal/hr	X 0.0012 lb / 1000 gal	X 8760 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 1.9e-4 ton/yr

Comments:
2011 Kerosene fuel Rate = 37.03 gal/hr
Ef = 0.0012 lb/1000 gal, 8760 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: MERCK

SCC: 10100501

Unit: Thermal Oxidation

Model Id: TOU

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, fuel oil Heat Content from an emission permit.

Pollutant: LEAD

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	$135000000 \frac{Btu}{hr}$	$\times \frac{9\ lb}{10^{12}\ Btu}$	$\times \frac{8760\ hrs/yr}{2000\ lb/ton} \times$	$(1-0.0) = 5.3e^{-4} \frac{ton}{yr}$

Comments:

2011 Kerosene = 100 gal/hr, Ef = 9 lb/10^{12} Btu, 8760 hrs/yr, 135,000 Btu/gal

= 100 gal/hr × 135,000 Btu/gal = 135000000 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Pfizer

SCC: 10100501

Unit: Cogeneration, Electric Generation Turbine, Package Boiler

Model Id: PT01, PT02

Emission Factor Reference: AP-42, chapter 1.3, Table 1.3-10, fuel oil Heat content from an emission permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	$30013200 \frac{Btu}{hr}$	$\times \frac{9\ lb}{10^{12}\ Btu}$	$\times \frac{8760\ hrs/yr}{2000\ lb/ton}$	$\times (1-0.0) = 1.16e^{-3}$ ton/yr

Comments:

2011 No. 2 Fuel usage = 214.38 gal/hr, EF = 9 lb/10^{12} Btu, 140,000 Btu/gal, 8760 hrs/yr

= 214.38 gal/hr × 140,000 Btu/gal = 30013200 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: PREPA CAMBALACHE

SCC: 20 100 101

Unit: Gas Turbine 1, 2, 3

Model Id: 1S, 2S, 3S

Emission Factor Reference: AP-42, chapter 3.1, table 3.1-2a

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency	
Potential Emissions 2011 =	898 MMBtu/hr	x	1.4e-5 lb/MMBtu	x	8760 hrs/yr / 2000 lb/ton	x	(1 – 0.0)	= 0.055 ton/yr

Comments:
Gas Turbine = 898 MMBtu/hr
EF = 1.4e-5 lb/MMBtu
8760 hrs/yr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Eaton

SCC: 10300501

Unit: Eaton 1&2

Model Id: EATON1, EATON2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, fuel oil
Head Content from our emission permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	9544500 Btu/hr	x 9 lb/10^{12} Btu	x 8760 hrs/yr / 2000 lb/ton	x (1 − 0.0) = 3.76 E^{-4} ton/yr

Comments:

2011 No2 fuel rate = 70.7 gal/hr, 135000 Btu/gal, 8760 hrs/yr, 9 lb/10^{12} Btu

= 70.7 gal/hr x 135,000 Btu/gal = 9544500 Btu/hr

ARECIBO LEAD SIP
Baseline Emission Inventory 2011: Emissions Calculations

Industry: Scafotech

SCC: 50100103

Unit: Ducon Incinerator

Model Id: Ducon

Emission Factor Reference: AP-42 Chapter 2.1, Table 2.1-8

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
Potential Emissions 2011 =	0.5 ton/yr	X $2.01e^{-1}$ lb/ton	X 8604 hrs/yr / 2000 lb/ton	X (1 − 0.98) = 0.009 ton/yr

Comments:

Ef = $2.01e^{-1}$ lb/ton
Raw material = 0.5 ton/hr
hrs/yr = 8604

APPENDIX B: 2016 Emissions Projection Year Inventory, Arecibo Lead SIP

A. Overview

This is the Emissions Projection 2016 (EPI2016) for the Revision to Puerto Rico State Implementation Plan (SIP) to Control Lead Emissions in accordance with Clean Air Act Section 110(a)(2) - Arecibo Lead Nonattainment Area. In 2008 EPA promulgated the new National Ambient Air Quality Standard (NAAQS) for the lead rolling 3-month average of 0.15 ug/m^3. The new standard implementation rule required a source oriented monitor in all areas where the lead emissions are equal or more than 0.5 tons/yr.

The Battery Recycling Company Inc. (TBRCI) in Arecibo has potential lead emissions over 0.5 tons/yr. In June 2010, PREQB installed a source oriented air quality monitor near this industry and captured a lead concentration over the new standard of 0.15 ug/m^3. The area was declared as non-attainment for the new lead standard in 2011. PREQB Air Quality Area creates a task group to attend the permit emissions, controls measures and the revision to the State Implementation Plan (SIP) for lead non-attainment area according to the new lead standard.

PREQB prepared and submitted to EPA, the Arecibo Lead SIP Baseline Emission Inventory 2011 (BEI2011). The facilities inventoried in the BEI2011 were included in the EPI2016.

The EPI2016 includes the following facilities: TBRCI, Safetech Corporation, Energy Answers PREPA Cambalache, Antonio Nery Juarbe Airport (ANJ), Eaton, Pfizer Pharmaceuticals, LLC, Merck Sharp & Dohme, Abbvie Ltd (Formerly, Abbott Laboratories) and Sunbeam Synergy. PREQB is using the industry potential emissions or permit limit for the EPI2016. In the case of the airport the baseline lead emissions are from EPA EIS/NEI system and the projections were made using the procedure recommended by the Office of Transportation and Air Quality (OTAQ). No future expansion or emissions growth is projected to any of the emission sources, then the lead emissions will remain constant in the EPI2016. The Arecibo Lead SIP attainment year will be 2016.

TBRCI is a secondary lead smelter facility, dedicated to recycle lead-acid batteries and had potential lead emissions over 0.5 tons/yr. Safetech Corporation is a nearby source dedicated to the incineration of commercial and industrial non-hazardous solid waste. Energy Answers and Sunbeam Synergy are renewable energy sources under construction permit and they are planned to start in the next years, their potential lead emissions were used for projections. PREPA Cambalache is an electric power facility.

The Antonio Nery Juarbe is a general aviation airport located near TBRCI. The other facilities are Eaton, dedicated to power and transformer manufacturing and Abbvie Ltd, Merck Sharp & Dohme and Pfizer with pharmaceuticals processes.

B. Emissions Projection Inventory

PREQB used the facilities lead potential emissions or permit limit to prepare the EPI2016. PREQB understand that the emission sources potential lead emissions will be lower or remain constant during the emission projections period and afterwards. Therefore no lead emissions increase is expected in the area. For the EPI2016 of the ANJ airport, PREQB used the information provided by the Puerto Rico Ports Authority[1] and the information presented in the EPA technical support documents, Lead Emissions from the Use of Leaded Aviation Gasoline in the United States[2] and Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory[3]. The procedure and calculation is presented in Appendix B-1.

The preliminary air quality modeling studies indicate that TBRCI fugitive emissions are the major contributor to the high lead concentration in Arecibo. PREQB is working with the TBRCI permit and is requesting control measures to lower the potential fugitive lead emissions in the main process building and in the handling operations. Thus, the PREQB strategy through the lead SIP revision is to use more stringent permit requirements to achieve attainment of this area. The emissions projection inventory has the control measures that TBRCI must implement as a condition permit.

The lead control measures include the full enclosure of the main process building, which is expected to reduce the potential fugitive emissions by approximately 99.5% with a 95% of capture efficiency[4]. The control measures for the handling operations are the use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility. The Table 1 presents the industries in the Emissions Projection Inventory and their projected potential lead emissions for 2016.

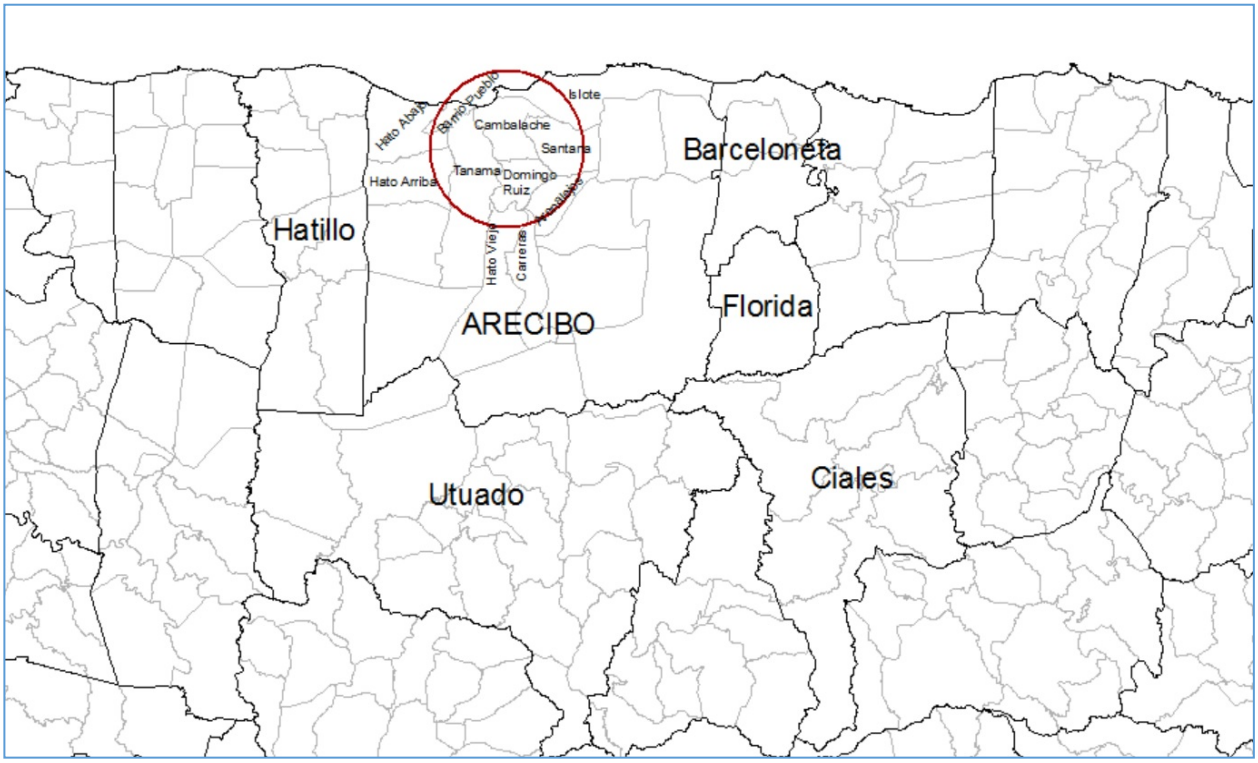
Table 1: Industries in 2016 Emissions Projection Year Inventory

Industry	Municipality	Classification	Potential Lead Emissions tons/yr
PREPA Cambalache	Arecibo	Title V	0.28
TBRCI	Arecibo	Title V	0.3353
Safetech Corporation	Arecibo	Title V	0.009
Energy Answers	Arecibo	Title V	0.3063
ANJ	Arecibo	-	0.037
Abbvie Ltd	Barceloneta	Title V	0.0161
Merck-Sharp & Dohme	Barceloneta	Title V	0.018
Pfizer Pharmaceuticals, LLC	Barceloneta	Synthetic Minor	0.0035
Eaton	Barceloneta	Synthetic Minor	0.00075
Sunbeam Synergy	Barceloneta	Minor Source	0.11

The emission factors used in the emissions projection inventory were from AP-42 and from the industry permit. Emission factors, calculating data, and references used for the emissions calculation are provided in the Appendix B-1. TBRCI lead emissions and the calculating data was submitted by the industry and reviewed by the PREQB. The potential lead process emissions were estimated with the applicable Secondary Lead Smelting MACT standard rule. The Energy Answers lead emissions were from the PSD permit. Sunbeam Synergy potential lead emissions were from the construction permit. Figure 1 shows a map with the industries in the EPI2016. Figure 2 present the Arecibo Lead SIP Area.

FIGURE 1: Arecibo Lead SIP, Emissions Projection Inventory Industries 2016

FIGURE 2: ARECIBO LEAD SIP IMPACT AREA



The emissions projection for Arecibo is presented in Table 2. This data will be used in the attainment model to determine compliance with the new lead standard.

TABLE 2: ARECIBO LEAD SIP, 2016 EMISSIONS PROJECTION YEAR INVENTORY

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP

Battery Recycling

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Lead Smelting Furnaces, (5.0 m^3 EU-1) & (10.0 m^3 EU-7)	Road 2, Km 72.2, Cambalache Ward/PO BOX 1016 Arecibo, PR 00613-1016	Arecibo	30301002	EP-1, EP-7	743546	2042005	Baghouse	99.5	0.31	0.070776	20.6	1.58115	9.58	351.8
9 Molten Lead Refining Kettles Burners (EU2-6) (EU-8-11)			30400426	EP2-6/EP8-11										
Main Building Fugitive Emissions				1	743541	2041976	Control Device/ Enclosure	99.5/95 Capture	0.01538	0.003511	-	-	-	-
Material Transport and Handling				2	743386	2042067	Water Sprinklers, Sweeper Machine	30	0.01	0.002283	-	-	-	-
								Total	**0.33538**	**0.07657**				

Energy Answers

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
2 Riley Spreader-Stoker Boilers	Road 2, Cambalache Ward, Arecibo	Arecibo		EA1	742631	2042526	Fabric Filters		0.3059	0.06984	95.5	3.017	29.09	429.8
Electric Generators				EA2	742611.8	2042599			4.03E-04	9.20E-05	10	0.152	99.4	779
								Total	**0.3063**	**0.0699**				

PREPA Cambalache

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Gas Turbine 1	Road 681, Km 0.5, Arecibo/PO BOX 364267 SAN JUAN, PR 00936-4267	Arecibo	20100101	1s	742887	2043963	-	-	0.09374	0.021402	30.48	4.7	34.4	654
Gas Turbine 2			20100101	2s	742907	2043974	-	-	0.09374	0.021402	30.48	4.7	34.4	654
Gas Turbine 3			20100101	3s	742917	2043994	-	-	0.09374	0.021402	30.48	4.7	34.4	654
								Total	**0.28**	**6.40E-02**				

Safetech Corporation

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Ducon Incinerator, HC96-10P Model Two Chambers	PO Box 140909 Arecibo, PR 00634/Lote 30, Santana Industrial Park, Arecibo	Arecibo	50100103	Ducon	746938	2042285	Wet Scrubber	98	0.009	2.01E-03	27.4	1.2	29.6	1276
								Total	**0.009**	**2.01E-03**				

TABLE 2: ARECIBO LEAD SIP, 2016 EMISSIONS PROJECTION YEAR INVENTORY, (CONTINUED)

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP

Antonio Nery Juarbe Airport

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Airport	1079 Santana Arecibo, PR 00612-6614	Arecibo		ANJ	785844	2041395	-	-	0.037	0.008447	-	-	-	-
								Total	0.037	8.45E-03				

Abbvie Ltd (Abbott Laboratories)

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler 101	Road 2, Km 59, Barceloneta/PO BOX 278 BARCELONETA, PR 00617	Barceloneta	10200501	EU8-P2	756337	2039253	-	-	0.00199	0.000454	60.3504	0.762	11.31722	415.3722
Boiler 102			10200501		756337	2039253	-	-	0.00199	0.000454	60.3504	0.762	11.31722	415.3722
Cogeneration Unit			10100401	EU9-P1	756885	2039967	-	-	0.007517	0.001812	53.34	1.8288	24.9936	449.8167
Boiler 1			10200401	EU10-P1	756993	2039914	-	-	0.002513	0.000574	24.384	0.9144	10.0584	433.15
Boiler 4			10100501	EU11-P2	756993	2039914	-	-	0.002097	0.000479	24.384	0.9144	13.42034	425.3722
								Total	0.0161	0.00377				

Merck-Sharp & Dohme, Puerto Rico Branch

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler A, Serial: 02968	ROAD 2 KM 56.7 BARCELONETA/PO BOX 601 BARCELONETA	Barceloneta	10200401	EP-BOILER 1	759030	2039239	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler B, Serial: 06256			10200401	EP-BOILER 1	759030	2039239	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler C, Serial: 04043			10200401	EP-BOILER 2	759029	2039229	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler Cleaver Brook CB (Stand-by)			10100501	EP-BOILER 2	759029	2039229	-	-	0	0	27.432	1.2192	22.86	449.8167
Co-Generation Turbine, Serial: 83-			10100501	COGEN 1	759007	2039228	-	-	0.011286	0.002577	22.9	1.22	19.8	470
Rotary Kiln Incinerator			50300113	EP-RKI 1	759402	2039008	Wet & Collision Scrubber	99	0.00069	0.000158	27.5	0.91	9.2	390
			50300113						0.002135	0.000488				
			50300113						0.000281	6.41E-05				
Solvent Incinerator			50300113	EP-SOLV 1	759126	2039002	Caustic Wet Scrubber	-	0.000195	4.44E-05	14.48	0.36	12.29	361
Thermal Oxidation Units (2)			10100501	TOU	759129	2039148	Scrubber	95	0.000532	0.000122	6.096	0.4064	18.288	1255.372
								Total	0.018	0.004156				

Pfizer Pharmaceuticals LLC (Barceloneta)

Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
HRSG Cogeneration Unit (CU01)	Road 140, Km 64.4, Barceloneta/PO BOX 11247 BARCELONETA, PR 00617	Barceloneta	10100501	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.00027	57.912	1.0668	7.9248	422.0389
5 Electric Generation Engines			20200102	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.00027	57.912	0.762	15.5448	422.0389
Package Boiler (CU02)			10100501	PT02	756618	2039949	-		0.001183	0.00027	57.912	1.0668	7.9248	422.0389
								Total	0.0035	0.00081				

Table 2: Arecibo Lead SIP, 2016 Emissions Projection Year Inventory, (Continued)

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP														
Eaton (Cutler-Hammer Electrical Company)														
Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
					East	North			Allowable					
Boiler 1	Road 681, Km 0.5, Arecibo/PO BOX	Arecibo	10300501	Eaton1	746475	2041401	-	-	0.000376	8.59E-05	11.5824	0.4572	14.6304	802.5944
Boiler 2			10300501	Eaton2	746475	2041401	-	-	0.000376	8.59E-05	11.5824	0.4572	14.6304	802.5944
								Total	0.00075	0.000171				
Sunbeam Synergy														
Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
					East	North			Allowable					
MSW Gasifier	PR 140, Km 64.4 Barceloneta, PR	Barceloneta		MSW	757473	2038739	Baghouse	98	0.11	0.025114	30.48	0.914	60.12	394
								Total	0.11	0.02511				

APPENDIX B-1: Emissions Calculation - 2016 Emissions Projection Year Inventory

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: PREPA CAMBALACHE

SCC: 20100101

Unit: Gas turbines 1, 2, 3

Model Id: 1S, 2S, 3S

Emission Factor Reference: PSD permit

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
100% load 2016 =	0.023 lb/hr	x	6760 hrs/yr	x	1 ton / 2000 lb	x	(1 – 0.0) = 0.07774 ton/yr
60% load 2016 =	0.016 lb/hr	x	2000 hrs/yr	x	1 ton/lb	x	(1–0) = 0.016 ton/yr

total = 0.07774 + 0.016 = 0.09374 ton/yr

Comments:
Each gas turbine
100% load = 6,760 hrs/yr
60% load = 2,000 hrs/yr
Ef = 0.023 lb/hr, 100% load
Ef = 0.016 lb/hr, 60% load

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Safetech

SCC: 50100103

Unit: Ducon Incineraton

Model Id: Ducon

Emission Factor Reference: AP-42, Chapter 2.1, Table 2.1-8

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency	
2016 =	0.5 ton/hr	X	2.01e-1 lb/ton	X	8604 hrs/yr / 2000 lb/ton	X	(1 – 0.98)	= 0.009 ton/yr

Comments:

Ef = 2.01e-1 lb/ton
Raw Material = 0.5 ton/hr
8604 hrs/yr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Abbvie Ltd

SCC: 10200501

Unit: Boiler 101, Boiler 102

Model Id: EU 8- P1

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, fuel oil
Heat content from permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	50490000 $\frac{Btu}{hr}$	X 9 $lb/10^{12}$ Btu	X $\frac{8760\ hrs/yr}{2000\ lb/ton}$	X (1 – 0.9 = 1.99e^{-3} $\frac{ton}{yr}$ (each Boiler)

Comments:
fuel oil = 90,000 Btu/gal, 561 gal/hr, 8760 hrs/yr
Ef = 9 $lb/10^{12}$ Btu

= 561 gal/hr × 90,000 Btu/gal
= 50490000 Btu/hr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Abbvie Ltd

SCC: 10100401

Unit: Cogeneration Turbine

Model Id: EU 9-P1

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-11

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency	
2016 =	1200 gal/hr	X	$1.51e^{-3}$ lb / 1000 gal	X	8297 hrs/yr / 2000 lb/ton	X	(1 – 0.0)	= $7.51e^{-3}$ ton/yr

Comments:
NO6. = 1200 gal/hr , 8297 hrs/yr
Ef = $1.51e^{-3}$ lb/1000 gal

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Abbvie Ltd

SCC: 10200401

Unit: Boiler 1

Model Id: EU10-P1

Emission Factor Reference: AP-42, chapter 1.3, table 1.3-11

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency	
2016 =	380 gal/hr	X	$1.51e^{-3}$ lb/1000 gal	X	8760 hrs/yr / 2000 lb/ton	X	(1 – 0.0)	= $2.51e^{-3}$ ton/yr

Comments:

NO6. = 380 gal/hr, 8760 hrs/yr
Ef = $1.51e^{-3}$ lb/1000 gal

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Abbvie Ltd

SCC: 10100501

Unit: Boiler 4

Model Id: EU11-P1

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, Fuel oil heat content from permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	53200000 Btu/hr	X 9 lb/10^{12} Btu	X 8760 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 2.097 e^{-3} ton/yr

Comments:

Diesel = 380 gal/hr, 8760 hrs/yr, 140,000 Btu/gal
Ef = 9 lb/10^{12} Btu

= 380 gal/hr × 140,000 Btu/gal
= 53200000 Btu/hr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Merck-Sharp & Dohme

SCC: 10200401

Unit: Boilers A, B, C

Model Id: EP Boiler 1, EP Boiler 2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-11

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
2016 =	155.5 gal/hr	X	1.51e-3 lb / 1,000 gal	X	8760 hr/yr / 2000 lb/ton	X	(1 – 0.0) = 1.028 e-3 ton/yr

Comments:
NO.6 = 155.5 gal/hr, 8760 hrs/yr
Ef = 1.51 e-3 lb/1000 gal

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Merck-Sharp & Dohme

SCC: 10100501

Unit: Cogeneration Turbine

Model Id: EP-Cogen 1

Emission Factor Reference: From permit data.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	330 gal/hr	X $7.8e^{-3}$ lb / 1000 gal	X 8760 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 0.01127 ton/yr

Comments:
Kerosene = 330 gal/hr, 8760 hrs/yr
Ef = $7.8e^{-3}$ lb/1000 gal

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Merck Sharp & Dohme

SCC: 50300113

Unit: Rotary Kiln Incinerator

Model Id: EP-RKI 1

Emission Factor Reference: Our permit

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
Solid waste 2016 =	2.5 ton/hr	X	0.000063 lb/ton	X	8760 hrs/yr / 2000 lb/ton	X	(1 – 0.) = 6.89 e-4 ton/yr
Liquid waste =	0.375 ton/hr	×	0.0013 lb/ton	×	8760 hrs/yr / 2000 lb/ton	×	(1-0) = 2.13 e-3 ton/yr
Kerosene =	53.4 gal/hr	×	0.0012 lb/1000 gal	×	8760 hrs/yr / 2000 lb/ton	×	(1-0) = 2.8 e-4 ton/yr

Comments:
Solid waste = 2.5 ton/hr, Ef = 0.000063 lb/ton
Liquid waste = 0.375 ton/hr, Ef = 0.0013 lb/ton
Kerosene = 53.4 gal/hr, Ef = 0.0012 lb/1000 gal
8760 hr/yr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Merck Sharp & Dohme

SCC: 50300113

Unit: Solvent Incinerator

Model Id: EP 501V1

Emission Factor Reference: Our permit

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	37 gal/hr	X 0.0012 lb / 1000 gal	X 8760 hrs/yr / 2000 lb/ton	X (1 – 0.0) = 1.944 e-4 ton/yr

Comments:
Kerosene = 37 gal/hr, 8760 hrs/yr
Ef = 0.0012 lb/1000 gal

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Merck - Sharp & Dohme

SCC: 10100501

Unit: Thermal Oxidation Units

Model Id: TOU

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, Fuel oil
Lead content from permit.

Pollutant: Lead

Calculations:

	Operating Rate		Emission Factor		Conversion Factor		Control Efficiency
2016 =	13500000 Btu/hr	x	9 lb / 10^{12} Btu	x	8760 hr/yr / 2000 lb/ton	x	(1 – 0.0) = $5.32e^{-4}$ ton/yr

Comments:
Kerosene: 100 gal/hr, 8760 hrs/yr, 135,000 Btu/gal
Ef = 9 lb / 10^{12} Btu

= 100 gal/hr x 135000 Btu/gal
= 13500000 Btu/hr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Pfizer Pharmaceuticals LLC

SCC: 10100501

Unit: HRSG Cogeneration Unit, 5 Electric Generation Engines, Boiler

Model Id: PT01, PT02

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, Fuel oil Heat Content from permit

Pollutant:

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	$30013200 \frac{Btu}{hr}$	x $9 lb/10^{12} Btu$	x $\frac{8760 hrs/yr}{2000 lb/ton}$	$(1 - 0.0)$ = $1.18 e^{-3} \frac{tons}{yr}$

Comments:

No. 2 = 214.38 gal/hr, 140,000 Btu/gal, 8760 hrs/yr

Ef = 9 lb/10^{12} Btu

= 214.38 gal/hr x 140,000 Btu/gal

= 30013200 Btu/hr

ARECIBO LEAD SIP
Emission Projections 2016: Emissions Calculations

Industry: Eaton

SCC: 10300501

Unit: Boiler 1 & 2

Model Id: Eaton 1, Eaton 2

Emission Factor Reference: AP-42, Chapter 1.3, Table 1.3-10, fuel oil heat content from permit.

Pollutant: Lead

Calculations:

	Operating Rate	Emission Factor	Conversion Factor	Control Efficiency
2016 =	9544500 Btu/hr	x 9 lb/10^{12} Btu	x 8760 hrs/yr / 2000 lb/ton	x (1 − 0.0) = 3.76E-4 ton/yr

Comments:

NO 2. = 70.7 gal/hr, 135,000 Btu/gal, 8760 hrs/yr

Ef = 9 lb/10^{12} Btu

= 70.7 gal/hr x 135,000 Btu/gal

= 9544500 Btu/hr

A. Antonio Nery Juarbe Airport (ANJ) 2016 Projected Lead Emissions

To calculate the projected lead emissions at the ANJ airport, the EPA technical document Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory[2] (EPA 2008) was used. According to the Planning Division of the Puerto Rico Ports Authority[1], the projected operations for 2016 at the ANJ airport will be 1836 aircrafts. The lead emissions calculation uses the landing and takeoff cycle (LTO), then 1836 LTO/year will be projected for 2016 in the ANJ airport. This airport does not have an aircraft fuel record because they do not supply it. The information about the aircrafts fuel type and usage is not available. PREQB used a conservative approach to calculate the projected lead emissions and is explained below.

The EPA 2008 document establish that the piston engine aircrafts uses the 100LL avgas which contain lead, instead of jet-fuel that do not have the lead additive. The document also mentioned that commercial, military and other turbine-engine aircrafts uses jet-fuel which does not have the lead additive and lead emissions are not calculated for these types of aircrafts.

Because the ANJ airport do not maintain information about the aircrafts fuel type and usage, PREQB is assuming a conservative approach and will consider that the 1836 LTO/year projected for 2016 will be piston-engine aircrafts or aircrafts that use 100LL avgas with the lead additive. The EPA 2008 document specified that the average fuel usage by LTO of the single piston-engine or twin piston-engine aircrafts is 2.83 gal/LTO and 9.12 gal/LTO, respectively. PREQB is assuming that all aircrafts will be twin piston-engine to use the major fuel usage during LTO and maintain the conservative approach. The EPA 2008 document mentioned that the lead concentration in the 100LL avgas specified by the ASTM is 2.12 grams of Pb per gallon. EPA 2008 also explain that the data collected from piston-engine aircrafts suggests that about 5% of the lead is retained in the engine and the engine oil, thus the emitted fraction of lead is 0.95.

The following equation[2] is used to calculate the projected lead emissions in the ANJ airport:

$$\text{Pb (tons/year)} = \frac{\text{(piston-engine LTO) (g Pb/LTO) (0.95)}}{\text{907,180 g/ton}}$$

Where,

(piston-engine LTO) = 1836 LTO/year
(g Pb/LTO) = 9.12 gal/LTO * 2.12 grams Pb/gal = 19.3344 g Pb/LTO
(0.95) = % lead emitted
907,180 g/ton = conversion factor

Then, the 2016 lead projected emissions for ANJ airport will be:

$$\text{Pb (tons/year)} = \frac{(1836\ \text{LTO/year})\ (19.3344\ \text{g Pb/LTO})\ (0.95)}{907{,}180\ \text{g/ton}}$$

= **0.037 tons/year**

B. Fugitive Process Emissions, Main Building

Lead fugitive emission estimates for the main building after total enclosure has been calculated as 1.54 e^{-2} tons/year. The rationale is as follows:

The estimated Pb fugitive emissions from the main building, categorized as process fugitive emissions (smelting, refining and casting) and fugitive dust sources (furnace charge mix operations), has been estimated as 0.281 tons/year. This was calculated with applicable AP-42 emission factors and proposed production limit of 30,305 tons of Pb/year.

The following table is a list of AP-42 emission factors for process fugitive emissions in secondary lead smelting operations.

Operation/ Process	Emission factor (from AP-42)
Sweating	*0.4-0.8 lb of Pb/ton of Pb smelting raw material
Smelting	*0.2-0.6 lb of Pb/ton of Pb produced – uncontrolled 0.0133 lb of Pb/ton of Pb produced – controlled
Kettle refining	0.0006 lb of Pb/ton of Pb produced
Casting	0.0007 lb of Pb/ton of Pb produced

Table 12.11-4 of AP-42, page 12.11-8 at: http://www.epa.gov/ttn/chief/ap42/ch12/final/c12s11_2010.pdf
*not applicable to TBRCI.

Note: TBRCI submitted a "consolidated" emission factor of 3.772 pounds/ton which included smelting, refining and casting processes. This was not approved by EQB. EQB used AP-42 emission factors and are the ones included in the calculations herein.

Calculations for the total estimated lead emission of 0.281 tons/year:

a. **Smelting** operations: process fugitive emissions of lead

$$\frac{30{,}305 \text{ tons}}{1 \text{ year}} * \frac{0.0133 \text{ lb}}{1 \text{ ton}} * \frac{1 \text{ ton}}{2{,}000 \text{ lbs}} =$$

$$\mathbf{0.201 \text{ ton of Pb/year}}$$

b. **Refining** operations: process fugitive emissions of lead

$$\frac{30{,}305 \text{ tons}}{1 \text{ year}} * \frac{0.0006 \text{ lb}}{1 \text{ ton}} * \frac{1 \text{ ton}}{2{,}000 \text{ lbs}} =$$

$$\mathbf{0.0091 \text{ ton of Pb/year}}$$

c. **Casting** operations (lead/slag tapping): process fugitive emissions of lead

$$\frac{30{,}305 \text{ tons}}{1 \text{ year}} * \frac{0.0007 \text{ lb}}{1 \text{ ton}} * \frac{1 \text{ ton}}{2{,}000 \text{ lbs}}$$

$$\mathbf{0.011 \text{ ton of Pb/year}}$$

d. **Furnace charge mix** operations: fugitive dust source of lead

$$496.1947 \frac{\text{lbs of PM}}{\text{year}} * \frac{1 \text{ ton}}{2{,}000 \text{ lbs}} = 0.25 \frac{\text{ton of PM}}{\text{year}}$$

Then, the lead content in PM was assumed to be 23%;

$$0.25 \frac{\text{ton of PM}}{\text{year}} * \left(\frac{23}{100}\right) = \mathbf{0.06 \text{ ton of Pb/year}}$$

Note: See rationale for this calculation in Appendix A, Section C.

Estimated process fugitive emissions and dust source emissions of lead (Pb, lead compounds) from TBRCI as of April, 2013, related with secondary lead smelting operations inside main process building.

Emission source/process	Lead potential emissions (ton/yr)
Process fugitive emissions:	
a. Smelting	0.201
b. Refining	0.009
c. Casting	0.011
Fugitive dust source:	
d. Furnaces charge mix	0.06
TOTAL	**0.281**

After the total enclosure, estimated lead emissions of 0.281 tons of Pb/year will be subject to a level of capture efficiency not lower than 95% and a control device efficiency not lower than 99.5%, for a combined reduction level of emissions of 94.525% for the whole building.

The rationale is as follows. 95% of 0.281 will be subject to control equipment of the main building (dust collector or baghouse) and 5% of 0.281 will be emitted to the atmosphere.

Then,

$$0.281 * [1-(95/100)] = 0.01405 \text{ ton of Pb/year},$$

$$0.281 – 0.01405 = 0.26695 \text{ ton of Pb/year}$$

This means that a quantity 0.26695 tons/year will be capture after the enclosure and will be directed to the baghouse of the main building.

The efficiency of the baghouse of the main building must be equal or more than 99.5%. Therefore, 99.5% of the captured emissions will be controlled at the baghouse and the remaining 0.5% will be uncontrolled emissions emitted to the atmosphere.

This was calculated as:

0.26695 * [1-(99.5/100)] = 0.00133475 ton of Pb/year,

0.26695 – 0.00133475 = 0.26561525 ton of Pb/year

An estimated lead quantity of 0.26561525 tons/year will be controlled in the baghouse's filters, while 0.00133475 will be uncontrolled emissions emitted to the atmosphere,

Lead emissions not capture by the enclosure of the building plus the building's baghouse uncontrolled emissions (emissions of the building's baghouse stack) are equivalent to the total lead emissions of the main building after the total enclosure.

Therefore,

0.01405 ton of Pb/year + 0.00133475 ton of Pb/year =

0.01538475 ton of Pb/year or $1.54e^{-2}$ ton of Pb/year
After the total enclosure of the main building

C. Stack Emissions

0.31 ton of Pb/year

From The Battery Recycling Company, Inc construction permit limit.

To estimate the annual lead emission rate for TBRCI, an hourly mass emission rate and source specific emission factor were determined. The potential to emit of Pb for process vents at the facility were estimated in 0.31 ton of Pb/year, with a site-specific maximum lead emission rate in process emissions of 0.071 lb of Pb/hour and a source specific process emission factor of 0.0205 lb of Pb/ton of Pb produced.

To determine an hourly mass emission rate for process emissions in TBRCI the general equation: [Air pollutant] * stack gas flow rate = hourly mass emission rate, was used. The air pollutant concentration used, in this case lead or inorganic lead as surrogate of lead compounds, is the applicable lead standard of flow-weighted average concentration required by the Secondary Lead Smelting MACT rule for all process vent gases in the facility.

The MACT standard concentration limit is 0.2 mg of lead/dscm (0.000087 grains of lead/dscf), this value was converted to units of pounds per dry standard cubic feet and the result was $1.24323e^{-8}$ lb of lead/dscf, which is the value included in the equation as pollutant concentration.

The stack gas flow rate was determined with the ideal gas law general equation:

$$Q_{std} = Q_o(T_{std}/T_o)\ (P_o/P_{std})$$

Where:

Q_{std} = gas flow rate at standard temperature and pressure, as scfm
Q_o = gas flow rate at actual conditions, as acfm
P_{std} = pressure at standard conditions is 29.92 inches Hg or 1 atmosphere
T_{std} = temperature at standard conditions is 70 °F
P_o = pressure at actual conditions (inches Hg, or "Hg), assumed equal to P_{std}.
T_o = temperature at actual conditions (°F)

The general equation was derived as:

$$Q_{scfm} = Q_{acfm} * (460 + 70\ °F) * P_o / (460 + T_o) * P_s$$

Units of scfm were converted to dry standard cubic feet per minute (dscfm) as follows:

$$Q_{dscfm} = Q_{scfm} * (100 - \%\ moisture/100)$$

The flow rate used as actual cubic feet per minute (acfm) is from the maximum flow rate capacity by design in each of the two fans of the process vents connected to rotary furnace #1(EU1) and #2(EU7). Both fans have a manufacturer's rated capacity of 60,000 cubic feet per minute (cfm), the value was obtained from the construction permit application data. The temperature values at actual conditions and moisture content of each vent gases were from the most recent compliance test performed in TBRCI on August 2, 2012, required by EPA.

Flow rate of furnace #1 (EU1):

$$Q_{scfm} = 60{,}000\ acfm * (460 + 70\ °F) * 29.92\ "Hg / (460 + 179\ °F) * 29.92\ "Hg$$

$$Q_{scfm} = 49{,}765.26\ scfm;\ multiplied\ by\ (100\text{-}4.5/100) = 47{,}525.82\ dscfm$$

Flow rate of furnace #2 (EU7):

$$Q_{scfm} = 60{,}000\ acfm * (460 + 70\ °F) * 29.92\ "Hg / (460 + 177\ °F) * 29.92\ "Hg$$

$$Q_{scfm} = 49{,}921.51\ scfm;\ multiplied\ by\ (100\text{-}4.7/100) = 47{,}575.20\ dscfm$$

The hourly mass emission rate for each furnace process vent was calculated as:

[Lead] * vent gas flow rate = hourly mass emission rate

Furnace #1 (EU1):

$1.24323e^{-8}$ lb of Pb/dscf * 47,525.82 dscfm * 60 min/hr = 0.03545 lb of Pb/hr

Furnace #2 (EU7):

$1.24323e^{-8}$ lb of Pb/dscf * 47,575.20 dscfm * 60 min/hr = 0.03549 lb of Pb/hr

The hourly mass emission rate for all the process vents (stack) in TBRCI was calculated as:

$\sum$ Process vents hourly emission rates

Then,

0.03545 + 0.03549 = 0.071 lb of Pb/hr in process emissions of TBRCI

Once the Pb hourly emission rate of process emissions was estimated, a source specific emission factor (EF_{ss}) was determined dividing the hourly emission rate by the hourly Pb production activity proposed in the construction permit application of the facility of 3.4595 tons of Pb produced per hour. The estimated yearly activity of Pb production proposed by TBRCI is 30,305 tons/year.

The emission factor calculation is as follows:

EF_{ss} = 0.071 lb of Pb emitted/hr ÷ 3.4595 lb of Pb produced/hr =

0.0205 lb of Pb emitted/ton of Pb produced

Then, the annual emission rate of Pb in process vents was estimated according to the source specific emission factor and the proposed annual Pb production of 30,305 tons/year.

The annual Pb emission rate calculation is as follows:

0.0205 lb of Pb emitted/ton of Pb produced * 30,305 tons of Pb/year =

621.25 lb of Pb emitted/year

A conversion factor was employed to change annual emission rate of lead, from lb/year to ton/year. The calculation is as follows:

621.25 lb of Pb emitted/year * (1 ton/2,000 lb) =

0.31 ton of Pb emitted/year

D. Furnaces Charge Mix Fugitive Emissions

In the AP-42, there is no emission factor to estimate lead in fugitive dust sources from secondary lead smelting operations. Equation 1 of section 13.2.4.3 - Aggregate Handling and Storage Piles in the AP-42 document was used to generate a custom emission factor to describe quantity of particulate matter emitted according to the load of material transferred. After the PM emission determination, the content of lead in PM was estimated to be 23%, according to Pb emission factors in AP-42.

Equation 1 of section 13.2.4.3 from AP-42 to determine a custom emission factor for PM is as follows:

$$E = k(0.0032) * \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ lb}s/ton$$

Where:

E = emission factor; **applicable to TBRCI is in pounds (lbs) per ton of material transferred (mix material)**
k = particle size multiplier (dimensionless); **TBRCI assumed as 0.74 from section 13.2.4.3 of AP-42 document**
U = mean wind speed (m/s or mph); **TBRCI assumed to be 10 mph**
M = material moisture content (%); **TBRCI assumed as 4.15%**

$$E = 0.74 * \ (0.0032) * \frac{\left(\frac{10}{5}\right)^{1.3}}{\left(\frac{4.15}{2}\right)^{1.4}} =$$

$$0.00209843 \text{ lb } of\ PM/ton\ of\ mix\ material$$

Therefore, the emission factor generated by TBRCI to calculate PM emissions from furnace charge mix operations as a process dust source inside the main building was 0.00209843 pounds of PM/ton of raw material transferred.

The estimated quantity of lead containing raw material handled in the facility was multiplied by the emission factor to obtain the amount of

PM that may be emitted during mix preparation processes. The resulted amount was multiplied by 5 as an average of the handling events performed to homogenize the smelting mixture.

Particulate matter emission estimation:

$$5\left(\frac{47{,}292 \text{ tons of raw Pb}}{1 \text{ year}} * \frac{0.00209843 \text{ lbs of PM}}{1 \text{ ton}}\right) =$$

$$496.1947 \ \frac{\text{lbs of PM}}{\text{year}}$$

As indicated in the "Secondary Lead Smelting" section of the AP-42 document, it is assumed a 23% lead content in PM, therefore, Pb emissions were estimated as follows:

$$496.1947 \ \frac{\text{lbs of PM}}{\text{year}} * \frac{1 \text{ ton}}{2{,}000 \text{ lbs}} = 0.25 \frac{\text{ton of PM}}{\text{year}}$$

Then, the lead content in PM was assumed to be 23%,
the calculation is as follows:

$$0.25 \frac{\text{ton of PM}}{\text{year}} * \left(\frac{23}{100}\right) = \mathbf{0.06 \text{ ton of Pb/year}}$$

E.

E. Handling and Transport Operations – Fugitive Emissions

The estimated Pb emissions from resuspension of loose material as fugitive dust source due to vehicle traffic and handling operations outside the process building was determined by TBRCI. As with the furnace charge mix, the AP-42 document does not include an emission factor for this activity. TBRCI has determined a custom emission factor and submitted quantitative emission estimation based in section 13.2.1 – Miscellaneous Sources/Fugitive Dust Sources/Paved Roads of AP-42 document.

Equation 2 of section 13.2.1.3 from AP-42 was used to generate the PM emission factor as follows:

$$E_{ext} = [k(sL)^{0.91} * (W)^{1.02}](1 - P/4N)$$

Where:

E_{ext} = annual or other long term average emission factor in the same units of k; **TBRCI used monthly term in pounds (lbs)/VMT (VMT=vehicle mile traveled); $E_{monthly}$**

k = particle size multiplier for particle size range and units of interest; **TBRCI used 0.011 pounds/VMT as per Table 13.2.1-1**

sL = road surface silt loading (grams per square meter)(**g/m^2**), **TBRCI used 9.7 g/m^2 as per Table 13.2.1-3**

W = average weight (tons) of the vehicles traveling the road, **TBRCI used 30 tons as mean weight of each vehicle (truck)**

P = number of "wet" days with at least 0.254 mm (<**0.01 in**) of precipitation during the averaging period; **TBRCI used 13 days according to data provided by the National Weather Service for the Arecibo area**

N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly); **TBRCI used 30 as monthly basis**

Facility data: 300 truck vehicles/month - operated in the facility
30 tons - mean weight of each truck
600 meters – maximum distance covered by trucks

$$E_{mont\ hly} = \left[\left(0.011\frac{pounds}{VMT}\right)\left(9.7\frac{g}{\mathrm{m}^2}\right)^{0.91} * (30\ tons)^{1.02}\right]\left(1 - \frac{13\ days}{(4)(30days)}\right)$$

$$\boldsymbol{E_{monthly} = 2.49\ \mathrm{lbs}/VMT}$$

The emission factor used to calculate PM emissions from truck traffic and materials handling operations as a process dust source outside the main process building is 2.49 pounds of PM/vehicle mile traveled in the facility roadways.

The emission factor derived by TBRCI was included in a general equation to estimate particulate matter emissions which includes a representative quantity of vehicles during regular operations and the approximate length of process related roadways in the facility (meters). The immediate emissions result is expressed as pounds of PM per month, which is then multiplied by 12 to obtain annual emissions of PM.

Monthly particulate matter estimation:

$$300\ \frac{\text{vehicles}}{\text{month}} *\ 600\ \text{meters} * \frac{1\ \text{mile}}{1{,}600\ \text{meters}} * 2.49\ \frac{\text{lbs}}{\text{VMT}} =$$

$$280.1\ \frac{\text{lbs of PM}}{\text{month}}$$

TBRCI assumed a 30% of control efficiency in the fugitive emissions control measures performed as part of the Standard Operating Procedures required by the *Secondary Lead Smelting MACT* rule.

Controlled yearly particulate matter estimation:

$$\left(\frac{280.14\ \text{lbs PM}}{1\ \text{month}}\right) * \left(\frac{12\ \text{months}}{1\ \text{year}}\right) * \left(1 - \frac{30}{100}\right) =$$

$$2{,}353.17\ \frac{\text{lbs of PM}}{\text{year}}$$

TBRCI assumed 1% of Pb content in PM. The 1% was derived from the results of a stack testing analysis of controlled process emissions in TBRCI.

Emission estimation of Pb:

$$\left(\frac{2{,}353.17 \text{ lbs PM}}{\text{year}}\right) * \left(\frac{1 \text{ ton}}{2{,}000 \text{ lbs}}\right) * \left(\frac{1 \text{ Pb}}{100 \text{ PM}}\right) =$$

$$\mathbf{0.01\ \frac{ton\ of\ Pb}{year}}$$

APPENDIX C: Attainment Model Protocol, Arecibo Lead SIP

A. Introduction

This document presents the protocol for the attainment model in the area of The Battery Recycling Company Inc, (TBRCI) in Arecibo. In 2008, EPA promulgated the new National Ambient Air Quality Standard (NAAQS) for the lead rolling 3-month average of 0.15 ug/m^3. The new standard rule required a source oriented monitor in all areas where the lead emissions are equal or more than 0.5 tons/yr.

TBRCI in Arecibo had lead potential emissions over 0.5 tons/yr. In June 2010 a source oriented air quality monitor installed by PREQB near this industry, capture a lead concentration over the new standard of 0.15 ug/m^3. The area was declared as non-attainment for the new lead standard in 2011. The PREQB Air Quality Area create a task group to determine what facilities contribute to this concentration, establish emissions control measures and prepare the revision to the State Implementation Plan for the lead non-attainment area.

B. Emission Inventory

PREQB prepare the Baseline Emission Inventory 2011 (BEI2011) with the lead emission sources in Arecibo and background lead emission sources up to 16 km from TBRCI. The municipalities in the BEI2011 are Arecibo, Barceloneta, Ciales, Florida, Utuado and Hatillo, see Figure 1. For the attainment modeling study the Emissions Projection Inventory 2016 (EPI2016) will be used and it have emissions projections from all lead emission sources included in the BEI2011 according to the EPA recommendations.

The EPI2016 have all the facilities in the BEI2011 projected to 2016 and two proposed to be constructed by 2016, Energy Answers in Arecibo and Sunbeam Synergy in Barceloneta. The EPI2016 has all the control measures that PREQB require to TBRCI as a permit condition. The control measures that PREQB required TBRCI are, the full enclosure of the main process building, use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility. The Arecibo Lead SIP attainment year will be 2016.

The facilities that emit lead in Arecibo are TBRCI, Safetech Corporation and PREPA Cambalache. Energy Answers is planning to build a renewable energy plant nearby TBRCI and their potential lead emissions will be included in the attainment model. The Antonio Nery Juarbe (ANJ) airport is near TBRCI and their lead emissions were included in the modeling study. The air quality model is AERMOD and this is the current preferred EPA model for air quality modeling studies.

PREQB does not have a lead air quality monitor in Arecibo that could be used as background concentration or a representative one in a nearby area. The EPA recommendation to addresses the lead background concentration in the attainment modeling study is a multi-source AERMOD run using the background lead emissions from Arecibo nearby facilities projected to 2016. The municipalities used for background lead emissions were Barceloneta, Ciales, Florida, Hatillo and

Utuado. The only municipality with background lead emissions sources is Barceloneta along with the facilities in Arecibo. Lead potential emissions or permit allowable rate projected to 2016 will be used in the attainment modeling study. The ANJ airport lead emissions are from EPA EIS/NEI system and were projected to 2016 using the methodology recommended by the U.S. Office of Transportation and Air Quality (OTAQ).

The TBRCI potential lead emissions were submitted by the source during the permit process and reviewed by the permit area. A site-visit along with PREQB GPS personnel was made to take the coordinates and dimensions of the facility buildings and emission points. TBRCI have three types of lead emission points, the stack, the fugitive emissions from the main process building and the fugitive emissions due to the material handling and transport across the facility property.

FIGURE 3: ARECIBO LEAD SIP, INDUSTRY AND MUNICIPALITY MAP

PREQB is working with many industry permits in Arecibo and nearby municipalities, and changes or reductions are expected in the sulfur percent and the fuel oil type. These future changes may impact the industries in Arecibo and nearby areas resulting in lowering the lead emissions. The Appendix C-1 presents the emission inventory data.

C. Model

The preferred EPA model AERMOD will be used in the attainment model. TBRCI emission points will be divided in stack, area source and volume source fugitive emissions. The volume source is the main process building and this will be fully enclosed as a control measure. For the attainment model a 99.5% reduction will be consider in the fugitive lead emissions of the main process building with a 95% of capture efficiency[1].

The area source was selected for the modeling of the emissions generated from the vehicle movement between the carbon, scrap and soda ash storages. A fourteen-tier polygon area will cover the daily vehicles transit between storages, approximately 4742 m^2, see Appendix C-1. Figure 2 shows the facility with the property fenceline, stack, main building and area source. EPA Leadpost processor is used for the calculation of the lead rolling 3-month average using the monthly modeling results.

Background concentration was omitted because PREQB does not have a nearby lead air quality monitor that could be representative of the Arecibo area. PREQB will addresses this using the EPA recommendation of a multi-source modeling scenario with projected or controlled emissions to 2016 of the facilities in the six municipalities previously mentioned in this document, including the Arecibo airport.

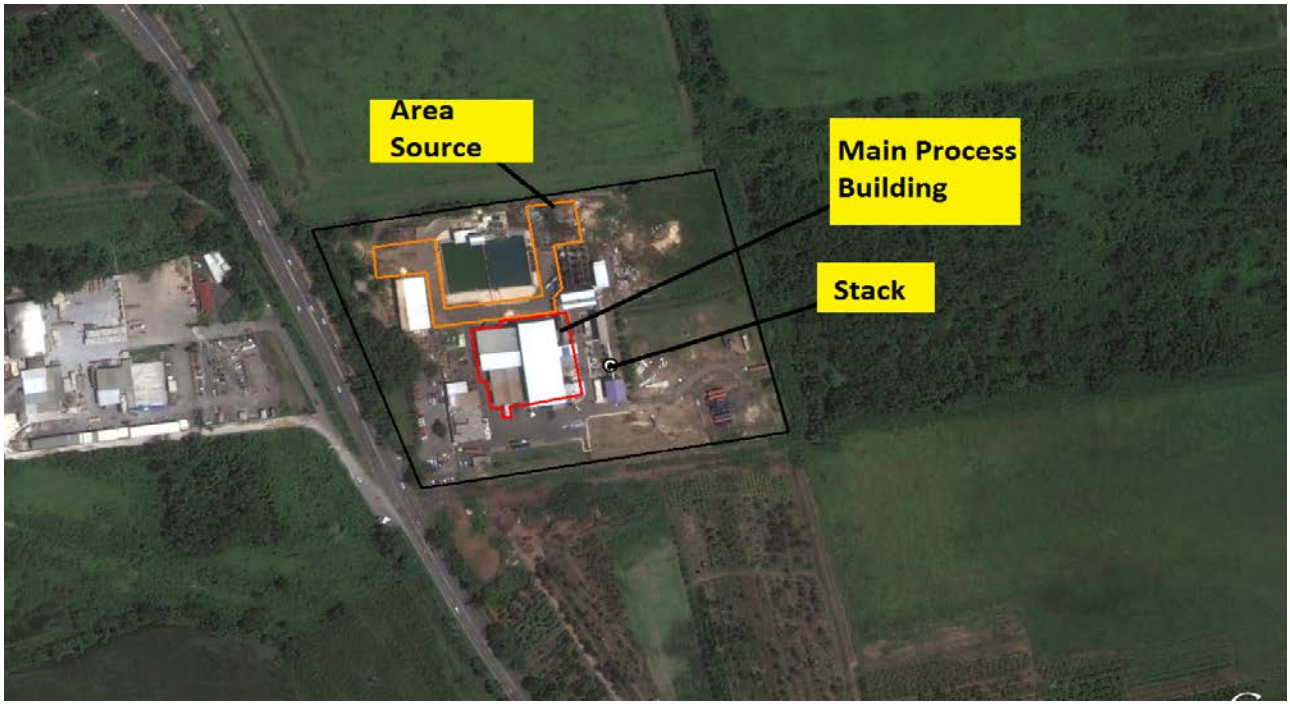


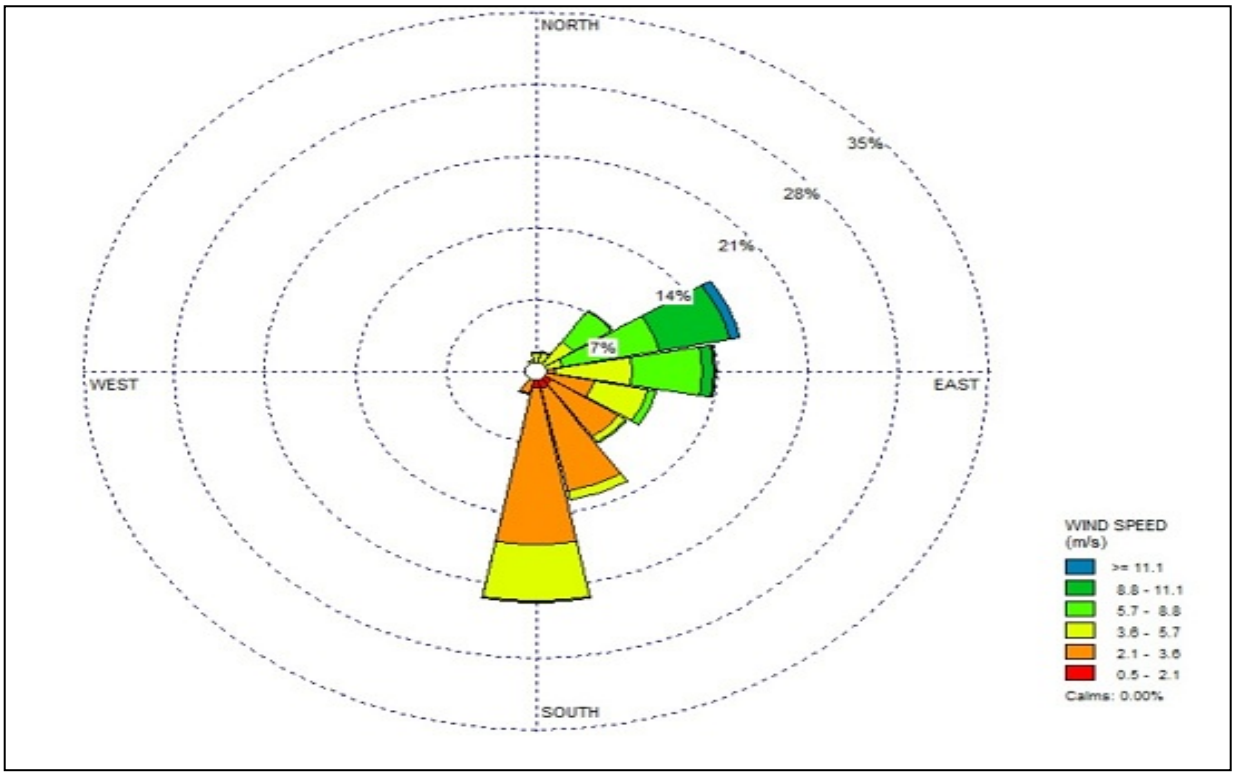
FIGURE 4: FACILITY STACK, VOLUME AND AREA SOURCES

[1]Addendum to the 2008 Lead NAAQS Implementation Questions and Answers Signed on July 11, 2011, by Scott Mathias. August 10, 2012.

D. Meteorology

One year of site-specific meteorological data from 1992-1993 collected in the PREPA Cambalache station was used in the model. The data was processed using the AERMET new version that incorporates two surface characteristics in cases of missing data. Meteorological data from San Juan station was used for the substitution of the site-specific missing data. Figure 3 shows a wind rose of the Cambalache Station data.

FIGURE 5: WIND ROSE FROM CAMBALACHE STATION, ARECIBO



I. Receptors

The terrain area that surrounds TBRCI is flat rural area with some elevated terrain at 4 km approximately to the southeast/southwest. Three receptor grids will be used for the attainment model. A 500 meters grid and two refined grids of 250 and 100 meters. Fenceline grid was also included with receptors approximately 25 meters apart.

AERMOD model uses AERMAP to process the terrain data and the receptor elevations are extracted from the DEM maps. The UTM coordinates for the grids were southwest corner 739500 East/2038000 North and northeast corner 763000 East/2045500 North for the 500 meters, southwest corner 739500 East/2038000 North and northeast corner 746500 East/2045750 North for the 250 meters and southwest corner 742750 East/2042000 North and northeast corner 743950 East/2043000 North for the 100 meters. Figures 4 and 5 shows the grids.

FIGURE 6: RECEPTOR GRID (500 METERS)

FIGURE 7: REFINED RECEPTOR GRIDS (250 AND 100 METERS)

APPENDIX C-1: Attainment Model Protocol Arecibo SIP

2016 Emissions Projection Year Inventory, Arecibo Lead SIP

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP														
Battery Recycling														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Lead Smelting Furnaces, (5.0 m^3 EU-1) & (10.0 m^3 EU-7)	Road 2, Km 72.2, Cambalache Ward/PO BOX 1016 Arecibo, PR 00613-1016	Arecibo	30301002	EP-1, EP-7										
9 Molten Lead Refining Kettles Burners (EU2-6) (EU-8-11)			30400426	EP2-6/EP8-11	743546	2042005	Baghouse	99.5	0.31	0.070776	20.6	1.58115	9.58	351.8
Main Building Fugitive Emissions				1	743541	2041976	Control Device/ Enclosure	99.5/95 Capture	0.01538	0.003511	-	-	-	-
Material Transport and Handling				2	743386	2042067	Water Sprinklers, Sweeper Machine	30	0.01	0.002283	-	-	-	-
								Total	**0.33538**	**0.07657**				
Energy Answers														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
2 Riley Spreader-Stoker Boilers	Road 2, Cambalache Ward, Arecibo	Arecibo		EA1	742631	2042526	Fabric Filters		0.3059	0.06984	95.5	3.017	29.09	429.8
Electric Generators				EA2	742611.8	2042599			4.03E-04	9.20E-05	10	0.152	99.4	779
								Total	**0.3063**	**0.0699**				
PREPA Cambalache														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Gas Turbine 1	Road 681, Km 0.5, Arecibo/PO BOX 364267 SAN JUAN, PR 00936-4267	Arecibo	20100101	1s	742887	2043963	-	-	0.09374	0.021402	30.48	4.7	34.4	654
Gas Turbine 2			20100101	2s	742907	2043974	-	-	0.09374	0.021402	30.48	4.7	34.4	654
Gas Turbine 3			20100101	3s	742917	2043994	-	-	0.09374	0.021402	30.48	4.7	34.4	654
								Total	**0.28**	**6.40E-02**				
Safetech Corporation														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Ducon Incinerator, HC96-10P Model Two Chambers	PO Box 140909 Arecibo, PR 00634/Lote 30, Santana Industrial Park, Arecibo	Arecibo	50100103	Ducon	746938	2042285	Wet Scrubber	98	0.009	2.01E-03	27.4	1.2	29.6	1276
								Total	**0.009**	**2.01E-03**				

2016 Emissions Projection Year Inventory, Arecibo Lead SIP (Continued)

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP														
Antonio Nery Juarbe Airport														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Airport	1079 Santana Arecibo, PR 00612-6614	Arecibo		ANJ	785844	2041395	-	-	0.037	0.008447	-	-	-	-
								Total	**0.037**	**8.45E-03**				
Abbvie Ltd (Abbott Laboratories)														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Boiler 101	Road 2, Km 59, Barceloneta/PO BOX 278 BARCELONETA, PR 00617	Barceloneta	10200501		756337	2039253	-	-	0.00199	0.000454	60.3504	0.762	11.31722	415.3722
Boiler 102			10200501	EU8-P2	756337	2039253	-	-	0.00199	0.000454	60.3504	0.762	11.31722	415.3722
Cogeneration Unit			10100401	EU9-P1	756885	2039967	-	-	0.007517	0.001812	53.34	1.8288	24.9936	449.8167
Boiler 1			10200401	EU10-P1	756993	2039914	-	-	0.002513	0.000574	24.384	0.9144	10.0584	433.15
Boiler 4			10100501	EU11-P2	756993	2039914	-	-	0.002097	0.000479	24.384	0.9144	13.42034	425.3722
								Total	**0.0161**	**0.00377**				
Merck-Sharp & Dohme, Puerto Rico Branch														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
Boiler A, Serial: 02968	ROAD 2 KM 56.7 BARCELONETA/PO BOX 601 BARCELONETA	Barceloneta	10200401	EP-BOILER 1	759030	2039239	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler B, Serial: 06256			10200401	EP-BOILER 1	759030	2039239	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler C, Serial: 04043			10200401	EP-BOILER 2	759029	2039229	-	-	0.001029	0.000235	27.5	0.91	16.2	450
Boiler Cleaver Brook CB (Stand-by)			10100501	EP-BOILER 2	759029	2039229	-	-	0	0	27.432	1.2192	22.86	449.8167
Co-Generation Turbine, Serial: 83-			10100501	COGEN 1	759007	2039228	-	-	0.011286	0.002577	22.9	1.22	19.8	470
Rotary Kiln Incinerator			50300113	EP-RKI 1	759402	2039008	Wet & Collision Scrubber	99	0.00069	0.000158	27.5	0.91	9.2	390
			50300113						0.002135	0.000488				
			50300113						0.000281	6.41E-05				
Solvent Incinerator			50300113	EP-SOLV 1	759126	2039002	Caustic Wet Scrubber	-	0.000195	4.44E-05	14.48	0.36	12.29	361
Thermal Oxidation Units (2)			10100501	TOU	759129	2039148	Scrubber	95	0.000532	0.000122	6.096	0.4064	18.288	1255.372
								Total	**0.018**	**0.004156**				
Pfizer Pharmaceuticals LLC (Barceloneta)														
Emission Unit	**Address Physical/Postal**	**Municipality**	**SCC**	**Point ID**	**UTM**		**Control Equipment**	**Control Efficiency %**	**Emissions (ton/yr)**	**Model Emission Rate lbs/hr**	**Stack Height (m)**	**Stack Diameter (m)**	**Stack Exit Velocity (m/s)**	**Stack Temperature (K)**
					East	**North**			**Allowable**					
HRSG Cogeneration Unit (CU01)	Road 140, Km 64.4, Barceloneta/PO BOX 11247 BARCELONETA, PR 00617	Barceloneta	10100501	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.00027	57.912	1.0668	7.9248	422.0389
5 Electric Generation Engines			20200102	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.00027	57.912	0.762	15.5448	422.0389
Package Boiler (CU02)			10100501	PT02	756618	2039949	-		0.001183	0.00027	57.912	1.0668	7.9248	422.0389
								Total	**0.0035**	**0.00081**				

2016 Emissions Projection Year Inventory, Arecibo Lead SIP (Continued)

2016 EMISSIONS PROJECTION YEAR INVENTORY, ARECIBO LEAD SIP														
Eaton (Cutler-Hammer Electrical Company)														
Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
					East	North			Allowable					
Boiler 1	Road 681, Km 0.5, Arecibo/PO BOX	Arecibo	10300501	Eaton1	746475	2041401	-	-	0.000376	8.59E-05	11.5824	0.4572	14.6304	802.5944
Boiler 2			10300501	Eaton2	746475	2041401	-	-	0.000376	8.59E-05	11.5824	0.4572	14.6304	802.5944
								Total	**0.00075**	**0.000171**				
Sunbeam Synergy														
Emission Unit	Address Physical/Postal	Municipality	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)	Model Emission Rate lbs/hr	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
					East	North			Allowable					
MSW Gasifier	PR 140, Km 64.4 Barceloneta, PR	Barceloneta		MSW	757473	2038739	Baghouse	98	0.11	0.025114	30.48	0.914	60.12	394
								Total	**0.11**	**0.02511**				

Baseline Emission Inventory 2011, Arecibo Lead SIP

BASELINE EMISSION INVENTORY 2011 FOR ARECIBO LEAD SIP

Abbott Laboratories

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler 101	Road 2, Km 59, Barceloneta/PO BOX 278 BARCELONETA, PR 00617	Barceloneta	325412	10200501		756337	2039253	-	-	0.000758	0.00022	60.3504	0.762	11.31722	415.3722
Boiler 102				10200501	EU8-P2	756337	2039253	-	-	0.000758	0.00093	60.3504	0.762	11.31722	415.3722
Cogeneration Unit				10100401	EU9-P1	756885	2039967	-	-	0.007517	0.006558	53.34	1.8288	24.9936	449.8167
Boiler 1				10200501						0.000855	6.46E-05				
				10200401	EU10-P1	756993	2039914	-	-	0.000209	0.000968	24.384	0.9144	10.0584	433.15
Boiler 4				10100501						0.000855	0.000158				
				10200401	EU11-P2	756993	2039914	-	-	0.000209	0	24.384	0.9144	13.42034	425.3722
Boiler 6				10100501						0.000855	0				
				10200401	EU11-P3	756999	2039878	-	-	0.000209	0	24.384	0.762	16.48663	416.4833
									Total	**0.012**	**0.0088**				

Merck-Sharp & Dohme, Puerto Rico Branch

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Boiler A, Serial: 02968	ROAD 2 KM 56.7 BARCELONETA/PO BOX 601 BARCELONETA	Barceloneta	325412	10200401	EP-BOILER 1	759030	2039239	-	-	0.001029		27.5	0.91	16.2	450
				10100501						-	0.000199				
Boiler B, Serial: 06256				10200401	EP-BOILER 1	759030	2039239	-	-	0.001029		27.5	0.91	16.2	450
				10100501						-					
Boiler C, Serial: 04043				10200401	EP-BOILER 2	759029	2039229	-	-	0.001029		27.5	0.91	16.2	450
				10100501						-	0.000168				
Boiler Cleaver Brook CB				10100501	EP-BOILER 2	759029	2039229	-	-	0.000476		27.432	1.2192	22.86	449.8167
Co-Generation Turbine, Serial: 83-06				10100501	EP-COGEN 1	759007	2039228	-	-	0.011287	1.14E-05	22.9	1.22	19.8	470
Rotary Kiln Incinerator				50300113	EP-RKI 1	759402	2039008	Wet & Collision Scrubber	99	0.00069		27.5	0.91	9.2	390
				50300113						0.002135					
				50300113						0.000281					
Solvent Incinerator				50300113	EP-SOLV 1	759126	2039002	Caustic Wet Scrubber	-	0.000195		14.48	0.36	12.29	361
Thermal Oxidation Units (2)				10100501	TOU	759129	2039148	Scrubber	95	0.000532		6.096	0.4064	18.288	1255.372
									Total	**0.018**	**0.00037**				

Pfizer Pharmaceuticals LLC (Barceloneta)

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
HRSG Cogeneration Unit (CU01)	Road 140, Km 64.4, Barceloneta/PO BOX 11247 BARCELONETA, PR 00617	Barceloneta	325412	10100501	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183		57.912	1.0668	7.9248	422.0389
5 Electric Generation Engines				20200102	PT01	756618	2039949	Selective Catalytic Reduction	98.7	0.001183	0.001045	57.912	0.762	15.5448	422.0389
Package Boiler (CU02)				10100501	PT02	756618	2039949	-	-	0.001183	0	57.912	1.0668	7.9248	422.0389
									Total	**0.0035**	**0.00105**				

PREPA Cambalache

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM East	UTM North	Control Equipment	Control Efficiency %	Emissions (ton/yr) Allowable	Emissions (ton/yr) Actual	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
Gas Turbine 1	Road 681, Km 0.5, Arecibo/PO BOX 364267 SAN JUAN, PR 00936-4267	Arecibo	221112	20100101	1s	742887	2043963	-	-	0.055065	0.001753	30.48	4.7	34.4	654
Gas Turbine 2				20100101	2s	742907	2043974	-	-	0.055065	0.006958	30.48	4.7	34.4	654
Gas Turbine 3				20100101	3s	742917	2043994	-	-	0.055065	0.003103	30.48	4.7	34.4	654
									Total	**0.17**	**0.011**				

Baseline Emission Inventory 2011, Arecibo Lead SIP (Continued)

BASELINE EMISSION INVENTORY 2011 FOR ARECIBO LEAD SIP

Battery Recycling

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)		Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
						East	North			Allowable	Actual				
Lead Smelting Furnace, 5.0 m^3 (EU-1)	Road 2, Km 72.2, Cambalache Ward/PO BOX 1016 Arecibo, PR 00613-1016	Arecibo	331419	30301002	EP-1										
5 Molten Lead Refining Kettles Burners (EU2-6)				30400426	EP2-6	743546	2042005	Baghouse	99.5	0.59	-	20.6	1.58115	9.58	351.8
Main Building Fugitive Emissions					1	743541	2041976	-	-	0.35	-	-	-	-	-
Material Transport and Handling					2	743386	2042067	Water Sprinklers, Sweeper Machine	30	0.27	-	-	-	-	-
									Total	**1.21**	-				

Eaton (Cutler-Hammer Electrical Company)

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)		Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
						East	North			Allowable	Actual				
Boiler 1	PO Box 709 Arecibo, PR 00613-0709/Road 2, Km 67.6, Santana Industrial Park, Arecibo	Arecibo	335311	10300501	Eaton1	746475	2041401	-	-	0.000376	4.3E-05	11.5824	0.4572	14.6304	802.5944
Boiler 2				10300501	Eaton2	746475	2041401	-	-	0.000376	2.0E-05	11.5824	0.4572	14.6304	802.5944
									Total	**0.00075**	**6.20E-05**				

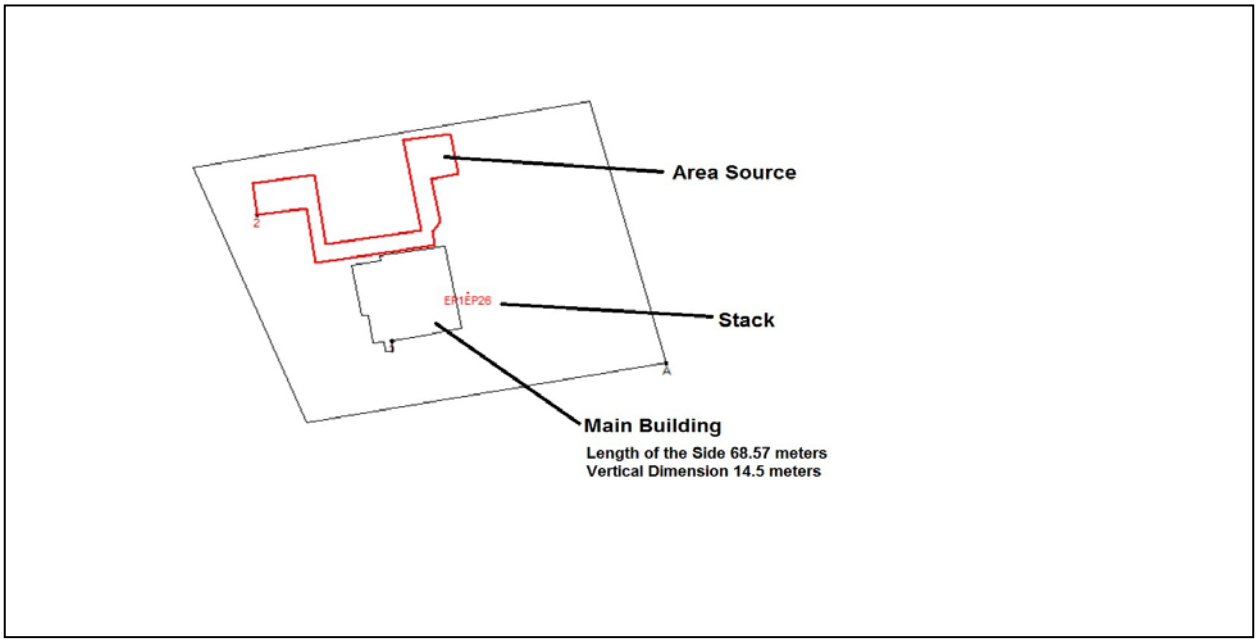
Safetech Corporation

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)		Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
						East	North			Allowable	Actual				
Ducon Incinerator, HC96-10P Model Two Chambers	PO Box 140909 Arecibo, PR 00634/Lote 30, Santana Industrial Park, Arecibo	Arecibo	562211	50100103	Ducon	746938	2042285	Wet Scrubber	98	0.009	0.009	27.4	1.2	29.6	1276
									Total	**0.009**	**0.009**				

Antonio Nery Juarbe Airport

Emission Unit	Address Physical/Postal	Municipality	NAICS	SCC	Point ID	UTM		Control Equipment	Control Efficiency %	Emissions (ton/yr)		Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)	Stack Temperature (K)
						East	North			Allowable	Actual				
Airport	1079 Santana Arecibo, PR 00612-6614	Arecibo	48811		ANJ	785844	2041395	-	-	-	0.00364	-	-	-	-
									Total	-	**0.00364**				

TBRCI Facility Layout



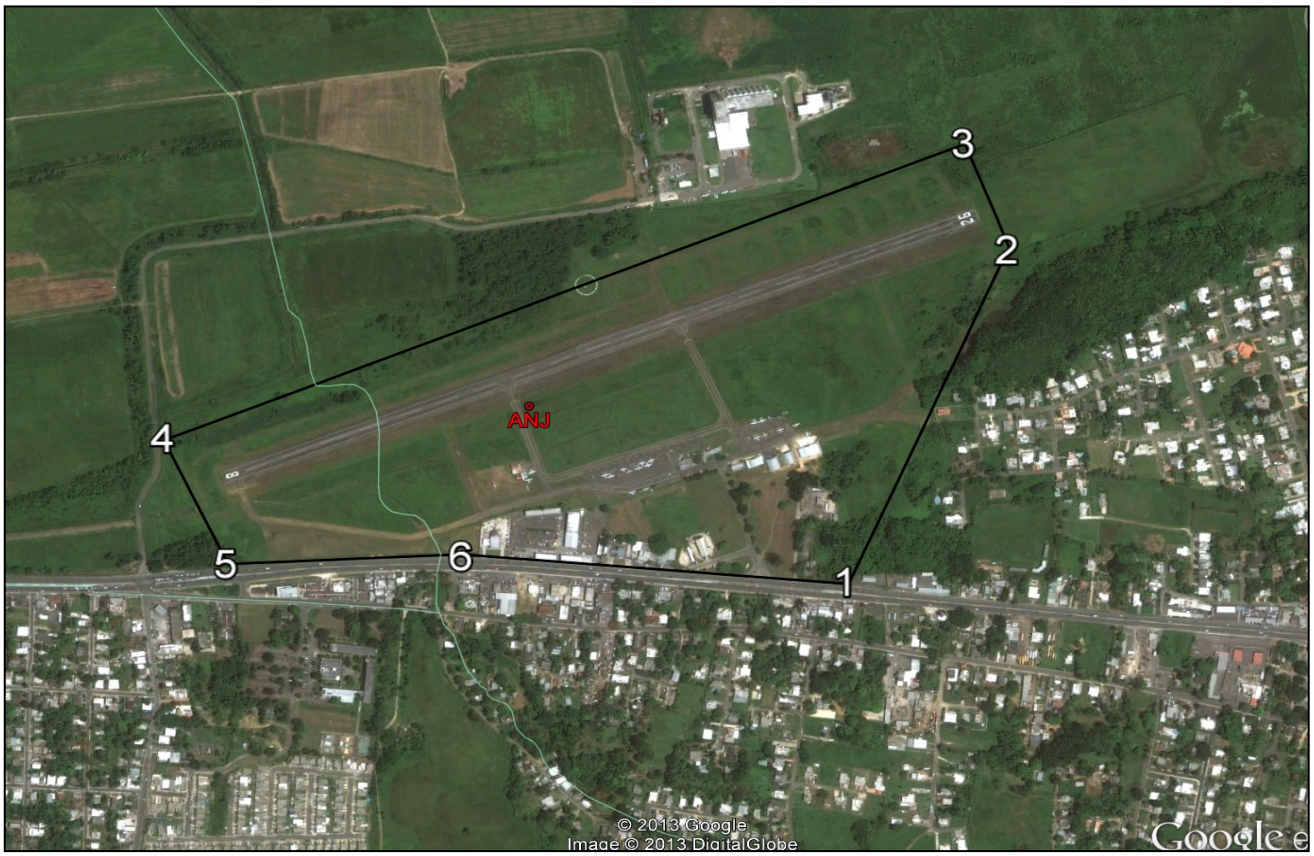
σ_{zo}= 68.57 meters/4.3 = 15.94 m

σ_{yo}= 14.5 meters/2.15 = 6.74 m

Area Source Tiers

Area Source		
Tiers	Easting m	Northing m
1	743386.59	2042067.55
2	743383.32	2042092.31
3	743429.30	2042099.32
4	743437.83	2042043.62
5	743509.97	2042054.84
6	743496.68	2042127.20
7	743532.44	2042132.31
8	743538.46	2042099.94
9	743517.69	2042095.80
10	743524.47	2042061.34
11	743518.54	2042053.84
12	743520.17	2042042.46
13	743430.52	2042028.47
14	743423.51	2042072.56

ANJ Airport Layout



Area Source Tiers

Tiers	Easting m	Northing m
1	745844	2041395
2	746069	2041924
3	745998	2042096
4	744817	2041576
5	744917	2041372
6	745268	2041396

Area = 506619 m^2

APPENDIX D: Attainment Model Results

A. Introduction

This document presents the attainment modeling results for the lead non-attainment area in Arecibo. In 2008 EPA promulgated the new National Ambient Air Quality Standard (NAAQS) for the lead rolling 3-month average of 0.15 ug/m^3. The new standard rule required a source oriented air quality monitor in all areas where the lead emissions are equal or more than 0.5 tons/yr.

In June 2010 PREQB installed a source oriented air quality monitor near The Battery Recycling Company Inc, (TBRCI) in Arecibo and capture a lead concentration over the new standard of 0.15 ug/m^3. In 2011, the area was declared as non-attainment for the new lead standard.

PREQB prepared the Revision to Puerto Rico State Implementation Plan (SIP) to Control Lead Emissions and the attainment modeling. PREQB also implemented control measures to reduce lead emissions in the non-attainment area. The air quality model used for the attainment modeling was AERMOD and this is the current preferred EPA model for air quality modeling studies. The lead emissions used in the attainment modeling study were the projected to 2016.

B. Emission Inventory

According to EPA recommendations the following municipalities were revised to prepare the Baseline Emission Inventory 2011 (BEI2011) and the Emission Projections Inventory 2016 (EPI2016): Arecibo, Barceloneta, Ciales, Florida, Hatillo and Utuado. The facilities in the BEI2011 that emit lead in Arecibo are TBRCI, Safetech Corporation, PREPA Cambalache and the Antonio Nery Juarbe Airport (ANJ). The other municipality that has background lead emission sources is Barceloneta and the following facilities were included in the BEI2011: Abbott Laboratories, Merck-Sharp & Dohme, Pfizer Pharmaceuticals LLC and Eaton. All industries were included in the EPI2016 along with the proposed new facilities, Energy Answers and Sunbeam Synergy.

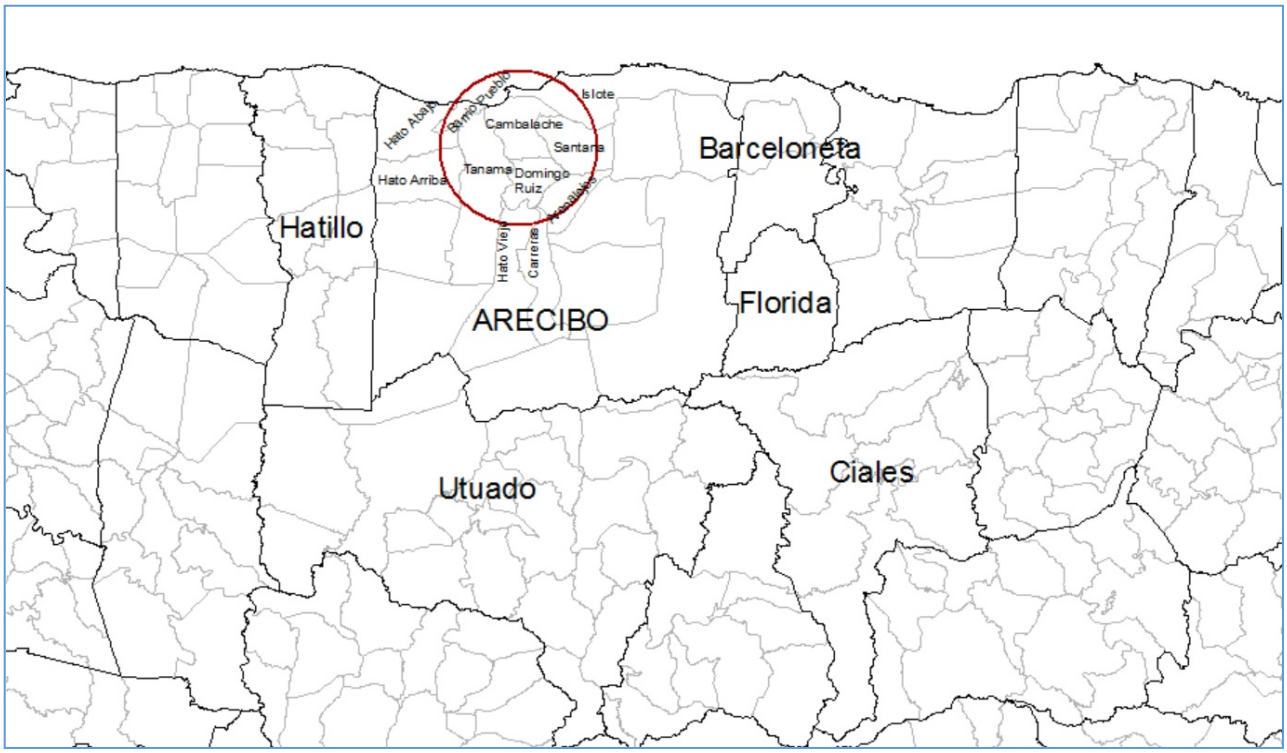
Energy Answers is planning to build a renewable energy plant near TBRCI and their projected lead emissions were included in the attainment model. Sunbean Synergy is also planning to build a renewable energy plant in Barceloneta and their projected lead emissions were also included in the attainment model.

The air quality model was AERMOD and this is the current preferred EPA model for air quality modeling studies. Following the EPA recommendations for the lead background concentration, a multi-source AERMOD run was performed, using the background lead emissions from facilities nearby Arecibo. The following municipalities were recommended by EPA to be included in the model along with Arecibo: Barceloneta, Ciales, Florida, Hatillo and Utuado.

For the attainment model an AERMOD run was performed using the lead emissions projected in the EPI2016. The Arecibo lead non-attainment area is a 4 km radio that includes the wards in Arecibo municipality that could be impacted with high lead concentrations, see Figure 1. This area

was selected with the maximum results of the lead designation model using the lead emissions in the BEI2011.

FIGURE 8: ARECIBO LEAD SIP IMPACT AREA



C. Model

The preferred EPA model AERMOD was used in the attainment model. The modeling scenario has all the facilities included in the EPI2016. TBRCI emission points were divided in three categories, stack, volume and area source fugitive emissions. PREQB will require TBRCI the full enclosure of the main process building as a control measure, then for the attainment model a 99.5% reduction with 95% capture efficiency will be consider for the volume fugitive lead emissions of the main process building. The area source represents the emissions generated from the vehicle movement and handling of materials between the carbon, scrap and soda ash storage, see modeling protocol. Control measures were also applied to the lead emissions of this area source, like the use of sweepers and water sprinklers during the transport and movement of materials, a vehicle cleaning station and pavement of the roads inside the facility.

EPA Leadpost processor was used for the calculation of the rolling 3-month average using the monthly modeling results. Background concentration was omitted because PREQB does not have a nearby lead air quality monitor that could be representative of the Arecibo area. The impact of the background lead emissions was evaluated using the multi-source modeling scenario.

D. Meteorology

One year of site-specific meteorological data from 1992-1993 collected in the PREPA Cambalache station was used in the model. The data was processed using the AERMET new version that incorporates two surface characteristics in cases of missing data. Meteorological data from San Juan station was used for the substitution of the site-specific missing data.

E. Results

The attainment modeling results are presented in the following tables. The Table 1 presents the lead modeling results for all the facilities in the multi-source model. Table 2 presents the results for the TBRCI facility emission points. The tables include the facility maximum lead monthly concentration, the lead cumulative monthly concentration result, the rolling 3-month average and their respective receptor coordinates. AERMOD attainment modeling output is in Appendix D-1.

TABLE 3: MULTI-SOURCE AERMOD MODELING RESULTS, ARECIBO LEAD SIP

Industry	Municipality	Results ug/m^3					
		Highest Monthly			Rolling 3-Month Average		
		Concentration	East (m)	North (m)	Concentration	East (m)	North (m)
Abbott	Barceloneta	0.00016	756500	2040000	0	743500	2042134
Eaton	Arecibo	0.00009	746250	2041250	0	743500	2042134
Merck	Barceloneta	0.00052	758500	2039000	0	743500	2042134
Pfizer	Barceloneta	0.00004	756000	2039500	0	743500	2042134
PREPA	Arecibo	0.00064	742250	2043750	0.2e-4	743500	2042134
Safetech	Arecibo	0.00013	746500	2042000	0.667e-5	743500	2042134
ANJ	Arecibo	0.05404	745500	2041750	0.473e-3	743500	2042134
Energy Answers	Arecibo	0.00077	741500	2042000	0.1e-4	743500	2042134
Battery	Arecibo	0.34704	743525	2042139	0.3308	743500	2042134

Recycling							
Cumulative Concentration	-	0.34729	743525	2042139	0.3313	743500	2042134

TABLE 2: TBRCI AERMOD MODELING RESULTS, ARECIBO LEAD SIP

TBRCI Emission Points	Model ID	Municipality	Results ug/m^3					
			Highest Monthly			**Rolling 3-Month Average**		
			Concentration	East (m)	North (m)	Concentration	East (m)	North (m)
Main Building	Fugitive	Arecibo	0.08686	743550	2042143	0.5527e-1	743500	2042134
Stack	BR		0.01835	743250	2042000	0.2113e-2	743500	2042134
Handling and Transport Area	Handling		0.29055	743500	2042134	0.2734	743500	2042134
Cumulative Concentration	Battery		0.34704	743525	2042139	0.3308	743500	2042134

The impact of the background sources in the Arecibo lead concentration was insignificant, see Table 1. All background concentrations were minimum or none. The multi-source model maximum cumulative monthly result was 0.34729 ug/m^3 with the major contribution from TBRCI with maximum lead monthly concentration of 0.34704 ug/m^3. These concentrations were registered in the same receptor, on the TBRCI property fenceline, see Figures 2 & 3.

The rolling 3-month average for the multi-source model was 0.3313 ug/m^3 with the major contribution from TBRCI with a rolling 3-month average of 0.3308 ug/m^3. Both results were registered in the same receptor of the TBRCI property fenceline or 735000 East/2042134 North. See Figure 4.

FIGURE 9: ARECIBO LEAD SIP, MULTI-SOURCE MODELING SCENARIO,

MAXIMUM MONTHLY RESULTS, UG/M^3

FIGURE 10: ARECIBO LEAD SIP, MULTI-SOURCE MODELING SCENARIO, TBRCI MAXIMUM MONTHLY RESULTS, UG/M^3

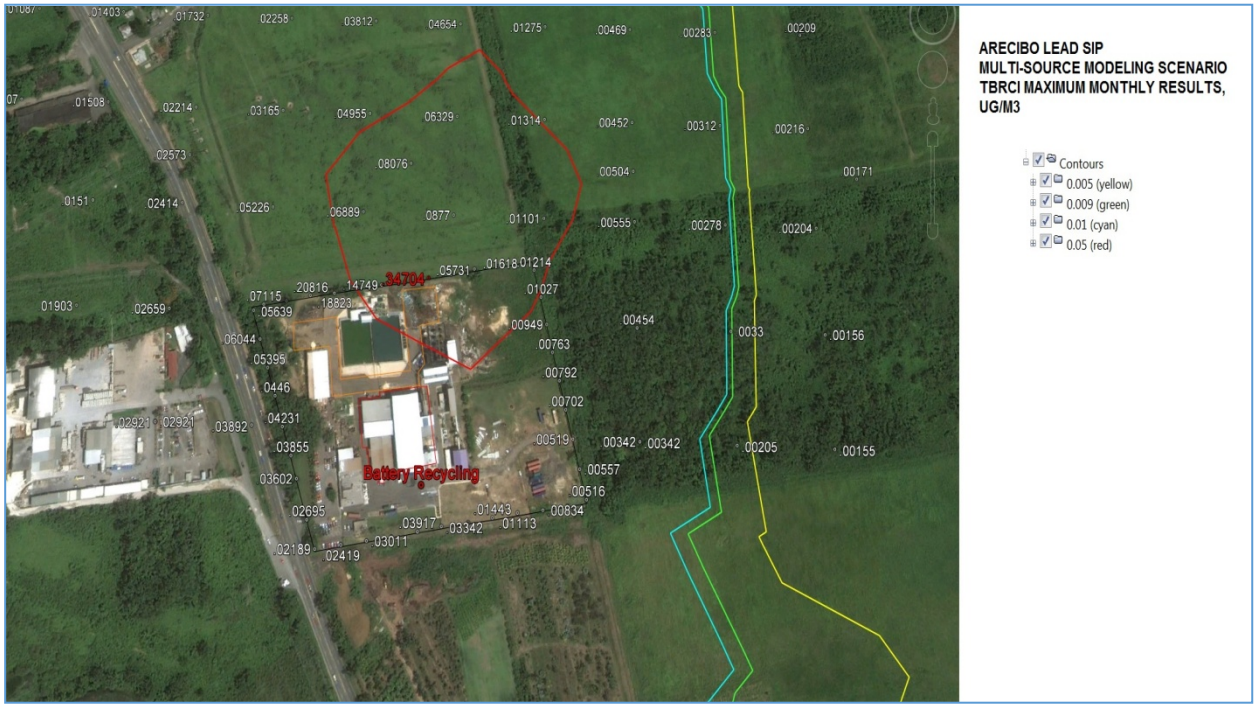


Figure 11: Arecibo Lead SIP, Multi-Source Modeling Scenario, Rolling 3-Month Average, ug/m^3

THE LEADPOST OUTPUT IS IN FIGURE 5 WITH THE ROLLING 3-MONTH AVERAGE FOR ALL THE FACILITIES INCLUDED IN THE ATTAINMENT MODELING AND THE CUMULATIVE RESULT. THE MULTI-SOURCE MODELING LEAD ROLLING 3-MONTH AVERAGE WAS 0.3313 UG/M^3. THE LEADPOST OUTPUT SHOWS THAT THE FACILITY WITH THE MAXIMUM CONTRIBUTION TO THE ROLLING 3-MONTH AVERAGE IS TBRCI WITH 0.3308 UG/M^3 AND THE TBRCI EMISSION POINT WITH THE MAJOR CONTRIBUTION TO THIS RESULT WAS THE HANDLING EMISSION POINT WITH 0.27342 UG/M^3. THE CONTRIBUTION OF OTHER FACILITIES AND TBRCI EMISSION POINTS WERE INSIGNIFICANT OR MINIMUM.

FIGURE 5: ARECIBO LEAD SIP, MULTI-SOURCE MODELING SCENARIO, LEADPOST

```
################################ SUMMARY ################################

Overall maximum 3-month averaged concentration
With individual source contributions

Month      Year              X              Y       Elev    Hill ht   Flagpole
April      1993   743500.12500  2042134.37500       3.00       3.00       0.00

Group      Concentration
ALL        0.331353E+00
BATTERY    0.330803E+00
HANDLING   0.273420E+00
FUGITIVE   0.552767E-01
BR         0.211333E-02
ANJ        0.473333E-03
SUNBEAM    0.233333E-04
PREPA      0.200000E-04
ENERGYA    0.100000E-04
SAFETECH   0.666667E-05
MERCK      0.333333E-05
EATON      0.000000E+00
PFIZER     0.000000E+00
ABBOTT     0.000000E+00


#########################################################################
```

OUTPUT

F. Conclusion

The Arecibo Lead SIP attainment modeling has a result over the rolling 3-month average standard. This concentration was registered in the TBRCI fenceline. There were other high monthly concentrations all registered in the TBRCI facility fenceline. TBRCI handling and transport lead emissions was the major contributor to these concentrations but none of them were registered outside the facility property.

Although the attainment modeling results showed high lead monthly concentrations and a rolling 3-month average over the standard, these results were in the facility fenceline and no concentrations over the lead standard or high monthly concentrations were found outside or nearby the facility property. Therefore, air quality monitoring in the TBRCI vicinity should be maintained after the implementation of control measures.

APPENDIX D-1: Attainment Modeling Results

```
*** AERMOD - VERSION  12345 ***   *** Lead Model Multi-Source Projected Emissions 2016          ***       08/01/13

                    *** Multisource + Enclosure Battery Recycling Emissions 2016 Stack + Fug ***       10:51:17

                                                                                  PAGE   1

 **MODELOPTs:  RegDFAULT CONC                                  ELEV

                 NODRYDPLT NOWETDPLT


                          ***     MODEL SETUP OPTIONS SUMMARY       ***


 **Model Is Setup For Calculation of Average CONCentration Values.


  --  DEPOSITION LOGIC  --

 **NO GAS DEPOSITION Data Provided.

 **NO PARTICLE DEPOSITION Data Provided.

 **Model Uses NO DRY DEPLETION.  DRYDPLT  =  F

 **Model Uses NO WET DEPLETION.  WETDPLT  =  F


 **Model Uses RURAL Dispersion Only.
```

**Model Uses Regulatory DEFAULT Options:

1. Stack-tip Downwash.

2. Model Accounts for ELEVated Terrain Effects.

3. Use Calms Processing Routine.

4. Use Missing Data Processing Routine.

5. No Exponential Decay.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates 1 Short Term Average(s) of: MONTH

**This Run Includes: 25 Source(s); 14 Source Group(s); and 1631 Receptor(s)

**The Model Assumes A Pollutant Type of: OTHER

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:

Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)

Model Outputs External File(s) of Concurrent Values for Postprocessing (POSTFILE Keyword)

Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours

m for Missing Hours

b for Both Calm and Missing Hours

**Misc. Inputs: Base Elev. for Pot. Temp. Profile (m MSL) = 10.00 ; Decay Coef. = 0.000 ; Rot. Angle = 0.0

Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = 0.10000E+07

Output Units = MICROGRAMS/M**3

**Approximate Storage Requirements of Model = 4.9 MB of RAM.

**Input Runstream File: LEAD2013FINALEPACOMMENTS_2yrs_OTHER.DTA

**Output Print File: LEAD2013FINALEPACOMMENTS_2yrs_OTHER.LST

**File for Summary of Results: C:\Documents Elianeth\D\My DocumentsINFORMES\LeadST\LEADSIP\Enclosure2013wihEPAFinalComments\LEA

*** AERMOD - VERSION 12345 *** *** Lead Model Multi-Source Projected Emissions 2016 *** 08/01/13

*** Multisource + Enclosure Battery Recycling Emissions 2016 Stack + Fug *** 10:51:17

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**MODELOPTs: RegDFAULT CONC ELEV

NODRYDPLT NOWETDPLT

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***

(1=YES; 0=NO)

1 1 1

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***

(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

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**MODELOPTs: RegDFAULT CONC ELEV

NODRYDPLT NOWETDPLT

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: CAM.SFC Met Version: 11059

Profile file: CAM.PFL

Surface format: FREE

Profile format: FREE

Surface station no.: 11641 Upper air station no.: 11641

Name: SAN_JUAN,PR Name: SAN_JUAN,PR

Year: 1992 Year: 1992

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
92	08	12	225	01	-19.1	0.185	-9.000	-9.000	-999.	183.	30.0	0.19	0.28	1.00	2.60	122.	10.0	295.9	2.0
92	08	12	225	02	-10.6	0.111	-9.000	-9.000	-999.	86.	11.7	0.19	0.28	1.00	2.20	126.	10.0	295.2	2.0
92	08	12	225	03	-17.1	0.165	-9.000	-9.000	-999.	155.	24.0	0.19	0.28	1.00	2.50	134.	10.0	295.2	2.0
92	08	12	225	04	-19.2	0.234	-9.000	-9.000	-999.	261.	60.6	0.19	0.28	1.00	2.80	139.	10.0	294.6	2.0
92	08	12	225	05	-19.1	0.234	-9.000	-9.000	-999.	260.	60.6	0.14	0.28	1.00	3.00	158.	10.0	295.0	2.0
92	08	12	225	06	-18.1	0.221	-9.000	-9.000	-999.	239.	54.1	0.19	0.28	1.00	2.70	139.	10.0	294.6	2.0
92	08	12	225	07	-11.4	0.234	-9.000	-9.000	-999.	260.	101.7	0.19	0.28	0.53	2.60	139.	10.0	294.9	2.0
92	08	12	225	08	26.7	0.296	0.489	0.005	158.	370.	-87.7	0.19	0.28	0.24	2.70	127.	10.0	297.2	2.0
92	08	12	225	09	62.6	0.651	1.015	0.005	606.	1208.	-399.9	0.19	0.28	0.16	6.30	106.	10.0	299.0	2.0
92	08	12	225	10	93.1	0.660	1.260	0.005	779.	1233.	-280.0	0.10	0.28	0.15	7.40	96.	10.0	302.4	2.0

92	08	12	225	11	115.9	0.697	1.391	0.005	843.	1336.	-264.7	0.10	0.28	0.14	7.80	73.	10.0	304.0	2.0
92	08	12	225	12	129.7	0.858	1.493	0.006	931.	1822.	-440.9	0.10	0.28	0.14	9.70	62.	10.0	303.9	2.0
92	08	12	225	13	133.6	0.808	1.582	0.006	1076.	1675.	-357.4	0.10	0.28	0.14	9.10	63.	10.0	304.0	2.0
92	08	12	225	14	130.0	0.799	1.631	0.006	1212.	1643.	-355.1	0.10	0.28	0.14	9.00	63.	10.0	303.1	2.0
92	08	12	225	15	116.0	0.688	1.619	0.005	1328.	1330.	-254.7	0.10	0.28	0.14	7.70	68.	10.0	301.0	2.0
92	08	12	225	16	94.3	0.685	1.548	0.005	1427.	1305.	-309.2	0.10	0.28	0.15	7.70	70.	10.0	301.0	2.0
92	08	12	225	17	65.0	0.715	1.389	0.006	1493.	1388.	-508.2	0.10	0.28	0.16	8.10	74.	10.0	300.8	2.0
92	08	12	225	18	29.9	0.683	1.079	0.006	1524.	1302.	-967.2	0.10	0.28	0.23	7.80	77.	10.0	300.5	2.0
92	08	12	225	19	-13.6	0.665	-9.000	-9.000	-999.	1249.	1962.5	0.10	0.28	0.50	7.70	80.	10.0	300.0	2.0
92	08	12	225	20	-44.1	0.432	-9.000	-9.000	-999.	703.	165.6	0.10	0.28	1.00	5.30	87.	10.0	299.1	2.0
92	08	12	225	21	-40.9	0.399	-9.000	-9.000	-999.	581.	140.6	0.19	0.28	1.00	4.30	102.	10.0	298.1	2.0
92	08	12	225	22	-25.2	0.244	-9.000	-9.000	-999.	293.	52.6	0.19	0.28	1.00	3.00	128.	10.0	296.8	2.0
92	08	12	225	23	-9.7	0.106	-9.000	-9.000	-999.	95.	11.2	0.19	0.28	1.00	2.10	109.	10.0	296.6	2.0
92	08	12	225	24	-22.9	0.222	-9.000	-9.000	-999.	241.	43.5	0.10	0.28	1.00	3.20	92.	10.0	296.4	2.0

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
92	08	12	01	2.0	0	-999.	-99.00	296.0	99.0	-99.00	-99.00

92 08 12 01 10.0 1 122. 2.60 -999.0 99.0 -99.00 -99.00

F indicates top of profile (=1) or below (=0)

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**MODELOPTs: RegDFAULT CONC ELEV

NODRYDPLT NOWETDPLT

*** THE SUMMARY OF HIGHEST MONTH RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

GROUP ID	AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	NETWORK OF TYPE GRID-ID

BR HIGH 1ST HIGH VALUE IS 0.01835 ON 93063024: AT (743250.00, 2042000.00, 7.00, 7.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.01687m ON 93073124: AT (743250.00, 2042000.00, 7.00, 7.00, 0.00) DC

FUGITIVE HIGH 1ST HIGH VALUE IS 0.08686m ON 92103124: AT (743549.49, 2042143.11, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.07433m ON 93043024: AT (743525.30, 2042139.24, 3.00, 3.00, 0.00) DC

HANDLING HIGH 1ST HIGH VALUE IS 0.29055 ON 92113024: AT (743500.14, 2042134.40, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.28392m ON 93043024: AT (743500.14, 2042134.40, 3.00, 3.00, 0.00) DC

BATTERY HIGH 1ST HIGH VALUE IS 0.34704m ON 93043024: AT (743525.30, 2042139.24, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.34528m ON 93043024: AT (743500.14, 2042134.40, 3.00, 3.00, 0.00) DC

PREPA HIGH 1ST HIGH VALUE IS 0.00064m ON 93073124: AT (742250.00, 2043750.00, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00057 ON 92083124: AT (742000.00, 2043500.00, 0.00, 0.00, 0.00) DC

SAFETECH HIGH 1ST HIGH VALUE IS 0.00013 ON 92083124: AT (746500.00, 2042000.00, 5.67, 5.67, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00011m ON 93073124: AT (746500.00, 2042000.00, 5.67, 5.67, 0.00) DC

ENERGYA HIGH 1ST HIGH VALUE IS 0.00077m ON 93073124: AT (741500.00, 2042000.00, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00067 ON 92083124: AT (741500.00, 2042000.00, 3.00, 3.00, 0.00) DC

ANJ HIGH 1ST HIGH VALUE IS 0.05404m ON 93043024: AT (745500.00, 2041750.00, 7.00, 7.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.05397 ON 92113024: AT (745500.00, 2041750.00, 7.00, 7.00, 0.00) DC

ABBOTT HIGH 1ST HIGH VALUE IS 0.00016m ON 93073124: AT (756500.00, 2040000.00, 95.00, 128.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00015 ON 93063024: AT (756500.00, 2040000.00, 95.00, 128.00, 0.00) DC

MERCK HIGH 1ST HIGH VALUE IS 0.00052m ON 93073124: AT (758500.00, 2039000.00, 89.00, 167.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00041 ON 92083124: AT (758500.00, 2039000.00, 89.00, 167.00, 0.00) DC

PFIZER HIGH 1ST HIGH VALUE IS 0.00004 ON 92083124: AT (756000.00, 2039500.00, 85.00, 121.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00003 ON 93053124: AT (756000.00, 2039500.00, 85.00, 121.00, 0.00) DC

EATON HIGH 1ST HIGH VALUE IS 0.00009 ON 92083124: AT (746250.00, 2041250.00, 13.00, 13.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00008m ON 93073124: AT (746250.00, 2041250.00, 13.00, 13.00, 0.00) DC

SUNBEAM HIGH 1ST HIGH VALUE IS 0.00209m ON 93073124: AT (757000.00, 2038500.00, 110.67, 200.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.00191 ON 92083124: AT (757000.00, 2038500.00, 110.67, 200.00, 0.00) DC

ALL HIGH 1ST HIGH VALUE IS 0.34729m ON 93043024: AT (743525.30, 2042139.24, 3.00, 3.00, 0.00) DC

HIGH 2ND HIGH VALUE IS 0.34553m ON 93043024: AT (743500.14, 2042134.40, 3.00, 3.00, 0.00) DC

*** RECEPTOR TYPES: GC = GRIDCART

GP = GRIDPOLR

DC = DISCCART

DP = DISCPOLR

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**MODELOPTs: RegDFAULT CONC ELEV

NODRYDPLT NOWETDPLT

*** Message Summary : AERMOD Model Execution ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)

A Total of 8 Warning Message(s)

A Total of 96 Informational Message(s)

A Total of 8760 Hours Were Processed

A Total of 0 Calm Hours Identified

A Total of 96 Missing Hours Identified (1.10 Percent)

******** FATAL ERROR MESSAGES ********

*** NONE ***

```
********   WARNING MESSAGES   ********

SO W320      57  PPARM:Input Parameter May Be Out-of-Range for Parameter          VS


SO W320     111  PPARM:Input Parameter May Be Out-of-Range for Parameter          VS

ME W396    1769 MEOPEN:Met data from outdated version of AERMET, version:       11059

OU W565    1773 OUPOST:Possible Conflict With Dynamically Allocated FUNIT     POSTFILE

OU W565    1783 OUPOST:Possible Conflict With Dynamically Allocated FUNIT     POSTFILE


OU W565    1784 OUPOST:Possible Conflict With Dynamically Allocated FUNIT     POSTFILE

OU W565    1785 OUPOST:Possible Conflict With Dynamically Allocated FUNIT     POSTFILE

OU W565    1786 OUPOST:Possible Conflict With Dynamically Allocated FUNIT     POSTFILE
```