November 18, 2020

Maggie Crocker
Environmental Manager
Buick Resource Recycling Division
18594 Hwy KK
Boss, MO 65440

RE: New Source Review Permit - Project Number: 2020-04-028

Dear Maggie Crocker:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application, and with your operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

This permit may include requirements with which you may not be familiar. If you would like the department to meet with you to discuss how to understand and satisfy the requirements contained in this permit, an appointment referred to as a Compliance Assistance Visit (CAV) can be set up with you. To request a CAV, please contact the Southeast Regional Office or fill out an online request. The regional office contact information can be found at the following website: http://dnr.mo.gov/regions/. The online CAV request can be found at http://dnr.mo.gov/cav/compliance.htm.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to §§621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the administrative hearing commission, whose contact information is: Administrative Hearing Commission, United States Post Office Building, 131 West High Street, Third Floor, P.O. Box 1557, Jefferson City, Missouri 65102, phone: 573-751-2422, fax: 573-751-5018, website: www.oa.mo.gov/ahc.

If you have any questions regarding this permit, please do not hesitate to contact Alana Hess, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Susan Heckenkamp
New Source Review Unit Chief

SH:aha

Enclosures

c: Southeast Regional Office
PAMS File: 2020-04-028

Permit Number: 112020-011

MISSOURI DEPARTMENT OF NATURAL RESOURCES

## MISSOURI AIR CONSERVATION COMMISSION

# PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 112020-011 Project Number: 2020-04-028
Installation Number: 093-0009

Parent Company: The Doe Run Company

Parent Company Address: 1801 Park 270 Dr., Suite 300, St. Louis, MO 63146

Installation Name: Buick Resource Recycling Division

Installation Address: 18594 Hwy KK, Boss, MO 65440

Location Information: Iron County, S14, T34N, R2W

Application for Authority to Construct was made for:
Installation of a new stabilization process for blast furnace slag, soil, scrubber gypsum, and wastewater treatment solids. This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*.

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☐ Standard Conditions (on reverse) are applicable to this permit.

☑ Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

Kendall B. Hale

Director or Designee
Department of Natural Resources

November 18, 2020

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if the permittee fails to begin construction or modification within two years from the effective date of this permit. The permittee should notify the Enforcement and Compliance Section of the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

The permittee will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

The permittee must notify the Enforcement and Compliance Section of the Department's Air Pollution Control Program of the anticipated date of start up of these air contaminant sources. The information must be made available within 30 days of actual startup. Also, the permittee must notify the Department's Southeast Regional Office within 15 days after the actual start up of these air contaminant sources.

A copy of the permit application and this permit and permit review shall be kept at the installation address and shall be made available to Department's personnel upon request.

The permittee may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If the permittee chooses to appeal, the permittee must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If the permittee chooses not to appeal, this certificate, the project review, the application, and associated correspondence constitutes the permit to construct. The permit allows the permittee to construct and operate the air contaminant sources, but in no way relieves the permittee of the obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources, and other applicable federal, state, and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit using the contact information below.

Contact Information:
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102-0176
(573) 751-4817

The regional office information can be found at the following website:
http://dnr.mo.gov/regions/

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

*The special conditions listed in this permit were included based on the authority granted to the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060(3)(E) "Conditions required by permitting authority."*

Buick Resource Recycling Division
Iron County, S14, T34N, R2W

1. Haul Road Requirements
   A. EU-139 Paved Haul Road – Slag Processing to CMSB, EU-140 Paved Haul Road – CMSB to Landfill, and EU-141 Unpaved Haul Road at Landfill are subject to MACT X. Buick Resource Recycling Division shall update their MACT X Fugitive Dust Standard Operating Procedures Manual within 30 days of permit issuance to include these haul roads and specify the frequency of their required cleaning/watering.

   B. All vehicles exiting the slag processing area and the CMSB are subject to MACT X and shall be washed in accordance with the MACT X Fugitive Dust Standard Operating Procedures Manual requirements.

2. Lead Emission Limitation
   A. Buick Resource Recycling Division shall emit less than 0.01 tons of Lead Compounds from EU-130 Re-Feed Hopper, EU-131 Transfer Screw, EU-132 Belt Press, EU-133 Weigh Belt Feeder, EU-136 Paddle Mixer, EU-137 Loadout Screw, and EU-138 Truck Loadout to Landfill in any consecutive 12-month period.

   B. Attachment A, or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program shall be used to demonstrate compliance with Special Condition 2.A.

3. Moisture Testing
   A. Buick Resource Recycling Division shall determine the moisture content of the blast furnace slag, wastewater treatment plant solids, soil, and scrubber gypsum processed by the new stabilization process.

   B. Testing shall be conducted according to the method prescribed by the American Society for Testing Materials (ASTM) D-2216, C-566, or another method approved by the Director. For each sampling event, a minimum of three samples of each material shall be tested. Each sample shall be taken from a different location within the material pile.

   C. The initial test shall be conducted no later than 45 days after processing a material for the first time. Subsequent testing shall be performed once per

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

calendar quarter for each material processed by the new stabilization process during the calendar quarter.

D. The written analytical report shall include the raw data and moisture content of each sample, the test date, and the original signature of the individual performing the test. The report shall be filed on-site or at the Buick Resource Recycling Division main office within 30 days of completion of the required test.

E. The average moisture content from the three samples of each material shall be used in Attachment A.

4. Lead Testing

A. Buick Resource Recycling Division shall determine the lead content of the blast furnace slag, wastewater treatment plant solids, soil, and scrubber gypsum processed by the new stabilization process.

B. Testing shall be conducted according to the EPA Method 6010B or other methods approved by the Air Pollution Control Program. A minimum of three samples of each material shall be tested. Each sample shall be taken from a different location within the material pile.

C. The initial test shall be conducted no later than 45 days after processing a material for the first time. Subsequent testing shall be performed once per calendar quarter for each material processed by the new stabilization process during the calendar quarter.

D. The written analytical report shall include the raw data and lead content of each sample, the test date, and the original signature of the individual performing the test. The report shall be filed on-site or at the Buick Resource Recycling Division main office within 30 days of completion of the required test.

E. The average lead content from the three samples of each material shall be used in Attachment A.

5. Record Keeping and Reporting Requirements

A. Buick Resource Recycling Division shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.

B. Buick Resource Recycling Division shall report to the Air Pollution Control Program's Compliance/Enforcement Section, by mail at P.O. Box 176, Jefferson City, MO 65102 or by email at

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

AirComplianceReporting@dnr.mo.gov, no later than 10 days after the end of the month during which any record required by this permit shows an exceedance of a limitation imposed by this permit.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (5) REVIEW
Project Number: 2020-04-028
Installation ID Number: 093-0009
Permit Number:112020-011

Installation Address:
Buick Resource Recycling Division
18594 Hwy KK
Boss, MO 65440

Parent Company:
The Doe Run Company
1801 Park 270 Dr., Suite 300
St. Louis, MO 63146

Iron County, S14, T34N, R2W

## REVIEW SUMMARY

- Buick Resource Recycling Division has applied for authority to install a new stabilization process for blast furnace slag, soil, and wastewater treatment solids.

- The application was deemed complete on September 2, 2020.

- HAP emissions are expected from the proposed equipment. Blast furnace slag, soil, scrubber gypsum, and wastewater treatment solids contain lead, arsenic, antimony, cadmium, chromium, and nickel. Material handling will result in emission of these metals. The silt on the haul roads contains lead. Lead will be emitted during use of the haul roads.

- 40 CFR Part 63, Subpart X – *National Emission Standards for Hazardous Air Pollutants From Secondary Lead Smelting* is applicable to the haul roads associated with this project (EU-139, EU-140, and EU-141). Under current normal operations, blast furnace slag, soil, and scrubber gypsum do not meet the definition of *lead bearing material* at §63.542; therefore, EU-130 through EU-138 are not subject to MACT X. The wastewater treatment area is exempt from MACT X per §63.544(b).

- The haul roads associated with this project are subject to MACT X, which requires cleaning, watering, and/or application of dust suppressant according to the frequency in the installation's approved MACT X Fugitive Dust Standard Operating Procedures Manual.

- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*. Potential emissions of lead are above the SMAL, but below the de minimis level.

- This installation is located in Iron County, a lead nonattainment area and an attainment/unclassifiable area for all other criteria pollutants.

- This installation is on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2, Item #19 – *Secondary metal production plants*. The installation's major source level is 100 tons per year and fugitive emissions are counted toward major source applicability.

- Ambient air quality modeling of PM, $PM_{10}$, and $PM_{2.5}$ was not performed as potential emissions of the application are below de minimis levels. Ambient air quality modeling of arsenic, antimony, cadmium, chromium, and nickel was not performed as potential emissions of the application are below the SMALs. Ambient air quality modeling of lead was not performed as the haul roads are subject to MACT X and EU-130 thru EU-133 and EU-136 thru EU-138 are being conditioned below the SMAL.

- Emissions testing is not required for the equipment as a part of this permit. Testing may be required as part of other state, federal or applicable rules.

- The installation of the new stabilization process is an off-permit change (see 10 CSR 10-6.065(5)(C)9) to the installation's current Part 70 operating permit. The stabilization process shall be included in the installation's Part 70 operating permit renewal application, due by no later than June 30, 2023.

- Approval of this permit is recommended with special conditions.

## INSTALLATION DESCRIPTION

The Doe Run Company owns and operates the Buick Resources Recycling Division located near Boss, Missouri. The Doe Run Company purchased the property on November 1, 1986 when it was known as the AMAX primary lead smelter. In 1989, the Doe Run Company received a PSD permit to convert the primary smelter to a secondary smelter for battery recycling. Buick Resources Recycling Division began operation as a lead-acid battery recycling operation and a secondary lead smelter in 1991.

Buick Resources Recycling Division receives and processes approximately 460 million pounds of lead-bearing materials annually, including approximately 13.5 million recycled lead-acid batteries each year. Other recycled lead-bearing materials include ammunition, submarine ballasts, lead-bearing glass, and lead-based paint blasting grit material and debris, as well as cathode ray tube (CRT) glass. The installation converts these materials into pure lead and lead alloys for new products. The installation is an existing major source for both construction and operating permits. The installation operates under Part 70 operating permit OP2018-116 which was issued December 31, 2018. The installation's secondary metal production operations consist of three main areas: raw material preparation, smelting, and refining. The installation also contains other miscellaneous operations.

Raw Material Preparation

Buick Resource Recycling Division receives automotive and industrial batteries, lead dross, lead fume, and other lead bearing materials from over the road trucks. Approximately 75 percent or more of the lead recycled at the installation comes from automotive and industrial batteries. The materials received are sorted during the unloading process for efficient processing at the installation.

Blast Furnace Feed

The feed to the blast furnace consists of metallurgical coke, iron scrap, lime (limestone), silica, lead bearing scrap, and other plant secondaries (i.e. dross and slag) generated by the smelting and refining operations. The metallurgical coke, iron scrap, limestone, and silica are delivered to the installation by trucks and placed into dedicated storage piles, segregated by feed material type. The installation uses a front-end loader, equipped with an on-board scale for weight measurement of the individual feed components, to retrieve the feed materials from the individual dedicated storage piles, and then transfer them to a charge hopper. This hopper empties onto the main conveyor that delivers the blended feed materials to the blast furnace. The component "blend" sent to the blast furnace is dependent on the specific metallurgical properties desired for the product lead.

BSN Process

Trucks containing lead-acid batteries and other lead bearing materials are unloaded at the receiving dock. The batteries are either stored in areas adjacent to the dock or immediately processed. There are two major types of lead acid batteries: starting, lighting, and ignition (SLIs) which are relatively small, like a car battery, and industrial batteries from large equipment or large capacity power backup. Industrial batteries often come in a steel outer casing and the battery cells must either be pulled or cut from the outer casing before processing. Industrial batteries that must have the steel cut off are taken to the industrial line cutting station adjacent to the receiving dock. Once removed from the steel outer casing industrial batteries are stored or processed like other batteries.

Each lead-acid battery contains metal grids, lead posts, plastic components, separators, lead sulfate paste, and battery acid (weak sulfuric acid). Approximately one-third of all batteries received still have a charge on them; therefore, the batteries must be shredded. After coming off a truck or from storage, batteries are placed onto a tilt table and vibrating pan that feeds the battery shredder. The batteries are then shredded in the battery shredder. After the batteries are shredded, they move to a vibrating screen. A conveyor transfers oversized material from the vibrating screen to the conveyor (8210) that feeds the hammer mill. Electrolyte (dilute sulfuric acid) is removed in the vibrating screen and drains to the V102, V103, and V104 electrolyte storage tanks. The overflow is conveyed to the electrolyte tank (referred to as the "Pinta" tank). Some residual acid remains on the lead bearing material.

The 8210 conveyor feeds the lead bearing material into the hammer mill. From the hammer mill, battery components go to an enclosed vibrating screen that washes lead sulfate paste off the components. The lead sulfate paste is directed to the 202 Tank for holding and settling. Paste from the 202 Tank is pumped to the 301A or B Tanks, which feed the filter press. The filter press squeezes excess liquid from the lead sulfate paste. The lead sulfate paste is stored in the Paste Bunker.

From the enclosed vibrating screen, all remaining components (plastic, posts and grids, and separators[1]) go to a hydrodynamic separator to separate out the posts and grids. The posts and grids proceed via two enclosed conveyors to the Paste Bunker where they are stored for later processing in the blast furnace or reverberatory furnace. The remaining materials from the hydrodynamic separator (the plastic and separators) are then sent to a trommel screen to remove any fines. The fines proceed to the sink float and onto a screw conveyor, which conveys the fines to the Paste Bunker. Plastics and separators go to a hydrostatic separator tank to separate the separators from the recyclable plastics. The separators move through an enclosed conveyor to Separator Storage. The plastics are sent to a wash tank (known as a “poly wash tank”). After the poly wash tank the plastics proceed through a trommel screen and through a screw conveyor. After the screw conveyor, the material moves through a poly blower and to a truck to transport the plastics off-site for recycling.

The entire BSN process is contained within the BSN building. The BSN building (TE-5 BSN Building) contains *lead bearing material* and is required to meet the total enclosure standards at §63.544. Each vent from the total enclosure is required to meet the process vent standards at §63.543. To achieve compliance with the process vent standards for the BSN Process, the installation uses three different control devices: CD-103 BSN Baghouse, CD-101 Receiving Dock Baghouse, and CD-10 BSN Scrubber.

The following equipment/processes in lead bearing material service vent to CD-103 BSN Baghouse:

- Steel Conveyor
- Battery shredder
- Acid vibrator
- V102 tank
- H103 conveyor
- 8210 conveyor
- Diversion chute
- Vibrating hopper
- Paste bunker
- Acid Filter Press

[1] A battery separator is the material that separates the positive plate from the negative plate in the internal portions of the battery container. It offers resistance to electrical conductivity for isolation of the electrodes. Separators are electrically insulating membranes whose ionic resistance is brought into the desired range by manipulating the membrane thickness and porosity. Separator composition varies due to different types of batteries and different manufacturers. A typical separator composition is 29% moisture, 27% carbon, 10% lead, 22.7% silicon dioxide, 5% oxygen, and 6.3% other elements.

The following equipment/processes in lead bearing material service vent to CD-101 Receiving Dock Baghouse:

- Truck unloading of batteries
- Palletized storage area
- Industrial battery dump
- Battery tilters
- Vibration pan

The following equipment/processes are either a sulfuric acid mist emission source or are in *lead bearing material* service and vent to CD-10 BSN Scrubber:

- Industrial battery cutting station
- V103 tank
- V104 tank
- Hammer mill
- Paste vibrator
- Hydrodynamic separator
- First trommel
- Hydrostatic separator
- Second trommel
- Poly wash tank
- Santa maria/paste settler
- 202 tank paste
- 301A tank
- 301B tank
- Paste filter press
- 311C tank
- 311F tank

Drum Shredder Process

The drum shredder is a Saturn Model No. 60-44HT with two 300 HP motors and a 22.25” cutter diameter. The Drum Shredder has a maximum hourly design rate of 25 tph. The Drum Shredder is located in a three-sided bunker within the Paste Storage Room. A door separates the three-sided bunker from the Drum Shredder Room. The door is opened to access the Drum Shredder, but remains closed at all other times. Emissions from the Drum Shredder route to EP-31B Drum Shredder Hygiene Baghouse and EP-31C Drum Shredder Process Baghouse.

The drum shredder is used to shred containers of *lead bearing material* such as manufacturing plant scrap, post-consumer lead bearing materials, batteries without free liquid, and remediation materials. Iron and steel from the shredded material is magnetically separated from the *lead bearing material* and stored for later use in the blast furnace. The lead is stored for later processing in the blast or reverberatory furnaces.

The Paste Bunker, the three-sided Drum Shredder bunker, and the Drum Shredder Room are all located within the larger BSN building (TE-5 BSN Building) which meets

the definition of *total enclosure* under §63.542, meets the requirements of §63.544(c)(1) and (2), and is monitored pursuant to §63.548(k).

Sweat Furnaces

Two sweat furnaces (also known as reclamation furnaces) are used to remove metal and nonmetal contaminants from lead bearing scrap cables and related lead scrap metal. The scrap wire is fed to a sweat furnace, which is fired with propane. The propane burners on each sweat furnace are rated at 7.5 MMBtu/hr. The installation heats the lead scrap in the sweat furnace to drive off the nonmetal contaminants and to sweat the lead from the metals with higher melting points. The installation taps lead from the sweat furnace into molds. The installation processes the molds in the refinery area.

Each sweat furnace exhausts to an afterburner to control volatile organic materials driven off in the furnace. The installation vents emissions from the afterburners to CD-38 Process Baghouse or CD-9 Main Baghouse for filterable particulate control. The sweat furnaces are located in the TE-4 Hot Metals Building total enclosure.

Smelting

The smelting process produces lead by melting and separating the lead from other metal and non-metal contaminants and by reducing oxides to elemental lead. The installation performs smelting in two different furnaces – the blast furnace or the reverberatory furnace.

Blast Furnace and Slag Processing

The blast furnace utilizes several different types of raw materials to produce a hard lead. Hard lead has a high antimony content (~3.0%). The raw materials for the blast furnace include iron, limestone, silica, pretreated lead bearing scrap materials, and other plant secondaries (i.e. recycled dross, rerun slag, and flue dust). The raw materials are fed to the blast furnace through a series of conveyors. The installation layers the raw materials in the top of the blast furnace with metallurgical coke. As the raw materials slowly move through the furnace, the material becomes fluid as the metallurgical coke burns and melts the charge. Within the blast furnace, lead oxides are reduced to elemental lead and the limestone and iron form a slag byproduct. The blast furnace also operates a propane burner rated at 2 MMBtu/hr.

The molten lead and slag are transferred to a settler that separates the two components. The lead is poured into a transfer pot and is further processed in the refinery. The slag is water granulated, separated, and then disposed of in the onsite landfill.

The exhaust from the blast furnace is transferred through a cooling chamber and then to either CD-38 Process Baghouse (normal operating mode) or CD-9 Main Baghouse (bypass mode) for filterable particulate control. The dust captured in these baghouses is recycled back into the blast furnace feed or reverberatory furnace feed.

The blast furnace, settler, transfer pot, and conveyer 3110 are located in the TE-4 Hot Metal Building which meets the definition of *total enclosure* under §63.542.

Reverberatory Furnace

The reverberatory furnace produces a soft lead. Soft lead is a product with low antimony content. Soft lead is typically produced from the battery paste from the BSN Process.

The battery paste is transferred from the Paste Bunker using front-end loaders and dump trucks. The trucks unload the paste into the reverberatory feed storage building. The paste is then mixed with fluxes and other material prior to being placed into the screw feed system. The screw feeders then continuously deliver the feed materials to the reverberatory furnace.

The reverberatory furnace has internal dimensions of approximately 17 feet by 35 feet. The reverberatory furnace contains five oxy-fuel fired propane burners; three rated at 10 MMBtu/hr and two rated at 6 MMBtu/hr. Oxy-fuel fired means that the installation uses oxygen as the combustion gas rather than ambient air. During oxy-firing, oxygen replaces more than 90% of the nitrogen in the combustion gas. Exhaust gases from the reverberatory furnace vent to an afterburner. Excess air blown into the afterburner oxidizes sulfur compounds to $SO_2$ and CO to $CO_2$. The afterburner is designed to operate at approximately 1900°F with a residence time of 1 second. From the afterburner, exhaust gases enter the sonic cooler where the temperature of the gas is reduced using air and water sprays. In Normal Operating Mode, gases from the sonic cooler route to a baghouse to control filterable particulates and then to a dry lime scrubber. In the dry lime scrubber, hydrated lime absorbs $SO_2$ and $SO_3$. The gas stream then passes through another baghouse before venting to atmosphere. The installation recycles dust from the baghouses by transferring the dust via enclosed screw conveyors back to the reverberatory furnace or blast furnace. During Scrubber Bypass Operating Mode, the installation routes the exhaust gases from the sonic cooler to CD-38 Process Baghouse or CD-9 Main Baghouse prior to venting to the atmosphere. The installation adds soda ash to the reverberatory furnace feed during Scrubber Bypass Operating Mode to reduce $SO_2$ emissions.

The installation continuously taps the reverberatory furnace slag via a water-cooled launder. The slag produced in the reverberatory furnace contains a significant amount of lead; therefore, the slag is recycled back to either the reverberatory furnace or the blast furnace. The installation taps lead intermittently using an underflow siphon lead well from the reverberatory furnace to a 225-ton dross kettle.

The waste from the scrubber is processed by a pug mill to reach a moisture content of 20 to 25 percent, by weight, prior to disposal in the onsite landfill or an offsite landfill.

Refining and Casting

The refinery area receives crude lead from the smelting area. In the refinery area, the installation softens, alloys, and/or oxidizes the lead to achieve the desired degree of purity and the desired type of lead alloy.

Dross Kettles

The installation has five 225-ton dross kettles (D1-D5). Agents used to create dry dross typically include coke breeze, sawdust, and ebonite. The installation pumps lead from underneath the dross layer to a refinery kettle (R1 or R2). Dross kettles D1 and D2 have a combined propane burner rating of 9 MMBtu/hr. Dross kettles D3-D5 have a combined propane burner rating of 9 MMBtu/hr.

Both process and combustion emissions from the five dross kettles (D1-D5) are vented to CD-9 Main Baghouse.

Refinery Kettles

Refinery kettles R1 and R2 receive lead from the smelting area. The installation makes numerous different alloys for customers. All refinery kettles, excluding R5 and R6, are used to perform various treatments, and to add alloying materials. The treatments performed include those to remove copper, tin, antimony, and arsenic. Several reagents are used to perform these treatments including pyrite, sulfur, caustic, and sodium nitrate. After treatments are performed, the dross that forms is skimmed from the top of the kettle using an overhead crane and this dross is transferred to either drums or containers for shipment to customers or a wet dross screw conveyor. The wetted dross from the screw conveyor is transferred to the smelting furnace for metals recovery. Kettles R5 and R6 are used to remove zinc from the molten metal using vacuum seal hoods. From the refinery kettles lead is pumped to the casting machines.

Each refinery kettle, with the exception of R10, has a capacity of 225 tons. R10 has a capacity of 70 tons.

The installation vents process emissions from refinery kettles R1, R2, and R4 to CD-28 North Refinery Baghouse. The installation vents process emissions from refinery kettles R3 and R7 through R10 to CD-38 Process Baghouse (normal operating mode) or CD-9 Main Baghouse (bypass mode). Process emissions from refinery kettles R5, R6, R11, and R12 vent to CD-40 ERP Baghouse.

Refinery kettles R1 and R2 have a combined propane burner rating of 11.5 MMBtu/hr.
Refinery kettles R3 and R4 have a combined propane burner rating of 11.5 MMBtu/hr.
Refinery kettles R5 and R6 have a combined propane burner rating of 11.5 MMBtu/hr.
Refinery kettles R7 and R8 have a combined propane burner rating of 13.5 MMBtu/hr.
Refinery kettles R9 and R10 have a combined propane burner rating of 8.4 MMBtu/hr.
Refinery kettles R11 and R12 have a combined propane burner rating of 12 MMBtu/hr.
Combustion emissions from refinery kettles R1 through R8 are uncontrolled.

Combustion emissions from refinery kettles R9 through R12 vent to CD-40 ERP Baghouse.

Casting Machines

The installation pumps lead to the casting machines from the refinery kettles. The installation may cast the lead into 1-ton blocks, ½-ton blocks, 100-pound pigs, 60-pound pigs, or billets of various weights.

There are two pig-casting machines, a single block caster, and a single billet-casting machine. The lines that transfer lead to the casting machines have a 0.608 MMBtu/hr propane burner that keeps the lead molten as it is transferred. Both process and combustion emissions from the casting machines vent to CD-81 Baghouse.

Other Operations

Pallet Burning/Grinding

The installation receives *lead bearing materials*, raw materials, and warehouse supplies on wooden pallets. The installation disposes of clean wooden pallets (i.e. those that have not been contaminated with battery acid and are not covered in lead bearing dust) by grinding them or incinerating them.

Incineration occurs in an ACD, which is capable of incinerating 30 tons per day. The ACD forms a high velocity airflow. The installation directs the airflow over/into the fire pit creating a circular current of air. The continued airflow keeps the fire temperature high to achieve better combustion. The curtain of air created in the process traps unburned fine particles under the curtain in the high temperature zone. The increased combustion time and turbulence result in a reburn and more complete combustion of the wooden pallets. The installation provides airflow to the ACD using a 66 hp diesel engine.

Grinding is performed by the pallet grinder (Maxigrind 460G), which is rated at 22.5 tph. The installation powers the pallet grinder with a diesel engine (Caterpillar 3406). A conveyor transfers the ground wood from the pallet grinder to a 0.36-acre storage pile. The installation uses the ground wood for ground cover on tailing piles.

Steel Processing

The installation receives and generates several pieces of steel contaminated with *lead bearing material*. In the steel processing building cutting torches and mechanical shears are used to cut the contaminated steel into small pieces in order to feed the steel to the blast furnace as a flux and to recover the lead. Additionally, steel may be cleaned in this area to allow for offsite recycling of the metal.

Landfill

Slag, gypsum, and other waste materials generated onsite are landfilled onsite. The landfill consists of approximately 13 acres; of that amount, approximately eight acres have been closed and re-vegetated.

Cooling Towers

The installation contains four cooling towers. Two cooling towers with a circulation rate of approximately 800 gpm each are associated with the blast furnace. One cooling tower with a circulation rate of approximately 800 gpm is associated with the reverberatory furnace. One cooling tower with a circulation rate of 600 gpm is associated with the refinery area.

Gasoline Storage

The installation contains a 1,950-gallon gasoline storage tank, which is used to fuel mobile equipment.

Emergency Fire Pump

The installation maintains a 115 HP diesel fired engine to pump firewater in case of an emergency during a power outage. The installation fuels the engine with diesel from a 1,950-gallon diesel storage tank. The installation also utilizes the diesel storage tank to fuel mobile equipment.

Change house Boiler

The installation operates a boiler to provide hot water for their employee showers and to heat the change house building. The Change house boiler is rated at 2.93 MMBtu/hr propane.

Haul Roads

The installation contains multiple paved haul roads and one unpaved haul road. Due to the amount of lead processed onsite, lead is present in the silt on the haul roads. These haul roads are fugitive emission sources. As the installation is named, the installation must count fugitive emissions major source applicability. The installation controls emissions from the haul roads by sweeping and applying water.

The following NSR permits have been issued to Buick Resource Recycling Division by the Air Pollution Control Program.

**Table 1: NSR Permit History**

| Permit Number | Description |
|---|---|
| 0179-018 | Minor source permit |
| 0989-003 | Major source permit |
| 0792-016 | Minor source permit |

| Permit Number | Description |
|---|---|
| 0493-006 | Minor source permit |
| 1093-010 | Minor source permit |
| 0693-013 | Minor source permit |
| 1093-003 | Minor source permit |
| 0989-003 | Minor source permit |
| 0989-003A | Amendment |
| 1095-009 | Minor source permit |
| 1296-012 | Minor source permit |
| 0297-015 | Minor source permit |
| 0997-006 | Minor source permit |
| 102000-007 | Minor source permit |
| 012005-008[2] | PSD – increase production |
| 092006-007 | Minor NSR – new multi-hearth rotary furnace |
| 012005-008A | PSD amendment |
| 012010-006 | Minor NSR – 34.87 MMBtu/hr propane boiler |
| 012005-008B | No permit required |
| 062011-004 | Minor NSR – install afterburner on reverberatory furnace |
| 102011-005 | Minor NSR – install 22.5 tph wood processing pallet grinder |
| 012005-008C | PSD amendment |
| 092014-006 | Minor NSR – install ERP Kettles |
| 062011-004A | Amendment to re-evaluate NOx emissions from afterburner |
| 072015-013 | Minor NSR – convert propane combustion sources to natural gas |
| 072015-017 | Minor NSR – install air curtain incinerator |
| 092014-006A | Extension |
| 052017-004 | Minor NSR – replace and relocate Drum Shredder |
| 072015-013A | Extension |

## PROJECT DESCRIPTION

The Doe Run Company is proposing to construct a new stabilization process at Buick Resource Recycling Division in Boss, MO. The purpose of the new stabilization process is to stabilize lead-containing material so that the material can be landfilled as non-hazardous waste. The process includes a new belt press (EU-132) for removing moisture from the blast furnace slag. The belt press dewaters the blast furnace slag by applying pressure to squeeze out the water. The slag is sandwiched between two tensioned porous belts, which are passed over and under rollers of various diameters.

Blast furnace slag containing ~30% moisture will be loaded into a series of existing screw conveyors (EU-60) to move the material onto a new transfer screw conveyor (EU-131). A new re-feed hopper (EU-130) containing soil, scrubber gypsum, and/or wastewater treatment solids also moves material to EU-131. From EU-131, material enters the new belt press (EU-132).

- Based on blast furnace slag assays from February 2020, the maximum HAP metal content of the blast furnace slag is 8.14 wt% lead, 0.05 wt% arsenic, 0.31 wt% antimony, and 0.14 wt% nickel.

[2] The installation did receive permits prior to PSD Permit 012005-008; however, all provisions of those permits have since been superseded.

- Based on wastewater treatment solids assays from 2019 and 2020, the minimum moisture content is 44.6% and the maximum HAP metal content is 0.08% arsenic, 0.03% cadmium, 0.01% chromium, and 8.75% lead.
- Based on waste soil assays from 2019 and 2020, the minimum moisture content is 8.48% and the maximum HAP metal content is 0.06% arsenic, 0.43% cadmium, and 7.63% lead.

Following the belt press, the material will contain ~15% moisture. The material will then be loaded out of the belt press onto a weigh belt feeder (EU-133), and then loaded into a paddle mixer (EU-136). In the paddle mixer, the material is mixed with a calcium silicate-based product for stabilizing and encapsulating the lead and other metals. For every ton of material requiring stabilization, 0.05 tons of stabilizer is required. The calcium silicate-based stabilizer will be stored in a silo (EU-134) and loaded into the paddle mixer by a screw conveyor (EU-135). The stabilized material will be loaded out of the paddle mixer into trucks (EU-137) and driven (EU-139) to the Covered Material Storage Building (CMSB). From the CMSB, the stabilized material will be hauled (EU-140) to the existing onsite landfill (EU-141) and unloaded (EU-138).

The physical MHDR of the stabilization process is 25 tph.

The only controls associated with the new blast furnace slag treatment process is the watering/cleaning of the haul roads and vehicle washing required by MACT X.

## EMISSIONS/CONTROLS EVALUATION

Particulate emissions from EU-130 thru EU-135, EU-137, and EU-138 were determined using the drop point equation (Equation 1) from EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Section 13.2.4 “Aggregate Handling and Storage Piles” (November 2006), assuming an average wind speed of 10 mph. The worst-case material was evaluated for each pollutant. Scrubber gypsum, with a minimum moisture content of 1.06%, was the worst-case material for PM, $PM_{10}$, and $PM_{2.5}$. Stabilizer was evaluated at the minimum moisture content (0.25%) within the allowable range for the drop point equation.

Particulate emissions from EU-136 were determined using the concrete batch mixing equation from EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Section 11.12 “Concrete Batching” (June 2006), assuming an average wind speed of 10 mph. The worst-case material was evaluated for each pollutant. Scrubber gypsum, with a minimum moisture content of 1.06%, was the worst-case material for PM, $PM_{10}$, and $PM_{2.5}$. Stabilizer was evaluated at the minimum moisture content (0.25%) within the allowable range for the drop point equation.

HAP metal emissions from EU-130 thru EU-138 were determined by multiplying the HAP metal content by the PM emission factor. Soil, with a minimum moisture content of 8.48%, a maximum lead content of 7.63%, a maximum cadmium content of 0.43%, and a maximum arsenic content of 0.06%, was determined to be the worst-case material for lead, cadmium, and arsenic. Blast furnace slag, with a minimum moisture content of 15%, a maximum antimony content of 0.31%, and a maximum nickel content of 0.14%,

was determined to be the worst-case material for antimony and nickel. Wastewater treatment plant solids with a minimum moisture content of 44.6% and a maximum chromium content of 0.01%, was determined to be the worst-case material for chromium.

Particulate emissions from EU-139 and EU-140 were determined using AP-42 Section 13.2.1 “Paved Roads” (January 2011). EU-139 has a length of 1,515 feet. EU-140 has a length of 2,700 feet. Unloaded and loaded truck weights of 15 tons and 40 tons were assumed. According to the June 2000 dust samples from the site, the silt loading is 1.785 g/m$^2$ and contains 5.75% lead. A 50% control efficiency was applied for the watering/cleaning required by MACT X.

Particulate emissions from EU-141 were determined using AP-42 Section 13.2.2 “Unpaved Roads” (November 2006). EU-138 has a length of 150 feet. Unloaded and loaded truck weights of 15 tons and 40 tons were assumed. According to the June 2000 dust samples from the site, the silt content is 19.5% and contains 5.75% lead. A 50% control efficiency was applied for the watering required by MACT X.

Table 2 provides an emissions summary for this project. Existing potential emissions from the installation are unknown, but certain pollutants are known to be major based on past actual emissions. Existing actual emissions were taken from the installation’s 2019 EIQ. Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8760 hours per year).

**Table 2: Emissions Summary (tpy)**

| Pollutant | Regulatory *De Minimis* Levels | Existing Potential Emissions | Existing Actual Emissions (2019 EIQ) | Potential Emissions of the Project |
|---|---|---|---|---|
| PM | 25.0 | N/D | N/D | 15.99 |
| $PM_{10}$ | 15.0 | N/D | 57.82 | 6.59 |
| $PM_{2.5}$ | 10.0 | N/D | 56.89 | 1.01 |
| $SO_x$ | 40.0 | Major | 2,855.48 | N/A |
| $NO_x$ | 40.0 | N/D | 37.84 | N/A |
| VOC | 40.0 | N/D | 10.68 | N/A |
| CO | 100.0 | Major | 14,930.06 | N/A |
| Combined HAPs | 25.0 | Major | 13.91 | 0.32 |
| Lead Compounds | 10.0[3] | Major[4] | 3.50 | 0.32 |
| Arsenic Compounds | 10.0[5] | N/D | 0.32 | 4.97E-4 |

[3] This value represents the de minimis level for the hazardous air pollutant aggregate group “Lead Compounds”. The SMAL is 0.01 tpy. The de minimis level for the criteria pollutant “Lead” is 0.6 tpy.
[4] The installation is major for the hazardous air pollutant aggregate group “Lead Compounds”. It has not been determined if the installation is major for the criteria pollutant “Lead”.
[5] The SMAL is 0.005 tpy.

| Pollutant | Regulatory *De Minimis* Levels | Existing Potential Emissions | Existing Actual Emissions (2019 EIQ) | Potential Emissions of the Project |
|---|---|---|---|---|
| Antimony Compounds | 10.0[6] | N/D | N/D | 1.26E-3 |
| Nickel Compounds | 10.0[7] | N/D | 0.01 | 5.69E-4 |
| Cadmium Compounds | 10.0[8] | N/D | 0.04 | 3.09E-3 |
| Chromium Compounds | 10.0[9] | N/D | <0.01 | 4.73E-5 |

N/A = Not Applicable; N/D = Not Determined

Potential emissions of the project are over the SMAL for lead both including and excluding the haul roads. The haul roads are subject to MACT X, which has undergone RTR. EU-130 thru EU-138 do not meet the definition of *lead bearing material* in MACT X and are subject to the SMAL. In order to avoid SMAL modeling, the installation has accepted a lead limit equivalent to the SMAL.

PSD is not applicable to this project as the emission increase from this project is less than the significance levels.

Another project, Project 2020-06-039, was submitted by the installation during the review of this project. The installation states that these projects do not require aggregation as they are not technically dependent on each other and are not part of the same capital expenditure. The installation states that this project was part of their 2020 budget while Project 2020-06-039 is still in the engineering feasibility phase and any required capital expenditure would not occur for at least six months.

## PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*. Potential emissions of lead are above the SMAL, but below the de minimis level.

## APPLICABLE REQUIREMENTS

Buick Resource Recycling Division shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the

[6] The SMAL is 5 tpy.
[7] The SMAL is 1 tpy.
[8] The SMAL is 0.01 tpy.
[9] The SMAL for Chromium Compounds is 5 tpy. The SMAL for Chromium (VI) Compounds is 0.002 tpy. It is unknown how much of the measured chromium is chromium (VI); however, project chromium emissions are below both the chromium compounds and the chromium (VI) compounds SMALs.

application, has been verified at the time this application was approved. For a complete list of applicable requirements for the installation, please consult Part 70 operating permit OP2018-116.

GENERAL REQUIREMENTS

- 10 CSR 10-6.065 *Operating Permits*
- 10 CSR 10-6.050 *Start-Up, Shutdown, and Malfunction Conditions*
- 10 CSR 10-6.110 *Submission of Emission Data, Emission Fees and Process Information*
    - Per 10 CSR 10-6.110(4)(B)2.B(II) and (4)(B)2.C(II) a full EIQ is required every year for Part 70 installations
- 10 CSR 10-6.170 *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*
- 10 CSR 10-6.220 *Restriction of Emission of Visible Air Contaminants*
- 10 CSR 10-6.165 *Restriction of Emission of Odors*

SPECIFIC REQUIREMENTS

- 10 CSR 10-6.400 *Restriction of Emission of Particulate Matter From Industrial Processes*
- 10 CSR 10-6.120 *Restriction of Emissions of Lead From Specific Lead Smelter-Refinery Installations*
- 10 CSR 10-6.075 *MACT Regulations*
    - 40 CFR Part 63, Subpart X - *National Emission Standards for Hazardous Air Pollutants From Secondary Lead Smelting*

## STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060 *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated April 15, 2020 received April 21, 2020 designating The Doe Run Company as the owner and operator of the installation.

# Attachment A - Lead Compliance Worksheet, pg. 1

Buick Resource Recycling Division
Iron County, S14, T34N, R2W
Project Number: 2020-04-028
Installation ID Number: 093-0009
Permit Number: 112020-011

This sheet covers the period from _____ to _____.
(month, year) (month, year)

| Test Date (Month/Year) | Average Blast Furnace Slag Moisture Content (%) | Average Blast Furnace Slag Lead Content (%) | Blast Furnace Slag Lead Emission Factor[10] (lb/ton) |
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[10] Blast Furnace Slag Lead Emission Factor (lb/ton) = $\frac{1.17E-2}{\left(\left(\frac{Average\ Blast\ Furnace\ Slag\ Moisture\ Content\ (\%)}{2}\right)^{1.4}\right)}$ x Average Blast Furnace Slag Lead Content (%)/100 + 1.88E-2 x Average Blast Furnace Slag Lead Content (%)/100 x Average Blast Furnace Slag Moisture Content (%)

# Attachment A - Lead Compliance Worksheet, pg. 2

| Test Date (Month/Year) | Average WWTP[11] Solids Moisture Content (%) | Average WWTP Solids Lead Content (%) | WWTP Solids Lead Emission Factor[12] (lb/ton) |
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[11] WWTP = Wastewater Treatment Plant

[12] WWTP Solids Lead Emission Factor (lb/ton) = $\frac{1.17E-2}{\left(\left(\frac{Average\ WWTP\ Solids\ Moisture\ Content\ (\%)}{2}\right)^{1.4}\right)}$ x Average WWTP Solids Lead Content (%)/100 + 1.88E-2 x Average WWTP Solids Lead Content (%)/100 x Average WWTP Solids Moisture Content (%)

# Attachment A - Lead Compliance Worksheet, pg. 3

| Test Date (Month/Year) | Average Soil Moisture Content (%) | Average Soil Lead Content (%) | Soil Lead Emission Factor[13] (lb/ton) |
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[13] If the average soil moisture content is greater than 15%: Soil Lead Emission Factor (lb/ton) = $\frac{1.17E-2}{\left(\left(\frac{Average\ Soil\ Moisture\ Content\ (\%)}{2}\right)^{1.4}\right)}$ x Average Soil Lead Content (%)/100 + 1.88E-2 x Average Soil Lead Content (%)/100 x Average Soil Moisture Content (%)

If the average soil moisture content is less than or equal to 15%: Soil Lead Emission Factor (lb/ton) = $\frac{2.33E-2}{\left(\left(\frac{Average\ Soil\ Moisture\ Content\ (\%)}{2}\right)^{1.4}\right)}$ x Average Soil Lead Content (%)/100 + $\frac{1.11E-2}{\left(\left(\frac{Average\ Soil\ Moisture\ Content\ (\%)}{2.1}\right)^{1.4}\right)}$ x Average Soil Lead Content (%)/100 + $\left(\frac{5.42E-3}{\left(\frac{Average\ Soil\ Moisture\ Content\ (\%)}{1.05}\right)^{0.9}} + 0.001\right)$ x $\frac{Average\ Soil\ Lead\ Content\ (\%)/100}{1.05}$

# Attachment A - Lead Compliance Worksheet, pg. 4

| Test Date (Month/Year) | Average Scrubber Gypsum Moisture Content (%) | Average Scrubber Gypsum Lead Content (%) | Scrubber Gypsum Lead Emission Factor[14] (lb/ton) |
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[14] Scrubber Gypsum Lead Emission Factor (lb/ton) = $\frac{2.33E-2}{\left(\left(\frac{Average\ Gypsum\ Moisture\ Content\ (\%)}{2}\right)^{1.4}\right)}$ x Average Gypsum Lead Content (%)/100

$+\frac{1.11E-2}{\left(\left(\frac{Average\ Gypsum\ Moisture\ Content\ (\%)}{2.1}\right)^{1.4}\right)}$ x Average Gypsum Lead Content (%)/100 + $\left(\frac{5.42E-3}{\left(\frac{Average\ Gypsum\ Moisture\ Content\ (\%)}{1.05}\right)^{0.9}} + 0.001\right)$ x $\frac{Average\ Gypsum\ Lead\ Content\ (\%)/100}{1.05}$

# Attachment A - Lead Compliance Worksheet, pg. 5

| Date (Month/Year) | Blast Furnace Slag Processed (tons) | WWTP Solids Processed (tons) | Soil Processed (tons) | Scrubber Gypsum Processed (tons) | Monthly Lead Emissions[15] (tons) | 12-Month Rolling Total Lead Emissions[16] (tons) |
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[15] Monthly Lead Emissions (tons) = [Blast Furnace Slag Processed (tons) x Blast Furnace Slag Lead Emission Factor (lb/ton) + Wastewater Treatment Plant Solids Processed (tons) x Wastewater Treatment Plant Solids Lead Emission Factor (lb/ton) + Soil Processed (tons) x Soil Lead Emission Factor (lb/ton) + Scrubber Gypsum (tons) x Scrubber Gypsum Lead Emission Factor (lb/ton)] x 0.0005 (tons/lb).

[16] 12-Month Rolling Total Lead Emissions (tons) = the sum of the 12 most recent Monthly Lead Emissions (tons). **12-Month Rolling Total Lead Emissions of less than 0.01 tons indicates compliance with Special Condition 2.**

Lead (Pb) Emission Factor Equations Derivations:

Pb emissions from the stabilization process =

EU-130 Transfer Point Pb emissions + EU-131 Transfer Point Pb emissions + EU-132 Transfer Point Pb emissions + EU-133 Transfer Point Pb emissions + EU-137 Transfer Point Pb emissions + EU-138 Transfer Point Pb emissions + EU-136 Paddle Mixer Pb emissions =

EU-130 Transfer Point PM emissions x Pb content + EU-131 Transfer Point PM emissions x Pb content + EU-132 Transfer Point PM emissions x Pb content + EU-133 Transfer Point PM emissions x Pb content + EU-137 Transfer Point PM emissions x Pb content + EU-138 Transfer Point PM emissions x Pb content + EU-136 Paddle Mixer PM emissions x Pb content =

$$0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M1}{2}\right)^{1.4}} \times Pb_1 + 0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M1}{2}\right)^{1.4}} \times Pb_1 + 0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M2}{2}\right)^{1.4}} \times Pb_2 + 0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M2}{2}\right)^{1.4}} \times Pb_2 + 0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M3}{2}\right)^{1.4}} \times Pb_3 + 0.74 \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M3}{2}\right)^{1.4}} \times Pb_3 + \left(0.19 \times 0.0032 \times \frac{(U)^{0.95}}{(M_3)^{0.9}} + 0.001\right) \times Pb_3 =$$

$$2 \times \left(2.37E-3 \times \frac{\left(\frac{10}{5}\right)^{1.3}}{\left(\frac{M1}{2}\right)^{1.4}} \times Pb_1\right) + 2 \times \left(2.37E-3 \times \frac{\left(\frac{10}{5}\right)^{1.3}}{\left(\frac{M2}{2}\right)^{1.4}} \times Pb_2\right) + 2 \times \left(2.37E-3 \times \frac{\left(\frac{10}{5}\right)^{1.3}}{\left(\frac{M3}{2}\right)^{1.4}} \times Pb_3\right) + \left(6.08E-4 \times \frac{(10)^{0.95}}{(M_3)^{0.9}} + 0.001\right) \times Pb_3 =$$

$$\left(\frac{1.17E-2}{\left(\frac{M1}{2}\right)^{1.4}} \times Pb_1\right) + \left(\frac{1.17E-2}{\left(\frac{M2}{2}\right)^{1.4}} \times Pb_2\right) + \left(\frac{1.17E-2}{\left(\frac{M3}{2}\right)^{1.4}} \times Pb_3\right) + \left(\frac{5.42E-3}{(M_3)^{0.9}} + 0.001\right) \times Pb_3$$

Where:
$M_1$ = The initial moisture content of the material.
$M_2$ = The moisture content after the belt press. The belt press removes water. If $M_1 \geq 15\%$, $M_2 = 15\%$. If $M_1 < 15\%$, $M_2 = M_1$.
$M_3$ = The moisture content after the addition of stabilizer. $M_3 = M_2/1.05$. For every ton of material requiring stabilization, 0.05 tons of stabilizer is required. So, if $M_1 \geq 15\%$, $M_3 = 14.29\%$. If $M_1 < 15\%$, $M_3 = M_1/1.05$.
$Pb_1$ = The initial lead content of the material.
$Pb_2$ = The lead content after the belt press. The belt press removes water. If $M_1 \geq 15\%$, $Pb_2 = Pb_1 \times M_1/15\%$. If $M_1 < 15\%$, $Pb_2 = Pb_1$.
$Pb_3$ = The lead content after the addition of stabilizer. $Pb_3 = Pb_2/1.05$. For every ton of material requiring stabilization, 0.05 tons of stabilizer is required. So, if $M_1 \geq 15\%$, $Pb_3 = Pb_1 \times M_1 / 15.75\%$. If $M_1 < 15\%$, $Pb_3 = Pb_1/1.05$.

# APPENDIX A

## Abbreviations and Acronyms

**%**.....percent
**ºF**.....degrees Fahrenheit
**acfm**.....actual cubic feet per minute
**BACT**.....Best Available Control Technology
**BMPs**.....Best Management Practices
**Btu**.....British thermal unit
**CAM**.....Compliance Assurance Monitoring
**CAS**.....Chemical Abstracts Service
**CEMS**.....Continuous Emission Monitor System
**CFR**.....Code of Federal Regulations
**CO**.....carbon monoxide
**$CO_2$**.....carbon dioxide
**$CO_2e$**.....carbon dioxide equivalent
**COMS**.....Continuous Opacity Monitoring System
**CSR**.....Code of State Regulations
**dscf**.....dry standard cubic feet
**EIQ**.....Emission Inventory Questionnaire
**EP**.....Emission Point
**EPA**.....Environmental Protection Agency
**EU**.....Emission Unit
**fps**.....feet per second
**ft**.....feet
**GACT**.....Generally Available Control Technology
**GHG**.....Greenhouse Gas
**gpm**.....gallons per minute
**gr**.....grains
**GWP**.....Global Warming Potential
**HAP**.....Hazardous Air Pollutant
**hr**.....hour
**hp**.....horsepower
**lb**.....pound
**lbs/hr**.....pounds per hour
**MACT**.....Maximum Achievable Control Technology
**$\mu g/m^3$**.....micrograms per cubic meter
**m/s**.....meters per second
**Mgal**.....1,000 gallons
**MW**.....megawatt
**MHDR**.....maximum hourly design rate
**MMBtu**....Million British thermal units
**MMCF**.....million cubic feet
**MSDS**.....Material Safety Data Sheet
**NAAQS**....National Ambient Air Quality Standards
**NESHAPs** National Emissions Standards for Hazardous Air Pollutants
**$NO_x$**.....nitrogen oxides
**NSPS**.....New Source Performance Standards
**NSR**.....New Source Review
**PM**.....particulate matter
**$PM_{2.5}$**.....particulate matter less than 2.5 microns in aerodynamic diameter
**$PM_{10}$**.....particulate matter less than 10 microns in aerodynamic diameter
**ppm**.....parts per million
**PSD**.....Prevention of Significant Deterioration
**PTE**.....potential to emit
**RACT**.....Reasonable Available Control Technology
**RAL**.....Risk Assessment Level
**RTR**.....Risk and Technology Review
**SCC**.....Source Classification Code
**scfm**.....standard cubic feet per minute
**SDS**.....Safety Data Sheet
**SIC**.....Standard Industrial Classification
**SIP**.....State Implementation Plan
**SMAL**.....Screening Model Action Levels
**$SO_x$**.....sulfur oxides
**$SO_2$**.....sulfur dioxide
**SSM**.....Startup, Shutdown & Malfunction
**tph**.....tons per hour
**tpy**.....tons per year
**VMT**.....vehicle miles traveled
**VOC**.....Volatile Organic Compound