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NARRATIVE

TO: Cynthia Dorrough

FROM: Jada Levers

DATE: July 3, 2023

Facility Name:	**Aurubis Richmond LLC**
AIRS No.:	245-00209
Location:	Augusta, GA (Richmond County)
Application #:	28917
Date of Application:	June 20, 2023

Background Information

Aurubis Richmond LLC (Aurubis) is planning to construct a copper scrap recycling plant on Valencia Way in Augusta, Georgia. The facility will process low-grade copper bearing scrap materials, Waste Electrical and Electronic Equipment (WEEE), and general copper metal bearing materials. The generated valuable materials will be directly available for market consumption and further treated in the existing Aurubis production network. In addition to the core element, copper, multiple metals such as tin, lead, nickel, zinc and further precious metals will also be recovered. The facility is currently considered a true minor source with respect to Title V and PSD/NSR regulations. Since the facility is subject to 40 CFR 63 Subpart FFFFFF, the facility is required to operate under a Title V operating permit.

Aurubis will produce copper ingots primarily from printed circuit boards, shredded metals, metal fractions, and copper cables using the top blown rotary converter (TBRC) process. Raw material is delivered to the site, then the material is analyzed for chemical composition and quality control. Material is then shredded to the desired fraction size for melting. In the smelting, converting and refining process valuable metal is separated from the waste and organic material. After casting, the copper ingots are conveyed to storage for off-site transfer. The lead-tin alloy is casted and stored for off-site shipment. The dry slag formed in the TBRCs is granulated and sent to storage for off-site shipment. The following provides a listing of the emission sources at the facility:

- Raw materials (Scrap) handling and processing including storage, blending, pre-treatment, sampling and analyzing and a feed mix charging system;
- A pre-shredder for insulated copper wire (ICW) material and scrap, and two (2) shredder systems consisting of two (2) shredders each for printed circuit boards including three (3) separate filters for the pre-shredder and the shredder systems;
- Four (4) Top Blown Rotary Converters (TBRCs 1, 2, 3 and 4) equipped with two (2) preheaters (one for TBRC 1&2 and one for TBRC 3&4) used for preheating of new relined TBRCs. Emissions from the converter will be primarily controlled via baghouses BH01 and BH05 with supplemental control devices used to further control emissions prior to exiting from the primary baghouses. Emissions from the preheaters are controlled via baghouses BH03 and BH06;

- Two Lead Tin Alloy Furnace (LTAF 1 and LTAF 2) each with a Heater and Ladle Treatment Stand (LTS) controlled via baghouses BH02 and B07 respectively;
- Two Ladle heaters and Two Ladle Dryers (LH01, LH02, LD01 and LD02) controlled via baghouse BH03;
- Two Ladle Heaters and one Ladle Dryer (LH03, LH04 and LD03) controlled via baghouse BH06;
- Lab & Sampling Hoods [covering Small Sampling Furnaces (electric-powered) and Small Separation Furnace (natural gas powered)], Charging Hood TBRC 1, Charging Hood TBRC 2, Tapping Hood TBRC 1, Tapping Hood TBRC 2, Material Handling and Roof Extraction controlled via baghouse BH03;
- Charging Hood TBRC 3, Charging Hood TBRC 4, Tapping Hood TBRC 3, Tapping Hood TBRC 4, Roof Extraction, including a Lead Tin Alloy Casting Station controlled via baghouse BH06
- Slag Holding Furnace (SHF) including the Slag Holding Furnace Launders, the Dry Slag Granulation and the Copper Casting Unit including the Copper Casting Unit Launders controlled via baghouses BH04;
- Two (2) Carbon Silos
- Two (2) Flue Dust Silos
- Cooling Tower
- Five (5) Diesel Fueled Emergency Generators
- Seven Roof Vents
- Slag Storage and Processing including Wind Erosion.

Scrap Pretreatment

All materials are delivered by truck and enter the plant at an entrance facility. The trucks enter an uncovered or a covered lot pile area where the raw material is unloaded. Vehicles such as forklifts, front loaders and excavators are operated in these areas. Inside of the lot piles, as well as inside the sampling area, excavators and front loaders will be operated to move raw material within the site. Packaging will be removed from the material and an initial sample for moisture will be taken. Samples are also taken to the laboratory facilities for further treatment and analysis. Three (electric) shredder lines are operated in the laboratory and sampling area. The originally planned tire cleaning station will not be constructed at this time.

Different materials will then be unloaded in the material handling area in open and covered lot piles depending on specific material and particle size. Flux materials will be unloaded directly into the feed mix hall. Metal shredder material will be unloaded from trucks in the open lot pile area outside as well. Metal shredders will basically be supplied at the needed particle size for the converter process already. Several storage boxes are used in the open lot pile area for the metal shredder material and the metal shredder material is further transported by front end loader to the feed mix hall.

Material that is processed in the shredding area include:

- Printed Circuit Board material with a low copper grade,
- Printed Circuit Board materials with a medium or high copper grade and
- Insulated copper wire (ICW) material.

Materials that don’t meet the needed physical properties and particle size distributions are sent through the shredding process consisting of three shredder aggregates. ICWs and copper scrap are fed into the first shredder (pre-shredder) by front loader or excavator into a filling hopper. The main material flow from the first shredder is conveyed by belt into the feed mix hall. Circuit boards will be fed in to two (2) second shredder system (two shredders in line per system) used to achieve the final physical properties. All shredder aggregates are ventilated with separate filter systems that will vent into the building and are not emission sources.

After completion of the shredding process, materials are conveyed into the feed mix hall which is a closed building where all materials for processing in the furnaces are mixed after their respective preprocessing. Internal revert material is also provided in the feed mix hall for reprocessing. The input mixtures entering the TBRCs must be uniform and suitable for charging. Vehicles such as front loaders, forklifts and excavators will be operated in the feed mix hall. The feed mix hall is equipped with material storage boxes for organizing and mixing the material handling. The storage boxes in the feed mix hall are designed to cover the input material supply of the whole plant for at least three days which results in nine converter batches.

Representative Sampling Process

In the shredder area, the raw material will be broken down to grain sizes which can be treated in the sampling furnaces. Representative samples will be taken at the shredder area for further analysis. The weight of these samples will be between 50 and 500 kilograms (kg) depending on the kind of material. The first steps in the sampling area are to dry the samples before they are further reduced. In large and small induction furnaces the samples are going to be smelted to separate slag and metal. This process is supported by using additives such as pyrite. The metal and slag samples will be analyzed after milling, machining, or drilling, depending on the following analytical process in the laboratory. The sampling area will be equipped with the following equipment:

- Two 2 m^3 Heating Cabinets;
- Three 500-kilogram (kg) Induction Crucible Furnaces using a pyrite additive;
- A 0.5 m^3 Separation Furnace combusting natural gas;
- A 50 kg Induction Crucible Furnace;
- A 0.5 m^3 Smelting with Induction Furnace;
- A 1000 kg/hour Pan Mill;
- Mills, drilling and machining equipment.

Material	Amount (tpy)	Process Location
Shredded Material	106	Induction Furnace
Printed Circuit Boards	210	Induction Furnace
ICW	108	Induction Furnace w/Smelting

The emissions from these units will consist of volatile organic compounds (VOC) and carbon monoxide (CO). The emission factors for VOC and CO used for calculating emissions from the TBRCs were also used for the calculation of emissions in the representative sampling area. The emissions of VOC from this process are estimated to be 0.0077 tons per year (tpy) and the CO emissions are 0.090 tpy. Emission calculations are provided in Appendix C of Application No. 28917.

Aurubis proposes to initially startup material receiving and sampling furnaces approximately 9 to 12 months prior to the startup of the secondary smelting operations for the purposes of qualifying scrap materials and training employees. The above-mentioned operations will utilize a temporary baghouse with lime injection in the interim until the secondary baghouse is operational. SO_2 uncontrolled emissions during this period are expected to be 10.3 tpy. The lime injection in the temporary baghouse is anticipated to reduce the emissions of SO_2 by 80% to 2.06 tpy during the initial startup period.

Pyro Metallurgical Process

Following the completion of the material preprocessing and handling steps, different pyro metallurgical processes are operated to recover the valuable metals from input materials. Four TBRCs, two LTAFs/LTSs and a slag holding furnace are used along the process chain. The first aggregates of the pyro metallurgical process are the TBRCs. All four TBRCs are built identically. Each pair of TBRCs are operated in parallel but in different process phases. The four TBRCs will be controlled by Post-Combustors, SNCRs, Quenches, baghouses and equipped with scrubbers (one off-gas treatment line per pair of TBRCs).

After processing the input materials in the TBRCs the different products are further treated in the following furnaces:

- The slag out of the smelting phase of the TBRC is treated in the Slag Holding Furnace (SHF).
- The slag out of the converting phase of the TBRC is further treated in the LTAF (Lead-Tin Alloy Furnace) process. The LTAF slag is treated in the SHF as well.
- The product blister copper is tapped at the end of the TBRC process; the product lead-tin-alloy is the product out of the LTAF/LTS (Ladle Treatment Stand) process.
- All other metal content intermediate materials will be recharged into the TBRC.

The four TBRC reactors are used to process all raw materials. The reactor vessels are comprised of a bottom, a cylindrical main part and a conical upper part. The vessel is open at the top of the conical upper part for charging and skimming products. Each TBRC reactor is operated in three successive process steps:

- Material smelting,
- Converting process, and
- Refining process

A TBRC batch production has duration of roughly 16 hours. The initial smelting takes roughly seven hours while converting takes roughly 2.5 hours. All raw materials and fluxes provided for the process are continuously charged in the smelting phase. The converting process is charged continuously with some fluxes and shredded material. The TBRCs are operated alternatingly in terms of smelting and converting. Process scheduling is established to ensure the second TBRC will be converting while the first TBRC is smelting.

Lead-Tin Alloy Furnaces

The two identical LTAFs are cylindrical drum furnaces closed with two side covers each. One side cover is equipped with a natural gas burner to keep the process at the needed temperature. The second side cover is equipped with a tap hole. The LTAF furnace process gas is ventilated, and all emissions are captured in a baghouse (baghouses BH02 and BH07). The furnace is operated in three successive process steps reactively reducing the focus elements from the slag into a metal phase. In all three steps the furnace is rotated for a couple of degrees from one side to the other, stirring and moving the melted slag continuously. The metal phase (raw lead-tin-alloy) will be tapped into a small ladle, in which the metal is further treated in the two identical Ladle Treatment Stand (LTS) to produce a lead-tin-alloy. This alloy will be casted as blocks for transportation and further treatment. With the completion of phase 2 a dedicated casting station with a hood will be constructed.

Ladle Heaters and Dryers

Liquid metals and slag are transported from the furnace to a furnace/casting plant using ladles. These ladles are steel vessels relined with refractory material. When a steel ladle is newly relined, the new and cold refractory material must be dried and heated up to approximately 1,800°F. Ladle heaters/dryers combust natural gas to bring the required heat into the refractory. The ladle is placed in a ladle stand, and a roof, which includes a burner and a recuperator, closes the ladle from the top. In addition to drying and heating the newly relined ladles, the ladle heater keeps the ladles hot between the different transportation tasks. Three ladles must always be hot, two will be in operation and one will be used as a spare.

Slag Holding Furnace
The slag holding furnace (SHF) is a cylindrical drum furnace, similar to the LTAF vessel. The SHF consists of a cylindrical shell with two side end covers. One side end cover is equipped with a tap hole. After the tap hole, a relined launder is attached to drain the tapped melt straight into a metal ladle. The SHF is equipped with a central opening mouth for charging different kinds of liquid slag by crane and ladle comparable to the LTAF charging. Emissions from the SHF process will be routed to ventilated hoods and vented to a baghouse (Baghouse 4). The slag is kept at the targeted temperature of roughly 1,250°C.

Metals entrained in the slag phase are settled at the bottom due to differences in their physical density. A metal phase with significant copper concentration is collected at the bottom of the SHF for a couple of days and multiple batches of the TBRCs and LTAF batches. A SHF batch is processed roughly four hours. Finally, the slag is skimmed through the opening by rotation of the furnace and guided by a launder into the granulation unit.

Slag Granulation and Handling
Molten slag is guided by a launder from the SHF into the granulation process. A compressed air jet blows the slag into the granulation chamber. The slag is dispersed into droplets solidifying quickly and heat transfer results in solid granulated slag particles settling in the granulation chamber. The granulation chamber is ventilated to a baghouse (BH04). Also, the heat balance of the granulation chamber requires the discharge of heat from the slag. Cooled air is injected and ventilated from the granulation chamber. The cooling air used has been ventilated at the copper casting and cooling unit. The injected cooling air, granulation air and all emissions are further treated in a baghouse (BH04). Slag granulation takes roughly one hour and will occur at intervals of four hours. The granulation chamber can store the slag from multiple batches. For handling of the granulated slag, a door can be opened for a front loader to move the slag. The slag is a product available for the market in granulated form and is conveyed by front loader to the adjacent slag pile for further storage and sale. The Slag pile is located outside in the product handling area ready for shipping off-site.

Blister Copper Casting and Handling
Blister copper is tapped into ladles on a ladle car in front of the TBRC's. The ladle is then taken to the copper casting chair on the opposite side of the melt shop. The ladle is positioned in the casting chair, which is equipped with ventilated hoods. The process unit is called the Copper Casting Unit (CCU). All emissions occurring by casting the blister are captured in a baghouse (BH04). The ladle is tilted by the electric cylinder to pour the blister copper melt into an adjacent ingot casting machine. The ingot casters are equipped to take roughly 200 kg of blister copper each. Continuous casting of one TBRC batch blister takes roughly one hour. The melt is first poured into a buffer tundish and further into a pouring tundish where the molds are filled out precisely. The casting molds are chain driven and continuously returned to the pouring tundish. The upper side of the caster comprises a cooling unit using water spray to cool down the molds from top and bottom. The blister copper solidifies until the end of the upper chain is reached. Solidified blister copper ingots fall from of the molds when turned upside down for returning to the pouring tundish. The molds returning to the pouring tundish on the downside of the caster are preheated again with natural gas burners. Finally, they can be filled again, dried, and preheated for continuous casting. The blister copper blocks are automatically conveyed further into a stacking and labeling unit, then strapped automatically, and finally

provided in stacks for further transport by forklifts. Forklifts are used to take the material outside into the products storage area ready for shipping.

Purpose of Application

Application No. 28917 was dated and received June 20, 2023, to update the emission units list to reflect current as-built operations. The application was accepted into the Expedited Permitting Program on June 22, 2023. A public advisory was not required for this application.

Updated Equipment List

Emission Units		Air Pollution Control Devices	
ID No.	**Name/Description**	**ID No.**	**Description**
TBRC1 TBRC2	Top Blown Rotary Converter – 1&2 and Operational Heaters [**68.24 MMBtu/hr**] 12 m^3 rotary tilt-able furnace for smelting copper	BH01 SC01 COMB1 **SNCR01** QC01	Baghouse Scrubber [**3.41 MMBtu/hr**] Post Combustor Selective Non-Catalytic Reduction Quench
SBH01	Secondary Baghouse controls emissions leaving Smelting Canopy 01, Secondary Hoods TBRC1 and TBRC2, Sampling and Material handling	BH03	Baghouse
LH01 **LH02** **LD01** **LD02**	**Ladle Heater 1** **Ladle Heater 2** **Ladle Dryer 1** **Ladle Dryer 2**		
PH01	**Preheater No. 1**		
EIF01-EIF03	**3 Electric Induction Furnaces**		
SF01	**0.68 MMBtu/hr Separation Furnace**		
SL	**Sampling Lab**		
TBRC3 TBRC4	Top Blown Rotary Converter – 3&4 and Operational Heaters [**68.24 MMBtu/hr**] 12 m^3 rotary tilt-able furnace for smelting copper	BH05 SC02 COMB2 **SNCR02** QC02	Baghouse Scrubber [**3.41 MMBtu/hr**] Post Combustor Selective Non-Catalytic Reduction Quench
SBH02	Secondary Baghouse controls emissions leaving Smelting Canopy 02, Secondary Hoods TBRC3 and TBRC4	BH06	Baghouse
LH03 **LH04** **LD03**	**Ladle Heater 3** **Ladle Heater 4** **Ladle Dryer 3**		
PH02	**Preheater No. 2**		
LTAF1/LTS1	**5.5 m^3 Lead Tin Alloy Furnace, Heater and Ladle Treatment Stand**	**BH02**	**Baghouse**

Emission Units		Air Pollution Control Devices	
ID No.	**Name/Description**	**ID No.**	**Description**
LTAF2/LTS2	**5.5 m^3 Lead Tin Alloy Furnace, Heater and Ladle Treatment Stand**	**BH07**	**Baghouse**
SHF /LSHF / DSG / CCU/LCCU	**37 m^3 Slag Holding Furnace/ Slag Holding Furnace Launders/Dry Slag Granulation/Copper Casting Unit/ Copper Casting Unit Launders**	BH04	Baghouse
RMS	Raw Outside Material Storage and Handling	NA	None
FDS01	80 m^3 Flue Dust Silo with Bin Vent for BH01 Flue Dust	BV02	Filter
FDS02	80 m^3 Flue Dust Silo with Bin Vent for BH05 Flue Dust	**BV04**	Filter
CS01	30 m^3 Carbon Silo with Bin Vent for use in BH01	BV01	Filter
CS02	30 m^3 Carbon Silo with Bin Vent for use in BH05	**BV03**	Filter
EG01	2,720 hp Diesel Fired Emergency Generator	NA	None
EG02	**1,360 hp Diesel Fired Emergency Generator**	NA	None
EG03	1,360 hp Diesel Fired Emergency Generator	NA	None
EG04	**1,360 hp Diesel Fired Emergency Generator**	**NA**	**None**
EG05	**2,720 hp Diesel Fired Emergency Generator**	**NA**	**None**
EIF01-EIF03	**3 Electric Induction Furnaces**	**NA**	**None**
RV01-RV07	**7 Roof Ventilations (filtered) to Exchange Air in Bunker Bay of the Melt-shops**	**NA**	**None**

*proposed within current application

Fuel Burning Equipment

Emission Unit ID No.	Total Input Heat Capacity (MMBtu/hr)	Description	Installation Date	Construction Date
TBRC1 TBRC2	**68.24**	Top Blown Rotary Converter – 1&2 Operational Heaters [68.24 MMBtu/hr], and Pre-heaters [**5.12 MMBtu/hr**] Post-Combustor [**3.41 MMBtu/hr**] Fuel: Natural Gas	TBD	2022/2023
TBRC3 TBRC4	**68.24**	Top Blown Rotary Converter – 3&4 Operational Heaters [68.24 MMBtu/hr], and Pre-heaters [**5.12 MMBtu/hr**] Post-Combustor [**3.41 MMBtu/hr**] Fuel: Natural Gas	TBD	2024/2025

Emission Unit ID No.	Total Input Heat Capacity (MMBtu/hr)	Description	Installation Date	Construction Date
LTAF1/LTS1	**10.24**	**Lead-Tin Alloy Furnace** **Fuel: Natural Gas**	**TBD**	**2022/2023**
LTAF2/LTS2	**10.24**	**Lead-Tin Alloy Furnace** **Fuel: Natural Gas**	**TBD**	**2024/2025**
LH01 **LH02** **LD01** **LD02**	**19.96**	**Ladle Heaters and Dryers** **Fuel: Natural Gas**	**TBD**	**2022/2023**
LH03 **LH04** **LD03**	**13.82**	**Ladle Heaters and Dryer** **Fuel: Natural Gas**	**TBD**	**2024/2025**
SHF/ LSHF / DSG / CCU/ LCCU	**16.38**	**Slag Holding Furnace/Slag Holding Furnace Launders, Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit Launders** **Fuel: Natural Gas**	**TBD**	**2022/2023**
SF01	**0.68**	**Separation Furnace in the Lab**	**TBD**	**2022/2023**

Emission Unit ID No.	Total Rating (hp)	Design Capacity (MMBtu/hr)	Description	Installation Date	Construction Date
EG01	2,720	**22.0**	Diesel Fired Emergency Generator	TBD	2022/2023
EG02	**1,360**	**11.0**	Diesel Fired Emergency Generator	TBD	2022/2023
EG03	1,360	**11.0**	Diesel Fired Emergency Generator	TBD	2022/2023
EG04	**1,360**	**11.0**	**Diesel Fired Emergency Generator**	**TBD**	**2024/2025**
EG05	**2,720**	**22.0**	**Diesel Fired Emergency Generator**	**TBD**	**2024/2025**

Emissions Summary

Potential facility-wide emissions have been provided in Appendix B of Application No. 28917 and based upon operating hours of 8,760 hours/year, 500 hours/year for emergency generators EG01 through EG05, 7,200 hours/year for the post-combustors, and specific annual hours of operation for sources such as the Slag Holding Furnace, Copper Casting and Dry Slag Granulation. Actual emissions were calculated based upon an operating scenario consisting of 4 weeks of downtime for total operating hours of 8,088 hours/year. Total emissions include stack and fugitive emissions, as well as emissions from sources that can be classified as insignificant sources upon the issuance of the required Title V Permit.

Particulate Matter (PM/PM_{10}/$PM_{2.5}$)

PM emissions were calculated based on readily available emission factors, manufacturer's specifications and/or data from a similarly operated facility. Material handling and shredding will be vented to the secondary baghouses and are not included as PM emission sources separately.

TBRC

The four TBRCs will be controlled by a baghouse (BH01 for TBRCs 1 & 2 and BH05 for TBRCs 3 & 4). The baghouse is designed to meet a grain loading of 0.002 grains/dry standard cubic feet (gr/dscf). Emissions were calculated by multiplying the grain loading factor by the flowrate (dry standard cubic feet [dscf]) for each of the two baghouses, then converting to pounds per hour. Particulate emissions from fuel combustion in the two combustor units will be captured in the TRBCs primary baghouses (Baghouses 1 and 5). PM emissions from natural gas combustion in the two preheaters (one for TBRC 1&2 and one for TBRC 3 & 4) will be captured by the Secondary baghouses (Baghouses 3 and 6, respectively). PM Emissions from the operational burners will be captured in the TBRC/LTAF baghouses (BH01, BH02, BH05 and BH07).

Building Emissions from Secondary Baghouses

PM emissions from the Smelting and Sampling Building 01, the secondary hoods of the TBRCs, the lab and sampling furnaces as well as from material handling will be controlled by secondary baghouse (BH03). Particulate emissions from fuel combustion in the Separation Furnace will also be captured by baghouse (BH03). A second baghouse (BH06) will control the Smelting operations in Building 2 as well as the Lead-tin Alloy Casting Station. The baghouses are designed to meet a grain loading of 0.002 gr/scf. Emissions were calculated by multiplying the grain loading factor by the flowrate, then converting to pounds per hour. Potential annual emissions were based on annual flowrates based on number of hours each emission source could operate in a year.

Lead-Tin Alloy Furnaces (LTAF1 and LTAF2) and Ladle Treatment Stands (LTS1 and LTS2)

PM emissions from the LTAFs and LTSs were calculated by multiplying the grain loading factor by the flowrate then converting to pounds per hour. Potential annual emissions were based on annual flowrates based on number of hours each emission source could operate in a year. Particulate emissions from fuel combustion in the LTAFs will be routed to the baghouses (BH02 and BH07) for capture.

Slag Holding Furnace (SHF)/Slag Holding Furnace Launders (LSHF)/Dry Slag Granulation (DSG)/Copper Casting (CCU)/Copper Casting Launders (LCCU)

PM Emissions from the Slag Holding Furnace, Launders to Slag Holding Furnace, Dry Slag Granulation, Copper Casting, and Launders to Copper Casting will be captured by baghouse (Baghouse 4). The baghouse is designed to meet a grain loading of 0.002 gr/dscf. Emissions were calculated by multiplying the grain loading factor by the flowrate then converting to pounds per hour. Potential annual emissions are based on the specific hours of operation of each source per year.

Emergency Generators (EG01, EG02, EG03, EG04, and EG05)

PM emissions from the five emergency generators were calculated based on the emission limits of 0.2 g/kW-hr in NSPS Subpart IIII multiplied by 500 hours/year, the potential hours of operation to remain classified as an emergency generator.

Roof Vents (RV01 through RV07)

Seven roof vents will be installed in the bunker bay of each smelter building. The vents will provide cooling to the bunker bay areas. These will have Minimum Efficiency Reporting Values (MERV) 8 filters to control particulate matter emissions. Emissions are based on an emission factor of 0.1 mg/m^3 measured at a similar facility in Germany. The filters in Germany were 85% efficient, where as a MERV8[1] efficiency is expected to be 35%[1]. Therefore, the German emission factor was recalculated by multiplying 0.1 milligrams per cubic meter (mg/m^3 by 85 and dividing by 35 to get a factor of 0.24 mg/m^3 (converted to 1.52E-08 pounds per cubic feet (lb/ft^3).

[1] See Appendix E of Application No. 28917

Raw Material (Scrap) Storage Piles

The Aurubis - Richmond Plant receives scrap, scrap substitutes, carbon, fluxes, and other materials by truck. After unloading, the scrap is stored in stockpiles and pre-processed (shredded) and sampled. The scrap and other feedstock materials are then added on the conveyor prior to entering the TBRC. Particulate matter emissions from these operations were calculated based on AP-42 Chapter 13.2.4.

Slag Handling

Particulate matter emission from Slag Handling were calculated using AP-42 Chapter 13.2.4. The aerodynamic particle size was determined using an analysis of slag from a similar facility in Germany. The results of the analysis is provided in section 4.1.7 of Application No. 28917.

Slag Storage Wind Erosion

Particulate matter emissions from the Slag Storage piles due to Wind Erosion were calculated using AP-42 Chapter 13.2.5. The aerodynamic particle size was determined using an analysis of slag from a similar facility in Germany as discussed in Section 4.1.8.1.

Carbon Silos and Flue Dust Silo

Particulate matter emissions from the two carbon silos and the two flue dust silos were calculated using a grain loading of 0.01 gr/dscf. Emissions were calculated by multiplying the grain loading factor by the flowrate, then converting to pounds per hour.

Paved Roads and Front-End Loaders

Particulate matter emissions from the trucks traveling on paved roads and front-end loaders moving raw materials were calculated based on AP-42 Chapter 13.2.1.

Cooling Tower

The method used in determining emissions from the cooling tower is the "Expanded Resiman-Frisbie" method[2].

Nitrogen Oxides (NOx)

NOx will be emitted from the following sources:

- Four TBRCs (TBRC 1 & 2 and TBRC 3 &4)
- Two LTAFs/LTSs (LTAF1/LTS1 and LTAF2/LTS2)
- Four Ladle Heaters and Three Ladle Dryers (LH01-LH04 and LD01-LD03)
- Slag Holding Furnace including launders, Dry Slag Granulation, and the Copper Casting Unit including launders
- Two Post-Combustors (included in the TBRC off-gas)
- One Separation Furnace
- Five Emergency Generators

The four TBRCs with a total of two preheaters that use natural gas as a fuel to raise the temperature of the refractory material to the proper operational temperature after relining and four process heaters. The two LTAFs/LTSs will have heaters that use natural gas to raise the temperature of the material to the proper operational temperature. There are two post combustion chambers where the control of NOx emissions occurs at the chamber exits using selective non-catalytic reduction (SNCR1 and SNCR2). These combustion

[2] Smith, R, Woerner, A, and Hanna, T. "Determining PM10 and PM2.5 Emissions from Wet Cooling Towers", ERM, October 2011.

chambers also fire natural gas when needed. NOx emissions will result from the combustion of natural gas in the Ladle Heaters and Dryers (LH01-LH04 and LD01-LD03) and two post-combustion chambers (COMB1 and COMB2). In order to control NOx emission in the primary off-gas of the TBRCs, post-combustion chambers will use SNCR with urea injection.

NOx emissions were based on stack test at a similar facility in Germany and a conservative factor of 20% was added. Since the facility in Germany did not have SNCR, the calculated emissions were reduced by 65% to reflect the SNCR controls[3]. In addition, the TBRC burners will operate on high oxygen which will further reduce NOx emissions. Ninety percent of the NOx was assumed to be emitted from the TBRCs and ten percent was emitted from the LTAFs. The emissions from the LTAFs will not be controlled.

NOx emissions from the natural gas (NG) combustion in the SHF/LSHF/DSG/CCU/LCCU, the two Post-Combustors, the Ladle Heaters and Ladle Dryers, the Preheaters and the Separation Furnace were calculated using a conservative AP-42 Chapter 1.4 emission factor of 50 pounds per $MMft^3$ of natural gas. The calculation was as follows:

NOx Emissions (tpy) = NOx emission factor [lb NOx/ $MMft^3$ NG combusted] x NG combusted per year [$MMft^3$/yr] x 1 ton/2000 lb.

Emergency generators EG01, EG02, EG03, EG04, and EG05 will be subject to the limit in NSPS Subpart IIII. Since the limit is for NOx + NMHC combined, the NOx and VOC emissions were calculated using a ratio of 67.8% NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.

Carbon Monoxide (CO)
Similar to NOx, emissions of carbon monoxide are a byproduct of fuel combustion, and CO emissions will be emitted from the following sources:

- Four TBRCs
- Two LTAFs/LTSs
- Four Ladle Heaters and Three Ladle Dryers
- Slag Holding Furnace including launders, Dry Slag Granulation, and the Copper Casting Unit including launders
- Two Post-Combustors
- One Separation Furnace
- Sampling Process
- Five Emergency Generators

In the four TBRCs and the two LTAFs/LTSs, CO is produced during the process due to incomplete combustion in an oxygen deficient environment. Emissions of CO from the TBRCs will be reduced by the post combustors. CO emissions were based on stack testing at a similar facility in Germany and were doubled to account for plastic content at the Augusta facility, as well as a conservative factor of 20% was

[3] Gideon M. Siringi. "Selective Non-Catalytic Reductions for Nitrogen Dioxides in Preheater Lime Kilns", International Journal of Applied Science and Technology. Vol 9, No. 2, June 2019. https://www.researchgate.net/publication/333149107_Selective_Non-Catalytic_Reduction_for_Nitrogen_Dioxides_Reduction_in_Preheater_Lime_Kilns

added. The facility in Germany that was tested was not operating any of the post combustors planned for the Augusta facility, which will further reduce CO emissions.

CO emissions from the Lab Sampling Process were calculated using the same emission factor for CO from the TBRCs. CO emissions from the natural fuel combustion in the SHF/LSHF/DSG/CCU/LCCU, the two Post-combustors, the Lead Tin Alloy Furnaces and Ladle Treatment Stands, the Ladle Heaters and Ladle Dryers, the Preheaters and the Separation Furnace were calculated using a conservative AP-42 Chapter 1.4 emission factor of 84 lb/MMft^3 of natural gas. The calculation was as follows:

CO emissions (tpy) = CO emission factor [lb CO/MMft^3 NG Combusted]x NG combusted per year [MMft^3/yr] x 1 ton/2000 lb.

Emission factor of 3.5 grams/kW-hr used for the emergency generators subject to NSPS IIII are from 40 CFR 1039, Appendix I, Table 3, Emission Standards for Tier 3 engines >560 kW.

Volatile Organic Compounds (VOC)
VOC emissions generated in the TBRCs were based on emission data provided by the Original Equipment Manufacturer (OEM) with an added conservative factor of 20%. VOC emissions will be reduced in the post-combustors and VOC will be emitted from the following sources:

- Four TBRCs
- Two LTAFs/LTSs
- Four Ladle Heaters and Three Ladle Dryers
- Slag Holding Furnace including launders, Dry Slag Granulation, and the Copper Casting Unit including launders
- Two Post-Combustors
- One Separation Furnace
- Sampling Process
- Five Emergency Generators

VOC emissions from the natural gas combustion in the SHF/LSHF/DSG/CCU/LCCU, the Lead Tin Alloy Furnaces and Ladle Holding Stands, the Ladle Heaters and Ladle Dryers, the Preheaters, and the Separation Furnace were calculated using conservative AP-42 Chapter 1.4 emission factor of 5.5 pounds per MMft^3 of NG. The calculation was as follows:

VOC Emissions (tpy) = VOC emission factor [lb VOC/MMft^3 NG]x NG combusted per year [MMft^3/yr] x 1 ton/2000 lb.

For the emergency generators, since the limit is for NOx + NMHC combined, the NOx and VOC emissions were calculated using a ratio of 67.8% NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.

Sulfur Dioxide (SO_2)
In addition to SO_2 being emitted from the combustion of fuel in the fuel burning equipment and emergency generators, SO_2 emissions result from the use of a conditioning agent in the wet off-gas cleaning part of the facility and were based on data provided by the OEM with a margin factor of safety of 20% added. SO_2 will be emitted from the following sources:

- Four TBRCs
- Two LTAFs/LTSs
- Four Ladle Heaters and Three Ladle Dryers
- Three Electric Induction Furnaces in the Sampling Laboratory using a pyrite additive
- Slag Holding Furnace including launders, Dry Slag Granulation, and the Copper Casting Unit including launders
- Two Post-Combustors
- One Separation Furnace
- Five Emergency Generators

The SO_2 emissions from the SHF/LSHF/DSG/CCU/LCCU, the Lead Tin Alloy Furnaces and Ladle Holding Stands, the Ladle Heaters and Ladle Dryers, the Preheaters, and the Separation Furnace were calculated using an AP-42 Chapter 1.4 emission factor of 0.6 pounds per $MMft^3$ of NG. SO_2 emissions from the emergency generators were calculated based on the emission factors in AP-42 Chapter 3.4 assuming a 15-ppm sulfur limit. The calculation was as follows:

SO_2 Emissions (tpy) = SO_2 emission factor [lb $SO_2/MMft^3$ NG]x NG combusted per year [$MMft^3$/yr] x 1 ton/2000 lb.

Aurubis will use pyrite in the Sampling process and has estimated that the pyrite consumption in the sampling operation will emit approximately 34.28 tons per year (tpy) of sulfur dioxide (SO_2). This value is based on similar operations at the Aurubis Lünen, Germany plant with a 20% safety factor added. These emissions will exit through baghouse BH03.

Hazardous Air Pollutants (HAPs)

Metal HAPs

Emissions of copper, aluminum, calcium, nickel, silicon, tin, and zinc from the process were estimated based an analysis of the material at various stages of the process from a similar facility in Germany or data from process modeling. Emissions of cadmium, antimony, chromium, cobalt, manganese, and mercury were based on emission testing at a similar facility in Germany with a conservative factor of 20% added to the emissions. Emissions of lead were based on emission testing at similar facility in Germany with a safety factor of 100% added. Activated carbon is injected into the baghouses on the TBRCs to reduce potential mercury emissions. Individual HAP emission calculations of the metal-HAP emissions can be found in Appendix C of Application No. 28917.

Inorganic HAPs

Hydrogen Bromide (HBr), Hydrogen Chloride (HCl), and Hydrogen Fluoride (HF) will be generated in the TBRCs and are classified as HAPs. Potential emissions of these acid gases were calculated based on stack testing conducted at a similar operation in Germany. The factors for HF and HCl were doubled to account for the plastics in the raw material stream and an additional 20% margin of safety factor was applied for all three compounds. The facility in Germany did not have a scrubber therefore an additional control of 90% was assumed for HCl and HF.

Dioxin/Furan (D/F)

Polycyclic organic compounds including dioxins and furans are included in the federal HAP list. Dioxins (polychlorinated dibenzo-p-dioxins (PCDD's), and furans (polychlorinated dibenzofurans (PCDFs)) are formed during the combustion of chlorinated compounds in the presence of hydrocarbons. The exact mechanisms for creation of D/F are complicated and have been demonstrated to be temperature dependent.

Temperatures between 200° and 450° Celsius (C) are most conducive to forming PCDD/PCDFs, with maximum formation occurring at around 350°C. If temperature falls outside this range in temperature, the amount of PCDD/PCDFs formed is minimized. Dioxins have shown to be decomposed at a temperature of 700 °C.

Techniques for controlling dioxin and furan formation and reducing emissions has been based upon a system of post combustion, quick off-gas cooling, and effective collection which has been applied across industries. According to the Waste Incineration Directive, all incineration plants should be designed, equipped, built, and operated in such a way that the gas resulting from the process is heated (after the last injection of combustion air, in a controlled and homogeneous fashion, and even under the most unfavorable conditions) to a temperature of 850 °C for 2 sec. McKay[4] recommended achieving a temperature above 1000 °C for at least 2 sec in high-turbulence (Reynolds number >50,000) conditions with approximately 3–6% excess of oxygen.

Recognizing and reacting to the need for improved emission control of dioxins and furans, BadischeStahlwerke (BSW) significantly reduced emissions during EAF steel making by a combination of post combustion, quick off-gas cooling (HTQ) and effective dust collection system. The achievement of this concept has brought BSW to comply with stringent German limiting value for dioxins and furans of 0.1 nanogram TE per normal cubic meter (ng TE/Nm^3)[5].

Therefore, in order to prevent dioxins from forming, Aurubis proposes a system of controlling dioxin and furan emissions based on the installation of post-combustors which are used that hold a temperature of 1,000 °C for over two seconds followed by a quick cooling of the off gas in a quench

Aurubis has calculated the D/F TEQ based on stack testing conducted at a similar facility in Germany. The factor was doubled to account for plastic content at the Augusta facility and a conservative factor of 20% was added. Activated carbon will be injected into the ductwork downstream from the TBRCs and post-combustors and water quench that quickly drop the temperature below D/F formation temperatures. Activated carbon will be used prior to the baghouses for the control of organic compounds including D/F.

Facility-Wide Emissions
(in tons per year)

Pollutant	Potential Emissions			Actual Emissions		
	Before Mod.	After Mod.	Emissions Change	Before Mod.	After Mod.	Emissions Change
$PM/PM_{10}/PM_{2.5}$	65.97/64.35/ 63.96	66.09/65.10/ 64.76	+0.12/+0.75/ +0.8	60.91/59.41/ 59.05	61.02/60.10/ 59.79	+0.11/+0.69/ +0.74
NOx	81.19	78.89	-2.30	74.97	71.41	-3.56
SO_2	21.27	54.16	+32.89	19.64	50.01	+30.37
CO	67.32	77.34	+10.02	62.16	72.84	+10.68
VOC	10.11	11.52	+1.41	9.33	10.64	+1.31

[4] McKay, G. Dioxin Characterization, Formation and Minimization during Municipal Solid Waste (MSW) Incineration: a Review; Chem. Eng. J. 2002, 86, 343-368.
[5] (2002). Dioxins and furans - Reduction solution with bse HTQ (High Temperature Quenching). SEAISI Quarterly (Southeast Asia Iron and Steel Institute). 31. 18-22.

Pollutant	Potential Emissions			Actual Emissions		
	Before Mod.	After Mod.	Emissions Change	Before Mod.	After Mod.	Emissions Change
Max. Individual HAP (Hexane)	0.49	0.62	+0.13	0.46	0.57	+0.11
Total HAP	2.01	1.78	-0.23	1.86	1.64	-0.22
Total GHG (if applicable)	38,273	181,961	+143,688	34,917	168,003	+133,086

Regulatory Applicability

40 CFR 52.21 - Prevention of Significant Deterioration (PSD) of Air Quality.
Aurubis Richmond plans to construct and operate a secondary copper recycling and secondary copper smelter, which is one of the 28 listed source categories listed in paragraph (b)(1) of 40 CFR 52.21 where potential emissions of any regulated NSR pollutant equal to 100 tons per year or more classifies the source as a major stationary source. Potential facility-wide emissions from the facility do not exceed 100 tons per year for any NSR regulated pollutant, therefore Aurubis is considered a minor stationary source under PSD regulations.

40 CFR 70- State Operating Permit Programs
Constructing and operating a secondary copper recycling and secondary copper smelter is part of a source category designated under 40 CFR 63.11153(d). Therefore, Aurubis must apply for a Title V Permit (Part 70) within a year of beginning the smelting operations.

40 CFR 60 Subpart CCCC--Standards of Performance for Commercial and Industrial Solid Waste Incineration Units (CISWI)
Waste material combusted by Aurubis is for the primary purpose of recovering metals in a secondary smelter and is exempt from this regulation under 60.2020(g), which exempts materials recovery units that combust waste for the primary purpose of recovering metals such as primary and secondary smelters. Therefore, Aurubis is not subject to 40 CFR 60 Subpart CCCC, Subpart AAAA, or Subpart DDDD as it pertains to CISWI units.

40 CFR 60, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Aurubis proposes to install five emergency generator engines classified as a CI ICE. Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder, that are not fire pump engines, must comply with the emission standards for new non-road CI engines in §60.4208, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

Aurubis plans to comply with the requirements of Subpart IIII by purchasing an EPA certified engine and will meet the fuel requirements of 40 CFR 80.510(b) for non-road engines. The emergency engines may be operated for a maximum of 100 hours per calendar year for the purposes of maintenance checks and readiness testing. Additionally, the emergency generators may be operated for up to 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year for maintenance and testing. Potential emissions from the engine are based on 500 hours of operation per year.

40 CFR 63, Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) MACT

Subpart ZZZZ applies to stationary reciprocating internal combustion engines (RICE) located at area and major sources of HAP that are new, existing, or reconstructed. For stationary RICE located at an area source of HAP emissions, the stationary RICE is considered existing if construction was commenced prior to June 12, 2006. Any stationary RICE constructed after this time is considered new under Subpart ZZZZ. New engines comply with Subpart ZZZZ by demonstrating compliance under either NSPS Subpart IIII, or JJJJ. Aurubis proposes to comply with the requirements of the RICE MACT by complying with the applicable requirements of NSPS Subpart IIII.

40 CFR 63 Subpart FFFFFF – National Emission Standards for Hazardous Air Pollutants for Secondary Copper Smelting Area Sources

Aurubis is subject to 40 CFR 63 Subpart FFFFFF. The rule requires the facility to operate a capture and control system for particulate matter (PM) emissions from any process operation that melts copper scrap, alloys, or other metals or that processes molten material. PM emissions from the control device must not exceed 0.002 grains per dry standard cubic meter. The facility must install, operate, and maintain a bag leak detection system on all baghouses used to comply with the mentioned PM emissions limit. Aurubis is also required to develop and submit to the Division for approval a site-specific monitoring plan for each bag leak detection system, as specified below. Each bag leak detection system must:

- Be certified by the manufacturer to be capable of detecting PM emissions at concentrations of 1 milligram per actual cubic meter (0.00044 grains per actual cubic foot) or less.

- Provide output of relative PM loadings. Aurubis must continuously record the output from the bag leak detection system using electronic or other means (e.g., using a strip chart recorder or a data logger.)

- Be equipped with an alarm system that will sound when the system detects an increase in relative particulate loading over the alarm set point established according to the rule and the alarm must be located such that it can be heard by the appropriate plant personnel.

- In the initial adjustment of the bag leak detection system, Aurubis must establish, at a minimum, the baseline output by adjusting the sensitivity (range) and the averaging period of the device, the alarm set points, and the alarm delay time.

- Following initial adjustment, any adjustments to the averaging period, alarm set point, or alarm delay time must be approved by the Division.

- Once per quarter, Aurubis may adjust the sensitivity of the bag leak detection system to account for seasonal effects, including temperature and humidity, according to the procedures specified in the rule.

- Aurubis must install the bag leak detection sensor downstream of the baghouse and upstream of the scrubbers.

- Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

Aurubis must operate and maintain the bag leak detection system according to the site-specific monitoring plan at all times. For each bag leak detection system, Aurubis must initiate procedures to determine the cause of every alarm within 1 hour of the alarm. The facility must alleviate the cause of the alarm within 3 hours of the alarm by taking whatever corrective action(s) are necessary.

Aurubis must maintain records of the information specified under Subpart FFFFFF, as well as conduct a performance test to demonstrate initial compliance with the PM emissions limit within 180 days after startup and report the results in your notification of compliance status. Aurubis must also conduct subsequent performance tests to demonstrate compliance with the PM emissions limit at least once every 5 years.
Aurubis is required to prepare and operate in accordance to the approved site-specific monitoring plan according to 40 CFR 63 Subpart FFFFFF for the selection, inspection, and pretreatment of copper scrap to minimize, to the extent practicable, the amount of oil and plastics in the scrap that is charged to the TBRCs. Aurubis is required to take corrective action as specified and record information as specified.

Georgia Rule 391-3-1-.02(2)(b) Emission Limitations and Standards for Visible Emissions
Rule (b) limits the opacity of visible emissions from any air contaminant source to less than forty (40) percent, except as provided in other more restrictive or specific rules or subdivisions of Georgia Rule 391-3-1-.02(2). This rule is applicable to the Top Blown Rotary Converters including the Preheaters, the Lead Tin Alloy Furnaces/Ladle Treatment Stands (Emission Unit ID Nos.: TBRC1, TRBC2, TBRC3, TRBC4, LTAF1/LTS1, and LTAF2/LTS2), Ladle Heaters (Emission Unit ID Nos.: LH1 through LH4), Slag Holding Furnace including Launders/Dry Slag Granulation/Copper Casting Unit including Launders (Emission Unit ID Nos.: SHF/LSHF/DSG/CCU/LCCU), Baghouses (Emission Unit ID Nos.: BH01 through BH07), Roof Vents (Emission Unit ID Nos.: RV01 through RV07), and the Carbon and Flue Dust Silos (Emission Unit ID Nos.: CS01, CS02, FDS01, and FDS02), and other supporting equipment with the capability of emitting particulates.

Georgia Rule 391-3-1-.02(2)(e) Emission Limitations and Standards for Particulate Emissions from Manufacturing Processes
Rule (e) limits particulate emissions from manufacturing processes as follows:

$E = 4.1\ P^{0.67}$; for process input weight rate up to and including 30 tons per hour.

$E = 55\ P^{0.11} - 40$; for process input weight rate above 30 tons per hour.

This rule is applicable to the Top Blown Rotary Converters including the Preheaters, the Lead Tin Alloy Furnaces/Ladle Treatment Stands (Emission Unit ID Nos.: TBRC1, TRBC2, TBRC3 ,TRBC4, LTAF1/LTS1 and LTAF1/LTS1), Ladle Heaters (Emission Unit ID Nos.: LH01 through LH04), Ladle Dryers (Emission Unit ID Nos. LD01 through LD03), Slag Holding Furnace/Slag Holding Furnace Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit Launders (Emission Unit ID Nos.: SHF/LSHF/DSG/CCU/LCCU), Baghouses (Emission Unit ID Nos.: BH01 through BH07), Roof Vents (Emission Unit ID Nos.: RV01 through RV07), and the Carbon and Flue Dust Silos (Emission Unit ID Nos.: CS01, CS02, FDS01, and FDS02), and other supporting equipment with the capability of emitting particulates.

Georgia Rule 391-3-1-.02(2)(g) Emission Limitations and Standards for Sulfur Dioxide
Rule (g) requires that all fuel burning sources below 100 million Btu of heat input per hour shall not burn fuel containing more than 2.5 percent sulfur, by weight. This rule applies to the Top Blown Rotary Converters including the Preheaters, Lead Tin Alloy Furnaces/Ladle Treatment Stands (Emission Unit ID

Nos.: TBRC1, TRBC2, TBRC3, TRBC4, LTAF1/LTS1, and LTAF2/LTS2), Ladle Heaters (Emission Unit ID Nos.: LH01 through LH04), Ladle Dryers (Emission Unit ID Nos. LD01 through LD03), Preheaters (Emission Unit IDs: PH01 and PH02), Slag Holding Furnace/Slag Holding Furnace Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit Launders (Emission Unit ID Nos.: SHF/LSHF/DSG/CCU/LCCU), and Post-Combustors (Emission Unit ID Nos: COMB1 and COMB2). Aurubis plans to fire natural gas exclusively in these units to ensure compliance with Georgia Rule (g).

Georgia Rule 391-3-1-.02(2)(n) Emission Limitations and Standards Fugitive Dust
Rule (n) requires Aurubis to take all reasonable precautions to prevent fugitive dust from becoming airborne for any operation, process, handling, transportation or storage facility. This rule also limits the opacity from such sources to less than 20 percent. For Aurubis, this limit applies to paved and unpaved access roads and parking areas, and material handling equipment.

Permit Conditions

Modified Condition 2.2 requires the Permittee to comply with 40 CFR 63 Subpart FFFFFF, including the new Lead Tin Alloy Furnace/Ladle Treatment Stand and the Slag Holding Furnace/Slag Holding Furnace including Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit including Launders.

Modified Condition 2.3 limits particulate matter emissions from each baghouse to 0.002 grains/dry standard cubic foot, including new baghouse, BH07.

Modified Condition 2.4 requires the Permittee to comply with 40 CFR 63 Subpart ZZZZ for each emergency generator, including two new emergency generators, EG04 and EG05.

Modified Condition 2.5 requires the Permittee to comply with 40 CFR 60 Subpart IIII for each emergency generator, including two new emergency generators, EG04 and EG05.

Modified Condition 2.6 requires the Permittee to operate each emergency generator for no more than 500 hours during any calendar year, including the two new emergency generators, EG04 and EG05.

Modified Condition 2.7 requires the Permittee limit the operation of each emergency generator as defined for emergency engines under Subpart IIII, including the two new emergency generators, EG04 and EG05.

Modified Condition 2.8 limits the sulfur content to 15 ppm (0.0015% by weight) and either a minimum cetane index of 40 or maximum aromatic content of 35 volume percent for fuel in each emergency generator, including the two new emergency generators, EG04 and EG05.

Modified Condition 2.9 limits the opacity of visible emissions to less than 40%, including the Top Blown Rotary Converters, the two Preheaters, the new Lead Tin Alloy Furnace/Ladle Treatment Stand, the new Ladle Heaters and Dryers, the new Roof Vent, the new Baghouse, the Separation Furnace, and the Slag Holding Furnace/Slag Holding Furnace Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit Launders.

Modified Condition 2.10 limits the fuel sulfur content to 2.5% sulfur, by weight, including the Top Blown Rotary Converters, the two Preheaters, the new Lead Tin Alloy Furnace/Ladle Treatment Stand, the new Ladle Heaters and Dryers, the Separation Furnace, and the Slag Holding Furnace/Slag Holding Furnace Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit Launders.

Modified Condition 2.11 requires the Permittee to fire natural gas exclusively, including the Top Blown Rotary Converters, the two Preheaters, the new Lead Tin Alloy Furnace/Ladle Treatment Stand, the new Ladle Heaters and Dryers, the Separation Furnace, and the Slag Holding Furnace/Slag Holding Furnace including Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit including Launders.

Modified Condition 4.3 requires the Permittee to install, operate, and maintain a bag leak detection system as specified on each baghouse, including new baghouse, BH07.

Modified Condition 4.5 requires the Permittee to operate each bin vent when the respective silos are being filled. The Bin Vents have been renumbered; BV05 has become BV04 and BV04 has become BV03.

Modified Condition 4.6 requires the Permittee demonstrate compliance with all applicable emission standards specified in Subpart IIII for each emergency generator, including the two new emergency generators, EG04 and EG05.

Modified Condition 4.7 requires the Permittee to operate and maintain each emergency generator according to manufacturer's emission-related written specifications/instructions or approved procedures developed by the Permittee, including the two new emergency generators, EG04 and EG05.

Modified Condition 5.2.a and 5.2.b require the Permittee to install, calibrate, maintain, and operate a continuous emissions rate monitoring system (CERMS) for the NOx emission rate, including the NOx emission rate from the Top Blown Rotary Converters, the existing Lead Tin Alloy Furnace/Ladle Treatment Stand, and the new Lead Tin Alloy Furnace/Ladle Treatment Stand.

Modified Condition 5.2.h requires the Permittee to install, calibrate, maintain, and operate a continuous monitoring system for the inlet temperature to the Baghouses, including the new baghouse (Emission Control ID BH07), controlling emissions from the new Lead Tin Alloy Furnace/Ladle Treatment Stand and the Slag Holding Furnace/Slag Holding Furnace including Launders/Dry Slag Granulation/Copper Casting Unit/Copper Casting Unit including Launders.

Modified Condition 5.2.i requires the Permittee to install, calibrate, maintain, and operate a non-resettable hour meter for each emergency generators, including the two new emergency generators, EG04 and EG05.

Modified Condition 5.5 requires the Permittee to verify each shipment of distillate fuel oil received for combustion in each emergency generators, including the two new emergency generators, EG04 and EG05.

Modified Condition 6.6 requires the Permittee to conduct an initial performance test within 180 days startup of the Top Blown Rotary Converters including the Preheaters, and the Lead Tin Alloy Furnaces/Ladle Treatment Stands. Condition 6.6 also requires the Permittee to conduct subsequent performance testing.

Modified Condition 7.7 requires the Permittee to maintain records of the hours of operation for each emergency generator, including the two new emergency generators, EG04 and EG05.

Modified Condition 7.8 requires the Permittee to maintain fuel oil receipts obtained from fuel supplier certifying the distillate fuel oil fired in each emergency generator, including the two new emergency generators, EG04 and EG05.

Modified Condition 7.9 requires the Permittee to determine the monthly total emissions (in tons) of NOx, CO, and VOC emitted from the entire facility. The equations have been modified to include the two new emergency generators, the TRBC preheaters, the separation furnace, the ladle heaters and ladle dryers.

Toxic Impact Assessment

A toxic impact assessment in accordance with Georgia's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions* was conducted by Aurubis and reviewed by the Division. The emissions of air toxics were calculated using emissions data from a similar facility and/or process design values. The resulting potential annual TAP emissions were compared against the Minimum Emission Rate (MER) required for modeling contained in the *Guidelines*. For those pollutants emitted at rates above the MER, air dispersion modeling was conducted to determine whether or not the modeled ground level concentration was below the Acceptable Ambient Concentrations (ACC). The following table contains a list of TAP emissions compared to the respective MER and indication of the TAPs that were required to be modeled.

Air Toxic Compound		Facility-wide PTE (lb/yr)	Minimum Emission Rate (MER) (lb/yr)	Modelling Required (yes/no)
CAS No.	Substance			
7440-38-2	Arsenic	0.13	0.0567	Yes
7664-41-7	Ammonia	39,583	24,330	Yes
7440-48-4	Cobalt	21.22	11.7	Yes
7440-50-8	Copper	2,599	117	Yes
7664-39-3	Hydrogen Fluoride	700	284	Yes
7439-92-1	Lead	244.41	5.84	Yes
7439-96-5	Manganese	26.71	12.2	Yes
7440-02-0	Nickel	101.38	89.6	Yes
7440-02-13	Silicon	2,269	1,159	Yes
1314-13-2	Zinc Oxide	77,207	29,000	Yes

Air dispersion modeling analysis was performed to evaluate the effects that the proposed emissions from the facility may have on ambient air quality. Air dispersion models incorporate the source-specific parameters such as stack height, exit temperature, flow rate, and spatial location with meteorological conditions and building geometry to approximate the dispersion characteristics of a given stack plume across a study area. Dispersion modeling is used primarily to estimate the likely ambient concentration of the air constituent within the surrounding air. This demonstration supports the permit application for the proposed new installations by Aurubis, fulfilling the requirement to evaluate whether the potential ambient air concentrations of toxic air pollutants (TAP) at locations outside the facility boundary are acceptable.

USEPA regulatory model AERMOD version 21112 was used to perform the modeling analysis. AERMOD is the recommended model for air quality analyses per USEPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). AERMOD is steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The modeling was performed with AERMOD View commercial software developed by Lakes Environmental.

Several model options and input parameters are specified in order to customize the dispersion calculations to best approximate actual aerodynamic conditions at the project site. The model options and input parameters used for this analysis project were selected in accordance with EPD guidelines and are discussed in detail including outlining source-specific parameters used in the air dispersion modeling provided in Application No. 28917.

The MGLC (Maximum Ground Level Concentration) for the five-year data set is compared with the corresponding AAC (Acceptable Ambient Concentration) for each pollutant and averaging period in the following table. Since AERMOD does not report predicted concentrations in time averages less than 1-hour, the 15-minute average values are derived by multiplying 1-hour average results from AERMOD by a factor of 1.32. The use of this multiplying factor is done in accordance with the Georgia's *Guideline for Ambient Impact Assessment of TAP*. The results indicate that the predicted ambient concentrations for each modeled TAP are less than the AAC values that are considered to be protective of human health and the environment. Aurubis provided a copy of the AERMOD, AERMAP and BPIPPRM input and output files electronically to the Division. The Data Modeling Unit (DMU) received the modeling data provided by Aurubis and verified all modeled MGLCs of the TAPs were below the AAC values. The following table reflects the modeling review report received August 15, 2023.

TAP	AAC (µg/m3)	Time Average	Max Model Concentration (µg/m3)	Percent of AAC (%)
Arsenic	2.33E-04	Annual	< 1.0E-05	< 4.29%
Arsenic	0.2	15-min	1.19E-04	0.060%
Ammonia	100	Annual	2.89E-01	0.29%
Ammonia	2,400	15-min	12.37	0.52%
Cobalt	0.24	24-hour	1.88E-03	0.78%
Copper	2.4	24-hour	2.69E-01	11.19%
Hydrogen Fluoride	245	15-min	2.92E-01	0.12%
Hydrogen Fluoride	5.84	24-hour	6.22E-02	1.06%
Lead	0.12	24-hour	4.81E-02	40.11%
Manganese	500	15 min	1.12E-02	0.0022%
Manganese	0.05	Annual	2.60E-04	0.52%
Nickel	0.79	24-hour	1.18E-02	1.48%
Silicon	23.81	24-hour	2.08E-01	0.87%
Zinc Oxide	1,000	15 min	22.64	2.26%
Zinc Oxide	12	24-hour	5.08	42.32%

<u>Summary & Recommendations</u>

Based on the above considerations, I recommend issuing proposed Air Quality Permit No. 3341-245-0209-E-01-1 to Aurubis Richmond LLC for the construction and operation of a copper recycling facility and secondary copper smelter including the amendments to the emission units listing based on current operations. Public Advisory was not required for this application. Aurubis will remain a true minor source with respect to PSD/NSR and potential facility wide emissions, however, Aurubis will still be required to operate under a Title V Major Source Operating Permit due to subjection to 40 CFR 63 Subpart FFFFFF. Once Aurubis submits an application for a Part 70 permit within one year after startup of copper smelting operations, Aurubis will then become a Title V source in accordance with 40 CFR 63 Subpart FFFFFF.

Addendum to Narrative

The 30-day public review started on month day, year and ended on month day, year. Comments were/were not received by the Division.

//If comments were received, state the commenter, the date the comments were received in the above paragraph. All explanations of any changes should be addressed below.//