



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

White Paper on Metal Recycling and Shredding Operations

Regulatory Analysis and Recommendations to Further Reduce Fugitive Emissions
from Metal Recycling and Shredding Operations

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EXECUTIVE SUMMARY

The Bay Area Air Quality Management District (“Air District”) regulates air pollution in the San Francisco Bay Area. Air District staff have prepared a white paper to provide potential recommendations to further mitigate fugitive emissions from metal recycling and shredding facilities in the Bay Area. Metal recycling and shredding operations are sources of emissions of particulate matter (PM) (including metals that are listed as toxic air contaminants) and other pollutants. Communities near metal recycling and shredding facilities have raised concerns about air quality impacts from these sites. Concerns have been raised by the West Oakland community regarding several air quality issues resulting from frequent fires and the release of fugitive Light Fibrous Material (LFM) from a nearby facility. Additionally, the West Oakland Community Action Plan (WOCAP) included Strategy #68 for the Air District to pursue amendments to the existing rules to further reduce fugitive PM emissions from metal recycling and shredding operations. The Richmond-North Richmond-San Pablo Path to Clean Air (PTCA) also includes a strategy to evaluate potential efforts to address and reduce emissions from metal recycling sources: PTCA Strategy – Commercial and Industrial (C&I) 4.5.

This white paper includes background on metal recycling and shredding operations, as well as relevant information on the Air District’s current regulatory framework, including *Regulation 6: Particulate Matter, Rule 4: Metal Recycling and Shredding Operations* (Rule 6-4). The paper also provides a discussion of the challenges and opportunities related to the current Air District rules, including a review of control measures and regulations from other air pollution control agencies, and recommendations for potential further actions. Recommendations for further potential Air District actions include to:

- Amend Rule 6-4 to replace Emissions Minimization Plan requirements with specific mandatory Best Management Practices
- Amend Rule 6-4 to include fenceline monitoring requirements
- Amend Rule 6-4 to include registration requirements for facilities that are not required to have permits
- Provide better information to affected communities during air quality incidents
- Strengthen interagency partnerships and collaboration.

Further work on recommended actions should be developed in coordination with relevant stakeholders, including regulatory partners, community representatives, and affected industry. It is important to note this white paper provides a qualitative overview of these potential actions. The Air District will undertake additional analyses as part of future rule development activities to implement these proposed actions.

INTRODUCTION

In response to Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017), the Air District is partnering with Bay Area communities most impacted by air pollution to develop Community Emissions Reductions Plans (CERP), which include strategies to reduce harmful air pollution within those community. During the development of West Oakland’s CERP, “Owning Our Air: The West Oakland Community Action Plan” (WOCAP), community members repeatedly expressed concerns about the pollution from the Radius Recycling facility (formerly known as Schnitzer Steel), especially pertaining to deposition of light fibrous material (LFM) on both public and private properties around the facility and frequent fires that emit volatile organic compounds, particulate matter (and associated toxics and heavy metals), black carbon, and odor causing gases. As a result, Strategy #68 of the WOCAP states that the Air District should pursue *“amendments to existing regulations to further reduce emissions from metal recycling and foundry operations, such as changes to: 1) Rule 6-4: Metal Recycling and Shredding Operations, which requires metal recycling and shredding facilities to minimize fugitive PM emissions through the development and implementation of facility Emission Minimization Plans...by 2025.”* Community members also expressed additional concerns related to the need for additional controls and enclosures; community warnings during malfunctions, incidents, and fires; fire prevention and suppression; air pollution monitoring; increased ship calls; and improved coordination and communication between the various relevant regulatory agencies and the public. In addition, the Richmond-North Richmond-San Pablo Path to Clean Air (PTCA) includes a strategy to evaluate potential efforts to address and reduce emissions from metal recycling sources: PTCA Strategy – Commercial and Industrial (C&I) 4.5.

This white paper is the first step in assessing potential regulatory amendments to Regulation 6: Particulate Matter, Rule 4: Metal Recycling and Shredding Operations (Rule 6-4) and discusses the current understanding and knowledge of the air quality impacts from metal shredding and recycling operations and potential strategies for reducing those impacts. Note that although Strategy #68 of the WOCAP also highlights foundry and forging operations, an evaluation of those operations is anticipated to occur at a later time and is not within the scope of this white paper.

Rule 6-4 requires that metal recycling facilities that have a metal throughput of 50,000 tons or more per rolling twelve-month period; conduct shredder operations; or produce, receive, or process shredded metal must develop, have approved by the Air District, and comply with an Emissions Minimization Plan (EMP) designed to minimize their fugitive emissions of particulate matter. Facilities that do not conduct these activities or do not meet these throughput levels are exempt from this EMP requirement. Additionally, Rule 6-4 requires the maintenance of metal throughput records for all metal recycling facilities within the Air District with a metal throughput of 1,000 tons or more per rolling twelve-month period. Currently, there are three main metal recycling and shredding facilities in the Bay Area that are required to develop and implement EMPs: Radius Recycling (formerly known as Schnitzer Steel), Sims Metal - Richmond, and Sims Metal - Redwood City.

BACKGROUND

Process Overview

Metal recycling is the process of salvaging and recycling metals that are contained in end-of-life products such as automobiles and appliances. The recycling process involves breaking down products into scrap metal, extracting ferrous metals (iron and steel products) and non-ferrous metals (aluminum,

copper, brass, and other metals), and reprocessing them for use again. The various steps in this process are discussed in more detail below and shown in Figure 1.

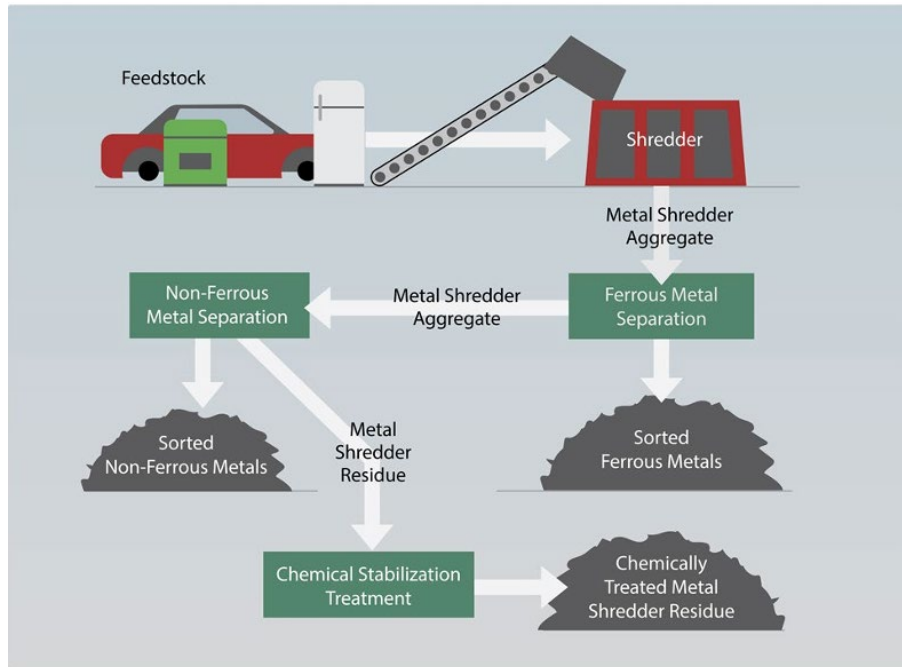


Figure 1 – Diagram of a typical metal shredding process.¹

Depollution Process

According to the California Metallic Discards Act, vehicles and appliances must be depolluted before they can be further processed as scrap. Depollution occurs as an initial step prior to processing and is not shown in Figure 1. Depollution involves the safe removal of materials that require special handling, which include organic materials such as gasoline and diesel fuel; motor oil; radiator, transmission, and brake fluids; unspent sodium azide (air bag) canisters; encapsulated polychlorinated biphenyls (PCBs) and metal encased capacitors; chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC), and other refrigerants from air-conditioning and refrigeration units; mercury switches and temperature control devices; and other materials regulated as hazardous wastes. Facilities that conduct depollution activities must be certified by the California Department of Toxic Substances Control (DTSC).

Shredding

The depolluted scrap metal is processed through a shredder which cuts and crushes the scrap metal into fist-sized scraps of metal, creating a mixture of scrap metal called metal shredder aggregate.² The shredder aggregate is a mix of ferrous and nonferrous metals (such as aluminum, copper, brass, and chromium), plastic, rubber, glass, and other components that were part of the scrap metal feedstock. Ferrous metals are segregated magnetically from the mixture of non-ferrous metals and shredder waste. The non-ferrous metals and shredder waste mixture can be further separated using air streams and

¹ Department of Toxic Substances Control (DTSC), 2021. Evaluation and Analysis of Metal Shredding Facilities and Metal Shredder Wastes. August.

² Some facilities may not shred all the scrap metal received. Some scrap materials received may bypass the shredder and be processed in other ways or may be collected and shipped off-site without additional processing. For instance, 40 percent of scrap metals received at Radius Recycling in West Oakland does not go through the shredding process.

screens to separate the lighter material from the heavier material containing metal.³ The remaining metal shredder aggregate is processed to separate the nonferrous metals. This resulting mixture is called “metal shredder residue.”

Shredder Residue Handling

Shredder residue is a by-product of metal recycling and is the material that remains after the metal scrap has been shredded and the usable metals have been separated out. Shredder residue composition varies, but is generally a mixture of plastic, vinyl, leather, textiles, sponge, foam, glass, and other metallic material. The shredder residue may also contain toxic compounds such as lead, mercury, arsenic, sodium azide, and PCBs.^{4,5} In addition, trace amounts of copper, cadmium, chromium, and zinc may be present, along with organic liquids such as oil, antifreeze, and transmission and brake fluids. Approximately 20 percent of the original weight of end-of-life vehicles and 27 percent of original mass of appliances will end up as shredder residue.⁶ Shredder residue may be transported offsite or stored onsite for the next step of chemical stabilization.

Chemical Stabilization

Facilities that conduct non-ferrous metal separation onsite treat the resulting metal shredder residue using a chemical stabilization process. Chemical stabilization is used to reduce the mobility of toxic heavy metals in the residue. The initial step is a thorough wetting of the material with liquid silicate. After the material is wetted, an alkaline activator, such as cement powder, is added, and the material is mixed in a pug mill (which is a paddle mixer that provides continuous and uniform mixing and blending of liquids and dry ingredients), yielding Chemically Treated Metal Shredder Residue (CTMSR). This CTMSR is passed under a final magnet for additional recovery of ferrous metals before it is transported offsite for disposal.

Metal Recycling in the Bay Area

The California Department of Resources Recycling and Recovery (CalRecycle) estimates that there are approximately 2,500 metal recycling facilities in California, which, in 2019, collected and processed for export an estimated 6.4 million tons of metal worth \$3.3 billion.⁷ In the Bay Area, there are currently 18 Air District permitted facilities that collect and recycle scrap metals and other non-metals like glass, plastics, rubber, and fiberglass. Staff understands there are many other additional sites that may handle and recycle scrap metal in smaller quantities and do not require Air District permits. These various scrap handlers and metal recycling operations have throughputs that can range from a few tons per year to thousands of tons of crushed or shredded metal per year. Sources of scrap metal are as varied as metallic products themselves; however, most of the scrap metal comes from automobiles, demolitions, manufacturing, wiring, and miscellaneous materials (cans, appliances, and other consumer products). The following list provides information on metal recycling, shredding, and/or scrapyards facilities that have some of the largest volumes of throughput in the Bay Area. It is important to note that while not all facilities operate a shredder, these operations still have the potential to contribute to fugitive particulate emissions.

³ Metallic Discards Act, Section 42175, California Codes, Public Resource Code.

⁴ Metallic Discards Act, Section 42175, California Codes, Public Resource Code.

⁵ Mensinger, Michael C.; Rehm, Mir; Saxema, Satish C.; and Rao, N. S.; Undated. “Treatment Technology for Auto Fluff.”

⁶ Department of Toxic Substances Control (DTSC), 2021. Evaluation and Analysis of Metal Shredding Facilities and Metal Shredder Wastes. August.

⁷ California Department of Resources Recycling and Recovery (CalRecycle), 2021. State of Disposal and Recycling in California for Calendar Year 2019, Publication # DRRR-2020-1697. February.

1. Recycle Central at Pier 96: Recycle Central is a waste management and recycling facility in eastern San Francisco. The facility accepts and collects a wide range of materials, including metal from home and business waste pickups and public drop-off locations and is equipped with advanced sorting and processing technology to ensure effective sorting and recycling of metals. This facility does not operate a shredder.
2. Sims Metal Management: Sims Metal Management is an international metal recycling company that has two locations in the Bay Area, specifically in Redwood City and Richmond. Sims Metal Redwood City, located at the Port of Redwood City, collects, depollutes automobiles and appliances, shreds, and segregates scrap metal. This facility operates a shredder. The Richmond location does not operate a shredder.
3. Radius Recycling (formerly Schnitzer Steel): Radius Recycling, formerly known as Schnitzer Steel, has been operating their metal recycling facility on a 26.4-acre lot in West Oakland since 1965. The facility purchases end-of-life vehicles, appliances, and scrap metal from various sources. Materials are typically brought into the facility by truck; once processed, the materials leave the facility via truck or ship. The facility is also accessible via train (Union Pacific). This facility operates a shredder.
4. Alco Iron and Metal: Alco Iron and Metal recycles ferrous and non-ferrous metals, appliances and vehicles as well as performs metal structure demolition and transformer dismantling. They also supply new and surplus ferrous and nonferrous metals. With their headquarters in San Leandro there are a total of five locations of Alco Iron across the Bay Area. This facility does not operate a shredder.
5. Berkeley Recycling: Berkeley Recycling is one of the largest recycling facilities in the East Bay region. The facility collects about 18,000 tons per year of various materials, including newspaper, cardboard, glass and plastic bottles, scrap metals, and household hazardous waste. This facility collects and sorts the waste for processing at shredding facilities. This facility does not operate a shredder.
6. Circosta Iron and Metal Company: Circosta Iron and Metal was established in 1932 and is the largest scrap recycling facility in San Francisco. The facility buys ferrous and non-ferrous metals to scrap them in their scrapyard. The scrap metal is then sold to other refiners, smelters, and mills. This facility does not operate a shredder, is not required to have an Air District permit, and is currently exempt from Rule 6-4.
7. CASS, Inc.: CASS, Inc. is a metal recycling and aluminum manufacturing company located in Oakland. This facility does not operate a shredder, and recycling operations are currently exempt from Rule 6-4. However, metal smelting operations that are conducted at the facility are subject to other Air District regulations (e.g., *Rule 12-13: Foundry and Forging Operations*).

Emissions from Metal Recycling and Shredding Operations

Volatile Organic Compounds

At metal recycling facilities, the shredding process is a significant source of volatile organic compounds (VOCs). VOCs are gas phase pollutants regulated by the Clean Air Act that can contribute to the formation of ground level ozone and secondary particulate matter (PM). During shredding, significant amounts of non-metallic materials (including plastics, paint, sealants, caulk, rubber, and residues from

fluids such as oils and fuels) are heated due to friction from mechanical shredding, grinding, and processing, releasing VOCs. Incomplete depollution of vehicles is another major source of VOCs due to the residual presence of fuel, engine oils, and lubricants. As a result, the non-metallic materials and hydrocarbons in the fuels can vaporize, emitting VOCs. Additional sources of VOCs at metal recycling and shredding facilities include material pile fires on the premises, as well as exhaust from ships, trucks, and other fossil-fuel powered machinery on site.

The type and quantity of VOCs emitted from a shredder is dependent on the size of the shredder and the type of material shredded. Emissions can typically be reduced using enclosures, scrubbers, and thermal oxidizers. VOC emissions for permitted recycling facilities in the Bay Area were estimated to be 172 tons per year in 2022.⁸

Particulate Matter

Particulate Matter, or PM, is solid or liquid matter suspended in the air. This material is typically composed of dust, soil, soot, metals, or organic material. PM is often characterized and differentiated based on size using the following categories:

- **PM_{2.5}** – particles less than or equal to 2.5 micrometers in diameter. These are classified as fine particles and can be breathed deep into the lungs and enter the blood stream, causing serious health problems.⁹
- **PM₁₀** – particles less than or equal to 10 micrometers in diameter. These particles are also small enough to be inhaled and can cause respiratory issues.
- **Total Suspended Particulate Matter (TSP)** – airborne particles of a wider range of sizes. For air monitoring, this typically includes particles sizes of up to 30 micrometers in diameter.

PM_{2.5} emissions for permitted recycling facilities in the Bay Area were estimated to be 13.9 tons per year and the total PM is estimated to be 26 tons per year for these facilities in 2022.

Sources of Particulate Matter at the Metal Recycling facilities:

Sources of PM which may include toxic metal components from metal recycling operations include:

- **Metal Shredder:** The violent mechanical grinding of metal and non-metal material in a shredder generates PM of various sizes. Depending on what is being shredded, the PM produced can contain a variety of materials including plastics, paints, sealant, rubber, organic pollutants, metals (such as iron, copper, and steel), and hazardous metals (such as lead, zinc, mercury, and cadmium). Exposure studies have shown that particulate matter from metal recycling facilities poses an increased cancer risk to residents living around a metal recycling facility.¹⁰ Another study analyzed heavy metals from a metal recycler and found statistically significant higher concentrations closer to the shredder for cadmium, lead, zinc, chromium, nickel, and manganese, along with some lower concentrations of arsenic.¹¹
- **Sorting and Handling Operations:** In some facilities like Radius Recycling (formerly Schnitzer Steel), not all scrap metal is processed through a shredder. Roughly 40 percent of material

⁸ Please note that Radius Recycling installed a pair of thermal oxidizers to mitigate VOC emissions in 2022. Reductions from these controls are not realized until the following year's emissions inventory.

⁹ United States Environmental Protection Agency (U.S. EPA), 2024. Particulate Matter (PM) Basics. <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>. Last updated June 20, 2024.

¹⁰ Loren, R.; Karl, P.; Daniel, H.; Donald, R.; Arturo, B.; and Jiao, L.; 2013. Unanticipated Potential Cancer Risk Near Metal Recycling Facilities. *Journal of Environmental Impact Assessment Review*, 41, 70-77.

¹¹ Solademi, F. and Thompson, S.; 2020. Spatial Analysis of Heavy Metal Emissions in Residential, Commercial and Industrial Areas Adjacent to a Scrap Metal Shredder in Winnipeg, Canada. *Journal of Geoscience and Environment Protection*, 8, 359-386.

handled at this facility does not go through the shredder. Some of this material is simply stockpiled and consolidated and then shipped directly off-site. Other material is processed by sheer cutting and torch cutting. Torch cutting operations have specific toxic concerns, notably a potential to emit hexavalent chromium. Sorting and handling operations involve movement of metal scrap and shredded materials and can disperse PM into the air. Loading and unloading of trucks/ships/rail and movement of material by heavy machinery on the property can also release PM into the air, primarily from dust from materials movement.

- **Material Piles:** Wind and mechanical (non-wind) agitation can disperse PM into the air from uncovered piles of material on the property. This PM can include toxic metal components. Material piles that may exist on property include the following:
 - Feedstock piles
 - Sorted ferrous metals
 - Metal shredder aggregate / residue
 - Sorted non-ferrous metals
 - Chemically treated metal shredder residue.
- **Fires:** Stockpile fires on the property release PM as a product of combustion. Depending on what material is burning, the PM produced may contain high levels of toxic components. For example, during the August 2023 fire at Radius Recycling, relatively higher levels were noted in the August 10, 2023 (midnight to midnight) samples from the Oakland - West and Livermore monitoring sites for several metals, including zinc, but also for lead, bromine, and sodium. Copper and chlorine were also elevated at the West Oakland site. The levels of different metals were higher at the West Oakland site, as that monitoring site was closer to and more impacted by the fire.
- **Cement Silo Storage:** Cement powder, which is used to stabilize light fibrous material, is stored in silos at the facilities and can become airborne during silo loading and when wind or agitation loft dust into the air.
- **Ship, Rail, and Truck Traffic:** Mobile sources release PM, including toxic diesel PM, into the air. In addition, ship fuel tends to be less refined and thus results in higher levels of particulate matter and black carbon than other fuel types.

Light Fibrous Material

Light Fibrous Material (LFM), as defined by DTSC,¹² is material produced during the metal shredding process that does not fall under the categories of recoverable ferrous or non-ferrous metal, but rather is characterized as metal shredder residue. LFM is also called shredder residue and “fluff.” This material can be dispersed offsite due to wind or rain if not adequately managed. LFM can consist of any materials that cannot be economically recovered from the feedstock during ferrous and non-ferrous metal removal. This includes plastics, rubber, glass, foam, fabric and carpets, wood, residual fluids (including fuel and oil), dirt, and a small quantity of unrecoverable metals.¹³ The shredding process is the main source of LFM at metal recycling facilities.

¹² Department of Toxic Substances Control (DTSC), 2021. Evaluation and Analysis of Metal Shredding Facilities and Metal Shredder Wastes. August.

¹³ Department of Toxic Substances Control (DTSC), 2021. Evaluation and Analysis of Metal Shredding Facilities and Metal Shredder Wastes. August.

In a 2012 California District Attorney investigation, LFM was found on both public and private properties near the Radius Recycling (formerly Schnitzer Steel) facility, including in locations that would allow LFM to migrate into waterways. Testing of the LFM near the facility found that the levels of metals, including lead, zinc, and copper, exceeded California hazardous waste thresholds.¹⁴

In a 2021 report from DTSC, results of the soil/sediment samples collected by U.S. EPA near a Sims Metal facility in Southern California revealed exceedances of DTSC’s Total Threshold Limit Concentrations (TTL) for cadmium, copper, lead, and zinc.¹⁵ DTSC also conducted an air monitoring study using TSP monitors and collected samples of LFM from the ground in the areas surrounding Radius Recycling’s (formerly Schnitzer Steel) West Oakland shredder facility from December 2020 to May 2023.¹⁶ The analysis showed that emissions from the facility likely caused or contributed to the higher levels of metals (including lead and nickel) found in the air samples.

REGULATORY HISTORY

Bay Area Air Quality Management District Rules

The Air District currently regulates sources of air pollution from metal recycling and shredding operations under the following rules and regulations:

- Regulation 1: General Provisions and Definitions
- Regulation 2: Permits, Rule 1: General Requirements
- Regulation 2: Permits, Rule 2: New Source Review
- Regulation 2: Permits, Rule 5: New Source Review of Toxic Air Contaminants
- Regulation 2: Permits, Rule 6: Major Facility Review
- Regulation 6: Particulate Matter, Rule 4: Metal Recycling and Shredding Operations
- Regulation 7: Odorous Substances
- Regulation 8: Organic Compounds, Rule 2: Miscellaneous Operations
- Regulation 12: Miscellaneous Standards of Performance, Rule 7: Motor Vehicle Air Conditioner Refrigerant

Relevant provisions of select rules are further discussed in the “Challenges and Opportunities” section of this paper.

Air Pollution Regulations Outside Bay Area Air District

Federal Regulations

U.S. EPA’s National Ambient Air Quality Standards (NAAQS) set nationwide air quality standards for various pollutants, including those potentially emitted from metal recycling and shredding operations (e.g., particulate matter, TSP-lead, and volatile organic compounds and other precursors that contribute to formation of PM and ozone).¹⁷ U.S. EPA also establishes basic requirements for New Source Review

¹⁴ Superior Court of the State of California – County of Alameda, 2021. Stipulation for Entry of Final Judgment and Order on Consent, Case No. RG21087468. Filed February 3, 2021.

¹⁵ Department of Toxic Substances Control (DTSC), 2021. Evaluation and Analysis of Metal Shredding Facilities and Metal Shredder Wastes. August.

¹⁶ Department of Toxic Substances Control (DTSC), 2023. LFM Sampling and Air Monitoring Study Data Summary. August.

¹⁷ 40 CFR Part 50, National Ambient Air Quality Standards

(NSR) permitting for new or modified facilities exceeding certain emission thresholds.¹⁸ The maximum achievable control technology (MACT) standards may also apply to new or modified operations at metal recycling and shredding facilities if the facility is a major source¹⁹ of Hazardous Air Pollutants (HAPs).

State Regulations

Metal recycling facilities in California must comply with the California Air Resource Board's AB 2588 Air Toxics "Hot Spots" Program. Any business or facility in California that emits greater than 10 tons per year of organic gases, PM, oxides of nitrogen (NOx), or sulfur oxides (SOx) are subject to the program. In addition, facilities emitting less than 10 tons per year are being phased into the program during 2022-2028. The local air districts implement and enforce this regulation.²⁰ In 2028, AB 2588 would be applicable to facilities that scrap and recycle waste, handling 40,000 tons per year or more of shredded material or 1,000 tons per year or more of metal recycled.

Metal shredding facilities are also required to operate under state hazardous waste facility permits (per the October 15, 2021, emergency rule) set forth by the California Department of Toxic Substances Control (DTSC), which is the state agency responsible for enforcing hazardous waste laws and restoring contaminated resources. DTSC requires businesses to manage hazardous waste from its generation to its proper disposal or recycling, which is known as "cradle-to-grave" liability and is required by law.²¹ DTSC has designated metal shredder aggregate as a hazardous waste.²² Material and hazardous waste, such as light fibrous material, may be hauled off-site to other disposal facilities that are regulated by other agencies, such as CalRecycle.

Other agencies with relevant authorities include the San Francisco Bay Regional Water Quality Control Board due to stormwater requirements and the San Francisco Bay Conservation and Development Commission (BCDC) due to proximity to the San Francisco Bay.

Regulations from Other Air Districts

Local air districts in California also have the authority to adopt regulations addressing air pollution from metal recycling and shredding facilities within their jurisdiction. There are limited regulations at other air districts that specifically focus on metal recycling and shredding operations; broadly, most air districts have general regulations for stationary sources generating PM emissions and apply those same regulations and requirements to metal recycling facilities as well. However, one notable exception is the South Coast Air Quality Management District (SCAQMD), which has regulations that specifically address industries dealing with the handling, processing, torching, shredding, and recycling of metals. Relevant rules from SCAQMD include:

- *Rule 1420.2: Emission Standards for Lead from Metal Melting Facilities* – This rule is intended to protect public health by reducing emissions and ambient air concentrations of lead from metal

¹⁸ 40 CFR Part 51 & Part 52

¹⁹ The Clean Air Act defines "major source" as any stationary source or group of stationary sources located within a contiguous area that emit or have the potential to emit (considering controls), in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.

²⁰ California Air Resources Board (CARB), 2024. AB 2588 Air Toxics "Hot Spots." <https://ww2.arb.ca.gov/our-work/programs/ab-2588-air-toxics-hot-spots/about>.

²¹ California Department of Toxic Substances Control (DTSC), 2024. Hazardous Waste Management for Scrap Metal Recyclers. <https://dtsc.ca.gov/hazardous-waste-management-for-scrap-metal-recyclers/>.

²² California Department of Toxic Substances Control (DTSC), 2024. Metal Shredding Facilities and Wastes. <https://dtsc.ca.gov/metal-shredders/>.

melting facilities, reduce public health impacts by reducing the exposure to lead, and help ensure attainment and maintenance of the National Ambient Air Quality Standard for Lead.²³

- *Rule 1430: Control of Emissions from Metal Grinding Operations at Metal Forging Facilities* – This rule addresses toxic emissions, particulate matter emissions, and odors from metal grinding and metal cutting operations at metal forging facilities.²⁴
- *Rule 1460: Control of Particulate Emissions from Metal Recycling and Shredding Operations* – This rule is aimed at minimizing fugitive dust from metal recycling facilities and metal shredding facilities.²⁵
- *Rule 1480: Ambient Monitoring and Sampling of Metal Toxic Air Contaminants (TACs)* – This rule requires an owner or operator of a facility with metal TAC emissions to conduct ambient monitoring and sampling.²⁶

A comparison of the provisions in these rules and relevant rules from other air districts is discussed below in the “Gap Analysis” section.

CHALLENGES AND OPPORTUNITIES

Challenges with Existing Air District Regulations/Rules

In examining the challenges of the Air District’s current regulatory framework, this section focuses on the rules that can most directly address emissions from metal recycling and shredding facilities.

Rule 6-4: Metal Recycling and Shredding Operations

Air District Rule 6-4 requires all metal recycling facilities with a metal throughput of 1,000 tons or more per rolling twelve-month period to maintain records of metal throughput. Rule 6-4 also requires certain metal recycling facilities to develop, and comply with, an Emissions Minimization Plan (EMP) designed to minimize their fugitive PM emissions. Facilities that do not conduct shredder operations, process shredded metal, or that have a metal throughput of 50,000 tons or less per rolling twelve-month period are exempt from this EMP requirement. The rule requires facilities to provide comprehensive details about the operations and processes, permitted equipment, abatement and controls, and Best Management Practices (BMPs) to minimize emissions and fugitive PM. Although facilities are required to identify BMPs in their EMPs, the BMPs implemented can vary from one facility to another. Short of strengthening the rule to require specific BMPs to consistently apply standards across the industry, the flexibility of the current rule may not maximize the level of emissions reductions that could be achieved through available methods. Updating the rule to require industry standards and compliance with best practices rather than the submission of EMPs would allow staff time and resources be more efficiently and effectively utilized to ensure compliance and that specific air quality gains are achieved.

One of the main concerns from the West Oakland community is the amount of LFM seen in the residential and commercial neighborhoods around the Radius Recycling (formerly Schnitzer Steel) facility. LFM created during shredding and other metal separation processes can become airborne and travel outside of the facility boundaries, but LFM is not traditionally regulated as an air pollutant. While some EMP measures may also mitigate LFM emissions in addition to fugitive PM emissions, Rule 6-4

²³ South Coast Air Quality Management District (SCAQMD), 2015. Rule 1420.2: Emission Standards for Lead from Metal Melting Facilities.

²⁴ South Coast Air Quality Management District (SCAQMD), 2017. Rule 1430: Control of Emissions from Metal Grinding Operations at Metal Forging Facilities.

²⁵ South Coast Air Quality Management District (SCAQMD), 2022. Rule 1460: Control of Particulate Emissions from Metal Recycling and Shredding Operations.

²⁶ South Coast Air Quality Management District (SCAQMD), 2022. Rule 1480: Ambient Monitoring and Sampling of Metal Toxic Air Contaminants (TACs).

does not set LFM emissions standards at the facility or process-level. LFM components, such as Lead-Total Suspended Particulates (Pb-TSP), PM_{2.5}, and metal toxic air contaminants (TACs), are commonly regulated under air quality regulations,¹⁶ however, Rule 6-4 does not contain emission standards or monitoring requirements for these pollutants.

Another concern is the issue of frequent stockpile fires at the facilities. The EMPs may include BMPs designed to address stockpile management to prevent pile fires. These BMPs may involve following a proper depollution technique before accepting scrap feedstock, enclosing stockpiles, monitoring stockpiles, wetting stockpiles, minimizing stockpile size, increasing spacing, and shortening storage durations. While these BMPs are enforceable within the EMP, they can vary from one facility to another.

Rule 6-1: Particulate Matter – General Requirements

Air District Rule 6-1 sets general limitations of PM emissions to the atmosphere. Sources subject to Rule 6-4 (e.g., metal recycling facilities) are currently exempt from the requirements of Rule 6-1. It is important to note that although Rule 6-1 does not currently apply to sources at metal recycling facilities, some of the requirements in Rule 6-1 may potentially be effective in addressing LFM emissions. Rule 6-1 also contains requirements that are challenging to enforce. The burden of proof to issue violations from fugitive PM emissions is tied to opacity limits which require a minimum of three minutes of visible emissions above a certain threshold in any hour to trigger an exceedance. PM emissions and fugitive dust are typically caused by intermittent meteorological conditions, such as high winds, and/or facility operations (such as mechanical agitation of materials that increase the susceptibility of PM to becoming airborne) and do not always exceed the visible emissions evaluation standards in Rule 6-1. Further challenges associated with Rule 6-1 are discussed in the Air District's Fugitive Dust White Paper.²⁷ The Air District is currently developing amendments to Rule 6-1 and other related fugitive dust rules to address these challenges.

Gap Analysis

Staff reviewed existing regulations and programs at other agencies to understand their various approaches to controlling emissions from metal recycling and shredding operations. As previously noted, most agencies have not implemented regulations specific to emissions from metal recycling and shredding operations except SCAQMD. Most other agencies have general rules in place to address fugitive dust and establish specific emissions limits and control requirements for individual metal recycling and shredding operations through their permitting process. Some agencies, such as the Environment Agency in the United Kingdom, have technical guidance documents to support the permitting process for facilities mechanically treating metal wastes in shredders.²⁸ As discussed earlier, some strategies adopted to mitigate fugitive dust may broadly apply to emissions from metal recycling facilities, and the current Air District effort on amendments to rules concerning fugitive dust may also provide opportunities to address these issues.²⁹ Specifically, staff reviewed regulations and programs in the following jurisdictions and summarized key findings in Table 1.

1. California Air Resources Board (CARB)
2. Clark County (NV) Department of Environment and Sustainability (DES)
3. Imperial County Air Pollution Control District (ICAPCD)

²⁷ Bay Area Air Quality Management District, 2023. Fugitive Dust White Paper. March.

²⁸ United Kingdom Environment Agency, 2022. Metal Shredders – Appropriate Measures for Permitted Facilities. February. <https://consult.environment-agency.gov.uk/environment-and-business/metal-shredders-permitted-facilities/>.

²⁹ Bay Area Air Quality Management District, 2024. "Fugitive Dust." <https://www.baaqmd.gov/en/rules-and-compliance/rule-development/fugitive-dust>.

4. Maricopa County Air Quality Department (MCAQD)
5. Sacramento Metropolitan Air Quality Management District (SMAQMD)
6. South Coast Air Quality Management District (SCAQMD)
7. Chicago Department of Public Health (CDPH)
8. Arizona Department of Environmental Quality (ADEQ)
9. San Diego County Air Pollution Control District (SDAPCD)
10. San Joaquin Valley Air Pollution Control District (SJVAPCD)
11. U.S. Environmental Protection Agency (U.S. EPA)

Table 1: Other Agency Rules Focused on Metal Recycling/Shredding/Smelting Emissions

Agency	Rule	Relevant Sections	Rule Description
SCAQMD	Rule 1480 - Ambient Monitoring and Sampling of Metal Toxic Air Contaminants	d	An owner or operator of a facility that is designated as a Metal TAC Monitoring Facility pursuant to paragraph (d)(7) is required to conduct Monitoring and Sampling to determine emissions resulting from shredding and recycling operations.
			Metal Recycling and Shredding facilities are designated as Metal TAC (Toxic Air Contaminant) Monitoring facility if:
			(A) The facility has equipment or processes with metal TAC(s) emissions;
			(B) The metal TAC(s) emissions are capable of being released into the ambient air;
			(C) The facility has been designated as a potentially High-Risk Level Facility under SCAQMD Rule 1402 (Control of Toxic Air Contaminants from Existing Sources);
			(D) The facility's highest health risk value at a Sensitive Receptor exceeds the Significant Risk Level based on the Metal TAC emissions from the facility, location of the Sensitive Receptor with the highest health risk value, and the percent that each Metal TAC contributes to the highest health risk value, based on air dispersion modeling.
SCAQMD	Rule 1420.2 - Emissions Standards for Lead from Metal Melting facilities	d(1), d(3), e(1), e(2)	The owner or operator of a metal melting facility shall not discharge emissions into the atmosphere which contribute to ambient air concentrations of lead at or above 0.1 µg/m ³ averaged over 30 days. No later than March 1, 2016, the owner or operator of a metal melting facility shall submit a Lead Ambient Air

Agency	Rule	Relevant Sections	Rule Description
			Monitoring and Sampling Plan for review and approval by the district.
SCAQMD	Rule 1460 - Control of Particulate Emissions from Metal Recycling and Shredding Operations	e & f d(1)(2)(3)	<p>Facilities are required to follow good housekeeping measures for better stockpile management including complete enclosure of stockpile.</p> <p>Facilities are required to conduct wind monitoring to reduce the possibility of fugitive dust transport across property line.</p> <p>Facilities are required to pave roads to minimize track out where scrap metal unloading and loading, sorting, shearing, torch cutting, baling, shredding, or Scrap Metal storage activities take place.</p> <p>Facilities are required to comply with registration requirements.</p>
SCAQMD	Rule 1430 - Control of emissions from metal grinding operations at metal forging facilities	d	Facilities are required to: conduct all metal grinding/cutting operations within a total enclosure; vent emissions to an emission control device equipped with a HEPA filter; conduct source tests for PM, metals, and hexavalent chromium; and install a bag leak detection system to catch leaks.
SCAQMD	Rule 403 - Fugitive Dust	d & e	Facilities are required to mitigate fugitive dust emissions from large dust generating operations through best management practices.
MCAQD	Rule 310.01 – Fugitive Dust from Non-Traditional Sources of Fugitive Dust	301 & 302	General requirements for mitigating emissions from non-traditional sources of fugitive dust.

Opportunities for Improvement

Following the gap analysis, staff have identified potential opportunities to enhance the Air District’s current rules for metal recycling and shredding operations. These can be characterized into the following broad categories.

Improved Controls and Enforceability to Address Fugitive PM Emissions

SCAQMD Rule 1460 requires best practices and emissions controls for metal recycling and shredding operations. Rule 1460 requires all metal shredder residue to be housed in a permanent three-sided

enclosure or physical structure, or a portion of a building, with a floor, walls, and a roof to prevent exposure to the elements (e.g., precipitation, wind, runoff), where openings are only to allow access for people, vehicles, equipment, scrap metal, or shredder residue.³⁰ Rule 1460 also requires wind monitoring to reduce the possibility of fugitive dust transport across property line. The Air District could explore opportunities to amend Rule 6-4 to include similar requirements as specific Best Management Practices to address fugitive emissions from facility operations more effectively.

Additionally, SCAQMD Rule 1460 requirements for the registration of metal recycling and shredding can provide a better understanding of smaller operations and their size and potential for local air quality impacts. The Air District could consider registration requirements for smaller unpermitted facilities that do not operate a shredder but still process, recycle, and sort metals through crushing or other mechanical processes and have the potential to generate related fugitive PM emissions.

Air Monitoring

At metal recycling and shredding facilities, the types and amounts of pollutants emitted can vary based on facility activity, the amount and type of materials being processed, abatement measures, and any unforeseen events such as fires. Emissions from metal recycling operations are a result of a variety of activities occurring at the facilities, including the active shredding of scrap materials, sorting and separating of metals from shredded materials, wind lofting material from piles, wind lofting chemicals from storage silos, and transporting of materials around the property to and from trucks, railcars, and ships. The estimated emissions of PM or metals from these activities are also relatively uncertain. Additional sources of pollution associated with the recycling activities include pollution emitted from pile fires and from truck/ship/rail exhaust. SCAQMD Rule 1480 includes requirements for monitoring of metal Toxic Air Contaminants (TACs) at facilities if the significant risk level has been exceeded. Rule 6-4 currently has no monitoring requirements; air monitoring could provide data to better characterize ongoing emissions of LFM-related particles and other fugitive PM or VOC emissions from the facility and inform on whether progress is being made and maintained to address offsite impacts from those emissions.

³⁰ South Coast Air Quality Management District (SCAQMD), 2022. Final Staff Report, Proposed Rule 1460 – Control of Particulate Emissions from Metal Recycling and Shredding Operations. November.

RECOMMENDATIONS

Based on the initial analyses of challenges and opportunities provided in this white paper, staff are providing the following potential recommendations to further address emissions from metal recycling and shredding facilities. Staff recognize that the following section is not an exhaustive list of all potential regulatory changes and that other ideas may be considered throughout the stakeholder engagement and rule development process. It is also important to note that staff have not yet extensively evaluated impacts nor the required resources to support these initial recommendations. An in-depth assessment of these impacts will take place prior to the proposal of rule amendments.

I. Amend Rule 6-4 to replace Emissions Minimization Plan requirements with specific mandatory Best Management Practices

Staff recommend exploring opportunities for amending Rule 6-4 to eliminate the requirement of an Emissions Minimization Plan. In lieu of the EMP, the requirements for specific mandatory Best Management Practices (BMPs) should be included in the rule. Staff recommends the following as an initial list of BMPs to be considered for potential rule amendments:

1. Best Management Practices to reduce fugitive emissions from point sources
 - i. Require all metal shredding, crushing, grinding, cutting, sorting, separating, and recycling operations be conducted within a permanent enclosure that minimizes fugitive emissions. If venting is necessary, emissions should be vented into an approved emissions control system.
 - ii. Require either a permanent full or temporary enclosure, depending on the nature of the facility, to contain stockpiles and feedstock piles to minimize fugitive emissions.
 - iii. Require the trucks and railcar carriages transporting stockpiles (feedstock and/or shredded material/shredder residue) in and out of the facility to have coverings.
2. Best Management Practices for fire prevention
 - i. Require the enclosures housing all stockpiles to be equipped with fire detection and prevention devices like infrared cameras and/or sensors, sprinkler systems, and fire extinguishers.
 - ii. Require the facility to follow a stringent depollution methodology for the incoming feedstock. The depollution should be conducted at facilities with employees that are certified and trained.
 - iii. Require facility employees to frequently check for off-gassing of toxic and/or flammable gases from stockpiles using portable or stationary monitors, during the pre-shredding wait time.
 - iv. Require the facility to implement a “shred-to-ground” schedule to ensure a quick turnaround time to complete shredding of all incoming feedstock material and minimize accumulation of feedstock for extended periods of time. Additional limitations on scrap acceptance and management should be considered to minimize accumulation.
 - iv. Require the facility to adequately wet stockpiles and shredder residue piles on a scheduled basis throughout the operational hours.
3. Best Management Practices to reduce trackout emissions
 - i. Require the facility to pave all surfaces with vehicle traffic. Additionally, the facility should regularly clean paved surfaces and minimize trackout.

- ii. Require training for the employees at the facility to visually determine fugitive emissions from material sources.
- iii. Require activities at the facility to comply with similar opacity limits to Rule 6-1.

II. Amend Rule 6-4 to include fenceline air monitoring requirements

Staff recommend exploring opportunities to amend Rule 6-4 to include a fenceline air monitoring requirement for certain metal shredding and recycling facilities. Fenceline monitoring may serve different purposes, including to:

- Demonstrate effectiveness of fugitive emissions control measures and determine whether progress is being made and maintained to address offsite impacts from facility emissions.
- Provide data to inform improved emissions estimates from fugitive sources during a range of typical operations and environmental conditions; and
- Inform the public about levels of certain pollutants at the fenceline and potential air quality impacts in nearby communities.

Requirements for fenceline air monitoring may include descriptions of acceptable air and meteorological monitoring systems, pollutants to monitor and analyze for, monitoring frequency, and data reporting.

III. Amend Rule 6-4 to include registration requirements for facilities not requiring permits

Staff recommend evaluating the development of a registration requirement and program for metal recycling facilities that do not currently require permits. This includes facilities that do not operate a shredder but conduct metal recycling, processing, and sorting operations through grinding, crushing, and/or mechanical processes. This would potentially include facilities with less throughput than the thresholds specified in Rule 6-4.

IV. Provide better information to affected communities during air quality incidents

Staff recommend providing timely and accessible information to affected communities during an air quality incident. Staff should leverage the Air District's incident response program to facilitate proactive notification to community members during and after incidents, using the public notification tool and other methods such as media interviews, briefings and outreach via Air Quality Advisories and social media posts. Updates to other agencies, cities/counties and public health officers should be considered via email, meetings or Zoom briefings.

V. Strengthen interagency partnerships and collaboration

Staff recommend continuing efforts to improve Air District collaboration with other government entities agencies that have the jurisdiction to regulate metal recycling operations. This collaboration should focus on efficiently navigating regulatory issues and incident responses, jointly enforcing and issuing violations, and sharing air quality information with affected communities and addressing their concerns. Examples of agencies are DTSC, U.S. EPA Region 9, CARB, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Conservation and Development Commission, CalRecycle, and county public health departments. Note that the Air District currently participates in the Rapid Response Task Force (RRTF) formed by CalEPA and U.S. EPA in response to the 2023 fire at Radius Recycling (formerly Schnitzer Steel) in West Oakland.