



State of Oregon
Department of
Environmental
Quality

SIMPLE AIR CONTAMINANT DISCHARGE PERMIT REVIEW REPORT

NW Metals Inc
9537 North Columbia Boulevard
Portland, OR, 97218

Source Information:

SIC	5015, 5093	Source Categories (Table 1 Part, code)	Part B, 85
NAICS	423140, 423930	Public Notice Category	III

Compliance and Emissions Monitoring Requirements:

FCE		Source test	
Compliance schedule		COMS	
Unassigned emissions		CEMS	
Emission credits		PEMS	
Special Conditions	X	Ambient monitoring	

Reporting Requirements

Annual report (due date)	February 15	Monthly report (due dates)	
Quarterly report (due dates)		Excess emissions report	
		Other (Semi-Annual)	Feb. 15, July 15

Air Programs

Synthetic Minor (SM)		PSD	
SM -80		GHG	
NSPS (list subparts)		RACT	
NESHAP (list subparts)		TACT	
CAO	X	Other (specify)	
NSR			

TABLE OF CONTENTS

PERMITTING	3
SOURCE DESCRIPTION.....	4
COMPLIANCE HISTORY	5
EMISSIONS	6
TITLE V MAJOR SOURCE APPLICABILITY	6
CLEANER AIR OREGON.....	7
ADDITIONAL REQUIREMENTS.....	8
SOURCE TESTING	9
PUBLIC NOTICE.....	10
ATTACHMENT A – EMISSION DETAIL SHEETS	10

PERMITTING

PERMITTEE IDENTIFICATION

1. NW Metals Inc
9537 North Columbia Boulevard
Portland, OR, 97203

PERMITTING ACTION

2. NW Metals Inc (NW Metals) was initially located at 7600 NE Killingsworth and was determined to be an existing source for the purposes of Cleaner Air Oregon in accordance with OAR 340-245-0020 because construction had commenced on this facility prior to November 16, 2018. As an existing source the permittee is required to perform a risk assessment in accordance with OAR 340-245-0050, and demonstrate compliance with the Risk Action Levels for an "Existing Source" in OAR 340-245-8010 Table 1 when called in by DEQ. NW Metals was called in on May 19, 2020. However, NW Metals moved to 9537 North Columbia Boulevard prior to finalizing the risk assessment.
3. NW Metals has been determined to be a new source for the purposes of Cleaner Air Oregon in accordance with OAR 340-245-0020 because the air quality permit application was not submitted and deemed complete, nor had construction commenced on this facility before November 16, 2018, at the Columbia Boulevard location. As a new source the permittee is required to perform a risk assessment in accordance with OAR 340-245-0050, and demonstrate compliance with the Risk Action Levels for a "New and Reconstructed Source" in OAR 340-245-8010 Table 1.

OTHER PERMITS

4. NW Metals is not required to obtain a DEQ Solid Waste Permit. On January 4, 2021, Oregon Department of Motor Vehicles issued a DMV Dismantler's Certificate to NW Metals for this location. According to ORS 459.005(8)(b)(D), because NW Metals now operates under a dismantler certificate and only accepts vehicles, NW Metals at this location is no longer considered a solid waste disposal site so a DEQ solid waste permit is not required.
5. NW Metals is not required to obtain an industrial stormwater permit. The City of Portland's Bureau of Environmental Services is DEQ's agent for implementing the 1200-Z industrial stormwater general permit within the city limits. The city has confirmed that the site located at 9537 North Columbia Boulevard does not have the potential to discharge to waters of the state based on the topography of the site.
6. DEQ has not issued nor required any other permits for NW Metals at the North Columbia Boulevard location.

ATTAINMENT STATUS

7. The source is located in a maintenance area for carbon monoxide (CO) and ozone [oxides of nitrogen (NO_x) and volatile organic compounds (VOC) are precursors of ozone] and in an attainment area for all other NAAQS pollutants.

SOURCE DESCRIPTION

OVERVIEW

8. The permittee operates a metals recycling facility. NW Metals obtains end of life vehicles (ELVs), sheet metals, and left over metal from manufacturing.

ELVs are bought from auctions and individual sellers. Upon arrival, all fluids are drained, refrigerant recovered, batteries removed, and wheels and tires are removed. Batteries and oils are stored onsite and then sent for recycling. Gasoline and refrigerant are reused in automobiles. Usable tires are sold and waste tires are disposed of. Materials are then transferred to the shredding site where they are crushed and fed into an ARJES shredder (<https://www.arjes.de/en/>) to be shredded. NW Metals will not engage in any plasma or torch cutting in the dismantling process. Final products of the shredding process are iron, steel, zorba (e.g., aluminum) and fluff. The metals are sold as scrap and the fluff is sent to a municipal waste landfill. The facility began operation at 7600 NE Killingsworth St. on March 27, 2014, but did not operate a shredder until early 2018.
9. The permittee processes recreational vehicles (RVs). Some RVs contain asbestos-containing materials as defined in OAR 340-248-0010, and may not be demolished unless all conditions within OAR 340-248 are followed, including survey, abatement, and disposal requirements.
10. On June 20, 2018, DEQ approved a Type II Notice of Intent to Construct (NC) for installation and operation of an Arjes VZ 950 Mini Shredder for the shredding of scrap automobiles.
11. On August 24, 2018, DEQ informed NW Metals that the NC was reevaluated and an ACDP was required for installation and operation of the Arjes VZ 950 Shredder. DEQ provided NW Metals 60 days to submit an ACDP application.
12. In April of 2019, NW Metals informed DEQ that Arjes will be providing NW Metals with a replacement shredder due to the current shredder breaking down so frequently. The new shredder began operation on or around October 31, 2019.
13. On February 12, 2020, DEQ received an ACDP application. However, the application did not include a land use compatibility statement (LUCS). The LUCS was received by DEQ on March 13, 2020, and resulted in NW Metal's ACDP application being labeled complete as of March 13, 2020.

14. On August 16, 2020, the permittee notified DEQ that they plan to move their operations to 9537 North Columbia Boulevard and provided DEQ with a revised LUCS for the new location.
15. On September 8, 2020, the permittee provided DEQ with an updated project description and facility layout diagram for the North Columbia Boulevard location.

PROCESS AND CONTROL DEVICES

16. Air contaminant sources at the facility consist of the following:
 - a. Two Arjes VZ 950 Titan Shredders.
 - i. Shredder #2 (installed at the Killingsworth location in October 2018) is powered by a 768 hp Volvo Penta diesel engine certified to USEPA Tier 2 standards. NW Metals plans to move this unit off site but it is still capable of being operated. Until it's removed, NW Metals is prohibited from operating the emissions unit.
 - ii. Shredder #3 (installed at the Killingsworth location in October 2019) is powered by a 700 hp Volvo Penta diesel engine certified to USEPA Tier 4f standards. NW Metals plans to operate the shredder for approximately 30 hours per week.
 - iii. Both shredders are shearing shredders and each have a maximum capacity of approximately 10 tons of automotive scrap per hour.
 - b. Fluid (e.g., gasoline, oils) draining of autos prior to shredding which results in the emissions of VOC and HAP. All oils drained from automobiles are sent off-site for processing.
 - c. Aggregate insignificant activities from draining and recycling of automotive refrigerants (e.g., chlorofluorocarbons) which can result in emissions of GHGs to the atmosphere.

CONTINUOUS MONITORING DEVICES

17. The facility has non-resettable hour meters on both of the Volvo Penta engines that power the Arjes VZ 950 Titan Shredders.

COMPLIANCE HISTORY

18. On November 7, 2018, DEQ issued a Pre Enforcement Notice (2018-PEN-4015) to NW Metals for failing to submit an ACDP application.
19. On November 5, 2019, DEQ issued a Pre Enforcement Notice (2019-PEN-5105) to NW Metals for installing the new shredder without first submitting an ACDP application.

20. A full discussion of the compliance history for this facility's operations at 7600 NE Killingsworth Street is available on DEQ's web page at <http://www.oregon.gov/deq/Programs/Pages/nescrap.aspx>.
21. The facility will continue to be inspected by DEQ personnel to ensure compliance with the permit conditions and all other applicable regulations.

EMISSIONS

22. Proposed PSEL information:

Pollutant	Baseline Emission Rate (tons/yr)	Netting Basis		Plant Site Emission Limits (PSEL)		
		Previous (tons/yr)	Proposed (tons/yr)	Previous PSEL (tons/yr)	Proposed PSEL (tons/yr)	PSEL Increase (tons/yr)
PM	N/A	N/A	0	N/A	24	24
CO	N/A	N/A	0	N/A	99	99
VOC	N/A	N/A	0	N/A	39	39

- a. The netting basis is zero for Simple ACDPs and portable sources in accordance with OAR 340-222-0046(2).
- b. For Simple ACDPs, the proposed PSELs for all pollutants are equal to the Generic PSEL in accordance with OAR 340-216-0064(3)(b).
- c. The PTE for PM₁₀ and PM_{2.5} are both below de minimis levels so PSELs for these pollutants are not included in the ACDP.
- d. The PSEL is a federally enforceable limit on the potential to emit.

SIGNIFICANT EMISSION RATE ANALYSIS

23. For each pollutant, the proposed Plant Site Emission Limit is less than the sum of the Netting Basis and the significant emission rate, thus no further air quality analysis is required at this time.

TITLE V MAJOR SOURCE APPLICABILITY

24. A major source is a facility that has the potential to emit 100 tons/year or more of any criteria pollutant or 10 tons/year or more of any single HAP or 25 tons/year or more of combined HAPs. This facility is not a major source of emissions. The basis for this determination can be found in the emission detail sheet.

25. A source that has the potential to emit less than major source thresholds is called a true minor. This source is a true minor. The basis for this determination can be found in the emission detail sheet.

CRITERIA POLLUTANTS

26. This facility is a minor source of criteria pollutant emissions.

HAZARDOUS AIR POLLUTANTS

27. This source is not a major source of hazardous air pollutants. The HAP emissions detail is provided in the emission detail sheet.

CLEANER AIR OREGON

28. NW Metals performed a Level 1 Risk Assessment for the metal shredding operations and associated material handling activities at this facility as required by the Cleaner Air Oregon (CAO) program. This assessment included Toxic Air Contaminant (TAC) emissions from Shredder #3, the diesel engine used to power Shredder #3, and material handling activities of Automotive Shredder Residue. This assessment assumed a shredding capacity of 10 tons per hour for the shredder in order to calculate TAC emissions using hours of operation as the basis. The results of this assessment are shown in the table below, and indicate that risk does not exceed the Toxic Lowest Achievable Emissions Rate Risk Assessment Levels; however community engagement is required for this facility. Both Annual and Acute Source Risk Limits for this facility will be based on hours of operation, with monitoring requirements based on the non-resettable hour meters of the diesel engines in the shredders. The facility will also be required to demonstrate compliance with the risk assessment results by demonstrating that the maximum shredder throughput capacity does not exceed 10 tons per hour.

Risk Type	Facility Risk	Risk Assessment Results
Cancer Risk – added cancer risk per million with 70 years of exposure		
Residential (e.g. homes near facility)	4	Facility Risk is below the Risk Action Level* limit of 10.
Non-Residential Child (e.g. school near facility)	<0.5	
Non-Residential Worker (e.g. office near facility)	10	Facility Risk is at the Risk Action Level limit of 10.
Noncancer Risk – Hazard Index (less than or equal to 1 is considered safe)		
Annual Exposure-Residential (e.g. home)	<0.5	Facility Risk is below the Risk Action Level limit of 1.
Annual Exposure-Non-Residential Child (e.g. school)	<0.5	

Risk Type	Facility Risk	Risk Assessment Results
Annual Non-Residential Worker (e.g. office)	<0.5	
24-Hour Exposure (acute)	1	Facility Risk is at the Risk Action limit of 1.

**DEQ requires risk reduction if risk is above these Risk Action Levels.*

TOXICS RELEASE INVENTORY

29. The Toxics Release Inventory (TRI) is a federal program that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment, over which DEQ has no regulatory authority. It is a resource for learning about toxic chemical releases and pollution prevention activities reported by certain industrial facilities. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI Program. In general, [chemicals covered by the TRI Program](#) are those that cause:
- Cancer or other chronic human health effects;
 - Significant adverse acute human health effects; or
 - Significant adverse environmental effects.
30. There are currently over 650 chemicals covered by the TRI Program. Facilities that manufacture, process or otherwise use these chemicals in amounts above established levels must submit annual TRI reports on each chemical.
31. NW Metals is not covered by the TRI program because it is not one of the specific industry sectors required to report under the TRI program.

ADDITIONAL REQUIREMENTS

NEW SOURCE PERFORMANCE STANDARDS APPLICABILITY

32. There are no devices/processes at this facility for which a New Source Performance Standard has been promulgated. NSPS that appear applicable but do not apply to devices/processes at this facility are discussed below.
33. 40 CFR Part 60, Subpart III, "Stationary Compression Ignition Internal Combustion Engines" is not applicable to the source because the engines that power the shredders also propel the shredders, making them nonroad engines as opposed to stationary engines.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS APPLICABILITY

34. There are no sources at this facility for which a National Emission Standard for Hazardous Air Pollutant standard has been promulgated. NESHAP that appear applicable but do not apply to devices/processes at this facility are discussed below.
35. 40 CFR Part 63, Subpart ZZZZ, "Stationary Reciprocating Internal Combustion Engines" is not applicable to the source because the engines that power the shredders also propel the shredders, making them nonroad engines as opposed to stationary engines.

GREENHOUSE GAS REPORTING APPLICABILITY

36. The source is not subject to greenhouse gas reporting under division 215 if actual greenhouse gas emissions are less than 2,500 metric tons (2,756 short tons) of CO₂ equivalents per year. If the source ever emits more than this amount, they will be required to report greenhouse gas emissions.

REASONABLY AVAILABLE CONTROL TECHNOLOGY APPLICABILITY

37. The facility is located in the Portland AQMA but it is not one of the listed source categories in OAR 340-232-0010, thus the RACT rules do not apply.

TYPICALLY ACHIEVABLE CONTROL TECHNOLOGY APPLICABILITY

38. The source is likely meeting OAR 340-226-0130 Highest and Best Practicable Treatment and Control: Typically Achievable Control Technology (TACT) by:
 - a. Draining all fluids from automobiles prior to shredding;
 - b. Removing batteries, mercury switches, and lead from automobiles prior to shredding; and
 - c. Using an engine certified to USEPA Tier 4f standards.

SOURCE TESTING

PRIOR TESTING RESULTS

39. There are no previous source tests for this facility.

PROPOSED TESTING

40. DEQ is requiring NW Metals to perform source testing of Shredder#3 to determine its maximum throughput capacity.

41. DEQ is not requiring NW Metals to perform source testing to determine emissions from the shredding process. However, NW Metals may perform source testing if they want a source specific emission factor for their shredder. If NW Metals does emissions testing they must test in accordance with DEQ's Source Sampling Manual.

PUBLIC NOTICE

42. Pursuant to OAR 340-209-0030(4), issuance of this Air Contaminant Discharge Permit requires public notice in accordance with OAR 340-209-0030(3)(c), which requires DEQ to provide notice of the proposed permit action and a minimum of 35 days for interested persons to submit written comments. **The public notice was mailed on November 6, 2020 and the comment period will end on January 8, 2021 at 5 p.m.**

DEQ is hosting two virtual public hearings via Zoom; one on Saturday, December 12, 2020 at 1 p.m. and the other on Tuesday, December 15, 2020 at 6 p.m.

During the public comment period, DEQ received 152 written comments and 18 oral comments. In addition, DEQ received signatures from 145 people approving the proposed permit and signatures from 1,463 people opposing the proposed permit. Comments received during the public comment period as well as comments received at the public hearing are summarized in the attached document.

dg:pj

ATTACHMENT A – EMISSION DETAIL SHEETS

VOC and PM Shredder EF Derivation

	Greenf[1]	Sims[2]	Omni[3]	MN[4]	SSI[5]	ISRI [9]	CCM [10]	GenI [11]	GenI [11]		Mean
	Autos										
PM (lb/hr)	2.2			0.769			0.16	1.9			
VOC (lb/hr)	7.13		22.93	39.55					94.87		
Rate	53.21		165	195.5			67.5	302.83	390.13		
PM (lb/ton)	4.13E-02	3.16E-03		3.93E-03		2.57E-03	2.37E-03	6.27E-03			9.94E-03
VOC (lb/ton)	1.34E-01	1.32E-01	1.39E-01	2.02E-01	8.40E-01				2.43E-01		2.82E-01

Key

[1] Greenfield MA - wTe Recycling, November 18-20, 2015

[2] SMM New England Corporation Johnston, RI, April 26, 2018, VOC results as propane

[3] Omnisource Jackson MI, April 2010, VOC results as propane

[4] MN NorMet2017. <https://www.pca.state.mn.us/air/northern-metals-shredder-building-test-results>

[5] Schnitzer Steel Compilation, October 2019 Foulweather Consulting Report, 100% Autos

[9] ISRI Title V Applicability Workbook, 1998 Edition Table D10-F

[10] Capitol City Metals 2005

[11] General Iron, Chicago, IL, May 25, 2018

Shredder Emissions

Shredder Capacity	10 ton/hr		
Operational Limit	66 ton/day	CAO 24-hour Limit:	6.6 hour/day
Operational Limit	22,650 ton/yr	CAO Annual Limit:	2265 hour/year

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	PTE (lbs/hr)	PTE (lbs/day)	PTE (tons/yr)
PM	9.94E-03	lb/ton	VOC&PM Worksheet	0.10	0.66	0.11
PM ₁₀	9.94E-03	lb/ton		0.10	0.66	0.11
PM _{2.5}	9.94E-03	lb/ton		0.10	0.66	0.11
VOC	2.82E-01	lb/ton		2.82	18.59	3.19
Hazardous Air Pollutants						
As	7.00E-08	lb/ton	CAO Analysis	7.00E-07	4.62E-06	7.93E-07
Benzene	1.14E-03	lb/ton		1.14E-02	7.52E-02	1.29E-02
Cd	7.71E-06	lb/ton		7.71E-05	5.09E-04	8.73E-05
Co	1.34E-07	lb/ton		1.34E-06	8.84E-06	1.52E-06
Cr ⁶⁺	1.65E-05	lb/ton		1.65E-04	1.09E-03	1.87E-04
Dioxins/Furans	1.74E-11	lb/ton		1.74E-10	1.15E-09	1.97E-10
Ethylbenzene	1.05E-03	lb/ton		1.05E-02	6.92E-02	1.19E-02
Hexane	3.42E-03	lb/ton		3.42E-02	2.26E-01	3.87E-02
Hg	4.97E-05	lb/ton		4.97E-04	3.28E-03	5.62E-04
Methyl bromide (Bromomethane)	1.30E-06	lb/ton		1.30E-05	8.56E-05	1.47E-05
Methyl chloroform (1,1,1-Trichloroethane)	2.00E-04	lb/ton		2.00E-03	1.32E-02	2.27E-03
Methyl Isobutyl Ketone	8.57E-05	lb/ton		8.57E-04	5.66E-03	9.71E-04
Methylene chloride (Dichloromethane)	2.37E-04	lb/ton		2.37E-03	1.56E-02	2.68E-03
Mn	2.39E-06	lb/ton		2.39E-05	1.57E-04	2.70E-05
Naphthalene	3.44E-05	lb/ton		3.44E-04	2.27E-03	3.89E-04
Ni	8.81E-07	lb/ton		8.81E-06	5.82E-05	9.98E-06
Pb	7.72E-05	lb/ton		7.72E-04	5.10E-03	8.74E-04
PCBs	1.51E-04	lb/ton		1.51E-03	9.97E-03	1.71E-03
Sb	2.23E-07	lb/ton		2.23E-06	1.47E-05	2.53E-06
Styrene	3.59E-04	lb/ton		3.59E-03	2.37E-02	4.07E-03
Tetrachloroethylene (Perchloroethylene)	2.03E-05	lb/ton		2.03E-04	1.34E-03	2.30E-04
Toluene	5.36E-03	lb/ton		5.36E-02	3.54E-01	6.07E-02
Trichloroethylene	6.67E-05	lb/ton		6.67E-04	4.40E-03	7.55E-04
Vinyl Chloride	3.44E-06	lb/ton		3.44E-05	2.27E-04	3.89E-05
Vinylidene chloride (1,1-Dichloroethylene)	2.67E-05	lb/ton		2.67E-04	1.76E-03	3.02E-04
Xylenes	4.89E-03	lb/ton		4.89E-02	3.23E-01	5.54E-02
Total HAPs	1.72E-02			1.72E-01	1.13	0.19

Engine 2 Emissions

Volvo Penta TAD1643VE

Tier II

Engine Capacity:	768 hp	
Engine Capacity:	565 kW	
Maximum Fuel Capacity	210 g/kW-hr	(TAD1643VE Specifications)
Maximum Fuel Capacity	37.68 gal/hr	
Diesel Fuel Heat Content	0.138 MMBtu/gal	
Heat Input Capacity	5.20 MMBtu/hr	
Sulfur Content of Fuel	0.0015 %	
Operational Limit	0 hr/year	Use Prohibited

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	PTE (lbs/hr)	PTE (tons/yr)
PM	0.15	g/hp-hr	Reference 1	0	0
PM ₁₀	0.15	g/hp-hr	Reference 1	0	0
PM _{2.5}	0.15	g/hp-hr	Reference 1	0	0
SO _x	1.21E-05	lb/hp-hr	Reference 2	0	0
NO _x	4.80	g/hp-hr	Reference 1	0	0
CO	2.60	g/hp-hr	Reference 1	0	0
VOC	4.80	g/hp-hr	Reference 1	0	0
Hazardous Air Pollutants					
1,3-Butadiene	2.17E-01	lb/Mgal	CAO Analysis	0	0
Acetaldehyde	7.83E-01	lb/Mgal		0	0
Acrolein	3.39E-02	lb/Mgal		0	0
As	1.60E-03	lb/Mgal		0	0
Benzene	1.86E-01	lb/Mgal		0	0
Cd	1.50E-03	lb/Mgal		0	0
Cr ⁶⁺	1.00E-04	lb/Mgal		0	0
Ethylbenzene	1.09E-02	lb/Mgal		0	0
Formaldehyde	1.73E+00	lb/Mgal		0	0
HCl	1.86E-01	lb/Mgal		0	0
Hexane	2.69E-02	lb/Mgal		0	0
Hg	2.00E-03	lb/Mgal		0	0
Mn	3.10E-03	lb/Mgal		0	0
Naphthalene	1.97E-02	lb/Mgal		0	0
Ni	3.90E-03	lb/Mgal		0	0
Pb	8.30E-03	lb/Mgal		0	0
Polycyclic Aromatic Hydrocarbons	3.62E-02	lb/Mgal		0	0
Toluene	1.05E-01	lb/Mgal		0	0
Xylene	4.24E-02	lb/Mgal		0	0
Total HAPs				0	0
Greenhouse Gases					
CO ₂	73.96	kg/MMBtu	Reference 3	0	0
CH ₄	3.00E-03	kg/MMBtu	Reference 4	0	0
N ₂ O	6.00E-04	kg/MMBtu	Reference 4	0	0
GHGs (mass basis)				0	0
GHGs (CO ₂ e basis) ^[1]				0	0

^[1]40 CFR 98, Table A-1 (10/2009)

Reference 1: Tier 2 Emission Standards

Reference 2: AP-42 Table 3.4-1 (10/96)

Reference 3: 40 CFR 98, Table C-1 (11/2013)

Reference 4: 40 CFR 98, Table C-2 (11/2013)

Engine 3 Emissions

Engine Capacity:	700 hp	
Engine Capacity:	515 kW	
Maximum Fuel Capacity	205 g/kW-hr	(TAD1670-1672VE Specifications)
Maximum Fuel Capacity	32 gal/hr	(at 490 kW)
Diesel Fuel Heat Content	0.138 MMBtu/gal	
Heat Input Capacity	4.42 MMBtu/hr	
Sulfur Content of Fuel	0.0015 %	
Operational Limit	2265 hr/year	CAO Annual Limit

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	PTE (lbs/hr)	PTE (tons/yr)
PM	2.00E-02	g/kW-hr	Reference 1	0.02	2.57E-02
PM ₁₀	2.00E-02	g/kW-hr	Reference 1	0.02	2.57E-02
PM _{2.5}	2.00E-02	g/kW-hr	Reference 1	0.02	2.57E-02
SO _x	1.21E-05	lb/hp-hr	Reference 2	8.49E-03	9.62E-03
NO _x	0.40	g/kW-hr	Reference 1	0.45	0.51
CO	3.50	g/kW-hr	Reference 1	3.97	4.50
VOC	0.19	g/kW-hr	Reference 1	0.22	0.24
Hazardous Air Pollutants					
1,3-Butadiene	2.17E-01	lb/Mgal	CAO Analysis	6.96E-03	7.88E-03
Acetaldehyde	7.83E-01	lb/Mgal		2.51E-02	2.84E-02
Acrolein	3.39E-02	lb/Mgal		1.08E-03	1.23E-03
As	1.60E-03	lb/Mgal		5.12E-05	5.80E-05
Benzene	1.86E-01	lb/Mgal		5.96E-03	6.75E-03
Cd	1.50E-03	lb/Mgal		4.80E-05	5.44E-05
Cr ⁶⁺	1.00E-04	lb/Mgal		3.20E-06	3.62E-06
Ethylbenzene	1.09E-02	lb/Mgal		3.49E-04	3.95E-04
Formaldehyde	1.73E+00	lb/Mgal		5.52E-02	6.26E-02
HCl	1.86E-01	lb/Mgal		5.96E-03	6.75E-03
Hexane	2.69E-02	lb/Mgal		8.61E-04	9.75E-04
Hg	2.00E-03	lb/Mgal		6.40E-05	7.25E-05
Mn	3.10E-03	lb/Mgal		9.92E-05	1.12E-04
Naphthalene	1.97E-02	lb/Mgal		6.30E-04	7.14E-04
Ni	3.90E-03	lb/Mgal		1.25E-04	1.41E-04
Pb	8.30E-03	lb/Mgal		2.66E-04	3.01E-04
Polycyclic Aromatic Hydrocarbons	3.62E-02	lb/Mgal		1.16E-03	1.31E-03
Toluene	1.05E-01	lb/Mgal		3.37E-03	3.82E-03
Xylene	4.24E-02	lb/Mgal		1.36E-03	1.54E-03
Total HAPs				0.11	0.12
Greenhouse Gases					
CO ₂	73.96	kg/MMBtu	Reference 3	720	815
CH ₄	3.00E-03	kg/MMBtu	Reference 4	2.92E-02	3.31E-02
N ₂ O	6.00E-04	kg/MMBtu	Reference 4	5.84E-03	6.62E-03
GHGs (mass basis)				720	815
GHGs (CO ₂ e basis) ^[1]				723	818

^[1]40 CFR 98, Table A-1 (10/2009)

Reference 1: Tier 4f Emission Standards (40 CFR 1039.101)

Reference 2: AP-42 Table 3.4-1 (10/96)

Reference 3: 40 CFR 98, Table C-1 (11/2013)

Reference 4: 40 CFR 98, Table C-2 (11/2013)

Material Handling Emissions - Shredding

AP-42 13.2.4 Drop Point Equation

Average Wind Speed (mph)^[1] 6.00^[1]From DEQ's Portland, Oregon Jefferson High School AQ Monitor for 6/19/2018-1/14/2021Moisture (%)^[2] 0.25^[2]Worst case assumption allowed for drop point equation

3-Sided Enclosure control efficiency based on NDEE 3-Sided Enclosure control for grain handling revised to account for Material Handling particle size distribution

PM: 71%, PM10: 63%, PM2.5: 49%

	No Control	3-Sided Enclosure
Emission Factor (per drop)		
PM (lb/ton)	5.52E-02	1.57E-02
PM10 (lb/ton)	2.61E-02	9.58E-03
PM2.5 (lb/ton)	3.95E-03	2.02E-03

Ferrous Metal Content	60 %
Nonferrous Metal Content	10 %
ASR Content	30 %
Max Process Hourly Throughput	10 ton/hr
Daily Operational Limit	6.6 hours/day
Annual Operational Limit	2,265 hours/year

Material Handling Transfer Point	% of Material	Throughput (ton/hr)	PM (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)
Ferrous Metal to Ferrous Storage	60	6	0.33	0.16	2.37E-02
Nonferrous to Nonferrous Separator					
Zorba	10	1	5.52E-02	2.61E-02	3.95E-03
ASR	30	3	0.17	7.83E-02	1.19E-02
Zorba to Zorba Storage	10	1	5.52E-02	2.61E-02	3.95E-03
ASR to ASR Pile (3-sided enclosure)	30	3	4.72E-02	2.87E-02	6.05E-03
ASR Pile to ASR Storage	30	3	0.17	7.83E-02	1.19E-02
Loadout					
Ferrous Metal	60	6	0.33	0.16	2.37E-02
Zorba	10	1	5.52E-02	2.61E-02	3.95E-03
ASR	30	3	0.17	7.83E-02	1.19E-02
Total Emissions			1.37	0.66	0.10
ASR Handling Emissions			0.54	0.26	4.16E-02

Total Material Handling Emissions	lb/hr	lb/day	ton/yr
PM	1.37	9.06	1.55
PM10	0.66	4.33	0.74
PM2.5	0.10	0.67	0.11

Material Handling Emissions - Shredding

Material Handling HAP Emissions					
Metallic & Semi-Volatile HAP = Total ASR Handling Emissions x HAP Emission Factor					
Volatile HAP = ASR Throughput x HAP Emission Factor (all VOC is volatilized in one drop)					
Hazardous Air Pollutants	Emission Factor		lb/hr	lb/day	lb/yr
Arsenic and compounds	1.60E-05	lb/lb PM ₁₀	4.22E-06	2.78E-05	9.56E-03
Cadmium and compounds	2.54E-05	lb/lb PM ₁₀	6.70E-06	4.42E-05	1.52E-02
Cobalt and compounds	2.19E-05	lb/lb PM ₁₀	5.77E-06	3.81E-05	1.31E-02
Lead and compounds	1.16E-02	lb/lb PM ₁₀	3.06E-03	2.02E-02	6.93
Manganese and compounds	5.47E-04	lb/lb PM ₁₀	1.44E-04	9.52E-04	0.33
Mercury and compounds	6.50E-07	lb/lb PM ₁₀	1.71E-07	1.13E-06	3.88E-04
Nickel compounds, insoluble	3.90E-04	lb/lb PM ₁₀	1.03E-04	6.79E-04	0.23
Benzene	5.00E-09	lb/lb ASR	3.00E-05	1.98E-04	6.80E-02
Polychlorinated biphenyls (PCBs)	1.60E-05	lb/lb PM ₁₀	4.22E-06	2.78E-05	9.56E-03
Hexachlorobenzene	1.10E-06	lb/lb PM ₁₀	2.90E-07	1.91E-06	6.57E-04
Polycyclic aromatic hydrocarbons	3.00E-05	lb/lb PM ₁₀	7.90E-06	5.21E-05	1.79E-02
Bis(2-ethylhexyl) phthalate (DEHP)	8.30E-06	lb/lb PM ₁₀	2.19E-06	1.44E-05	4.96E-03
Total HAP			3.37E-03	2.22E-02	7.63

Storage Pile Emissions

Equation (5) for Total Suspended Particulate from Wind Erosion of Active Storage Piles^[1]

$$EF = 1.7 \times \left(\frac{s}{1.5} \right) \times \left(\frac{365-p}{235} \right) \times \left(\frac{f}{15} \right) \times \left(\frac{1}{24} \right)$$

EF: Total suspended particulate emission factor (lb/day/acre)

s: Silt Content Material (%)^[2]

p: Number of days with greater than 0.01 in. of precipitation per year^[3]

p = 170

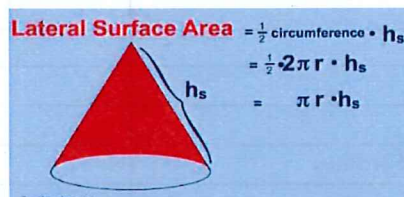
f: % of time unobstructed wind speed exceeds 12 mph at mean pile height^[4]

f = 6.09

The equation calculates TSP. It is assumed that 47% of the TSP equals PM₁₀, and 7% of PM is PM_{2.5}.^[5]

3-Sided Enclosure control efficiency based on NDEE 3-Sided Enclosure control for grain handling revised to account for Material Handling particle size distribution

PM: 71%, PM₁₀: 63%, PM_{2.5}: 49%



EP ID	Description	Silt Content ^[2] (%)	Maximum Pile Radius ^[6] (ft)	Maximum Pile Height ^[6] (ft)	Exposed Surface Area (Acres)	PM Emission Factor (lb/hr-acre)	PM ₁₀ Emission Factor (lb/hr-acre)	PM _{2.5} Emission Factor (lb/hr-acre)
FS 1	Fluff Storage	2	28.28	18	6.84E-02	3.18E-02	1.50E-02	2.28E-03
FS 2	Fluff Pile	2	5.66	6	3.36E-03	3.18E-02	1.50E-02	2.28E-03
FS 3	Ferrous Metal	2	28.28	21	7.19E-02	3.18E-02	1.50E-02	2.28E-03
FS 4	Non-Ferrous Metal	2	18.03	21	3.60E-02	3.18E-02	1.50E-02	2.28E-03

FS 1	Fluff Storage		
	lb/hr	lb/day	ton/yr
PM	2.18E-03	5.22E-02	9.53E-03
PM ₁₀	1.03E-03	2.47E-02	4.51E-03
PM _{2.5}	1.56E-04	3.74E-03	6.83E-04

FS 2	Fluff Pile	3-sided Enclosure
	lb/hr	lb/day ton/yr
PM	3.05E-05	7.32E-04 1.34E-04
PM ₁₀	1.86E-05	4.46E-04 8.13E-05
PM _{2.5}	3.91E-06	9.38E-05 1.71E-05

FS 3	Ferrous Metal		
	lb/hr	lb/day	ton/yr
PM	2.29E-03	5.49E-02	1.00E-02
PM ₁₀	1.08E-03	2.60E-02	4.74E-03
PM _{2.5}	1.64E-04	3.93E-03	7.17E-04

FS 4	Non-Ferrous Metal		
	lb/hr	lb/day	ton/yr
PM	1.14E-03	2.75E-02	5.01E-03
PM ₁₀	5.42E-04	1.30E-02	2.37E-03
PM _{2.5}	8.20E-05	1.97E-03	3.59E-04

^[1] From *Air Pollution Engineering Manual* (1992), Chapter 4: Fugitive Emissions; also Equation 4-9 from EPA 450-3-88-008

^[2] Margarido, Fernanda & Nogueira, Carlos. (2011). CHARACTERISATION OF AUTOMOTIVE SHREDDER RESIDUE. 10.13140/2.1.2251.6489.

^[3] From AP-42 Figure 13.2.1-2

^[4] From DEQ's Portland, Oregon Jefferson High School AQ Monitor for 6/19/2018-1/14/2021

^[5] From AP-42 13.2.4 Drop Point Equation

^[6] Maximum radius based on rectangular length and width provided by applicant.

Storage Pile Emissions

Total Storage Pile Emissions					
			lb/hr	lb/day	ton/yr
PM			5.64E-03	0.14	2.47E-02
PM ₁₀			2.67E-03	6.41E-02	1.17E-02
PM _{2.5}			4.06E-04	9.73E-03	1.78E-03
PM ₁₀ From ASR Piles			1.05E-03	2.51E-02	4.59E-03
Hazardous Air Pollutants	EF (lb/lb PM ₁₀)				
Arsenic and compounds	1.60E-05	lb/lb	1.68E-08	4.02E-07	7.34E-08
Cadmium and compounds	2.54E-05	lb/lb	2.66E-08	6.39E-07	1.17E-07
Cobalt and compounds	2.19E-05	lb/lb	2.29E-08	5.51E-07	1.01E-07
Lead and compounds	1.16E-02	lb/lb	1.22E-05	2.92E-04	5.32E-05
Manganese and compounds	5.47E-04	lb/lb	5.73E-07	1.38E-05	2.51E-06
Mercury and compounds	6.50E-07	lb/lb	6.81E-10	1.63E-08	2.98E-09
Nickel compounds, insoluble	3.90E-04	lb/lb	4.09E-07	9.81E-06	1.79E-06
Polychlorinated biphenyls (PCBs)	1.60E-05	lb/lb	1.68E-08	4.02E-07	7.34E-08
Polycyclic aromatic hydrocarbons	3.00E-05	lb/lb	3.14E-08	7.53E-07	1.37E-07
Bis(2-ethylhexyl) phthalate (DEHP)	8.30E-06	lb/lb	8.70E-09	2.09E-07	3.81E-08
Total HAP			1.33E-05	3.18E-04	5.81E-05

Fluid Draining Emissions

Gasoline Removed 2.7 gal/auto

Processing End-of-Life Vehicles: A Guide for Environmental Protection, Safety and Profit in the United States-Mexico Border Area JULY 2017

Throughput Capacity: 10 ton/hr

Average Auto Weight 1.5 ton

Daily Operational Limit 6.6 hour/day

Annual Operational Limit 2265 hour/year

Autos processed per hour: 6.67

Autos processed per year: 15,100

Fuel removed 40,770 gal/year

Saturation Factor (S) 1.45 AP-42 Table 5.2-1; worst case

True Vapor Pressure (P, psia)^b 7 AP-42 Table 7.1-2; RVP 13 GasolineVapor Molecular Weight (M, lb/lb-mol)^b 62 AP-42 Table 7.1-2; RVP 13 GasolineTemperature (T, deg R)^c 523 AP 42 Table 7.1-7; Salem ORVOC Emissions Factor (lb/10³ gal) 14.99 AP-42 Chapter 5.2 Eq. (1)

VOC EF = 12.46 x SPM / T

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	PTE (lbs/hr)	PTE (lbs/day)	PTE (tons/yr)
VOC	14.99	lb/10 ³ gal	Derived	0.27	1.78	0.31
Hazardous Air Pollutants						
2,2,4 Trimethylpentane	2.6	percent	Reference 1	7.02E-03	4.63E-02	7.95E-03
Benzene	2.2	percent	Reference 1	5.94E-03	3.92E-02	6.72E-03
Ethylbenzene	0.5	percent	Reference 1	1.35E-03	8.91E-03	1.53E-03
Hexane	4.4	percent	Reference 1	1.19E-02	7.84E-02	1.34E-02
Toluene	4.0	percent	Reference 1	1.08E-02	7.12E-02	1.22E-02
Xylenes	1.5	percent	Reference 1	4.05E-03	2.67E-02	4.58E-03
Total HAPs	11.0	percent	Reference 1	2.97E-02	1.96E-01	3.36E-02

Reference 1: Table 3-1 from Gasoline Distribution Industry (Stage 1) Background Information For Proposed Standards (January 1994)

Source PTE

Emissions at 2,265 hours of operation per year

Pollutant	Potential to Emit (tpy)						
	Engine ^[1]	Crusher	Material Handling	Storage Piles	Drain	Total	PSEL
PM	2.57E-02	0.11	1.55	2.47E-02		1.72	24
PM ₁₀	2.57E-02	0.11	0.74	1.17E-02		0.89	N/A
PM _{2.5}	2.57E-02	0.11	0.11	1.78E-03		0.25	N/A
SO _x	9.62E-03					9.62E-03	N/A
NO _x	0.51					0.51	N/A
CO	4.50					4.50	99
VOC	0.24	3.19			0.31	3.74	39
GHGs	815					815	N/A
Total HAP	0.12	0.19	3.81E-03	2.90E-08	3.36E-02	0.36	N/A

^[1] PTE based on highest emitting engine

Emissions without Permit Limits (i.e., 8,760 hours of operation per year)

Pollutant	Potential to Emit (tpy)						
	Engines	Crusher	Material Handling	Storage Piles	Drain	Total	PSEL
PM	1.21	0.87	6.01	0.02		8.12	24
PM ₁₀	1.21	0.87	2.87	0.01		4.96	14
PM _{2.5}	1.21	0.87	0.44	0.00		2.53	9
SO _x	7.80E-02					0.08	N/A
NO _x	37.59					37.59	39
CO	36.69					36.69	99
VOC	36.54	24.68			1.14	62.37	39
GHGs	7,001					7001.32	74,000
Total HAP	1.02	1.51	3.96E-02	2.90E-08	0.13	2.69	N/A

CAO Parameters

TEU		Activity	Hours of Operation	
		Tons/hour	Annual	Acute
Shredder		10	2265	6.6
Toxic Air Contaminant	Emission Factor	Emissions		
	[lb/ton]	[lb/hr]	[lb/yr]	[lb/day]
Antimony and compounds	2.23E-07	2.23E-06	5.05E-03	1.47E-05
Arsenic and compounds	7.00E-08	7.00E-07	1.59E-03	4.62E-06
Barium and compounds	1.56E-06	1.56E-05	3.54E-02	1.03E-04
Beryllium and compounds	1.46E-08	1.46E-07	3.32E-04	9.67E-07
Cadmium and compounds	7.71E-06	7.71E-05	1.75E-01	5.09E-04
Chromium VI, chromate and dichromate particulate	1.65E-05	1.65E-04	3.74E-01	1.09E-03
Cobalt and compounds	1.34E-07	1.34E-06	3.04E-03	8.84E-06
Copper and compounds	1.54E-06	1.54E-05	3.50E-02	1.02E-04
Lead and compounds	7.72E-05	7.72E-04	1.75E+00	5.10E-03
Manganese and compounds	2.39E-06	2.39E-05	5.40E-02	1.57E-04
Mercury and compounds	4.97E-05	4.97E-04	1.12E+00	3.28E-03
Nickel compounds, insoluble	8.81E-07	8.81E-06	2.00E-02	5.82E-05
Phosphorus and compounds	9.01E+00	9.01E+01	2.04E+05	5.95E+02
Selenium and compounds	3.00E-07	3.00E-06	6.80E-03	1.98E-05
Thallium and compounds	5.83E-08	5.83E-07	1.32E-03	3.85E-06
Silver and compounds	2.53E-07	2.53E-06	5.74E-03	1.67E-05
Zinc and compounds	1.69E-04	1.69E-03	3.82E+00	1.11E-02
1,1-Dichloroethane (Ethylidene dichloride)	1.33E-05	1.33E-04	3.01E-01	8.78E-04
Benzene	1.14E-03	1.14E-02	2.58E+01	7.52E-02
Ethyl benzene	1.05E-03	1.05E-02	2.38E+01	6.92E-02
Hexane	3.42E-03	3.42E-02	7.75E+01	2.26E-01
Bromomethane (Methyl bromide)	1.30E-06	1.30E-05	2.94E-02	8.56E-05
1,1,1-Trichloroethane (Methyl chloroform)	2.00E-04	2.00E-03	4.53E+00	1.32E-02
2-Butanone (Methyl ethyl ketone)	5.33E-06	5.33E-05	1.21E-01	3.52E-04
Methyl isobutyl ketone (MIBK, Hexone)	8.57E-05	8.57E-04	1.94E+00	5.66E-03
Dichloromethane (Methylene chloride)	2.37E-04	2.37E-03	5.36E+00	1.56E-02
Naphthalene	3.44E-05	3.44E-04	7.79E-01	2.27E-03
Styrene	3.59E-04	3.59E-03	8.13E+00	2.37E-02
Tetrachloroethene (Perchloroethylene)	2.03E-05	2.03E-04	4.60E-01	1.34E-03
Toluene	5.36E-03	5.36E-02	1.21E+02	3.54E-01
Trichloroethene (TCE, Trichloroethylene)	6.67E-05	6.67E-04	1.51E+00	4.40E-03
Vinyl Chloride	3.44E-06	3.44E-05	7.79E-02	2.27E-04
Vinylidene chloride	2.67E-05	2.67E-04	6.04E-01	1.76E-03
Xylene (mixture), including m-xylene, o-xylene, p-xylene	4.89E-03	4.89E-02	1.11E+02	3.23E-01
Polychlorinated biphenyls (PCBs)	1.51E-04	1.51E-03	3.42E+00	9.97E-03
Polychlorinated biphenyls (PCBs) TEQ	2.61E-10	2.61E-09	5.91E-06	1.72E-08
Polychlorinated dibenzo-p-dioxins (PCDDs) & dibenzofurans (PCDFs) TEQ	1.74E-11	1.74E-10	3.94E-07	1.15E-09
PAHs	8.99E-06	8.99E-05	2.04E-01	5.93E-04

CAO Parameters

TEU		Fuel	Hours of Operation	
		Mgal/hour	Annual	Acute
Diesel Engine		0.032	2265	6.6
Toxic Air Contaminant	Emission Factor	Emissions		
	[lb/Mgal]	[lb/hr]	[lb/yr]	[lb/day]
Benzene	1.86E-01	5.96E-03	1.35E+01	3.93E-02
1,3-Butadiene	2.17E-01	6.96E-03	1.58E+01	4.59E-02
Cadmium and compounds	1.50E-03	4.80E-05	1.09E-01	3.17E-04
Formaldehyde	1.73E+00	5.52E-02	1.25E+02	3.65E-01
Chromium VI, chromate, and dichromate particulate	1.00E-04	3.20E-06	7.25E-03	2.11E-05
Arsenic and compounds	1.60E-03	5.12E-05	1.16E-01	3.38E-04
Lead and compounds	8.30E-03	2.66E-04	6.02E-01	1.75E-03
Nickel and compounds	3.90E-03	1.25E-04	2.83E-01	8.24E-04
Naphthalene	1.97E-02	6.30E-04	1.43E+00	4.16E-03
PAHs (excluding Naphthalene)*	3.62E-02	1.16E-03	2.62E+00	7.65E-03
Benzo[a]pyrene*	3.55E-05	1.14E-06	2.57E-03	7.50E-06
Acetaldehyde	7.83E-01	2.51E-02	5.68E+01	1.65E-01
Acrolein	3.39E-02	1.08E-03	2.46E+00	7.16E-03
Ammonia**	8.00E-01	2.56E-02	5.80E+01	1.69E-01
Copper and compounds	4.10E-03	1.31E-04	2.97E-01	8.66E-04
Ethylbenzene	1.09E-02	3.49E-04	7.90E-01	2.30E-03
Hexane	2.69E-02	8.61E-04	1.95E+00	5.68E-03
Hydrochloric acid	1.86E-01	5.96E-03	1.35E+01	3.93E-02
Manganese and compounds	3.10E-03	9.92E-05	2.25E-01	6.55E-04
Mercury and compounds	2.00E-03	6.40E-05	1.45E-01	4.22E-04
Selenium and compounds	2.20E-03	7.04E-05	1.59E-01	4.65E-04
Toluene	1.05E-01	3.37E-03	7.64E+00	2.23E-02
Xylene (mixture), including m-xylene, o-xylene, p-xylene	4.24E-02	1.36E-03	3.07E+00	8.95E-03
Diesel exhaust particulates (PM 2.5)	7.4	2.37E-01	5.36E+02	1.56E+00

CAO Parameters

TEU					Hours of Operation	
					Annual	Acute
Material Handling (ASR)	Total PM10 from ASR Drops (lb/hr)			0.26	2265	6.6
	ASR Throughput (lb/hr)			6,000	2265	6.6
Toxic Air Contaminant				Emissions		
	Emission Factor	VOC?	Units	[lb/hr]	[lb/yr]	[lb/day]
Aluminum and compounds	7.87E-03	No	lb/lb PM10	2.08E-03	4.70E+00	1.37E-02
Arsenic and compounds	1.60E-05	No	lb/lb PM10	4.22E-06	9.56E-03	2.78E-05
Barium and compounds	3.45E-05	No	lb/lb PM10	9.10E-06	2.06E-02	6.00E-05
Cadmium and compounds	2.54E-05	No	lb/lb PM10	6.70E-06	1.52E-02	4.42E-05
Cobalt and compounds	2.19E-05	No	lb/lb PM10	5.77E-06	1.31E-02	3.81E-05
Copper and compounds	3.54E-02	No	lb/lb PM10	9.32E-03	2.11E+01	6.15E-02
Lead and compounds	1.16E-02	No	lb/lb PM10	3.06E-03	6.93E+00	2.02E-02
Manganese and compounds	5.47E-04	No	lb/lb PM10	1.44E-04	3.27E-01	9.52E-04
Mercury and compounds	6.50E-07	No	lb/lb PM10	1.71E-07	3.88E-04	1.13E-06
Nickel compounds, insoluble	3.90E-04	No	lb/lb PM10	1.03E-04	2.33E-01	6.79E-04
Zinc and compounds	1.17E-02	No	lb/lb PM10	3.09E-03	6.99E+00	2.04E-02
Benzene	5.00E-09	Yes	lb/lb ASR	3.00E-05	6.80E-02	1.98E-04
Polychlorinated biphenyls (PCBs)	1.60E-05	No	lb/lb PM10	4.22E-06	9.56E-03	2.78E-05
Polychlorinated biphenyls (PCBs) TEQ	2.00E-10	No	lb/lb PM10	5.27E-11	1.19E-07	3.48E-10
Polychlorinated dibenzo-p-dioxins (PCDDs) & dibenzofurans (PCDFs) TEQ	2.20E-10	No	lb/lb PM10	5.80E-11	1.31E-07	3.83E-10
Polychlorinated naphthalenes	3.70E-08	No	lb/lb PM10	9.76E-09	2.21E-05	6.44E-08
Hexachlorobenzene	1.10E-06	No	lb/lb PM10	2.90E-07	6.57E-04	1.91E-06
2,4,6-Trichlorophenol	1.00E-06	Yes	lb/lb ASR	6.00E-03	1.36E+01	3.96E-02
PBDDs/PBDFs	6.50E-08	No	lb/lb PM10	1.71E-08	3.88E-05	1.13E-07
Polybrominated diphenyl ethers (PBDEs)	1.75E-04	No	lb/lb PM10	4.61E-05	1.05E-01	3.05E-04
Tetrabromobisphenol A	5.85E-07	Yes	lb/lb ASR	3.51E-03	7.95E+00	2.32E-02
Hexabromocyclododecane	3.35E-06	No	lb/lb PM10	8.82E-07	2.00E-03	5.82E-06
2,4,6-Tribromophenol	1.24E-07	Yes	lb/lb ASR	7.44E-04	1.69E+00	4.91E-03
Polycyclic aromatic hydrocarbons (PAHs)	3.00E-05	No	lb/lb PM10	7.90E-06	1.79E-02	5.21E-05
Bis(2-ethylhexyl) phthalate (DEHP)	8.30E-06	No	lb/lb PM10	2.19E-06	4.96E-03	1.44E-05
*Volatile HAP assumed to all be emitted in a single drop						

*Volatile HAP assumed to all be emitted in a single drop

CAO Parameters

TEU		Activity	Hours of Operation	
		Tons/hour	Annual	Acute
Fluid Draining		10	2265	6.6
Toxic Air Contaminant	Emission Factor	Emissions		
		[lb/hr]	[lb/yr]	[lb/day]
2,2,4 Trimethylpentane	See Fluid Draining Emission Calculation Sheet	7.02E-03	15.89	4.63E-02
Benzene		5.94E-03	13.45	3.92E-02
Ethylbenzene		1.35E-03	3.06	8.91E-03
Hexane		1.19E-02	26.89	7.84E-02
Toluene		1.08E-02	24.45	7.12E-02
Xylenes		4.05E-03	9.17	2.67E-02

TEU		Storage Pile PM ₁₀ PTE		
		lb/hr	lb/yr	lb/day
Storage Piles (ASR)		1.05E-03	9.18	2.51E-02
Toxic Air Contaminant	Emission Factor	Emissions		
	[lb TAC/lb PM10]	[lb/hr]	[lb/yr]	[lb/day]
Aluminum and compounds	7.87E-03	8.25E-06	7.22E-02	1.98E-04
Arsenic and compounds	1.60E-05	1.68E-08	1.47E-04	4.02E-07
Barium and compounds	3.45E-05	3.61E-08	3.17E-04	8.68E-07
Cadmium and compounds	2.54E-05	2.66E-08	2.33E-04	6.39E-07
Cobalt and compounds	2.19E-05	2.29E-08	2.01E-04	5.51E-07
Copper and compounds	3.54E-02	3.70E-05	3.25E-01	8.89E-04
Lead and compounds	1.16E-02	1.22E-05	1.06E-01	2.92E-04
Manganese and compounds	5.47E-04	5.73E-07	5.02E-03	1.38E-05
Mercury and compounds	6.50E-07	6.81E-10	5.97E-06	1.63E-08
Nickel compounds, insoluble	3.90E-04	4.09E-07	3.58E-03	9.81E-06
Zinc and compounds	1.17E-02	1.23E-05	1.07E-01	2.94E-04
Polychlorinated biphenyls (PCBs)	1.60E-05	1.68E-08	1.47E-04	4.02E-07
Polychlorinated biphenyls (PCBs) TEQ	2.00E-10	2.10E-13	1.84E-09	5.03E-12
Polychlorinated dibenzo-p-dioxins (PCDDs) & dibenzofurans (PCDFs) TEQ	2.20E-10	2.31E-13	2.02E-09	5.53E-12
Polychlorinated naphthalenes	3.70E-08	3.88E-11	3.40E-07	9.30E-10
Hexachlorobenzene	1.10E-06	1.15E-09	1.01E-05	2.77E-08
PBDDs/PBDFs	6.50E-08	6.81E-11	5.97E-07	1.63E-09
Polybrominated diphenyl ethers (PBDEs)	1.75E-04	1.83E-07	1.61E-03	4.40E-06
Hexabromocyclododecane	3.35E-06	3.50E-09	3.07E-05	8.41E-08
Polycyclic aromatic hydrocarbons (PAHs)	3.00E-05	3.14E-08	2.75E-04	7.53E-07
Bis(2-ethylhexyl) phthalate (DEHP)	8.30E-06	8.70E-09	7.62E-05	2.09E-07

Calculating the Control Efficiency for 3-Sided Enclosure for Various Activities

Pollutants	Grain Size Distribution ^[1]	Control Efficiency for Grain ^[2]	AP-42 13.2.4 Drop Point Equation Particle Size Distribution
PM	1.00	70%	1.00
PM ₁₀	0.56	63%	0.47
PM _{2.5}	0.10	49%	0.07

Step 2 - Conversion of 3-Sided Enclosure for Grain to Drop Point

Pollutants	Grain Distribution Fraction	Fraction Removal	Control Efficiency for Your Activity
PM - PM ₁₀	44%	79%	71%
PM ₁₀ -PM _{2.5}	46%	66%	63%
PM _{2.5}	10%	49%	49%

^[1] Particle size distribution from AP-42 , Table 9.9.1-1 "Headhouse and grain handling" (03/03)

^[2] Capture and control efficiency based on the NDEE default control efficiency for operation within a 3-sided enclosure for grain receiving/handling. Control Efficiency (CE) varies based on the type of device/equipment utilized. The CE is modified to account for the different size distribution for drop point emissions vs. grain handling.