MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

GI-07 Spreadsheet

Facility Emissions Summary

Air Quality Permit Program

Doc Type: Permit Application

1a) AQ Facility ID number: 12300088

1b) Agency Interest ID number: 3518

2) Facility name: Northern Iron LLC

Follow the instructions to complete this spreadsheet. This spreadsheet can be copied into a tab for your emissions spreadsheet and must be submitted on a CD with your application. If you need to provide emissions information for more emissions units, add more sets of columns (3a through 3f) to the right as needed in the Emissions by Source table. If you need to provide information for more pollutants, add rows as needed.

Emissions Summary Table

4a)	**4b)**	**4c)** Potential (tons/year)		**4d)** Actual
Pollutant Name	Potential (lbs/hr)	Unrestricted	Limited	tons/year
PM	5.06	2,671.70	14.21	
PM10	3.39	2,203.97	9.43	
PM2.5	1.89	1,135.61	5.43	
NOx	5.50	24.37	23.85	
CO	63.00	430.83	79.07	
SO2	0.20	1.41	0.37	
VOC	55.07	542.13	91.46	
Lead	0.01	0.99	0.02	
Total HAPs	13.20	40.22	13.95	
Max Single HAP	2.66	7.20	4.63	
1,3-Dimethylnaphthalene	0.05	0.13	0.03	
1,4-Dimethylnaphthalene	0.02	0.06	0.01	
1,8-Dimethylnaphthalene	0.05	0.13	0.03	
1-Methylnaphthalene	0.17	0.45	0.11	
2,3,5-Trimethylnaphthalene	0.03	0.09	0.02	
2,3-Dimethylnaphthalene	0.03	0.08	0.02	
2,6-Dimethylnaphthalene	0.03	0.07	0.02	
2,7-Dimethylnaphthalene	0.02	0.05	0.01	
2-Methylnaphthalene	0.26	0.67	0.16	
3-Methylcholanthrene	0.00	0.00	0.00	
7,12-Dimethylbenz(a)anthracene	0.00	0.00	0.00	
Acenaphthalene/1,2-Dimethylnaphthalene	0.01	0.03	0.01	

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Emissions Summary Table

4a)	**4b)**	**4c)** Potential (tons/year)		**4d)** Actual
Pollutant Name	Potential (lbs/hr)	Unrestricted	Limited	tons/year
PM	5.05	2,671.44	14.19	
PM10	3.39	2,203.71	9.41	
PM2.5	1.89	1,135.35	5.41	
NOx	3.26	14.53	14.00	
CO	61.69	425.09	73.34	
SO2	0.19	1.37	0.33	
VOC	54.89	541.37	90.70	
Lead	0.01	0.99	0.01	
Total HAPs	13.18	40.09	13.80	
Max Single HAP	2.66	7.20	4.63	
1,3-Dimethylnaphthalene	0.05	0.13	0.03	
1,4-Dimethylnaphthalene	0.02	0.06	0.01	
1,8-Dimethylnaphthalene	0.05	0.13	0.03	
1-Methylnaphthalene	0.17	0.45	0.11	
2,3,5-Trimethylnaphthalene	0.03	0.09	0.02	
2,3-Dimethylnaphthalene	0.03	0.08	0.02	
2,6-Dimethylnaphthalene	0.03	0.07	0.02	
2,7-Dimethylnaphthalene	0.02	0.05	0.01	
2-Methylnaphthalene	0.26	0.67	0.16	
3-Methylcholanthrene	0.00	0.00	0.00	
7,12-Dimethylbenz(a)anthracene	0.00	0.00	0.00	
Acenaphthalene/1,2- Dimethylnaphthalene	0.01	0.03	0.01	

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Emissions by Source Table

3a) Tempo SI ID number:		EQUI1 (COMG1)				3a) Tempo SI ID number:		EQUI2 (COMG1)				3a) Tempo SI ID number:		EQUI3 (COMG1)			
3b) Delta ID No.:						3b) Delta ID No.:						3b) Delta ID No.:					
3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)
Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year
PM		0.24	2.96	--		PM		0.24	2.96	--		PM		0.09	5.91	--	
PM10		0.08	1.03	--		PM10		0.08	1.03	--		PM10		0.09	5.91	--	
PM2.5		0.07	0.80	--		PM2.5		0.07	0.80	--		PM2.5		0.09	5.91	--	
NOx		0.57	2.48	--		NOx		0.57	2.48	--		NOx					
CO		0.33	1.44	--		CO		0.33	1.44	--		CO					
SO2		0.00	0.01	--		SO2		0.00	0.01	--		SO2					
VOC		18.50	224.77	--		VOC		18.50	224.77	--		VOC					
Lead	7439-92-1	0.00	0.00	--		Lead	7439-92-1	0.00	0.00	--		Lead	7439-92-1	5.86E-04	0.04	--	
Total HAPs		0.01	0.03	--		Total HAPs		0.01	0.03	--		Total HAPs		2.24E-03	0.14	--	
1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7				
1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4				
1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5				
1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0				
2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7				
2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8				
2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0				
2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1				
2-Methylnaphthalene	91-57-6	0.00	0.00	--		2-Methylnaphthalene	91-57-6	0.00	0.00	--		2-Methylnaphthalene	91-57-6				
3-Methylcholanthrene	56-49-5	0.00	0.00	--		3-Methylcholanthrene	56-49-5	0.00	0.00	--		3-Methylcholanthrene	56-49-5				
7,12-Dimethylbenz(a)anthracene	57-97-6	0.00	0.00	--		7,12-Dimethylbenz(a)anthracene	57-97-6	0.00	0.00	--		7,12-Dimethylbenz(a)anthracene	57-97-6				
Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8				

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Emissions by Source Table

3a) Tempo SI ID number:		EQUI4 (COMG1)				3a) Tempo SI ID number:		EQUI5 (COMG1)			
3b) Delta ID No.:						3b) Delta ID No.:					
3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)
Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year
PM		0.09	5.91	--		PM		0.09	5.91	--	
PM10		0.09	5.91	--		PM10		0.09	5.91	--	
PM2.5		0.09	5.91	--		PM2.5		0.09	5.91	--	
NOx						NOx					
CO						CO					
SO2						SO2					
VOC						VOC					
Lead	7439-92-1	5.86E-04	0.04	--		Lead	7439-92-1	0.00	0.04	--	
Total HAPs		2.24E-03	0.14	--		Total HAPs		2.24E-03	0.14	--	
1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7				
1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4				
1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5				
1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0				
2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7				
2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8				
2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0				
2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1				
2-Methylnaphthalene	91-57-6					2-Methylnaphthalene	91-57-6				
3-Methylcholanthrene	56-49-5					3-Methylcholanthrene	56-49-5				
7,12-Dimethylbenz(a)anthracene	57-97-6					7,12-Dimethylbenz(a)anthracene	57-97-6				
Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8				

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Emissions by Source Table

3a) Tempo SI ID number:		EQUI1 (COMG1)				3a) Tempo SI ID number:		EQUI2 (COMG1)				3a) Tempo SI ID number:		EQUI3 (COMG1)			
3b) Delta ID No.:						3b) Delta ID No.:						3b) Delta ID No.:					
3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)
Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year
PM		0.24	2.96	--		PM		0.24	2.96	--		PM		0.09	5.91	--	
PM10		0.08	1.03	--		PM10		0.08	1.03	--		PM10		0.09	5.91	--	
PM2.5		0.07	0.80	--		PM2.5		0.07	0.80	--		PM2.5		0.09	5.91	--	
NOx						NOx						NOx					
CO						CO						CO					
SO2						SO2						SO2					
VOC		18.46	224.58	--		VOC		18.46	224.58	--		VOC					
Lead	7439-92-1					Lead	7439-92-1					Lead	7439-92-1	5.86E-04	0.04	--	
Total HAPs						Total HAPs						Total HAPs		2.24E-03	0.14	--	
1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7				
1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4				
1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5				
1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0				
2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7				
2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8				
2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0				
2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1				
2-Methylnaphthalene	91-57-6					2-Methylnaphthalene	91-57-6					2-Methylnaphthalene	91-57-6				
3-Methylcholanthrene	56-49-5					3-Methylcholanthrene	56-49-5					3-Methylcholanthrene	56-49-5				
7,12-Dimethylbenz(a)anthracene	57-97-6					7,12-Dimethylbenz(a)anthracene	57-97-6					7,12-Dimethylbenz(a)anthracene	57-97-6				
Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8				

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Emissions by Source Table

3a) Tempo SI ID number:		EQUI4 (COMG1)				3a) Tempo SI ID number:		EQUI5 (COMG1)			
3b) Delta ID No.:						3b) Delta ID No.:					
3c)	3d)	3e) Potential			3f)	3c)	3d)	3e) Potential			3f)
Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year	Pollutant Name	CAS #	Pounds (lbs) per hour	tons per year un-restricted	tons per year limited	Actual tons per year
PM		0.09	5.91	--		PM		0.09	5.91	--	
PM10		0.09	5.91	--		PM10		0.09	5.91	--	
PM2.5		0.09	5.91	--		PM2.5		0.09	5.91	--	
NOx						NOx					
CO						CO					
SO2						SO2					
VOC						VOC					
Lead	7439-92-1	5.86E-04	0.04	--		Lead	7439-92-1	0.00	0.04	--	
Total HAPs		2.24E-03	0.14	--		Total HAPs		2.24E-03	0.14	--	
1,3-Dimethylnaphthalene	575-41-7					1,3-Dimethylnaphthalene	575-41-7				
1,4-Dimethylnaphthalene	571-58-4					1,4-Dimethylnaphthalene	571-58-4				
1,8-Dimethylnaphthalene	569-41-5					1,8-Dimethylnaphthalene	569-41-5				
1-Methylnaphthalene	90-12-0					1-Methylnaphthalene	90-12-0				
2,3,5-Trimethylnaphthalene	2245-38-7					2,3,5-Trimethylnaphthalene	2245-38-7				
2,3-Dimethylnaphthalene	581-40-8					2,3-Dimethylnaphthalene	581-40-8				
2,6-Dimethylnaphthalene	581-42-0					2,6-Dimethylnaphthalene	581-42-0				
2,7-Dimethylnaphthalene	582-16-1					2,7-Dimethylnaphthalene	582-16-1				
2-Methylnaphthalene	91-57-6					2-Methylnaphthalene	91-57-6				
3-Methylcholanthrene	56-49-5					3-Methylcholanthrene	56-49-5				
7,12-Dimethylbenz(a)anthracene	57-97-6					7,12-Dimethylbenz(a)anthracene	57-97-6				
Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8					Acenaphthalene/1,2-Dimethylnaphthalene	573-98-8				

Melting & Refining Emissions

Scrap Preheating Sitewide Annual Melt Limit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Annual Throughput (ton/yr)	Capture (%)	Control ID Number	Control Efficiency (not used in calculations) PM	PM10	PM2.5	Emissions Factor[1] (lb/ton metal) PM	PM10	PM2.5	VOC	Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)* PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	VOC Emission Rate (lb/hr)	VOC Emission Rate (ton/yr)	Limited *(hourly @ bottlenecked capacity; annual @ sitewide melt limit)* PM Emission Rate (lb/hr)	PM Emission Rate[2] (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate[2] (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate[2] (ton/yr)	VOC Emission Rate (lb/hr)	VOC Emission Rate (ton/yr)
EQUI1	EU001	Scrap Preheat Oven 1	12.5	ton/hr	4.5	ton/hr	7,500	100%	TREA47	93%	93%	93%	0.054	0.0188	0.0147	4.102	0.675	2.957	0.235	1.029	0.184	0.805	51.275	224.585	0.2430	0.7290	0.0846	0.2538	0.0662	0.1985	18.4590	55.3770
EQUI2	EU002	Scrap Preheat Oven 2	12.5	ton/hr	4.5	ton/hr	7,500	100%	TREA47	93%	93%	93%	0.054	0.0188	0.0147	4.102	0.675	2.957	0.235	1.029	0.184	0.805	51.275	224.585	0.2430	0.7290	0.0846	0.2538	0.0662	0.1985	18.4590	55.3770
COMG1	GP001	Melting																								0.7290		0.2538		0.1985		55.3770

1 Emission factors based on 2023 Stack Test. Emissions controlled during test; therefore, control efficiency is not used in calculation

2 Combined annual emissions for EQUI1 and EQUI2 are capped based on the combined sitewide annual melt limit.

Limited emissions based on bottleneck from combined furnace capacity

Annual tput assumes 15,000 tons metal melted per year for actual emission calcuations.

Metal Melting Sitewide Annual Melt Limit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Annual Throughput (ton/yr)	Capture (%)	Control ID Number	Control Efficiency PM	PM10	PM2.5	HAP	Emission Factor[1] (lb/ton metal) PM	PM10	PM2.5	HAPs[2] Lead	Cadmium	Chromium	Manganese	Nickel
EQUI3	EU003	Electric Induction Furnace 1	1.5	ton/hr	1.5	ton/hr	5,000	100%	TREA47	93%	93%	93%	93%	0.9	0.9	0.9	0.00558	0.000102	0.00074	0.014	0.000897
EQUI4	EU004	Electric Induction Furnace 2	1.5	ton/hr	1.5	ton/hr	5,000	100%	TREA47	93%	93%	93%	93%	0.9	0.9	0.9	0.00558	0.000102	0.00074	0.014	0.000897
EQUI5	EU005	Electric Induction Furnace 3	1.5	ton/hr	1.5	ton/hr	5,000	100%	TREA47	93%	93%	93%	93%	0.9	0.9	0.9	0.00558	0.000102	0.00074	0.014	0.000897
COMG1	GP001	Melting																			

EQUI	Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)* PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI3	1.35	5.913	1.35	5.913	1.35	5.913	0.0084	0.0367	0.0002	0.0007	0.0011	0.0049	0.0210	0.0920	0.0013	0.0059	0.0320	0.1401
EQUI4	1.35	5.913	1.35	5.913	1.35	5.913	0.0084	0.0367	0.0002	0.0007	0.0011	0.0049	0.0210	0.0920	0.0013	0.0059	0.0320	0.1401
EQUI5	1.35	5.913	1.35	5.913	1.35	5.913	0.0084	0.0367	0.0002	0.0007	0.0011	0.0049	0.0210	0.0920	0.0013	0.0059	0.0320	0.1401
COMG1																		

EQUI	Limited *(hourly @ bottlenecked capacity; annual based on lesser of capacity X 8,760 hr/yr or annual melt limit; annual group emissions based on annual melt limit)* PM Emission Rate (lb/hr)	PM Emission Rate[3] (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate[3] (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate[3] (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate[3] (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI3	0.0945	0.4139	0.0945	0.4139	0.0945	0.4139	0.0006	0.0026	0.0000	0.0000	0.0001	0.0003	0.0015	0.0064	0.0001	0.0004	0.0022	0.0098
EQUI4	0.0945	0.4139	0.0945	0.4139	0.0945	0.4139	0.0006	0.0026	0.0000	0.0000	0.0001	0.0003	0.0015	0.0064	0.0001	0.0004	0.0022	0.0098
EQUI5	0.0945	0.4139	0.0945	0.4139	0.0945	0.4139	0.0006	0.0026	0.0000	0.0000	0.0001	0.0003	0.0015	0.0064	0.0001	0.0004	0.0022	0.0098
COMG1		0.8505		0.8505		0.8505		0.0053		0.0001		0.0007		0.0132		0.0008		0.0201

1 Emission factor from AP-42, Table 12.10-3. Because of the high temperatures involved, assumed high fraction of condensibles, assumed all PM = PM10 = PM2.5

2 CERP Foundry Process Emission Factors:
Baseline Emissions from Automotive
Foundries in Mexico (1999), Table 5.16 (found at https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexico8baseline_1997.pdf)

3 Combined annual emissions for EQUI3-5 are capped based on the combined sitewide annual melt limit.

Annual tput assumes 15,000 tons metal melted per year for actual emission calcuations.

Inoculation

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Annual Throughput (ton/yr)	Capture (%)	Control ID Number	Control Efficiency PM	PM10	PM2.5	HAP	Emission Factor[1] (lb/ton metal) PM	PM10	PM2.5	HAPs[2] Lead	Cadmium	Chromium	Manganese	Nickel
EQUI9	EU028	Inoculation	12.5	ton/hr	4.5	ton/hr	12,750	100%	TREA47	93%	93%	93%	93%	0.4	0.4	0.4	0.013087	0.000239	0.001736	0.032835	0.002104

EQUI	Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)* PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI9	5.00	21.90	5.00	21.90	5.00	21.90	0.1636	0.7165	0.0030	0.0131	0.0217	0.0950	0.4104	1.7977	0.0263	0.1152	0.6250	2.7375

EQUI	Limited *(based on lesser of capacity X 8,760 hr/yr or annual melt limit)* PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI9	0.1260	0.3780	0.1260	0.3780	0.1260	0.3780	0.0041	0.0124	0.0001	0.0002	0.0005	0.0016	0.0103	0.0310	0.0007	0.0020	0.0158	0.0473

1 Emission factor from AP-42, Table 12.10-7. Assumed all PM = PM10 = PM2.5. The Emitted to Atmosphere factor is used because it emissions are released into a building, where the enclosure limits emissions, before being routed to the control device.
Therefore, it is appropriate to consider reductions due to both (1) fallout of material and (2) control efficiency.

Note 1: A total HAP emission factor was obtained from "Total HAP Emission Factors for Preliminary Screening Analysis - Iron Foundries" 10/8/01, compiled by the American Foundrymen's Society Air Quality Committee and MACT Task Force (found at https://gaftp.epa.gov/ap42/ch12/s10-13/Technikor%202006.pdf). Individual HAPs were not identified in this document so individual HAP emission factors are calculated as follows (lead shown for example):

(Total HAP emission factor)x(%PB of MHAPtotal). The %PB of MHAPtotal of 26.2% was obtained from CERP Table 5.16 (found at https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexico8baseline_1997.pdf).

Annual throughput assumes 85% of melted metal is inoculated for actual emission calculations.

Pouring & Cooling Emissions

Pouring & Cooling Annual Melt Limit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Annual Throughput (ton/yr)	Capture (%)	Control ID Number	PM Control Efficiency	PM10 Control Efficiency	PM2.5 Control Efficiency	PM[1] Emission Factor[1] (lb/ton metal)	PM10[1] Emission Factor[1] (lb/ton metal)	PM2.5[1] Emission Factor[1] (lb/ton metal)	SOX[2] Emission Factor[1] (lb/ton metal)	NOX[2] Emission Factor[1] (lb/ton metal)	VOC[2] Emission Factor[1] (lb/ton metal)	CO[3] Emission Factor[1] (lb/ton metal)
EQUI12	EU015	DISA Line Pouring & Cooling	5	ton/hr	4.5	ton/hr	7,500	100%	TREA47	93%	93%	93%	1.045	0.5267	0.3857	0.02	0.01	0.14	3.02
EQUI13	EU016	30^2 Line Pouring & Cooling	10	ton/hr	4.5	ton/hr	7,500	100%	TREA46	93%	93%	93%	1.045	0.5267	0.3857	0.02	0.01	0.14	3.02
COMG3	GP003	Pouring/Cooling																	

EQUI	Potential (hourly @ rated capacity; annual = max hourly X 8,760 hr/yr) PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	SOX Emission Rate (lb/hr)	SOX Emission Rate (ton/yr)	NOX Emission Rate (lb/hr)	NOX Emission Rate (ton/yr)	VOC Emission Rate (lb/hr)	VOC Emission Rate (ton/yr)	CO Emission Rate (lb/hr)	CO Emission Rate (ton/yr)
EQUI12	5.2250	22.8855	2.6335	11.5347	1.9285	8.4468	0.1000	0.4380	0.0500	0.2190	0.7000	3.0660	15.0880	66.0853
EQUI13	10.4500	45.7710	5.2670	23.0695	3.8570	16.8937	0.2000	0.8760	0.1000	0.4380	1.4000	6.1320	30.1759	132.1706
COMG3														

EQUI	Limited (based on lesser of capacity X 8,760 hr/yr or annual melt limit) PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	SOX Emission Rate (lb/hr)	SOX Emission Rate (ton/yr)	NOX Emission Rate (lb/hr)	NOX Emission Rate (ton/yr)	VOC Emission Rate (lb/hr)	VOC Emission Rate (ton/yr)	CO Emission Rate (lb/hr)	CO Emission Rate (ton/yr)
EQUI12	0.3292	0.9875	0.1659	0.4977	0.1215	0.3645	0.0900	0.2700	0.0450	0.1350	0.6300	0.1350	13.5792	40.7375
EQUI13	0.3292	0.9875	0.1659	0.4977	0.1215	0.3645	0.0900	0.2700	0.0450	0.1350	0.6300	0.1350	13.5792	40.7375
COMG3		0.9875		0.4977		0.3645		0.2700		0.1350		0.1350		40.7375

[1] Emission factors based on 2023 Stack Test

[2] **Emission factors are from EPA's Webfire database**

Annual tput assumes 15,000 tons metal melted per year for actual emission calculations.

Note 3: CO Emission Factor calculated from "Foundary Air Contaminants from Green Sand Molds", American Industrial Hygiene Association Journal, 37:6, 335-344, 1976

Information from article used for calcluation

2.5	Liter exhaust/lb metal casting	Page 339 of AIGAJ 37:6, 1976
21.90%	Max CO % in exhaust pouring/casting/cooling	Table 1. page 336 of AIGAJ 37:6, 1976

Additional Information and Assumptions

28	g/mol	CO molecular weight
22.4	Liter/mol	Assuming ideal gas molar volume at stp
453.59	g/lb	Conversion Factor

Emission factor for pouring/cooling[1]

1.51E-03 lb CO/lb metal casting

3.02 lb CO/ton metal casting

[1] Emissions factor is conservatively assumed to be the factor for pouring/cooling and shakeout combined.

Pouring & Cooling HAP Emissions

Pollutant[1]	Emission Factor (lb/ton metal)	HAP Control [1]	EQUI12; EU 15 Potential (lb/hr)	EQUI12; EU 15 Potential (tpy)	EQUI12; EU 15 Limited (lb/hr)	EQUI12; EU 15 Limited (tpy)	EQUI13; EU 16 Potential (lb/hr)	EQUI13; EU 16 Potential (tpy)	EQUI13; EU 16 Limited (lb/hr)	EQUI13; EU 16 Limited (tpy)
Lead[4]	1.34E-03	93%	0.0067	0.0293	0.0004	0.0013	0.0134	0.0585	0.0004	0.0013
Cadmium	2.49E-05	93%	0.0001	0.0005	0.0000	0.0000	0.0002	0.0011	0.0000	0.0000
Chromium	2.80E-04	93%	0.0014	0.0061	0.0001	0.0003	0.0028	0.0122	0.0001	0.0003
Manganese	1.36E-03	93%	0.0068	0.0297	0.0004	0.0013	0.0136	0.0595	0.0004	0.0013
Selenium	4.10E-06	93%	0.0000	0.0001	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000
Acetaldehyde	3.49E-03	0%	0.0175	0.0765	0.0157	0.0472	0.0349	0.1530	0.0157	0.0472
Acetophenone	1.98E-04	0%	0.0010	0.0043	0.0009	0.0027	0.0020	0.0087	0.0009	0.0027
Benzene	3.71E-02	0%	0.1855	0.8123	0.1669	0.5007	0.3709	1.6245	0.1669	0.5007
o-Cresol	9.29E-04	0%	0.0046	0.0203	0.0042	0.0125	0.0093	0.0407	0.0042	0.0125
Cumene	1.27E-04	0%	0.0006	0.0028	0.0006	0.0017	0.0013	0.0056	0.0006	0.0017
Dibenzofuran	1.63E-05	0%	0.0001	0.0004	0.0001	0.0002	0.0002	0.0007	0.0001	0.0002
Ethylbenzene	1.97E-03	0%	0.0099	0.0432	0.0089	0.0266	0.0197	0.0863	0.0089	0.0266
Formaldehyde	1.87E-03	0%	0.0093	0.0409	0.0084	0.0252	0.0187	0.0818	0.0084	0.0252
Naphthalene	2.59E-03	0%	0.0130	0.0567	0.0117	0.0350	0.0259	0.1135	0.0117	0.0350
Nitrobenzene	5.03E-06	0%	0.0000	0.0001	0.0000	0.0001	0.0001	0.0002	0.0000	0.0001
Phenol	5.77E-03	0%	0.0288	0.1263	0.0259	0.0778	0.0577	0.2526	0.0259	0.0778
POMs	5.00E-03	0%	0.0250	0.1094	0.0225	0.0674	0.0500	0.2188	0.0225	0.0674
1,3-Dimethylnaphthalene	1.18E-04	0%	0.0006	0.0026	0.0005	0.0016	0.0012	0.0052	0.0005	0.0016
1,4-Dimethylnaphthalene	2.51E-05	0%	0.0001	0.0005	0.0001	0.0003	0.0003	0.0011	0.0001	0.0003
1,8-Dimethylnaphthalene	5.32E-06	0%	0.0000	0.0001	0.0000	0.0001	0.0001	0.0002	0.0000	0.0001
1-Methylnaphthalene	9.81E-04	0%	0.0049	0.0215	0.0044	0.0132	0.0098	0.0430	0.0044	0.0132
2,3-Dimethylnaphthalene	9.53E-05	0%	0.0005	0.0021	0.0004	0.0013	0.0010	0.0042	0.0004	0.0013
2,6-Dimethylnaphthalene	1.13E-05	0%	0.0001	0.0002	0.0001	0.0002	0.0001	0.0005	0.0001	0.0002
2,7-Dimethylnaphthalene	2.62E-05	0%	0.0001	0.0006	0.0001	0.0004	0.0003	0.0011	0.0001	0.0004
2-Methylnaphthalene	1.12E-03	0%	0.0056	0.0245	0.0050	0.0151	0.0112	0.0491	0.0050	0.0151
Acenaphthalene/1,2- Dimethylnaphthalene	2.45E-05	0%	0.0001	0.0005	0.0001	0.0003	0.0002	0.0011	0.0001	0.0003
Styrene	4.88E-04	0%	0.0024	0.0107	0.0022	0.0066	0.0049	0.0214	0.0022	0.0066
Toluene	2.00E-02	0%	0.0998	0.4369	0.0898	0.2693	0.1995	0.8738	0.0898	0.2693
Xylenes	1.20E-02	0%	0.0601	0.2631	0.0541	0.1622	0.1201	0.5261	0.0541	0.1622
		Total VOC	0.4446	1.9472	0.4001	1.2003	0.8891	3.8944	0.4001	1.2003
		Total HAPS	0.4596	2.0129	0.4011	1.2032	0.9192	4.0259	0.4011	1.2032

[1] Only particulate HAP emissions are controlled by TREA47.

[2] Pollutants in italics font are polycyclic organic matter and are included in the POMs emission total.

[3] Unless Otherwise Noted, HAP emission factors are from CERP Foundry Process Emission Factors:
Baseline Emissions from Automotive Foundries in Mexico (1999), Table 6.1 (found at https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexicoBaseline_1997.pdf)

[4] Emission factors base on 2023 Stack Testing

Metal Finishing Emissions

Shot Blast Booths — Annual Melt Limit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Shot Capacity (shot TPUT)	Bottlenecked Shot Capacity	Site Rated Metal Melt Capacity	Annual TPUT - Shot (ton/yr)[1]	Annual TPUT - Metal (ton/yr)[1]	Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Primary Control: HAP Control Efficiency	Secondary Control ID Number	Secondary Control: PM Control Efficiency	Secondary Control: PM10 Control Efficiency	Secondary Control: PM2.5 Control Efficiency	Secondary Control: HAP Control Efficiency
EQUI58	EU020	BCT Drumblast Machine	64,000 lb/hr	64,000 lb/hr	4.5 ton/hr	64,000	5,000	100%	TREA37/21	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI16	EU021	Tablesblast	32,000 lb/hr	32,000 lb/hr	4.5 ton/hr	32,000	5,000	100%	TREA29/19	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI51	na	Tumblemill	200 lb/hr	200 lb/hr	4.5 ton/hr	200	5,000	100%	TREA29/19	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%

HAP[2] — Emission Factor[2] (lb/lb - PM/10/2.5; lb/ton metal - HAPs)

EQUI	Lead	Cadmium	Chromium	Cobalt	Manganese	Nickel	PM	PM10	PM2.5
EQUI58	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.004	0.00344	0.00172
EQUI16	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.004	0.00344	0.00172
EQUI51	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.004	0.00344	0.00172

Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI58	256	1,121.28	200.16	964.30	110.08	482.15	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0138	0.0032	0.0138	0.0032
EQUI16	128	560.64	110.08	482.15	55.04	241.08	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0138	0.0032	0.0138	0.0032
EQUI51	0.8	3.50	0.69	3.01	0.34	1.51	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0032	0.0138	0.0138	0.0032	0.0138	0.0032

Limited *(hourly @ bottlenecked capacity; annual based on lesser of max hourly X 8,760 hr/yr or annual melt limit)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI58	5.36E-03	2.27E-03	4.42E-03	1.95E-03	2.31E-03	9.75E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04
EQUI16	2.68E-03	2.27E-03	2.31E-03	1.16E-03	1.16E-03	9.75E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04	6.61E-08	3.97E-04
EQUI51	1.68E-05	7.36E-05	1.44E-05	6.33E-05	7.22E-06	3.16E-05	6.61E-08	1.98E-07	6.61E-08	1.98E-07	6.61E-08	1.98E-07	6.61E-08	1.98E-07	6.61E-08	1.98E-07	6.61E-08	1.98E-07	6.61E-08	1.98E-08

1 Actual annual shot blast/put assumes 2,000 hours at rated capacity for shot, and 5,000 tons metal per year

2 The emission factor for PM emissions from abrasive blasting of steel shot was taken from the abrasive blasting template developed by MPCA Small Business Environmental Assistance Program (See the "Blasting charts" tab in this workbook"). The PM10 emission factor is also in this workbook and is derived from the STAPPA/ALAPCO PM10 factors (see reference in workbook). The calculation workbook is found in the following link: https://www.pca.state.mn.us/sites/default/files/p-stap5-19.xlsm.

3 PM2.5 conservatively calculated as 50% of PM10 emission factor based on comparison of PM10:PM2.5 emission factors referenced in "Particulate Emission Factors for Blasting Operations and Other Potential Sources" 9/18/1998, NSRP 0552, N1-97-4

4 A total HAP emission factor was obtained from "Total HAP Emission Factors for Preliminary Screening Analysis - Iron Foundries" 10/8/01, compiled by the American Foundrymen's Society Air Quality Committee and MACT Task Force (found at https://pdfa.epa.gov/epa042012/01-10-13/technical/h202008.pdf). The calculations conservatively assume that total HAP emissions are equal to each HAP's emissions.

5 Limited annual HAP emissions are limited to the sitewide annual melt limit.

Annual tpy assumes 15,000 tons metal melted per year (all sources combined (for actual emission calculations.

Finishing Operations — Annual Unit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity	Bottlenecked Capacity	Annual TPUT - Metal (ton/yr)	Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Primary Control: HAP Control Efficiency	Secondary Control ID Number	Secondary Control: PM Control Efficiency	Secondary Control: PM10 Control Efficiency	Secondary Control: PM2.5 Control Efficiency	Secondary Control: HAP Control Efficiency
EQUI17	EU029	South Swing Grinder	1 ton/hr	1 ton/hr	1,250	80%	TREA40/39	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI18	EU030	East Cutoff Saw	0.5 ton/hr	0.5 ton/hr	1,250	80%	TREA29/19	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI20	EU032	West Cutoff Saw	0.5 ton/hr	0.5 ton/hr	1,250	80%	TREA29/19	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI23	EU035	Double Belt Sander	0.25 ton/hr	0.25 ton/hr	1,250	80%	TREA13/30	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI17	EU036	NE Finishing Grinder	0.25 ton/hr	0.25 ton/hr	1,250	80%	TREA13/30	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI24	EU036	SW Bench Grinder	0.5 ton/hr	0.5 ton/hr	1,250	80%	TREA43/38	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI28	EU040	NE Chipping Bench	0.75 ton/hr	0.75 ton/hr	1,250	80%	TREA43/38	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI29	EU041	SE Chipping Bench	0.75 ton/hr	0.75 ton/hr	1,250	80%	TREA43/38	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI100	n.a	SW Chipping Bench	0.75 ton/hr	0.75 ton/hr	1,250	80%	TREA43/38	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI00	EU042	North Swing Grinder	1 ton/hr	1 ton/hr	1,250	80%	TREA41/42	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI41	n.a	Snag Grinder 2	1 ton/hr	1 ton/hr	1,250	80%	TREA22/35	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
EQUI42	n.a	Snag Grinder 3	1 ton/hr	1 ton/hr	1,250	80%	TREA22/35	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%
COMG5	GP005	Grinding/Cutting Operations														

HAP[2] — Emission Factor[2] (lb/ton metal)

EQUI	Lead	Cadmium	Chromium	Cobalt	Manganese	Nickel	PM	PM10	PM2.5
EQUI17	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.6	1.6	1.6
EQUI18	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.8	0.8	0.8
EQUI20	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.8	0.8	0.8
EQUI23	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.4	0.4	0.4
EQUI17	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.4	0.4	0.4
EQUI24	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.8	0.8	0.8
EQUI28	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.2	1.2	1.2
EQUI29	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.2	1.2	1.2
EQUI100	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.2	1.2	1.2
EQUI00	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.6	1.6	1.6
EQUI41	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.6	1.6	1.6
EQUI42	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.6	1.6	1.6
COMG5									

Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI17	7.01	0.16	7.008	0.16	0.7008	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0018	0.0079	0.0224	0.0367
EQUI18	3.50	0.08	0.3504	0.08	0.3504	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0009	0.0039	0.0112	0.0183
EQUI20	3.50	0.08	0.3504	0.08	0.3504	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0009	0.0039	0.0112	0.0183
EQUI23	0.16	0.04	0.1752	0.04	0.01	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0005	0.0020	0.0056	0.0092
EQUI17	0.16	0.04	0.1752	0.04	0.01	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0005	0.0020	0.0056	0.0092
EQUI24	0.16	0.08	0.3504	0.08	0.04	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0007	0.0002	0.0009	0.0039	0.0112	0.0183
EQUI28	0.16	0.12	0.5256	0.12	0.09	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0014	0.0059	0.0168	0.0275
EQUI29	0.16	0.12	0.5256	0.12	0.09	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0014	0.0059	0.0168	0.0275
EQUI100	0.16	0.12	0.5256	0.12	0.09	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0014	0.0059	0.0168	0.0275
EQUI00	0.16	0.16	0.7008	0.16	0.16	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0018	0.0079	0.0224	0.0367
EQUI41	0.16	0.16	0.7008	0.16	0.16	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0018	0.0079	0.0224	0.0367
EQUI42	0.16	0.16	0.7008	0.16	0.16	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0013	0.0003	0.0018	0.0079	0.0224	0.0367
COMG5																			0.30	

Limited *(hourly @ bottlenecked capacity; group emissions distributed among sources)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI17	0.0022	0.0037	0.0018	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	1.26E-05
EQUI18	0.0011	0.0018	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	1.26E-05	2.06E-05
EQUI20	0.0011	0.0018	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	1.26E-05	2.06E-05
EQUI23	0.0009	0.0006	0.0009	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	6.31E-06	1.03E-05
EQUI17	0.0009	0.0006	0.0009	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	1.72E-06	1.05E-06	6.31E-06	1.03E-05
EQUI24	0.0018	0.0011	0.0018	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	3.44E-06	2.10E-06	1.26E-05	2.06E-05
EQUI28	0.0028	0.0017	0.0028	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	1.89E-05	3.10E-05
EQUI29	0.0028	0.0017	0.0028	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	1.89E-05	3.10E-05
EQUI100	0.0028	0.0017	0.0028	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	5.16E-06	3.15E-06	1.89E-05	3.10E-05
EQUI00	0.0037	0.0022	0.0037	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	2.52E-05	4.13E-05
EQUI41	0.0037	0.0022	0.0037	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	2.52E-05	4.13E-05
EQUI42	0.0037	0.0022	0.0037	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	6.88E-06	4.21E-06	2.52E-05	4.13E-05
COMG5	0.03		5.68E-05		5.68E-05		5.68E-05		5.68E-05		5.68E-05		5.68E-05		5.68E-05		5.68E-05		5.68E-05	3.41E-04

1 The PM Emission Factor is from the Modern Casting article "An Inventory of Iron Foundry Emissions" dated January 1972. The document speciates the PM emissions from the EPA Fire emission factor for SCC 30400040 to distinguish emissions from shot blasting versus grinding. The operations for the units in GP 012 are solely grinding; therefore, the listed lb/ton emission factor for Grinding is representative. The PM10 emissions factor is calculated at the ratio as PM for SCC 30400040 [PM10 Factor = (Grinding PM Factor of 1.6) / (EPA Fire PM Factor 17 lb/ton) * (EPA Fire PM10 Factor of 1.7 lb/ton)] The document is included as an attachment to these calculations. PM2.5 is assumed to equal PM10. Though fallout is expected to occur, no reduction for fallout is claimed.

2 A total HAP emission factor was obtained from "Total HAP Emission Factors for Preliminary Screening Analysis - Iron Foundries" 10/8/01, compiled by the American Foundrymen's Society Air Quality Committee and MACT Task Force (found at https://pdfa.epa.gov/epa042012/01-10-13/technical/h202008.pdf). The calculations conservatively assume that total HAP emissions are equal to each HAP's emissions.

Annual tpy assumes 15,000 tons metal melted per year (all sources combined (for actual emission calculations.

Machine Shop

Double Disc Sander and Shot Blast Machine

EQUI	EU	Unit Desc	Rated Capacity	Bottlenecked Capacity	Annual Throughput - Metal (ton/yr)	Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Primary Control: HAP Control Efficiency	Secondary Control ID Number	Secondary Control: PM Control Efficiency	Secondary Control: PM10 Control Efficiency	Secondary Control: PM2.5 Control Efficiency	Secondary Control: HAP Control Efficiency
EQUI118	n.a	Machine Shop Double Disc Sander	0.1 ton/hr	0.1 ton/hr	876	80%	TREA45	99.97%	99.97%	99.97%	99.97%	TREA47	93%	93%	93%	93%

HAP[2] — Emission Factor[2] (lb/ton metal)

EQUI	Lead	Cadmium	Chromium	Cobalt	Manganese	Nickel	PM	PM10	PM2.5
EQUI118	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	1.6	1.6	1.6

Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI118	0.160	0.701	0.016	0.070	0.016	0.070	3.00E-05	1.31E-04	3.00E-05	1.31E-04	3.00E-05	1.31E-04	3.00E-05	1.31E-04	3.00E-05	1.31E-04	3.00E-05	1.31E-04	0.0002	0.0008

Limited *(captured portion to 1st + 2nd controls, uncaptured to 2nd control only)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI118	2.24E-03	9.82E-03	2.24E-04	9.82E-04	2.24E-04	9.82E-04	4.21E-07	1.84E-06	4.21E-07	1.84E-06	4.21E-07	1.84E-06	4.21E-07	1.84E-06	4.21E-07	1.84E-06	4.21E-07	1.84E-06	2.52E-06	1.11E-05

1 The PM Emission Factor is from the Modern Casting article "An Inventory of Iron Foundry Emissions" dated January 1972. The document speciates the PM emissions from the EPA Fire emission factor for SCC 30400040 to distinguish emissions from shot blasting versus grinding. The operations for the units in GP 012 are solely grinding; therefore, the listed lb/ton emission factor for Grinding is representative. The PM10 emissions factor is calculated at the ratio as PM for SCC 30400040 [PM10 Factor = (Grinding PM Factor of 1.6) / (EPA Fire PM Factor 17 lb/ton) * (EPA Fire PM10 Factor of 1.7 lb/ton)]. PM2.5 is assumed to equal PM10. Though fallout is expected to occur, no reduction for fallout is claimed.

2 A total HAP emission factor was obtained from "Total HAP Emission Factors for Preliminary Screening Analysis - Iron Foundries" 10/8/01, compiled by the American Foundrymen's Society Air Quality Committee and MACT Task Force (found at https://pdfa.epa.gov/epa042012/01-10-13/technical/h202008.pdf). The calculations conservatively assume that total HAP emissions are equal to each HAP's emissions. These grinding and shot blast emissions factors are listed as controlled or uncontrolled. They have been assumed to be an uncontrolled emission factor, thus primary control is included.

Shot Blast Booths

EQUI	EU	Unit Desc	Rated Capacity (shot TPUT)	Bottlenecked Capacity	Site Rated Metal Melt Capacity	Annual Throughput - Shot[1] (ton/yr)	Annual Throughput - Metal[1] (ton/yr)	Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Primary Control: HAP Control Efficiency
EQUI119	n.a	Machine Shop Blast Machine	40 lb/hr	40 lb/hr	4.5 ton/hr	40	1,500	100%	TREA44	99.97%	99.97%	99.97%	99.97%

HAP[4] — Emission Factor[2] (lb/lb - PM/10/2.5; lb/ton metal - HAP)

EQUI	Lead	Cadmium	Chromium	Cobalt	Manganese	Nickel	PM	PM10	PM2.5[3]
EQUI119	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.004	0.0034	0.0017

Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI119	0.160	0.701	0.136	0.596	0.068	0.298	3.15E-03	1.38E-02	3.15E-03	1.38E-02	3.15E-03	1.38E-02	3.15E-03	1.38E-02	3.15E-03	1.38E-02	3.15E-03	1.38E-02	0.0189	0.0828

Limited *(bottlenecked capacity to control; annual = max hourly X 8,760 hr/yr)*

EQUI	PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	Lead Emission Rate (lb/hr)	Lead Emission Rate (ton/yr)	Cadmium Emission Rate (lb/hr)	Cadmium Emission Rate (ton/yr)	Chromium Emission Rate (lb/hr)	Chromium Emission Rate (ton/yr)	Cobalt Emission Rate (lb/hr)	Cobalt Emission Rate (ton/yr)	Manganese Emission Rate (lb/hr)	Manganese Emission Rate (ton/yr)	Nickel Emission Rate (lb/hr)	Nickel Emission Rate (ton/yr)	Total HAP Emission Rate (lb/hr)	Total HAP Emission Rate (ton/yr)
EQUI119	4.80E-05	2.10E-04	4.08E-05	1.79E-04	2.04E-05	8.94E-05	9.45E-07	2.83E-06	9.45E-07	2.83E-06	9.45E-07	2.83E-06	9.45E-07	2.83E-06	9.45E-07	2.83E-06	9.45E-07	2.83E-06	5.67E-06	1.70E-05

1 Actual annual shot blast/put assumes 2,000 hours at rated capacity for shot, and 10% of 15,000 tons metal per year

2 The emission factor for PM emissions from abrasive blasting of steel shot was taken from the abrasive blasting template developed by MPCA Small Business Environmental Assistance Program (See the "Blasting charts" tab in this workbook"). The PM10 emission factor is also in this workbook and is derived from the STAPPA/ALAPCO PM10 factors (see reference in workbook). The calculation workbook is found in the following link: https://www.pca.state.mn.us/sites/default/files/p-stap5-19.xlsm.

3 PM2

Shakeout Emissions

Shakeout Annual Melt Limit: 27,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Annual Throughput - Metal (ton/yr)	Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Primary Control: HAP Control Efficiency	Secondary Control ID Number	Secondary Control: PM Control Efficiency	Secondary Control: PM10 Control Efficiency	Secondary Control: PM2.5 Control Efficiency	Secondary Control: HAP Control Efficiency	PM Emission Factor[1] (lb/ton metal)	PM10[2] Emission Factor[1] (lb/ton metal)	PM2.5[2] Emission Factor[1] (lb/ton metal)	CO Emission Factor[1] (lb/ton metal)
DISA Line																						
EQUI80	EU017	DISA #1 Oscillator	5	ton/hr	4.5	ton/hr	5,400	0%	--	0%	0%	0%	0%	TREA47	93%	93%	93%	93%	0.640	0.448	0.269	0.908
EQUI81	EU017	DISA #2 Oscillator	5	ton/hr	4.5	ton/hr	5,400	80%	TREA2	97.8%	97.7%	98.0%	97.7%	TREA47	93%	93%	93%	93%	0.640	0.448	0.269	0.908
EQUI82	EU017	DISA #3 Oscillator	5	ton/hr	4.5	ton/hr	5,400	80%	TREA2	97.8%	97.7%	98.0%	97.7%	TREA47	93%	93%	93%	93%	0.640	0.448	0.269	0.908
EQUI83	EU017	DISA Didion	5	ton/hr	4.5	ton/hr	5,400	80%	TREA2	97.8%	97.7%	98.0%	97.7%	TREA47	93%	93%	93%	93%	0.640	0.448	0.269	0.908
EQUI84	EU017	DISA #5 Oscillator	5	ton/hr	4.5	ton/hr	5,400	0%	--	0%	0%	0%	0%	TREA47	93%	93%	93%	93%	0.640	0.448	0.269	0.908
COMG4	**GP004**	**Shakeout**																				
30^2 Line																						
EQUI63	EU018	30^2 Unit 10	10	ton/hr	4.5	ton/hr	9,000	80%	TREA23	99.5%	99.5%	99.7%	99.7%	TREA46	93%	93%	93%	93%	1.067	0.747	0.448	0.908
EQUI65	EU018	30^2 Unit 11	10	ton/hr	4.5	ton/hr	9,000	0%	--	0%	0%	0%	0%	TREA46	93%	93%	93%	93%	1.067	0.747	0.448	0.908
EQUI66	EU018	30^2 Unit 12	10	ton/hr	4.5	ton/hr	9,000	0%	--	0%	0%	0%	0%	TREA46	93%	93%	93%	93%	1.067	0.747	0.448	0.908
COMG4	**GP004**	**Shakeout**																				

EQUI	Potential (hourly @ rated capacity; annual = max hourly X 8,760 hr/yr) PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	CO Emission Rate (lb/hr)	CO Emission Rate (ton/yr)	Limited (captured to both controls, uncaptured to 2nd only; annual by sitewide limit) PM Emission Rate (lb/hr)	PM Emission Rate (ton/yr)	PM10 Emission Rate (lb/hr)	PM10 Emission Rate (ton/yr)	PM2.5 Emission Rate (lb/hr)	PM2.5 Emission Rate (ton/yr)	CO Emission Rate (lb/hr)	CO Emission Rate (ton/yr)
DISA Line																
EQUI80	3.200	14.016	2.240	9.811	1.344	5.887	4.54	19.89	0.202	0.605	0.141	0.423	0.085	0.254	4.086	12.259
EQUI81	3.200	14.016	2.240	9.811	1.344	5.887	4.54	19.89	0.090	0.271	0.065	0.195	0.036	0.108	4.086	12.259
EQUI82	3.200	14.016	2.240	9.811	1.344	5.887	4.54	19.89	0.090	0.271	0.065	0.195	0.036	0.108	4.086	12.259
EQUI83	3.200	14.016	2.240	9.811	1.344	5.887	4.54	19.89	0.090	0.271	0.065	0.195	0.036	0.108	4.086	12.259
EQUI84	3.200	14.016	2.240	9.811	1.344	5.887	4.54	19.89	0.202	0.605	0.141	0.423	0.085	0.254	4.086	12.259
COMG4										2.023		1.432		0.831		12.259
30^2 Line																
EQUI63	10.667	46.720	7.467	32.704	4.480	19.622	9.08	39.77	0.086	0.257	0.061	0.182	0.034	0.102	4.086	12.259
EQUI65	10.667	46.720	7.467	32.704	4.480	19.622	9.08	39.77	0.336	1.008	0.235	0.706	0.141	0.423	4.086	12.259
EQUI66	10.667	46.720	7.467	32.704	4.480	19.622	9.08	39.77	0.336	1.008	0.235	0.706	0.141	0.423	4.086	12.259
COMG4										2.273		1.593		0.948		12.259

1 PM/PM10/PM2.5 Emissions factor source: AP42 table 12.10-7. Emissions factor is for shakeout process as a whole so factor divided be number of components in process (DISA-5; 30^2-3)

2 PM10 and PM2.5 factors based on Shakeout EF multiplied by AP 42 table 12.10-8 shakeout cumulative mass % of total PM (PM10:70%; PM2.5:42%)

3 CERP Foundry Process Emission Factors:
Baseline Emissions from Automotive
Foundries in Mexico (1999), Table 6.1 - Lead (found at https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexicoBaseline_1997.pdf)

DISA Line captured emissions controlled by TREA2. Uncaptured emissions controlled by TREA47

30^2 Line captured emissions controlled by TREA23. Uncaptured emissions controlled by TREA46

Note 3: CO Emission Factor calculated from "Foundary Air Contaminants from Green Sand Molds", American Industrial Hygiene Association Journal, 37:6, 335-344, 1976

Information from article used for calcluation

2.5	Liter exhaust/lb metal casting	Page 339 of AIGAJ 37:6, 1976
21.90%	Max CO % in exhaust pouring/casting	Table 1. page 336 of AIGAJ 37:6, 1976
1510	ppmV CO from pouring/cooling	Table II. page 343 of AIGAJ 37:6, 1976
650	ppmV CO from shakeout	Table II. page 343 of AIGAJ 37:6, 1976

Additional Information and Assumptions

28	g/mol	CO molecular weight
22.4	Liter/mol	Assuming ideal gas molar volume at stp
453.59	g/lb	Conversion Factor

Emission factor for Shakeout

4.54E-04 lb CO/lb metal casting
0.91 lb CO/ton metal casting

Shakeout HAP Emissions

Pollutant[1]	Emission Factor[2] (lb/ton metal)	HAP Control [3]	Disa Line (EQUI80 - EQUI84) Potential (lb/hr)	Disa Line Potential (tpy)	Disa Line Limited (lb/hr)	Disa Line Limited (tpy)	30^2 Line (EQUI 63, 65, 66) Potential (lb/hr)	30^2 Line Potential (tpy)	30^2 Line Limited (lb/hr)	30^2 Line Limited (tpy)
Lead	7.29E-05	See Table Above	0.0018	0.0080	7.77E-05	6.89E-05	0.0022	0.0096	5.14E-05	6.89E-05
Cadmium	1.67E-05	See Table Above	0.0004	0.0018	1.78E-05	1.58E-05	0.0005	0.0022	1.18E-05	1.58E-05
Chromium	1.71E-04	See Table Above	0.0043	0.0187	1.82E-04	1.62E-04	0.0051	0.0225	1.21E-04	1.62E-04
Manganese	3.39E-04	See Table Above	0.0085	0.0371	3.61E-04	3.20E-04	0.0102	0.0445	2.39E-04	3.20E-04
Acetaldehyde	5.78E-02	0%	1.4450	6.3291	1.8207	0.7803	1.7340	7.5949	0.7803	0.7803
Acetophenone	7.92E-04	0%	0.0198	0.0867	0.0249	0.0107	0.0238	0.1041	0.0107	0.0107
Benzene	2.68E-02	0%	0.6700	2.9346	0.8442	0.3618	0.8040	3.5215	0.3618	0.3618
o-Cresol	1.40E-02	0%	0.3500	1.5330	0.4410	0.1890	0.4200	1.8396	0.1890	0.1890
Cumene	3.82E-04	0%	0.0096	0.0418	0.0120	0.0052	0.0115	0.0502	0.0052	0.0052
Dibenzofuran	3.34E-04	0%	0.0084	0.0366	0.0105	0.0045	0.0100	0.0439	0.0045	0.0045
Ethylbenzene	2.91E-03	0%	0.0728	0.3186	0.0917	0.0393	0.0873	0.3824	0.0393	0.0393
Formaldehyde	2.57E-02	0%	0.6425	2.8142	0.8096	0.3470	0.7710	3.3770	0.3470	0.3470
Naphthalene	8.37E-03	0%	0.2093	0.9165	0.2637	0.1130	0.2511	1.0998	0.1130	0.1130
Phenol	2.80E-02	0%	0.7000	3.0660	0.8820	0.3780	0.8400	3.6792	0.3780	0.3780
POMs	2.21E-02	0%	0.5525	2.4200	0.6962	0.2984	0.6630	2.9039	0.2984	0.2984
1,3-Dimethylnaphthalene	1.03E-03	0%	0.0258	0.1128	0.0324	0.0139	0.0309	0.1353	0.0139	0.0139
1,4-Dimethylnaphthalene	4.64E-04	0%	0.0116	0.0508	0.0146	0.0063	0.0139	0.0610	0.0063	0.0063
1,8-Dimethylnaphthalene	1.06E-03	0%	0.0265	0.1161	0.0334	0.0143	0.0318	0.1393	0.0143	0.0143
1-Methylnaphthalene	3.41E-03	0%	0.0853	0.3734	0.1074	0.0460	0.1023	0.4481	0.0460	0.0460
2,3,5-Trimethylnaphthalene	7.14E-04	0%	0.0179	0.0782	0.0225	0.0096	0.0214	0.0938	0.0096	0.0096
2,3-Dimethylnaphthalene	6.50E-04	0%	0.0163	0.0712	0.0205	0.0088	0.0195	0.0854	0.0088	0.0088
2,6-Dimethylnaphthalene	5.68E-04	0%	0.0142	0.0622	0.0179	0.0077	0.0170	0.0746	0.0077	0.0077
2,7-Dimethylnaphthalene	4.10E-04	0%	0.0103	0.0449	0.0129	0.0055	0.0123	0.0539	0.0055	0.0055
2-Methylnaphthalene	5.22E-03	0%	0.1305	0.5716	0.1644	0.0705	0.1566	0.6859	0.0705	0.0705
Acenaphthalene/1,2- Dimethylnaphthalene	2.20E-04	0%	0.0055	0.0241	0.0069	0.0030	0.0066	0.0289	0.0030	0.0030
Styrene	4.81E-03	0%	0.1203	0.5267	0.1515	0.0649	0.1443	0.6320	0.0649	0.0649
Toluene	2.21E-02	0%	0.5525	2.4200	0.6962	0.2984	0.6630	2.9039	0.2984	0.2984
Xylenes	1.78E-02	0%	0.4450	1.9491	0.5607	0.2403	0.5340	2.3389	0.2403	0.2403
		Total VOC	5.5886	24.4781	7.0416	3.0178	6.7063	29.3737	3.0178	3.0178
		Total HAPS	5.6036	24.5437	7.0423	3.0184	6.7243	29.4525	3.0183	3.0184

[1] Pollutants in italics font are polycyclic organic matter and are included in the POMs emission total.

[2] HAP emission factors are from CERP Foundry Process Emission Factors:
Baseline Emissions from Automotive Foundries in Mexico (1999), Table 6.1 (found at https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexicoBaseline_1997.pdf)

[3] HAP emissions assume only secondary control (no primary control)

Nobake Cores

Emissions from the Nobake Core making come from mixing sand and resin together. Emission factors are from AP-42. Binder mixing emission factors are calculated from "Form R Reporting of binder chemicals used in Foundries" and SDS of binders used. Calculations are made using the conservative assumption that 2.0% of the core mix is binder.
VOCs, individual HAPs, and total HAPs are limited under COMG7. Sand throughputs are restricted by COMG2.
EQUI52 and EQUI53 are uncontrolled. Fugitives from these operations are contained within the building and routed to dust collector TREA47

																		Potential *(hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)*								**Limited** *(bottlenecked capacity to control; annual = max hourly X 8,760 hr/yr)*							
									PM	PM10	PM2.5	VOC	PM[2]	PM10	PM2.5[2]	VOC		PM		PM10		PM2.5		VOC		PM		PM10		PM2.5		VOC	
EQUI	**EU**	**Unit Desc**	**Rated Capacity**		**Bottlenecked Capacity**		**Annual Throughput (ton/yr)**	**Capture (%)**	**Control ID Number**	**Control Efficiency**				**Emission Factor[1] (lb/ton sand)**				**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**
EQUI52	EU010	Disco Core Machine	0.5	tons/hr	0.5	ton/hr	1,000	100%	TREA47	93%	93%	93%	0%	0.635	0.540	0.191	0.820	0.318	1.391	0.270	1.183	0.095	0.417	0.410	1.797	0.022	0.097	0.019	0.083	0.007	0.029	0.410	1.797
EQUI53	EU010	ABC6 Core Machine	0.4125	tons/hr	0.4125	ton/hr	825	100%	TREA47	93%	93%	93%	0%	0.635	0.540	0.191	0.820	0.262	1.148	0.223	0.976	0.079	0.344	0.338	1.482	0.018	0.080	0.016	0.068	0.006	0.024	0.338	1.482
COMG7	**GP007**	**Primary VOC/HAP Sources**																															

1 AP-42 Sect. 12.13 emission factors were selected rather than AP-42 Sect. 12.10. AP-42 factor is in units of lb/ton sand processed. EPA indicates that non-furnace emissions are expected to be similar between foundries.

2 PM and PM2.5 factor calculated based on PM Augmentation for sand handling: 85% PM10, 30% PM2.5. The PM Augmentation Calcualtor Tool can be downloaded at the following link: https://19january2017snapshot.epa.govsites/production/files/2016-05/pm_aug_tool_v1.2_20may2016.zip.

Note 1: Binder Emissions

The following tables are taken from "Form R Reporting of Binder Chemicals Used in Foundries" Fourth Edition, available online at https://afsinc.s3.amazonaws.com/Documents/EHS/airquality/1.5%20-%20AFS_CISA%20Guidance.pdf.
Worst case pollutant rates calculated following instructions provided in "Form R Reporting of Binder Chemicals Used in Foundries" and the SDS for binders used at Northern Iron and Machine.

Furan Nobake Binder

Material	% Reacted	% Evaporated	% Remaining	Chemical % in Binder From SDS	lb emitted/ lb binder used
Resin					
Phenol (108-95-2)	98	0	2	0	0
Formaldehyde (50-00-0)	98	2	0	1	0.0002
Methyl Alcohol (67-56-1)	0	50	50	3	0.015
Catalyst					
Methyl Alcohol (67-56-1)	0	50	50	0	0
Sulfuric Acid (8774-93-9)	100	0	0	3	0

Phenolic Urethane Nobake Binder

Material	% Reacted	% Evaporated	% Remaining	Chemical % in Binder From SDS	lb emitted/ lb binder used
Part I					
Phenol (108-95-2)	98	0	2	10	0
Formaldehyde (50-00-0)	98	2	0	0.1	2.00E-03
Naphthalene (91-20-3)	0	5.85	94.15	3	1.76E-03
1,2,4 Trimethyl Benzene (95-63-6)	0	5.85	94.15	0	0
Cumene (98-82-8)	0	5.85	94.15	0	0
Xylene (1330-20-7)	0	5.85	94.15	0	0
Part II					
Methylene Phenylene Isocyanate (101-68-8)	99.99	0	0.01	0	0
Polymeric Diphenylmethane Diisocyanate (9016-87-9)	99.99	0	0.01	50	0
Naphthalene (91-20-3)	0	5.85	94.15	3	1.76E-03
1,2,4 Trimethylbenzene (95-63-6)	0	5.85	94.15	0	0
Cumene (98-82-8)	0	5.85	94.15	0	0
Xylene (1330-20-7)	0	5.85	94.15	0	0

Phenolic Urethane Coldbox Binder

Material	% Reacted	% Evaporated	% Remaining	Chemical % in Binder From SDS	lb emitted/ lb binder used
Part I					
Formaldehyde (50-00-0)	98	2	0	0	0
Phenol (108-95-2)	98	0	2	5	0
Xylene (1330-20-7)	0	3.25	96.75	0	0
Cumene (98-82-8)	0	3.25	96.75	0	0
Naphthalene (91-20-3)	0	3.25	96.75	3	9.75E-04
1,2,4 Trimethylbenzene (95-63-6)	0	3.25	96.75	0	0
Part II					
Methylene Phenylene Isocyanate (101-68-8)	99.99	0	0.01	0	0
Polymeric Diphenylmethane Diisocyanate (9016-87-9)	99.99	0	0.01	10	0
Naphthalene (91-20-3)	0	3.25	96.75	3	9.75E-04
Xylene (1330-20-7)	0	3.25	96.75	0	0
Biphenyl (95-52-4)	0	3.25	96.75	0	0

Comparison of Core Binders

Binder content in core mix	0.02				
Material	lb/lb Furan Nobake binder used	lb/lb Phenolic Urethane Nobake Binder	lb/ lb Phenolic Urethane Coldbox Binder	worst case lb/lb binder	Worst case lb/ton core mix
Phenol	0	0	0	0	0
Formaldehyde	2.00E-04	0.002	0	2.00E-03	8.00E-02
Methyl Alcohol	1.50E-02	0	0	1.50E-02	6.00E-01
Naphthalene	0	3.51E-03	1.95E-03	3.51E-03	1.40E-01
1,2,4 Trimethyl Benzene	0	0	0	0	0
Cumene	0	0	0	0	0
Xylene	0	0	0	0	0
Methylene Phenylene Isocyante	0	0	0	0	0
Polymeric Diphenylmethane Diisocyanate	0	0	0	0	0
Biphenyl	0	0	0	0	0

Worst case pollutant rates calculated from tables in "Form R Reporting of Binder Chemicals used in Foundries" and the SDS for binders used at Northern Iron and Machine. Per Northern Iron and Machine, max amount of binder in cores is 2.75%.

Shell Cores

Higher tensile strength cores use premixed sand/resin and are heat treated during the curing process. Emissions from this operation are from sand handling and combustion. Combustion emissions for these units are included in summary page. Sand throughput is limited under COMG2
EQUI54, EQUI55, and EQUI56 are controlled by HEPA filters exhausting internally and ultimately to STRU12

								Primary Control			Secondary Control						**HAPs**			**Potential** *(hourly @ rated capacity; annual = hourly X 8,760 hr/yr)*														**Limited** *(captured to both controls, uncaptured to 2nd only)*											
								PM	PM10	PM2.5	PM	PM10	PM2.5	PM[2]	PM10	PM2.5[2]	Formaldehyde	Methyl Alcohol	Naphthalene	PM		PM10		PM2.5		Formaldehyde		Methyl Alcohol		Naphthalene		Total HAP		PM		PM10		PM2.5		Formaldehyde		Methyl Alcohol		Naphthalene		Total HAP	
EQUI	**EU**	**Unit Desc**	**Rated Capacity**		**Bottlenecked Capacity**		**Annual Throughput (ton/yr)**	**Capture (%)**	**Control Efficiency**			**Control Efficiency**			**Emission Factor[1] (lb/ton sand)**					**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**	**Emission Rate (lb/hr)**	**Emission Rate (ton/yr)**
EQUI55	EU013	East CR16	0.33	tons/hr	0.33	tons/hr	660	80%	99.97%	99.97%	99.97%	97.83%	97.71%	98.04%	0.635	0.540	0.191	0.080	0.600	0.140	0.210	0.918	0.178	0.781	0.063	0.275	0.026	0.116	0.198	0.867	0.046	0.203	0.271	1.186	9.13E-04	4.00E-03	8.15E-04	3.57E-03	2.47E-04	1.08E-03	0.026	0.116	0.198	0.867	0.046	0.203	0.271	1.186
EQUI54	EU013	West CR16	0.33	tons/hr	0.33	tons/hr	660	80%	99.97%	99.97%	99.97%	97.83%	97.71%	98.04%	0.635	0.540	0.191	0.080	0.600	0.140	0.210	0.918	0.178	0.781	0.063	0.275	0.026	0.116	0.198	0.867	0.046	0.203	0.271	1.186	9.13E-04	4.00E-03	8.15E-04	3.57E-03	2.47E-04	1.08E-03	0.026	0.116	0.198	0.867	0.046	0.203	0.271	1.186
EQUI56	EU013	CR-22	1.1	tons/hr	1.1	tons/hr	2,200	80%	99.97%	99.97%	99.97%	97.83%	97.71%	98.04%	0.635	0.540	0.191	0.080	0.600	0.140	0.699	3.061	0.594	2.602	0.210	0.918	0.088	0.385	0.660	2.891	0.154	0.676	0.902	3.953	3.04E-03	1.33E-02	2.72E-03	1.19E-02	8.23E-04	3.60E-03	0.088	0.385	0.660	2.891	0.154	0.676	0.902	3.953

1 AP-42 Sect. 12.13 emission factors were selected rather than AP-42 Sect. 12.10. AP-42 factor is in units of lb/ton sand processed. EPA indicates that non-furnace emissions are expected to be similar between foundries.

2 PM and PM2.5 factor calculated based on PM Augmentation for sand handling: 85% PM10, 30% PM2.5. The PM Augmentation Calcualtor Tool can be downloaded at the following link: https://19january2017snapshot.epa.govsites/production/files/2016-05/pm_aug_tool_v1.2_20may2016.zip.

Core Wash

Cores sent to tunnel oven go through a core wash. Core wash density and rate provided by Northern Iron. VOC emissions are limited under COMG7. Operations are uncontrolled.

Potential	**Limited**

EQUI	EU	Unit Desc	Capacity	Annual Throughput	VOC			
					Emission Rate (lb/hr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)	Emission Rate (ton/yr)
EQUI11	EU014	Core Wash	15 gal/day	757.143 gal/yr	3.50	15.33	3.50	15.33

Core Wash capacity, max rate, and wash density provided by Northern Iron

Capacity:	15	gallons
Rate:	1	Container per day
Wash density:	5.6	lb/gal
Emission factor:	1	lb VOC emitted/lb VOC used
	5.6	lb VOC/gallon

		Uncontrolled				
		PM (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)	PM2.5 (tpy)	Lead (lb/hr)
STRU12	TREA2	0.2238919	0.190	0.067	0.294	0
STRU13	TREA23	0	0	0	0	0

Sand Handling Emissions

Sand handling is composed of the DISA and 30^2 mold lines. Mold and core sand is reclaimed during the mold making process and shakeout. Reclaimed sand is stored in the muller tank to be used again in new molds. Both lines and the core making operations are limited to a single sand throughput limit at COMG2. PTE for COMG2 is the line with the highest emissions operating at the sand handling limit.

Shakeout Annual 30^2 Line Sand Limit: 270,000 ton/yr

EQUI	EU	Unit Desc	Rated Capacity		Bottlenecked Capacity		Capture (%)	Primary Control ID Number	Primary Control: PM Control Efficiency	Primary Control: PM10 Control Efficiency	Primary Control: PM2.5 Control Efficiency	Secondary Control ID Number	Secondary Control: PM Control Efficiency	Secondary Control: PM10 Control Efficiency	Secondary Control: PM2.5 Control Efficiency	PM Emission Factor[1] (lb/ton sand)	PM10[2] Emission Factor[1] (lb/ton sand)	PM2.5[2] Emission Factor[1] (lb/ton sand)	Potential (hourly @ rated capacity; annual = hourly X 8,760 hr/yr) PM Emission Rate (lb/hr)	Potential PM Emission Rate (ton/yr)	Potential PM10 Emission Rate (lb/hr)	Potential PM10 Emission Rate (ton/yr)	Potential PM2.5 Emission Rate (lb/hr)	Potential PM2.5 Emission Rate (ton/yr)	Limited (bottlenecked capacity to control; annual = hourly X 8,760 hr/yr) PM Emission Rate (lb/hr)	Limited PM Emission Rate (ton/yr)	Limited PM10 Emission Rate (lb/hr)	Limited PM10 Emission Rate (ton/yr)	Limited PM2.5 Emission Rate (lb/hr)	Limited PM2.5 Emission Rate (ton/yr)
DISA Line																														
EQUI96	EU008	DISA Bond Day Tank	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI72	EU008	DISA Line Muller	26	ton/hr	26	ton/hr	100%	TREA2	97.8%	97.7%	98.0%	--	0%	0%	0%	0.635	0.54	0.191	16.518	72.347	14.040	61.495	4.955	21.704	0.359	1.865	0.321	0.504	0.097	0.425
EQUI73	EU008	DISA Muller Discharge Belt	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI74	EU008	DISA Muller Distribution Belt	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI95	EU008	DISA Prepared Sand Tank	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI75	EU008	DISA Feed Belt	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI102	EU008	DISA Aerator	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI97	EU008	DISA Mold Machine	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI78	EU008	DISA Spill Belt	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI105	EU008	DISA Bond Transport	26	ton/hr	26	ton/hr	100%	TREA2	97.8%	97.7%	98.0%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.004	0.018	0.004	0.016	0.001	0.005
EQUI110	EU008	DISA Outdoor Bond Tank	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.192	0.839	0.163	0.713	0.057	0.252
EQUI79	EU008	DISA Cross Spill	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI76	EU008	DISA Spill Belt	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI77	EU008	DISA Spill Pan	26	ton/hr	26	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.013	0.059	0.011	0.050	0.004	0.018
EQUI85	EU008	DISA Mag Belt	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI86	EU008	DISA Return Sand Elevator	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI87	EU008	DISA 125 Ton Sand Bin	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI88	EU008	DISA 125 Ton Belt	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI89	EU008	DISA New/Old Belt	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI90	EU008	DISA New/Old Elevator	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI91	EU008	DISA Muller Storage Tank	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
EQUI115	EU008	DISA Hopper	26	ton/hr	26	ton/hr	80%	TREA2	97.8%	97.7%	98.0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.192	0.839	0.163	0.713	0.057	0.252	0.006	0.026	0.005	0.023	0.002	0.007
30^2 Line																														
EQUI104	EU009	30^2 Muller	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	0.635	0.54	0.191	28.588	125.216	24.300	106.434	8.576	37.565	0.136	0.409	0.123	0.368	0.030	0.090
EQUI92	EU009	30^2 Discharge Conveyor	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI94	EU009	30^2 Distribution belt conveyor	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI98	EU009	30^2 Mold Making	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI93	EU009	30^2 Cross Belt Conveyor	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI60	EU009	30^2 Machine Belt Sand	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI109	EU009	30^2 Prepared Sand Tank	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI61	EU009	30^2 Sprue Belt	45	ton/hr	45	ton/hr	0%	--	0%	0%	0%	TREA46	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.023	0.070	0.020	0.059	0.007	0.021
EQUI62	EU009	30^2 Machine Incline	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI64	EU009	30^2 Mag Belt	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI69	EU009	30^2 Incline to Blower	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI70	EU009	30^2 Blower	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI68	EU009	30^2 Aerator	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI71	EU009	30^2 Sand Cooler	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	2.00E+00	1.58E+00	9.00E-01	90.000	394.200	71.100	311.418	40.500	177.390	0.429	1.287	0.359	1.077	0.141	0.423
EQUI67	EU009	30^2 Return Sand Elevator	45	ton/hr	45	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.006	0.018	0.005	0.015	0.002	0.005
EQUI106	EU009	30^2 Sand Tank	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.002	0.005	0.001	0.004	0.000	0.001
EQUI107	EU009	30^2 Bond Tank	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.002	0.005	0.001	0.004	0.000	0.001
EQUI108	EU009	30^2 Sand Day Tank	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.002	0.005	0.001	0.004	0.000	0.001
EQUI116	EU009	30^2 Bond Day Tank	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.002	0.005	0.001	0.004	0.000	0.001
EQUI103	EU009	30^2 Return Sand Tank	45	ton/hr	45	ton/hr	100%	TREA23	99.5%	99.5%	99.7%	--	0%	0%	0%	7.37E-03	6.26E-03	2.21E-03	0.332	1.452	0.282	1.235	0.099	0.436	0.002	0.005	0.001	0.004	0.000	0.001
Core Making																														
EQUI111	EU010	ABC6 Sand Tank	0.5	ton/hr	0.5	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.004	0.016	0.003	0.014	0.001	0.005	6.56E-05	1.77E-02	5.65E-05	1.53E-02	1.86E-05	8.13E-05
EQUI112	EU010	Disco Sand Tank	0.4125	ton/hr	0.4125	ton/hr	80%	TREA23	99.5%	99.5%	99.7%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.003	0.013	0.003	0.011	0.001	0.004	5.41E-05	1.77E-02	4.66E-05	1.53E-02	1.53E-05	6.70E-05
EQUI113	EU010	Sand Loading (CR16 and CR22)	1.76	ton/hr	1.76	ton/hr	0%	--	0%	0%	0%	TREA47	93%	93%	93%	7.37E-03	6.26E-03	2.21E-03	0.013	0.057	0.011	0.048	0.004	0.017	9.08E-04	6.96E-02	7.72E-04	5.92E-02	2.72E-04	1.19E-03
COMG2	GP002	Sand Handling																								5.966		4.003		1.621

1 Emissions factor for sand handling is based on a calculation derived from AP-42 Table 11.19.1-1 and was approved by the MPCA. See supporting documentation in the Sand Handling EF tab. Muller factor: AP42, Tbl. 12.13-2. Sand Cooler factor: AP42, Tbl. 11.19.1-1. The Mueller and Sand Cooler Factors are reported as PM10 and have been divided by the EPA PM Augmentation too value of 85% to determine the PM emission factor. The PM2.5 emission factor for the Muller and Sand Cooler is calculated as 30% of the PM emission factor (based on data in the EPA PM Augmentation tool)

2 PM10 and PM2.5 calculated based on the PM Augmentation for the respective SCC. The PM Augmentation Calculator Tool can be downloaded at the following link: https://19january2017snapshot.epa.gov/sites/production/files/2016-05/pm_aug_tool_v1.2_20may2016.zip.

DISA Line EQUI 72, 85, 86, 87, 88, 89, 90, 91, 96, 105 and 115 are controlled by TREA 2. Fugitives from these operations are contained within the building and routed to dust collector TREA47

30^2 Line EQUI 63, 64, 67, 68, 69, 70, 71, 103, 104, 106, 107, 108, and 116 are controlled by TREA 23. Fugitives from these operations are contained within the building and routed to dust collectors TREA46 and TREA47

Core Making EQUI 113 is uncontrolled. Fugitives from EQUI 111, EQUI 112, and E QUI 113 are contained within the building and routed to dust collector TREA47

Potential (hourly @ rated capacity; annual = max hourly X 8,760 hr/yr)

EQUI	EU	Unit Desc.	Rated Capacity (MMBtu/hr)	PM		PM10		PM2.5		Lead		NOx		CO		SO2		VOC		CO2		N2O		Arsenic		Beryllium		Cadmium		Chromium		Cobalt		Manganese		Mercury		Nickel		Selenium		CH4		CO2e	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EQU1	EU081	Scrap Preheat Oven 1	4	0.000	0.000	0.000	0.000	0.000	0.000	1.96E-06	8.59E-06	0.065	2.476	0.329	1.440	2.26E-03	1.03E-02	0.040	0.190	544.18	2,383.52	0.039	0.171	7.84E-07	3.44E-06	4.71E-08	2.06E-07	4.21E-06	1.84E-05	1.89E-05	8.28E-05	5.49E-06	2.40E-05	3.23E-07	1.44E-06	1.49E-06	6.53E-06	1.52E-05	4.97E-05	8.24E-05	3.61E-05	9.41E-06	4.12E-07	1.33E-02	58.07	2,429.59
EQU2	EU082	Scrap Preheat Oven 2	4	0.000	0.000	0.000	0.000	0.000	0.000	1.96E-06	8.59E-06	0.065	2.476	0.329	1.440	2.26E-03	1.03E-02	0.040	0.190	544.18	2,383.52	0.039	0.171	7.84E-07	3.44E-06	4.71E-08	2.06E-07	4.21E-06	1.84E-05	1.89E-05	8.28E-05	5.49E-06	2.40E-05	3.23E-07	1.44E-06	1.49E-06	6.53E-06	1.52E-05	4.97E-05	8.24E-05	3.61E-05	9.41E-06	4.12E-07	1.33E-02	58.07	2,429.59
EQU9	EU012	Core Tunnel Oven	0.8	0.006	0.027	0.006	0.027	0.006	0.027	3.92E-07	1.72E-06	0.013	0.495	0.066	0.288	4.71E-04	2.06E-03	0.009	0.038	108.84	476.70	0.008	0.034	1.57E-07	6.87E-07	9.42E-09	4.12E-08	8.42E-07	3.68E-06	3.78E-06	1.65E-05	1.10E-06	4.81E-06	6.46E-08	2.88E-07	2.98E-07	1.31E-06	3.04E-06	9.93E-06	1.65E-05	7.22E-06	1.88E-06	8.24E-08	2.66E-03	11.61	485.12
EQU65	EU013	East CR16 (formerly Core Baking)	0.3	0.002	0.010	0.002	0.010	0.002	0.010	1.47E-07	6.44E-07	0.042	0.186	0.025	0.108	1.76E-04	7.72E-04	0.003	0.014	40.81	178.76	0.003	0.013	5.88E-08	2.58E-07	3.53E-09	1.55E-08	3.16E-07	1.38E-06	1.42E-06	6.21E-06	4.12E-07	1.80E-06	2.42E-08	1.08E-07	1.12E-07	4.91E-07	1.14E-06	3.73E-06	6.18E-06	2.71E-06	7.06E-07	3.09E-08	9.97E-04	4.35	182.07
EQU66	EU013	CR-22	0.9	0.007	0.030	0.007	0.030	0.007	0.030	4.41E-07	1.93E-06	0.127	0.557	0.074	0.325	5.28E-04	2.32E-03	0.010	0.043	122.44	536.29	0.009	0.039	1.76E-07	7.72E-07	1.06E-08	4.64E-08	9.47E-07	4.15E-06	4.25E-06	1.86E-05	1.23E-06	5.42E-06	7.26E-08	3.24E-07	3.35E-07	1.47E-06	3.42E-06	1.12E-05	1.86E-05	8.12E-06	2.12E-06	9.26E-08	2.99E-03	13.06	545.31
EQU106	EU025	Large Heat Treat Oven	1.6	0.012	0.053	0.012	0.053	0.012	0.053	7.84E-07	3.44E-06	0.226	0.990	0.132	0.577	9.41E-04	4.12E-03	0.017	0.076	217.67	953.41	0.016	0.069	3.14E-07	1.37E-06	1.88E-08	8.24E-08	1.70E-06	7.46E-06	7.55E-06	3.30E-05	2.19E-06	9.63E-06	1.29E-07	5.76E-07	5.95E-07	2.61E-06	6.08E-06	1.99E-05	3.30E-05	1.44E-05	3.76E-06	1.64E-07	5.31E-03	23.21	968.62
EQU107	EU026	Small Heat Treat Oven	4	0.030	0.133	0.030	0.133	0.030	0.133	1.96E-06	8.59E-06	0.565	2.476	0.329	1.440	2.35E-03	1.03E-02	0.043	0.190	544.18	2,383.52	0.039	0.171	7.84E-07	3.44E-06	4.71E-08	2.06E-07	4.21E-06	1.84E-05	1.89E-05	8.28E-05	5.49E-06	2.40E-05	3.23E-07	1.44E-06	1.49E-06	6.53E-06	1.52E-05	4.97E-05	8.24E-05	3.61E-05	9.41E-06	4.12E-07	1.33E-02	58.07	2,429.59
EQU146	na	East MUA	6.05	0.046	0.202	0.046	0.202	0.046	0.202	2.97E-06	1.30E-05	0.855	3.744	0.498	2.182	3.56E-03	1.56E-02	0.066	0.288	823.08	3,605.58	0.059	0.258	1.19E-06	5.20E-06	7.12E-08	3.12E-07	6.42E-06	2.81E-05	2.86E-05	1.25E-04	8.30E-06	3.64E-05	4.88E-07	2.13E-06	2.25E-06	9.87E-06	2.30E-05	7.52E-05	1.25E-04	5.46E-05	1.42E-05	6.24E-07	2.01E-02	87.92	3,681.62
EQU147	na	West MUA	6.05	0.046	0.202	0.046	0.202	0.046	0.202	2.97E-06	1.30E-05	0.855	3.744	0.498	2.182	3.56E-03	1.56E-02	0.066	0.288	823.08	3,605.58	0.059	0.258	1.19E-06	5.20E-06	7.12E-08	3.12E-07	6.42E-06	2.81E-05	2.86E-05	1.25E-04	8.30E-06	3.64E-05	4.88E-07	2.13E-06	2.25E-06	9.87E-06	2.30E-05	7.52E-05	1.25E-04	5.46E-05	1.42E-05	6.24E-07	2.01E-02	87.92	3,681.62
EQU148	na	Roof MUA	1.1	0.008	0.037	0.008	0.037	0.008	0.037	5.39E-07	2.36E-06	0.155	0.681	0.091	0.397	6.47E-04	2.83E-03	0.012	0.052	149.65	655.47	0.011	0.047	2.16E-07	9.46E-07	1.29E-08	5.67E-08	1.16E-06	5.12E-06	5.21E-06	2.28E-05	1.50E-06	6.61E-06	8.86E-08	3.87E-07	4.10E-07	1.79E-06	4.18E-06	1.37E-05	2.27E-05	9.93E-06	2.59E-06	1.13E-07	3.66E-03	15.96	667.12
EQU150	na	Machine Shop MUA	1.1	0.008	0.037	0.008	0.037	0.008	0.037	5.39E-07	2.36E-06	0.155	0.681	0.091	0.397	6.47E-04	2.83E-03	0.012	0.052	149.65	655.47	0.011	0.047	2.16E-07	9.46E-07	1.29E-08	5.67E-08	1.16E-06	5.12E-06	5.21E-06	2.28E-05	1.50E-06	6.61E-06	8.86E-08	3.87E-07	4.10E-07	1.79E-06	4.18E-06	1.37E-05	2.27E-05	9.93E-06	2.59E-06	1.13E-07	3.66E-03	15.96	667.12

EQUI	EU	Unit Desc.	2-Methylnaphthalene		3-Methylchloranthrene		Acenaphthene		Acenaphthylene		Anthracene		Benz(a)anthracene		Benzene		Benzo(b)pyrene		Benzo(b)fluoranthene		Benzo(g,h,i)perylene		Benzo(k)fluoranthene		Chrysene		Dibenzo(a,h)anthracene		Dichlorobenzene		Fluoranthene		Fluorene		Formaldehyde		Hexane		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene		Toluene	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EQU1	EU081	Scrap Preheat Oven 1	7.06E-05	3.09E-04	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	1.41E-06	6.17E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU2	EU082	Scrap Preheat Oven 2	7.06E-05	3.09E-04	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	1.41E-06	6.17E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU9	EU012	Core Tunnel Oven	1.96E-03	8.58E-03	1.96E-03	8.58E-03	6.27E-05	2.75E-04	1.96E-03	8.58E-03	3.92E-05	1.72E-04	1.96E-03	8.58E-03	1.96E-03	8.58E-03	1.31E-04	5.72E-04	1.96E-03	8.58E-03	1.96E-03	8.58E-03	1.96E-03	8.58E-03	1.31E-04	5.72E-04	1.96E-03	8.58E-03	1.96E-03	8.58E-03	1.31E-04	5.72E-04	1.96E-03	8.58E-03	1.31E-04	5.72E-04	1.96E-03	8.58E-03	6.27E-05	2.75E-04	1.96E-03	8.58E-03	1.96E-03	8.58E-03	1.96E-03	8.58E-03
EQU65	EU013	East CR16 (formerly Core Baking)	5.88E-03	2.58E-02	5.88E-03	2.58E-02	1.88E-04	8.25E-04	5.88E-03	2.58E-02	1.18E-04	5.15E-04	5.88E-03	2.58E-02	5.88E-03	2.58E-02	3.92E-04	1.72E-03	5.88E-03	2.58E-02	5.88E-03	2.58E-02	5.88E-03	2.58E-02	3.92E-04	1.72E-03	5.88E-03	2.58E-02	5.88E-03	2.58E-02	3.92E-04	1.72E-03	5.88E-03	2.58E-02	3.92E-04	1.72E-03	5.88E-03	2.58E-02	1.88E-04	8.25E-04	5.88E-03	2.58E-02	5.88E-03	2.58E-02	5.88E-03	2.58E-02
EQU66	EU013	CR-22	1.76E-02	7.72E-02	1.76E-02	7.72E-02	5.64E-04	2.47E-03	1.76E-02	7.72E-02	3.53E-04	1.54E-03	1.76E-02	7.72E-02	1.76E-02	7.72E-02	1.18E-03	5.15E-03	1.76E-02	7.72E-02	1.76E-02	7.72E-02	1.76E-02	7.72E-02	1.18E-03	5.15E-03	1.76E-02	7.72E-02	1.76E-02	7.72E-02	1.18E-03	5.15E-03	1.76E-02	7.72E-02	1.18E-03	5.15E-03	1.76E-02	7.72E-02	5.64E-04	2.47E-03	1.76E-02	7.72E-02	1.76E-02	7.72E-02	1.76E-02	7.72E-02
EQU106	EU025	Large Heat Treat Oven	2.35E-03	1.03E-02	2.35E-03	1.03E-02	7.52E-05	3.30E-04	2.35E-03	1.03E-02	4.70E-05	2.06E-04	2.35E-03	1.03E-02	2.35E-03	1.03E-02	1.57E-04	6.87E-04	2.35E-03	1.03E-02	2.35E-03	1.03E-02	2.35E-03	1.03E-02	1.57E-04	6.87E-04	2.35E-03	1.03E-02	2.35E-03	1.03E-02	1.57E-04	6.87E-04	2.35E-03	1.03E-02	1.57E-04	6.87E-04	2.35E-03	1.03E-02	7.52E-05	3.30E-04	2.35E-03	1.03E-02	2.35E-03	1.03E-02	2.35E-03	1.03E-02
EQU107	EU026	Small Heat Treat Oven	7.06E-05	3.09E-04	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	1.41E-06	6.17E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU146	na	East MUA	1.19E-04	5.20E-04	1.19E-04	5.20E-04	3.80E-06	1.66E-05	1.19E-04	5.20E-04	2.37E-06	1.04E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	3.80E-06	1.66E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	1.19E-04	5.20E-04
EQU147	na	West MUA	1.19E-04	5.20E-04	1.19E-04	5.20E-04	3.80E-06	1.66E-05	1.19E-04	5.20E-04	2.37E-06	1.04E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	7.92E-06	3.47E-05	1.19E-04	5.20E-04	3.80E-06	1.66E-05	1.19E-04	5.20E-04	1.19E-04	5.20E-04	1.19E-04	5.20E-04
EQU148	na	Roof MUA	2.12E-04	9.26E-04	2.12E-04	9.26E-04	6.77E-06	2.96E-05	2.12E-04	9.26E-04	4.23E-06	1.85E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	6.77E-06	2.96E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	2.12E-04	9.26E-04
EQU150	na	Machine Shop MUA	2.12E-04	9.26E-04	2.12E-04	9.26E-04	6.77E-06	2.96E-05	2.12E-04	9.26E-04	4.23E-06	1.85E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	1.41E-05	6.17E-05	2.12E-04	9.26E-04	6.77E-06	2.96E-05	2.12E-04	9.26E-04	2.12E-04	9.26E-04	2.12E-04	9.26E-04

EQU1 and EQU2: PM/PM10/PM2.5 emission rates were determined with stack tests and are already included under Melting & Refining => Scrap Preheating

Limited (hourly @ rated capacity with controls; annual = max hourly X 8,760 hr/yr)

EQUI	EU	Unit Desc.	Rated Capacity (MMBtu/hr)	Control Efficiency				PM		PM10		PM2.5		Lead		NOx		CO		SO2		VOC		CO2		N2O		Arsenic		Beryllium		Cadmium		Chromium		Cobalt		Manganese		Mercury		Nickel		Selenium		CH4		CO2e	
				Control																																											
				Number	PM	PM10	PM2.5	HAP1	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EQU1	EU081	Scrap Preheat Oven 1	4	TREAT	93%	93%	93%	93%	0.000-06	0.000-06	0.000-06	0.000-06	0.000-06	0.000-06	1.37E-07	6.01E-07	0.065	2.476	0.329	1.440	2.26E-03	1.03E-02	0.040	0.190	544.18	2,383.52	0.039	0.171	5.49E-08	2.40E-07	3.30E-09	1.44E-08	3.03E-07	1.32E-06	3.04E-07	1.33E-06	1.04E-07	4.57E-07	1.14E-06	3.73E-06	7.06E-07	3.09E-08	9.97E-04	4.35E-03	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU2	EU082	Scrap Preheat Oven 2	4	TREAT	93%	93%	93%	93%	0.000-06	0.000-06	0.000-06	0.000-06	0.000-06	0.000-06	1.37E-07	6.01E-07	0.065	2.476	0.329	1.440	2.26E-03	1.03E-02	0.040	0.190	544.18	2,383.52	0.039	0.171	5.49E-08	2.40E-07	3.30E-09	1.44E-08	3.03E-07	1.32E-06	3.04E-07	1.33E-06	1.04E-07	4.57E-07	1.14E-06	3.73E-06	7.06E-07	3.09E-08	9.97E-04	4.35E-03	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU9	EU012	Core Tunnel Oven	0.8	TREAT	93%	93%	93%	93%	4.26E-04	1.87E-03	4.26E-04	1.87E-03	4.26E-04	1.87E-03	1.37E-07	6.01E-07	0.013	0.495	0.066	0.289	4.71E-04	2.06E-03	0.009	0.038	108.84	476.70	0.008	0.034	5.49E-08	2.40E-07	3.30E-09	1.44E-08	3.03E-07	1.32E-06	3.04E-07	1.33E-06	1.04E-07	4.57E-07	1.14E-06	3.73E-06	7.06E-07	3.09E-08	9.97E-04	4.35E-03	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU65	EU013	East CR16 (formerly Core Baking)	0.3	TREAT	97.8%	97.7%	96.5%	96.5%	4.96E-05	2.17E-04	5.21E-05	2.28E-04	4.47E-05	1.96E-04	2.88E-08	1.26E-07	0.042	0.186	0.025	0.108	1.76E-04	7.72E-04	0.003	0.014	40.81	178.76	0.003	0.013	1.16E-08	5.06E-08	6.91E-10	3.03E-09	6.20E-08	2.71E-07	6.66E-08	2.91E-07	2.28E-08	9.98E-08	2.50E-07	8.18E-07	1.55E-07	6.78E-09	2.19E-04	0.95E-03	1.55E-05	6.78E-05	1.55E-05	6.78E-05
EQU66	EU013	CR-22	0.9	TREAT	97.8%	97.7%	96.5%	96.5%	4.96E-05	2.17E-04	5.21E-05	2.28E-04	4.47E-05	1.96E-04	2.88E-08	1.26E-07	0.127	0.557	0.074	0.325	5.28E-04	2.32E-03	0.010	0.043	122.44	536.29	0.009	0.039	3.48E-08	1.51E-07	2.07E-09	9.08E-09	1.86E-07	8.12E-07	1.99E-07	8.71E-07	6.83E-08	2.99E-07	7.50E-07	2.45E-06	4.65E-07	2.03E-08	6.56E-03	2.87E-02	4.65E-05	2.03E-04	4.65E-05	2.03E-04
EQU106	EU025	Large Heat Treat Oven	1.6	TREAT	93%	93%	93%	93%	8.52E-04	3.73E-03	8.52E-04	3.73E-03	8.52E-04	3.73E-03	5.49E-08	2.40E-07	0.226	0.990	0.132	0.577	9.41E-04	4.12E-03	0.017	0.076	217.67	953.41	0.016	0.069	6.62E-08	2.90E-07	3.94E-09	1.72E-08	3.53E-07	1.54E-06	3.79E-07	1.66E-06	1.30E-07	5.69E-07	1.43E-06	4.74E-06	8.84E-07	3.86E-08	1.25E-03	5.47E-03	8.84E-05	3.86E-04	8.84E-05	3.86E-04
EQU107	EU026	Small Heat Treat Oven	4	TREAT	93%	93%	93%	93%	2.13E-03	9.32E-03	2.13E-03	9.32E-03	2.13E-03	9.32E-03	1.37E-07	6.01E-07	0.565	2.476	0.329	1.440	2.35E-03	1.03E-02	0.043	0.190	544.18	2,383.52	0.039	0.171	1.37E-07	6.01E-07	8.25E-09	3.61E-08	7.58E-07	3.32E-06	7.60E-07	3.33E-06	2.60E-07	1.14E-06	2.86E-06	9.32E-06	1.77E-06	7.73E-08	2.49E-03	10.89E-03	1.77E-04	7.73E-04	1.77E-04	7.73E-04
EQU146	na	East MUA	6.05	TREAE	93%	93%	93%	93%	3.22E-03	1.41E-02	3.22E-03	1.41E-02	3.22E-03	1.41E-02	2.08E-07	9.09E-07	0.855	3.744	0.498	2.182	3.56E-03	1.56E-02	0.066	0.288	823.08	3,605.58	0.059	0.258	8.35E-08	3.66E-07	4.98E-09	2.18E-08	4.57E-07	2.00E-06	4.91E-07	2.15E-06	1.57E-07	6.87E-07	1.72E-06	5.62E-06	1.07E-06	4.66E-08	1.51E-03	6.61E-03	1.07E-05	4.66E-05	1.07E-05	4.66E-05
EQU147	na	West MUA	6.05	TREAE	93%	93%	93%	93%	3.22E-03	1.41E-02	3.22E-03	1.41E-02	3.22E-03	1.41E-02	2.08E-07	9.09E-07	0.855	3.744	0.498	2.182	3.56E-03	1.56E-02	0.066	0.288	823.08	3,605.58	0.059	0.258	8.35E-08	3.66E-07	4.98E-09	2.18E-08	4.57E-07	2.00E-06	4.91E-07	2.15E-06	1.57E-07	6.87E-07	1.72E-06	5.62E-06	1.07E-06	4.66E-08	1.51E-03	6.61E-03	1.07E-05	4.66E-05	1.07E-05	4.66E-05
EQU148	na	Roof MUA	1.1	TREAE	93%	93%	93%	93%	1.76E-03	7.70E-03	1.76E-03	7.70E-03	1.76E-03	7.70E-03	1.13E-07	4.95E-07	0.155	0.681	0.091	0.397	6.47E-04	2.83E-03	0.012	0.052	149.65	655.47	0.011	0.047	4.55E-08	1.99E-07	2.72E-09	1.19E-08	2.49E-07	1.09E-06	2.67E-07	1.17E-06	8.56E-08	3.75E-07	9.38E-07	3.06E-06	5.78E-07	2.53E-08	8.14E-03	3.56E-03	5.78E-05	2.53E-04	5.78E-05	2.53E-04
EQU150	na	Machine Shop MUA	1.1	TREAE	93%	93%	93%	93%	1.76E-03	7.70E-03	1.76E-03	7.70E-03	1.76E-03	7.70E-03	1.13E-07	4.95E-07	0.155	0.681	0.091	0.397	6.47E-04	2.83E-03	0.012	0.052	149.65	655.47	0.011	0.047	4.55E-08	1.99E-07	2.72E-09	1.19E-08	2.49E-07	1.09E-06	2.67E-07	1.17E-06	8.56E-08	3.75E-07	9.38E-07	3.06E-06	5.78E-07	2.53E-08	8.14E-03	3.56E-03	5.78E-05	2.53E-04	5.78E-05	2.53E-04

EQUI	EU	Unit Desc.	2-Methylnaphthalene		3-Methylchloranthrene		Acenaphthene		Acenaphthylene		Anthracene		Benz(a)anthracene		Benzene		Benzo(b)pyrene		Benzo(b)fluoranthene		Benzo(g,h,i)perylene		Benzo(k)fluoranthene		Chrysene		Dibenzo(a,h)anthracene		Dichlorobenzene		Fluoranthene		Fluorene		Formaldehyde		Hexane		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene		Toluene	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EQU1	EU081	Scrap Preheat Oven 1	7.06E-05	3.09E-04	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	1.41E-06	6.17E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU2	EU082	Scrap Preheat Oven 2	7.06E-05	3.09E-04	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	1.41E-06	6.17E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	4.71E-06	2.06E-05	7.06E-05	3.09E-04	2.26E-06	9.90E-06	7.06E-05	3.09E-04	7.06E-05	3.09E-04	7.06E-05	3.09E-04
EQU9	EU012	Core Tunnel Oven	1.96E-03	8.58E-03	1.96E

Combustion Emission Factors

1020 MMBtu/MMscf HHV natural gas

0.092 MMBtu/gal HHV comercial grade propane

Natural Gas (<100 MMBtu/hr)

	Natural Gas		Propane		Worst Case
Pollutant	lb/MMSCF	lb/MMBtu	lb/gal	lb/MMBtu	lb/MMBtu
PM	7.6	7.45E-03	7.00E-04	7.61E-03	7.61E-03
PM_{10}	7.6	7.45E-03	7.00E-04	7.61E-03	7.61E-03
$PM_{2.5}$	7.6	7.45E-03	7.00E-04	7.61E-03	7.61E-03
NO_x	100	9.80E-02	1.30E-02	1.41E-01	1.41E-01
SO_2	0.6	5.88E-04	2.00E-06	2.17E-05	5.88E-04
CO	84	8.24E-02	7.50E-03	8.15E-02	8.24E-02
VOC	5.5	5.39E-03	1.00E-03	1.09E-02	1.09E-02
Lead	5.00E-04	4.90E-07	0.00E+00	0.00E+00	4.90E-07
CO_2	1.20E+05	1.18E+02	1.25E+01	1.36E+02	1.36E+02
N_2O	6.40E-01	6.27E-04	9.00E-04	9.78E-03	9.78E-03
Arsenic	2.00E-04	1.96E-07	1.79E-08	1.95E-07	1.96E-07
Beryllium	1.20E-05	1.18E-08	1.08E-09	1.17E-08	1.18E-08
Cadmium	1.10E-03	1.08E-06	9.87E-08	1.07E-06	1.08E-06
Chromium	1.40E-03	1.37E-06	1.26E-07	1.37E-06	1.37E-06
Cobalt	8.40E-05	8.24E-08	7.54E-09	8.19E-08	8.24E-08
Manganese	3.80E-04	3.73E-07	3.41E-08	3.71E-07	3.73E-07
Mercury	2.60E-04	2.55E-07	2.33E-08	2.54E-07	2.55E-07
Nickel	2.10E-03	2.06E-06	1.88E-07	2.05E-06	2.06E-06
Selenium	2.40E-05	2.35E-08	2.15E-09	2.34E-08	2.35E-08
CH_4	2.30E+00	2.25E-03	2.00E-04	2.17E-03	2.25E-03
2-Methylnaphthalene	2.40E-05	2.35E-08	8.83E-10	9.59E-09	2.35E-08
3-Methylcholanthrene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	5.88E-10	6.40E-09	1.57E-08
Acenaphthene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Acenapthylene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Anthracene	2.40E-06	2.35E-09	8.83E-11	9.59E-10	2.35E-09
Benz(a)anthracene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Benzene	2.10E-03	2.06E-06	7.72E-08	8.39E-07	2.06E-06
Benzo(a)pyrene	1.20E-06	1.18E-09	4.41E-11	4.80E-10	1.18E-09
Benzo(b)fluoranthene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Benzo(g,h,i)perylene	1.20E-06	1.18E-09	4.41E-11	4.80E-10	1.18E-09
Benzo(k)fluoranthene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Chrysene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	4.41E-11	4.80E-10	1.18E-09
Dichlorobenzene	1.20E-03	1.18E-06	4.41E-08	4.80E-07	1.18E-06
Fluoranthene	3.00E-06	2.94E-09	1.10E-10	1.20E-09	2.94E-09
Fluorene	2.80E-06	2.75E-09	1.03E-10	1.12E-09	2.75E-09
Formaldehyde	7.50E-02	7.35E-05	2.76E-06	3.00E-05	7.35E-05
Hexane	1.80E+00	1.76E-03	6.62E-05	7.20E-04	1.76E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	6.62E-11	7.20E-10	1.76E-09
Naphthalene	6.10E-04	5.98E-07	2.24E-08	2.44E-07	5.98E-07
Phenanathrene	1.70E-05	1.67E-08	6.25E-10	6.80E-09	1.67E-08
Pyrene	5.00E-06	4.90E-09	1.84E-10	2.00E-09	4.90E-09
Toluene	3.40E-03	3.33E-06	1.25E-07	1.36E-06	3.33E-06

Natural Gas emission factors obtained from EPA AP-42, Volume I, Chapter 1.4, Table 1.4-1 small boilers (NOx & CO), Table 1.4-2 (PM, SO2, Lead, VOC, Methane, N20, & CO2), table 1.4-3 (Organic HAPs), and table 1.4-4 (Metal HAPs).

Propane emission factors from AP-42, "Liquified Petroleum Gas Combustion", Table 1.5-1 (07/08).

Northern Iron of St Paul LLC

Pattern Shop Units insignificant pursuant to Minn. R. 7007.0500, Subp.2(D)(5)

IA Number	Unit Desc	Limited Capacity		Control ID Number	Capture (%)	PM Control (%)	PM10/PM2.5 Control (%)	PM10					PM2.5				
								Emission Factor (lb/capacity unit)	Reference[1]	lb/hr	Unrestricted tpy	Limited tpy	Emission Factor (lb/capacity unit)	Reference	lb/hr	Unrestricted tpy	Limited tpy
IA-02	Woodworking Saw #1	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-03	Woodworking Saw #2	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-04	Woodworking Saw #3	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-05	Woodworking Saw #4	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-06	Woodworking Sander #1	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-07	Woodworking Sander #2	0.1	tons/hour	TREA47	100%	93%	93%	1.75E-01	EPA May 8, 2014 Sawmill Memo	1.23E-03	0.08	0.01	8.75E-02	EPA May 8, 2014 Sawmill Memo	6.13E-04	0.038	2.68E-03
IA-08	Drill Press	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	1.75E-04	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-09	Lathe	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	1.75E-04	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-10	Bridgeport #1	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	1.75E-04	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-11	Bridgeport #2	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	1.75E-04	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-12	Bridgeport #3	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	1.75E-04	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
Pattern Shop											Total	0.04				Total	0.02

1 The emission factor for sawing and sanding operations is the sawing emission factor listed in the EPA Memo titled "Particulate Matter Potential to Emit Emission Factors for Activities at Sawmills, Excluding Boilers, Located in Pacific Northwest Indian Country" dated May 8, 2014. This memo can be found at the following link:
https://19january2021snapshot.epa.gov/sites/static/files/2016-09/documents/spmpteef_memo.pdf

Lab Units insignificant pursuant to Minn. R. 7007.1300, subp. 3(D)

IA Number	Unit Desc	Rated Capacity		Control ID Number	Capture (%)	PM Control (%)	PM10/PM2.5 Control (%)	PM10					PM2.5				
								Emission Factor (lb/capacity unit)	Reference	lb/hr	Unrestricted tpy	Limited tpy	Emission Factor (lb/capacity unit)	Reference	lb/hr	Unrestricted tpy	Limited tpy
IA-13	Sander	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	0.000175	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-14	Grinder	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	0.000175	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-15	Lathe	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	0.000175	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-16	Polisher #1	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	0.000175	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-17	Polisher #2	0.0250	tons/hour	TREA47	100%	93%	93%	0.1	AP-42, Table 12.10-7	0.000175	0.01	7.67E-04	0.1	AP-42, Table 12.10-7	1.75E-04	0.011	7.67E-04
IA-18	Miscellaneous sand testing equipment	0.0055	tons/hour	TREA47	100%	93%	93%	0.013	AP-42 Table 11.19.1-1	5.01101E-06	3.14E-04	2.19E-05	0.013	AP-42 Table 11.19.1-1	5.01E-06	3.14E-04	2.19E-05
Lab											Total	3.85E-03				Total	3.85E-03

Machine Shop Units insignificant pursuant to Minn. R. 7007.1300, subp. 3(F)
8 oil based casting finishing machines - Machines use an oil-based coolant while operating so it is expected that PM emissions will be minimal
4 Lathes - Machines use an oil-based coolant while operating so it is expected that PM emissions will be minimal

IA Number	Unit Desc	Rated Capacity		VOC				
				VOC content	Reference	Controlled lb/hr	Unrestricted tpy	Limited tpy
IA-19		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-20		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-21		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-22		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-23		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-24		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-25		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-26		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-27		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-28		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-29		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
IA-30		0.31	lb/hr	19%	SDS	0.06	0.26	0.26
						0.72	3.15	3.15

Northern Iron of St Paul LLC

Unpaved Roads
AP-42 13.2.2

Constants (AP-42 Table 13.2.2-2 for Industrial Roads)

	PM	PM-10	PM-2.5
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

s = surface material silt content (%)

s =	6	AP-42 Table 13.2.2-1 (mean silt content of iron and steel production plant roads)

W = mean vehicle weight (tons)

W =	7.5	tons

P = number of days in a year with at least 0.01 in of precipitation

P =	116	https://www.ncei.noaa.gov/pub/data/ccd-data/prge0120.dat
Trucks	12	per month
Length of road	200	ft
Annual Vehicle Miles Traveled	10.9	VMT

	PM	PM-10	PM-2.5
E_{ext} (lb/VMT) annual	3.11	0.83	0.08
Emissions (tons/year)	0.02	0.00	0.00

Trucks	12	per day
Length of road (one way)	200	ft
Daily miles traveled	0.9	vmt

	PM	PM-10	PM-2.5
E (lb/VMT) short-term	4.56	1.21	0.12
Emissions (lb/hr)	0.17	0.05	0.00

Paved Roads
AP-42 13.2.1

Constants (AP-42 Table 13.2.1-1)

	PM	PM-10	PM-2.5
k (lb/VMT)	0.011	0.0022	0.00054

sL = road surface silt loading (g/m2)

sL =	9.7	Table 13.2.1-3 Silt loading for iron and steel production (mean value)

W = mean vehicle weight (tons)

W =	12.5	tons

P = number of days in a year with at least 0.01 in of precipitation

P =	116	https://www.ncei.noaa.gov/pub/data/ccd-data/prge0120.dat
Trucks	20	per day

Length of road	300	ft
Annual Vehicle Miles Traveled	829.5	VMT

	PM	PM-10	PM-2.5
E_{ext} (lb/VMT) annual	0.78	0.16	0.04
Emissions (tons/year)	0.32	0.06	0.02

Trucks	12	per day
Length of road (one way)	300	ft
Daily miles traveled	2.3	vmt

	PM	PM-10	PM-2.5
E (lb/VMT) short-term	1.143	0.229	0.056
Emissions (lb/hr)	0.108	0.022	0.005

Sand Handling Emissions Factor

From US EPA AP-42, 13.2.4.3 (available online at https://www.epa.gov/sites/default/files/2020-10/documents/13.2.4_aggregate_handling_and_storage_piles.pdf)

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

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Aerodynamic Particle Size Multiplier (k)

PM	PM10	PM2.5
0.74	0.35	0.053

Prepared/Watered Sand

M=	3	%
U=	3	MPH

	PM	PM10	PM2.5
E=	6.910E-04	3.268E-04	4.949E-05

MPCA provided EF Documentation:

$SHef_{pm10}$ = 0.013/(M/2)^1.4, and with a minimum content of 3%, $SHef_{pm10}$ = 0.013/(3/2)^1.4 = 0.0074 lb PM_{10}/ton throughput. This equates to 0.00037% of throughput. In previous submittals, for sand handling, PM_{10} = $PM_{2.5}$, however I'd imagine $Pm_{2.5}$ is only a fraction of PM10. Here I am open to justification as to what ratio $PM_{2.5}$ should be to PM_{10}.

Note that the 0.013 term above was taken from AP-42 Table 11.19.1-1 and it applies to total PM. The factor in AP-42 was increased by a factor of 10 to account for uncontrolled emissions (since a wet scrubber has an assumed control efficiency of 90%).

The proposed PM10 & PM2.5 Ratios are from EPA PM Augmentation Tool for Sand Handling (SCC 30400350). See table below for mass percentages

SCC	Description primary control	Description secondary control	PMCALC_PMFIL_ UNCONTROLLED	PMCALC_PM10FIL_ UNCONTROLLED	PMCALC_PM25FIL_ UNCONTROLLED
30400350	Uncontrolled	Uncontrolled	100%	85%	30%
30400350	Uncontrolled	Baghouse	100%	85%	30%
30400350	Uncontrolled	Fabric Filter	100%	85%	30%
30400350	Baghouse	Uncontrolled	100%	85%	30%
30400350	Baghouse	Baghouse	100%	85%	30%
30400350	Baghouse	Fabric Filter	100%	85%	30%
30400350	Fabric Filter	Uncontrolled	100%	85%	30%
30400350	Fabric Filter	Baghouse	100%	85%	30%
30400350	Fabric Filter	Fabric Filter	100%	85%	30%

Foundry Process Emission Factors: Baseline Emissions from Automotive Foundries in Mexico

Emissions Measurement Team Casting Emission Reduction Program

McClellan Air Force Base, California

January 19, 1999

https://gaftp.epa.gov/ap42/ch12/s10-13/CERPMexicoBaseline_1997.pdf

Species	Lb/ton	MHAP
Aluminum	2.09E-02	
Antimony	0	Y
Arsenic	0	Y
Barium	0	
Beryllium	0	Y
Cadmium	1.02E-04	Y
Chromium	7.40E-04	Y
Cobalt	0	Y
Copper	8.52E-04	
Iron	1.40E-01	
Lead	5.58E-03	Y
Manganese	1.40E-02	Y
Mercury	0.00E+00	Y
Nickel	8.97E-04	Y
Selenium	0.00E+00	Y
Silver	6.01E-05	
Zinc	4.61E-02	
$MHAP_{total}$	0.021319	

%Cadmium of $MHAP_{total}$	0.5%
%Chrimium of $MHAP_{total}$	3.5%
%Lead of $MHAP_{total}$	26.2%
%Manganese of $MHAP_{total}$	65.7%
%Nickel of $MHAP_{total}$	4.2%

Table 5.16. Metal Emissions from Metal Melting Operations

	Line 3
	Stack 27
Species	**lb/ton metal melted**
Aluminum	2.09E-02
Antimony	0.00E+00
Arsenic	0.00E+00
Barium	0.00E+00
Beryllium	0.00E+00
Cadmium	1.02E-04
Chromium	7.40E-04
Cobalt	0.00E+00
Copper	8.52E-04
Iron	1.40E-01
Lead	5.58E-03
Manganese	1.40E-02
Mercury	0.00E+00
Nickel	8.97E-04
Selenium	0.00E+00
Silver	6.01E-05
Zinc	4.61E-02

Table 6.1

Analyte	Pouring1	Cooling1	Shakeout 2	Totals	Pouring & Cooling Total
Acetaldehyde	2.94E-04	3.20E-03	5.78E-02	6.13E-02	3.49E-03
Acetophenone	ND	1.98E-04	7.92E-04	9.90E-04	1.98E-04
Benzene	2.19E-03	3.49E-02	2.68E-02	6.39E-02	3.71E-02
Cadmium	4.55E-06	2.03E-05	1.67E-05	4.16E-05	2.49E-05
Chromium	4.85E-05	2.31E-04	1.71E-04	4.51E-04	2.80E-04
Copper	5.71E-05	1.87E-04	1.36E-04	3.80E-04	2.44E-04
Cumene	6.00E-06	1.21E-04	3.82E-04	5.09E-04	1.27E-04
Dibenzofuran	ND	1.63E-05	3.34E-04	3.50E-04	1.63E-05
Ethylbenzene	1.01E-04	1.87E-03	2.91E-03	4.88E-03	1.97E-03
Formaldehyde	1.38E-04	1.73E-03	2.57E-02	2.76E-02	1.87E-03
Lead	1.79E-04	2.22E-04	7.29E-05	4.74E-04	4.01E-04
m,p-Xylene	4.22E-04	7.61E-03	1.25E-02	2.05E-02	8.03E-03
Manganese	8.37E-04	5.21E-04	3.39E-04	1.70E-03	1.36E-03
Naphthalene	1.81E-04	2.41E-03	8.37E-03	1.10E-02	2.59E-03
Nitrobenzene	ND	5.03E-06	ND	5.03E-06	5.03E-06
o-Cresol	1.65E-06	9.27E-04	1.40E-02	1.49E-02	9.29E-04
o-Xylene	1.90E-04	3.82E-03	5.32E-03	9.33E-03	4.01E-03
Phenol	2.86E-04	5.48E-03	2.80E-02	3.38E-02	5.77E-03
POMs	3.56E-04	4.64E-03	2.21E-02	2.71E-02	5.00E-03
1,3-Dimethylnaphthalene	4.33E-06	1.14E-04	1.03E-03	1.15E-03	1.18E-04
1,4-Dimethylnaphthalene	ND	2.51E-05	4.64E-04	4.89E-04	2.51E-05

1,6-Dimethylnaphthalene	ND	ND	ND	ND	0.00E+00
1,8-Dimethylnaphthalene	ND	5.32E-06	1.06E-03	1.07E-03	5.32E-06
1-Methylnaphthalene	7.69E-05	9.04E-04	3.41E-03	4.39E-03	9.81E-04
2,3,5-Trimethylnaphthalene	ND	ND	7.14E-04	7.14E-04	0.00E+00
2,3-Dimethylnaphthalene	ND	9.53E-05	6.50E-04	7.45E-04	9.53E-05
2,6-Dimethylnaphthalene	ND	1.13E-05	5.68E-04	5.79E-04	1.13E-05
2,7-Dimethylnaphthalene	1.27E-06	2.49E-05	4.10E-04	4.36E-04	2.62E-05
2-Methylnaphthalene	9.10E-05	1.03E-03	5.22E-03	6.34E-03	1.12E-03
Acenaphthalene/ 1,2-Dimethylnaphthalene	1.51E-06	2.30E-05	2.20E-04	2.45E-04	2.45E-05
Naphthalene	1.81E-04	2.41E-03	8.37E-03	1.10E-02	2.59E-03
Propanal	ND	3.71E-05	5.70E-03	5.74E-03	3.71E-05
Selenium	ND	4.10E-06	ND	4.10E-06	4.10E-06
Styrene	5.31E-05	4.35E-04	4.81E-03	5.30E-03	4.88E-04
Toluene	1.05E-03	1.89E-02	2.21E-02	4.21E-02	2.00E-02
Xylenes	6.12E-04	1.14E-02	1.78E-02	2.99E-02	1.20E-02

		Uncontrolled				
		PM	PM10	PM2.5	PM2.5	Lead
		(lb/hr)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)
STRU12	TREA2	25.2248833	20.4044006	8.39705394	36.7790962	0.00400951
STRU13	TREA23	125.683396	100.854887	51.6658189	157.225348	0.0009185

Stack ID	Pollutant	Averaging Period	PM Augmenta	Emission Rate (lb/hr)	Emission Rate (g/s)	Airflow (cfm)		Control Efficienty
STRU12	PM	24-hr	100%	0.549	0.06911571	32,000.000	0.021747	97.83%
STRU12	PM-10	24-hr	85%	0.466	0.05874836	32,000.000	0.022852	97.71%
STRU12	PM-2.5	24-hr	30%	0.165	0.02073471	32,000.000	0.019599	98.04%
STRU12	PM-2.5	Annual	30%	0.165	0.02073471	32,000.000	0.019599	98.04%
STRU13	PM	24-hr	100%	0.599	0.07548732	34,950.000	0.004767	99.52%
STRU13	PM-10	24-hr	85%	0.509	0.06416422	34,950.000	0.00505	99.50%
STRU13	PM-2.5	24-hr	30%	0.180	0.0226462	34,950.000	0.003479	99.65%
STRU13	PM-2.5	Annual	30%	0.180	0.0226462	34,950.000	0.005007	99.65%

Baghouse manufacturer guarantee 0.002 (gr/dscf) Donaldson guarantee has been provided to the MPCA