RK
& Associates, Inc.

June 25, 2018

R17421-3

Compliance Tracker, AE-18J
Air Enforcement and Compliance Assurance Branch
US Environmental Protection Agency - Region 5
77 W Jackson Boulevard
Chicago, IL 60604

Copy on Electronic Media
Delivered to USEPA Region V
Chicago, Illinois

Shredder Emissions Test Report - Total Hydrocarbons, Particulate, and Metals
General Iron Industries, Inc. – 1909 N. Clifton Avenue – Chicago, Illinois 60614

To Whom This May Concern:

On behalf of General Iron Industries, Inc. (General Iron), please find attached the report of total hydrocarbon (THC), filterable particulate matter (PM) and metals emissions testing from the existing hammermill shredder located at General Iron Industries in Chicago, Illinois.

These tests were performed in response to requirements specified in the United States Environmental Protection Agency's (USEPA's) *Request to Provide Information Pursuant to the Clean Air Act* (information request) dated November 16, 2017, and in accordance with the USEPA approved test protocol dated May 23, 2018.

The attached test report was prepared to provide the required information identified in Appendix B, Item 7 of the above-referenced USEPA information request.

In addition to the testing required by the information request, General Iron voluntarily decided to surpass the USEPA testing requirements and perform an impact assessment for the metals emissions on the surrounding community. The results of this analysis show that metals emissions from the shredder are far below the identified health-based standards, as described in Section 5 of the attached report.

Based on the results of the required emissions testing and the additional metals impact evaluation, we can reasonably conclude that:

1. Actual THC emissions from the shredder over the past 5 years were less than 89 tons per year, which demonstrates that emissions from this shredder do not exceed the current VOC major source threshold of 100 tpy.
2. PM/PM_{10} rate of 1.9 lb/hour is well below the limits in the current IEPA Lifetime Operation Permit.
3. Evaluation of the metals, as described above, demonstrates that related off-site impacts are far below the health-based standards identified in Section 5.

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If you have any questions, or require any additional information please do not hesitate to contact Mr. Jim Kallas, Environmental Manager for General Iron 847-508-9170 (jim@general-iron.com) or me at 630-393-9000 (jpinion@rka-inc.com).

Yours very truly,
RK & Associates, Inc.

John G. Pinion
Principal Engineer

Shredder Emissions Test Report for Total Hydrocarbons, Particulate, and Metals

General Iron Industries, Inc. – Chicago, Illinois

IEPA Bureau of Air Site ID No.: 031600BTB

June 25, 2018

R17421-3

Prepared for:
General Iron Industries, Inc.
1909 N. Clifton, Avenue
Chicago, Illinois 60614

Submitted to:
Compliance Tracker, AE-18J
Air Enforcement and Compliance Assurance Branch
US Environmental Protection Agency - Region 5
77 W Jackson Boulevard
Chicago, IL 60604

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APPENDICES

Appendix A Report of VOC Emission Testing on the Shredder Exhaust at the General Iron Facility Located in Chicago, Illinois Prepared by Stack Test Group, Inc.

Appendix B Test Report Particulate Matter and Total Select Metals Hammermill Shredder General Iron Industries, Inc. – Chicago, Illinois, prepared by Montrose Air Quality Services and Dated June 21, 2018

GI0000182

1.0 INTRODUCTION

General Iron Industries, Inc. (General Iron) is an existing scrap metal recycling facility located at 1909 N. Clifton Avenue, Chicago, Illinois (see Figure 1). General Iron receives and shreds mixed recyclable metal in various forms to produce uniform grades of ferrous and non-ferrous metals. Existing scrap handling and processing activities include receiving, sorting, shredding, metal separation and recovery of ferrous and nonferrous metals.

General Iron currently operates under an Illinois Environmental Protection Agency (IEPA) Lifetime Operating Permit (Application No. 81050001; Site ID No. 031600BTB) most recently revised and reissued on September 1, 2004.

General Iron received a *Request to Provide Information Pursuant to the Clean Air Act* (Information Request) from the United States Environmental Protection Agency (USEPA) requiring that General Iron conduct emissions testing to quantify emissions for total hydrocarbons, methane, ethane, particulate matter (PM), and metals from its hammermill shredder.

Specifically, in Appendix B, Item 1 of the information request, USEPA is requiring General Iron to…

> *…perform emission testing at the facility to determine:*
>
> a. *The total gaseous organic compound emission rate as volatile organic compounds (VOC) of the hammermill shredder using EPA Reference Methods 1 – 4 and Method 25A. Methane and ethane concentrations shall be determined using Method 18 and subtracted from the total hydrocarbon concentration measured following Method 25A to determine VOC concentrations;*
> b. *Particulate Matter emission rate using EPA Reference Methods 1 – 4 and Method 5; and,*
> c. *Metal emission rates of the hammermill shredder using EPA Methods 1 – 4 and Method 29.*

A revised protocol, dated May 23, 2018, was submitted to USEPA and approved. Testing for total hydrocarbon (THC) was performed by Stack Test Group on May 25, 2018, in accordance with the approved protocol. Testing for PM and Metals was performed by Montrose Environmental Services on June 13 and 14, 2018, in accordance with the approved protocol.

In addition to the testing required by the information request, General Iron voluntarily decided to surpass the USEPA testing requirements and perform an impact assessment for the metals emissions on the surrounding community. The results of this analysis show that metals emissions from the shredder are far below the identified health-based standards, as described in Section 5 of the attached report.

GI0000183

Based on the results of the required emissions testing and the additional metals impact evaluation, we can reasonably conclude that:

1. Actual THC emissions from the shredder over the past 5 years were less than 89 tons per year, which demonstrates that emissions from this shredder do not exceed the current VOC major source threshold of 100 tpy.
2. PM/PM_{10} rate of 1.9 lb/hour is well below the limits in the current IEPA Lifetime Operation Permit.
3. Evaluation of the metals, as described above, demonstrates that related off-site impacts are far below the health-based standards identified in Section 5.

The testing was witnessed by Mr. Scott Connolly, Environmental Engineer, from USEPA Region V and at USEPA's request, by Mr. Kevin Mattison, a stack testing specialist from Illinois Environmental Protection Agency (IEPA).

The Information Request requires that a complete report of emissions be submitted within 30 days of completion of the tests. This test report fulfills this requirement.

1.1 Facility Location

General Iron is located at 1909 N Clifton Avenue in Chicago (Cook County) Illinois as shown in Figure 1. A Facility Layout map is presented in Figure 2. Facility contact information is provided in Section 1.2.

1.2 Project Contact Information

Business Name:	General Iron Industries, Inc.
Source Location:	1909 N. Clifton Avenue – Chicago, Illinois 60614 Cook County Illinois
Latitude/Longitude	41.915823° N / -87.658231" W – Intersection of N Clifton Ave. and N Kingsbury Street - Front Gate
Office/Mailing Address:	1909 N. Clifton Avenue – Chicago, Illinois 60614
General Iron Contact:	Mr. Jim Kallas - Environmental Manager 847-508-9170 – jim@general-iron.com
IEPA Site ID No.:	031600BTB
SIC Code:	5093 – Scrap and Waste Materials
NAICS Code:	423930 – Recyclable Material Merchant Wholesalers
THC Emission Testing Contractor	Stack Test Group 1500 Boyce Memorial Drive - Ottawa, Illinois 61350 815-433-0545
PM/Metals Emissions Testing Contractor	Montrose Air Quality Services, LLC 1370 Brummel Avenue Elk Grove Village, Illinois 60007 630-860-4740
RKA Contact for Emission Testing	John Pinion - Principal Engineer 2S631 Route 59, Suite B - Warrenville, Illinois 60555 630-393-9000 jpinion@rka-inc.com

GI0000184

1.3 Report Certification

The Certification Statement required by the Information Request for all submittals is provided below.

Certification Statement:

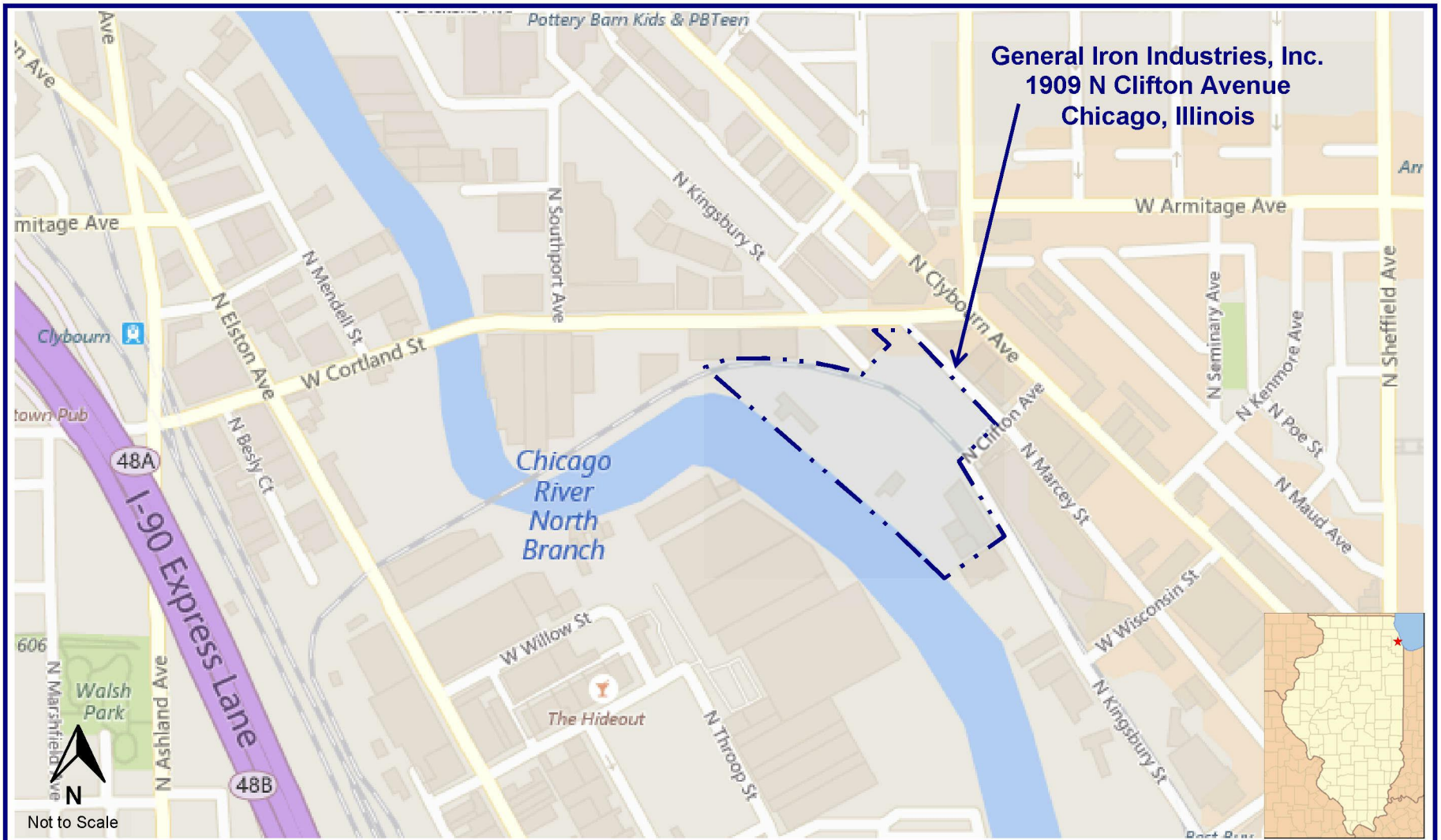
I certify under penalty of law that I have examined and am familiar with the information in the enclosed documents, including all attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are, to the best of my knowledge and belief, true and complete. I am aware that there are significant penalties for knowingly submitting false statements and information including the possibility of fines or imprisonment pursuant to Section 113(c)(2) of the Clean Air Act and 18 U.S.C. §§ 1001 and 1341.

Signature: _____ Date: 6/25/18

Name: JIM KALLAS

Attachment: Shredder Air Emission Test Report
General Iron Industries, Inc. – Chicago, Illinois

GI0000185



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COMMENTS:
Shredder Emissions Test Report
Total Hydrocarbons, Particulate, and Metals

Site Location Map
General Iron Industries, Inc.
Chicago, Illinois

FIGURE 1

DRAWN BY:	APPROVED BY:	PROJECT NUMBER	DATE DRAWN	REVISED DATE
	JGP	R17421-3	06-2018	

RK & Associates, Inc.
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WARRENVILLE, IL 60555
630-393-9000/630-393-9111

COMMENTS:				
Shredder Emissions Test Report Total Hydrocarbons, Particulate, and Metals		**Facility Map** General Iron Industries, Inc. 1909 N Clifton Avenue - Chicago, Illinois		FIGURE: 2
DRAWN BY:	APPROVED BY: JGP	PROJECT NUMBER: R17421-3	DATE: 06-2018	REVISED DATE:

2.0 SUMMARY OF RESULTS

Detailed testing reports of THC and PM/Metals are presented in Appendices A and B respectively. THC emissions are discussed in Section 2.1 and PM/Metals emissions are discussed in Section 2.2.

2.1 THC Emissions

2.1.1 THC Test Results

THC testing was performed by Stack Test Group on May 25, 2018. Detailed information from sample collection and analyses is presented in Stack Test Group's report presented in Appendix A of this document.

Table 2-1 below presents a summary of THC emission testing including the shredder feed rate, Uncorrected and Corrected THC emissions, and the corrected THC emission factor.

Table 2-1
Summary of Shredder THC Emission Testing - May 25, 2018[a]
General Iron - Chicago, Illinois

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/25/2018	5/25/2018	5/25/2018	
Start Time:	08:35AM	09:49AM	11:05AM	
Finish Time:	09:35AM	10:48 AM	12:26 PM	
Shredder Feed Rate (tph):	**396.34**	**389.69**	**384.37**	**390.13**
Stack Diameter, inches:	50	50	50	
Barometric Pressure, inches Hg:	29.33	29.33	29.33	
Static Pressure in Stack, Inches H2O:	-0.81	-0.81	-0.81	
Duration of Sample, minutes:	60	60	60	
Stack Gas Temperature, degrees F:	114.1	116.8	119.1	116.7
% Carbon Dioxide:	0.2	0.2	0.1	0.2
% Oxygen:	20.5	20.5	20.7	20.6
% Moisture:	4.1	3.77	3.86	3.91
Stack Gas Flow Rate, DSCFM:	60,258	60,953	61,197	60,803
VOC Calculations (Uncorrected)				
PPMvw as Propane:	281.0	169.9	270.3	240.4
LBS/DSCF	3.21E-05	1.94E-05	3.09E-05	2.75E-05
LBS/HR	121.0	73.7	117.9	104.2
THC from VOM-Exempt Compounds				
PPMvw as Propane (see Table 2-2):	10.7	28.0	27.6	20.1
VOC Calculations (Corrected)				
PPMvw as Propane:	268.8	146.6	241.4	218.9
LBS/DSCF	3.07E-05	1.67E-05	2.76E-05	2.50E-05
LBS/HR	**115.72**	**63.61**	**105.27**	**94.87**
LB-THC/TON SHREDDER FEED	**0.2920**	**0.1632**	**0.2739**	**0.2430**

a. See Appendix C of Stack Test Group THC Test Report attached in Appendix A of this document.

Uncorrected THC represents the 'raw' THC emissions measured during the test using Method 25A. No methane or ethane was detected in the samples collected.

Integrated exhaust gas samples were collected in Tedlar bags during each THC test run. Stack Test Group submitted the Tedlar Bag samples to DAT Laboratory in Plain City, Ohio. The gas samples were analyzed in accordance with USEPA Method TO-15 for the purposes of identifying compounds in the exhaust that are specifically exempt from the federal definition of Volatile Organic Compound (VOC) in 40 CFR 51.100(s).

The laboratory then prepared a 100 ppm sample of each VOC-exempt compound that had a three-sample average that exceeded the method detection limit. These samples were sent to Stack Test Group to measure an instrument response factor for each compound using the same Method 25A analyzer used during the testing. An instrument response factor is the ratio of the ppm of VOC-exempt compound to the corresponding ppm of THC. The average concentration of VOC-exempt compounds identified in the three TO-15 samples were then multiplied by the corresponding compound-specific instrument response factor to determine the concentration (ppm) of THC that could be subtracted from the raw data.

The total THC corresponding to the VOC-exempt compounds was then subtracted from the raw THC and is reported as the 'Corrected THC'. Table 2-2 identifies the VOC-Exempt compounds subtracted from the raw THC data.

The corrected THC, in Table 2-1 above, is the final result from these tests. Dividing the corrected THC (lb/hr) by the gross shredder feed rate (tph) yields a THC emission factor in units of lb-THC per ton of shredder feed. The shredder feed rate for the THC tests consisted of 21.3% end of life vehicles (ELVs) and 78.7% mixed recyclable metals. The average THC emission factor for this set of tests (as shown in Table 2-1 above) is 0.2430 lb/ton.

This emission factor may be applied to past actual shredder material feed rates to estimate past actual THC emissions. Information previously submitted in response to the EPA 114 Information Request included actual monthly shredder feed rates (tons per month) from July 2012 through December 2017. The maximum 12 consecutive month shredder feed rate was 729,790 tons from April 2016 through March 2017. Based on the above, application of the measured THC emission factor to the maximum annual shredder feed rate yields a maximum actual annual THC emission rate of 88.68 tons, which demonstrates that actual emissions from the shredder do not exceed the current VOC major source threshold of 100 tpy.

Table 2-2

Measured Response Factors for VOC Exempt Compounds[a]
General Iron - Chicago, Illinois

VOM Exempt Compound	Concentration in Sample PPM	FID Response (ppm) Trial 1	Trial 2	Trial 3	Average	Measured Response Factor
Chloromethane	100	67.1	67.0	67.0	**67.0**	0.67
Freon 22	100	47.50	47.70	47.80	47.70	0.48
Freon 12	100	117.60	117.40	117.80	117.60	1.18
Freon 152a	100	114.90	115.00	115.00	115.00	1.15
Freon 134a	100	114.80	115.10	115.20	115.00	1.15
Octamethycyclotetrasiloxane	100	114.80	114.90	114.90	114.90	1.15
Acetone	Response Factor obtained from Instrument Manufacturer					
Methylene Chloride	Response Factor obtained from Instrument Manufacturer					
Tetrachloroethylene	Response Factor obtained from Instrument Manufacturer					
Freon 11	Sample of Freon 11 was not available. The Freon 11 response factor is an estimated resonse factor based on the results of other Freon response factor testing					

a. See Appendix G of Stack Test Group THC Test Report attached in Appendix A of this document for details.

Corrected THC by Removal of VOC-Exempt Compounds[d]
General Iron - Chicago, Illinois

VOM Exempt Compound	Parameter	Run 1	Run 2	Run 3	Average	Response Factor
Chloromethane	TO-15 (PPM)	0.02	0.02	0.02	0.02	0.67 [a]
	Adjusted THC (PPM)	0.01	0.01	0.01	0.01	
Freon 22	TO-15 (PPM)	8.34	2.83	0.00	3.72	0.48 [a]
	Adjusted THC (PPM)	3.98	1.35	0.00	1.78	
Freon 12	TO-15 (PPM)	0.88	0.41	0.89	0.73	1.18 [a]
	Adjusted THC (PPM)	1.03	0.48	1.05	0.85	
Freon 152a	TO-15 (PPM)	0.00	3.84	1.56	1.80	1.15 [a]
	Adjusted THC (PPM)	0.00	4.42	1.79	2.07	
Freon 134a	TO-15 (PPM)	0.02	0.02	0.02	0.02	1.15 [a]
	Adjusted THC (PPM)	0.02	0.02	0.02	0.02	
Octamethycyclotetrasiloxane	TO-15 (PPM)	2.14	0.00	0.00	0.71	1.15 [b]
	Adjusted THC (PPM)	2.46	0.00	0.00	0.82	
Acetone	TO-15 (PPM)	2.71	14.73	29.91	15.80	0.72 [b]
	Adjusted THC (PPM)	1.95	10.61	21.54	11.40	
Methylene Chloride	TO-15 (PPM)	0.22	0.18	0.18	0.20	1.00 [b]
	Adjusted THC (PPM)	0.24	0.20	0.20	0.20	
Tetrachloroethylene	TO-15 (PPM)	0.03	0.03	0.04	0.03	1.30 [b]
	Adjusted THC (PPM)	0.04	0.04	0.05	0.04	
Freon 11	TO-15 (PPM)	2.00	10.21	5.98	6.10	0.48 [c]
	Adjusted THC (PPM)	0.95	4.87	2.85	2.90	
Methane	TO-15 (PPM)	3.29	3.10	3.40	3.26	0.33
	Adjusted THC (PPM)	1.10	1.03	1.13	1.09	
Ethane	TO-15 (PPM)	0.63	0.45	0.46	0.51	0.66
	Adjusted THC (PPM)	0.42	0.30	0.30	0.34	
Total THC from VOC Exempt Compounds		**12.20**	**23.33**	**28.94**	**21.52**	

a. Measured instrument response factor.
b. Instrument response factor from instrument manufacturer.
c. Instrument response factor for Freon 11 is conservatively assumed to be equal to the resonse factor for Freon 22.
d. See Appendix C of Stack Test Group THC Test Report attached in Appendix A of this document for details.

Uncorrected THC	**PPM**	**281.0**	**169.9**	**270.3**	**240.4**
Corrected THC	**PPM**	**268.8**	**146.6**	**241.4**	**218.9**

2.1.2 Process and Control Equipment Data – THC Testing

The following presents the process and control equipment data recorded during the test.

Shredder Feed Rate:

Table 2-3 presents a summary of shredder feed rate. A calibrated belt scale measures the total ferrous metal produced by the shredding operation. Based on recent facility operating data, the ferrous production rate is multiplied by a factor of 1.33 to estimate the gross shredder feed rate.

Table 2-3
Summary of Shredder Feed Rates for THC Emission Testing
General Iron Industries - Chicago, Illinois

Parameter	Units	Test Data from May 25, 2018			
		Run 1	Run 2	Run 3	Average
Pollutant		THC	THC	THC	THC
Test Method:		25A	25A	25A	25A
Start Time:		8:35 AM	9:49 AM	11:05 AM	
Stop Time:		9:35 AM	10:49 AM	12:26 PM	
Interruptions:		None	None	Note 1	
Duration:	minutes	60.0	60.0	60.0	60.0
Ferrous Metal Produced During Test Run	tons/hour	298	293	289	293
Factor to Convert Ferrous Produced to Gross Shredder Feed Rate	ton of gross feed / ton of ferrous produced	1.33	1.33	1.33	1.33
Hourly Gross Feed Rate to Shredder	tons/hour	396.3	389.7	384.4	390.1
Number of ELVs[2] Processed During Three Test Runs		189.00			
Average Weight of ELVs Processed[3]	ton/ELV	1.32			
Tons of ELVs Fed	tons	248.9			
Average Weight of ELVs Fed as % of Gross Shredder Feed	%	21.3%			

1. Run 3 testing was interrupted twice due to loss of feed to the shredder;
   - 11:19 to 11:30 AM (11-minutes) due to a feed roll jam
   - 11:33 to 11:43 AM (10-minutes) due to a feed discharge conveyor jam.
2. ELV = End of Life Vehicle.
3. A total of 201 ELVs (264.75-tons) were stockpiled for this test. These values were derived from summing the number of ELVs and corresponding weight of each load of ELVs. These data demonstrate that the average weight of ELVs stockpiled for this test was 1.32-tons.

End of life vehicles (ELVs) were fed to the shredder during this test. Based on recent operating data, the facility estimates that approximately 20% of total shredder feed is comprised of ELVs. The goal during this test was for ELVs to make up approximately 20% of the gross shredder feed rate.

ELVs were stockpiled for this test. The gross weight and number of ELVs in each incoming load of ELVs placed in the stockpile was recorded. A total of 201 ELVs weighing 264.75 tons were stockpiled for processing during the THC testing. The average weight of ELVs in this stockpile was 1.32 tons.

Ferrous production is electronically monitored in the control room from a totalizer on the calibrated belt scale. The value from the totalizer was manually recorded at the start and end of each test to identify the total mass of ferrous scrap produced. This value was multiplied by the conversion factor of 1.33 to

estimate the gross shredder feed rate. During testing, the number of cars fed to the shredder was manually recorded. A total of 189 cars (248.9 tons) were fed to the shredder during the three THC test runs.

As shown in Table 2-3 above, the total tons of material processed during the three tests was 1,170.4 tons, which included 248.94 tons of ELVs. Based on the above, ELVs comprised 21.3% of the total mass of material process in the shredder. This is consistent with recent levels of ELV processing.

Shredder Water Injection:

Water is injected into the shredder as a safety measure. Heat from shredding converts the water to steam. The steam expands to displace ambient air from the interior of the shredder to reduce the volume of oxygen in the shredder to minimize the potential for deflagrations. The water feed rate is manually controlled such that the non-metal material discharged from the shredder contains some moisture. Water feed rate was manually recorded during the THC emissions tests. The average water injection rates from each THC test is shown in Table 2-4 below.

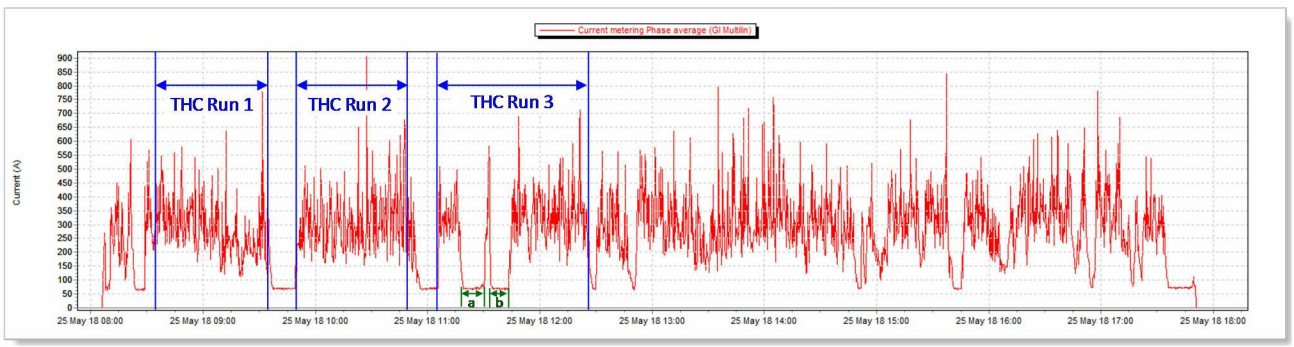
Table 2-4
Shredder Water Injection Rates
General Iron Industries - Chicago, Illinois

Test	Date	gpm
Run 1	5/25/18	42
Run 2	5/25/18	41
Run 3	5/25/18	41

Shredder Motor Amperage:

The amperage of the electric motor that powers the shredder is electronically recorded. Motor amperage is a function of the type and rate of material fed to the shredder. As shown in Table 2-5 below, the motor amperage indicates that the type and rate of material fed to the shredder was consistent during all three THC test runs.

Table 2-5 Shredder Motor Amperage
General Iron Industries - Chicago, Illinois



Shredder Emissions Capture:

An emissions capture hood is suspended over the top of the shredder. The hood is equipped with rubber curtains that extend downward to the top of the shredder to minimize the open area. The only opening to atmosphere is at the shredder feed chute, which is blocked by the feed rolls and incoming material. The placement of the hood and the air flow is maintained to minimize the amount of steam escaping the hood.

Although it is not possible to directly, or indirectly, measure the capture efficiency of the hood, it was the opinion of the USEPA and IEPA inspectors observing the test, that the hood appeared to provide > 95% capture of steam created in the shredder.

2.1.3 Errors During Testing – THC Testing

There were no errors during THC emission testing.

2.1.4 Deviation of Reference Test Methods – THC Testing

There were no deviations from the reference test methods as described in the approved test protocol.

2.1.5 Production Rates During Testing – THC Testing

The shredder production rate during THC testing is presented in Section 2.1.2 above.

2.2 PM/Metals Emissions

2.2.1 PM/Metals Test Results

PM/Metals emissions testing was performed using a single Method 29 sampling apparatus. Combining PM and Metals into a single test apparatus was approved by USEPA and IEPA observers on site at the initiation of testing on June 13, 2018. PM/Metals emissions testing was performed by Montrose Air Quality Services on June 13 and 14, 2018. Detailed information from sample collection and analyses is presented in the Montrose Air Quality Services test report presented in Appendix B of this document.

Table 2-6 below presents a summary of PM and Metals emissions testing including the shredder feed rate. PM emission rates averaged 1.9 lb/hr, which is significantly below the permitted PM emission limits from the current Lifetime Operation Permit of 67 lb/hr.

All of the filterable PM is assumed to be PM_{10} based on the performance of the roll media filter; therefore, measured filterable PM is assumed to be PM_{10}. The reported hourly PM/PM10 emission rate of 1.9 lb/hr is also significantly below the permitted PM_{10} emission limit from the current Lifetime Operation Permit of 34 lb/hr.

Table 2-6 Shredder PM/Metals Emissions Summary - June 13 & 14, 2018
General Iron Industries - Chicago, Illinois

Parameter	June 13, 2018 Run 1 lb/hr	June 13, 2018 Run 2 lb/hr	June 13, 2018 Run 3 lb/hr	June 14, 2018 Run 4 lb/hr	June 14, 2018 Run 5 lb/hr	Average Runs 1, 2, 4, 5 lb/hr
Start Time:	11:49	15:15	Run 3 failed the post test leak check due to a broken glass probe liner. With the concurrence of the IEPA observer on site to witness the leak check, Run 3 was deemed to be invalid and samples were not submitted for analysis.	10:56	13:45	
End Time:	13:40	17:09		12:45	15:33	
Particulate	1.55	2.09		2.21	1.75	1.90
Antimony	0.0000667	0.0000874		0.0000778	0.0000504	0.0000706
Arsenic	0.0000300	0.0000351		< 0.0000238	< 0.0000237	0.0000282
Barium	0.000551	0.00109		0.000469	0.000411	0.000630
Beryllium	< 0.00000583	< 0.00000583		< 0.00000595	< 0.00000592	< 0.0000059
Cadmium	0.000398	0.000231		0.000226	0.000188	0.0002608
Chromium	0.000288	0.000365		0.000289	0.000235	0.0002943
Cobalt	< 0.0000233	0.0000318		< 0.0000238	< 0.0000237	0.0000257
Copper	0.000315	0.000714		0.000369	0.00109	0.0006220
Lead	0.00105	0.00171		0.00114	0.000727	0.0011568
Manganese	0.000857	0.00111		0.00114	0.000738	0.0009613
Nickel	0.000349	0.000588		0.000284	0.000198	0.000355
Phosphorus	0.00388	0.00451		0.00319	0.00292	0.00363
Selenium	0.000149	0.000269		< 0.0000238	0.0000434	0.0001213
Thallium	< 0.0000233	< 0.0000233		< 0.0000238	< 0.0000237	< 0.0000235
Silver	0.0000233	0.0000233		0.000337	< 0.0000237	0.0001018
Zinc	0.0705	0.0795		0.0654	0.0563	0.0679
Mercury	0.0291	0.0117		0.0368	0.00243	0.0200

Table 2-7 identifies the average shredder feed rate from Runs 1, 2, 4, and 5.

Table 2-7 Summary of Shredder Feed Rates for PM and Metals Emission Testing
General Iron Industries - Chicago, Illinois

Parameter	Units	Test Data from June 13 & 14, 2018				
		Run 1	Run 2	Run 4	Run 5	Average
Pollutant		PM/Metals	PM/Metals	PM/Metals	PM/Metals	PM/Metals
Test Method:		M29	M29	M29	M29	M29
Start Time:		11:49 AM	3:15 PM	10:56 AM	1:45 PM	
Stop Time:		1:40 PM	5:09 PM	12:45 PM	3:33 PM	
Test Run Duration (includes traverse change)		111.0	114.0	109.0	108.0	
Sample Collection Time	minutes	96.0	96.0	96.0	96.0	
Shredder Feed Interruptions		None	None	None	None	
Hourly Rate of Ferrous Metal Production	tons/hour	303.38	303.89	300.00	304.04	302.83
Factor to Convert Ferrous Produced to Gross Shredder Feed	ton of gross feed / ton of ferrous produced	1.33	1.33	1.33	1.33	1.33
Gross Feed to Shredder During Testing Period	tons/hour	403.50	404.18	399.00	404.37	402.76
Hourly Rate of ELVs[1] Fed to Shredder	tons/hour	70.33	74.08	91.10	85.05	80.14
ELVs Fed as % of Gross Shredder Feed	%	17.4%	18.3%	22.8%	21.0%	19.9%
Average Weight of ELVs Processed[3]	ton/ELV	1.46	1.45	1.44	1.55	1.48
No. of ELVs Fed	# of ELVs	89	97	118	95	100

1. ELV = End of Life Vehicle.

As shown in Table 2-7 above, the demonstrated gross shredder feed rates were consistent with the targeted gross feed rate of 400 tph. ELVs ranged from 17.4% of gross shredder feed in Run 1 to 22.8% of gross shredder feed in Run 4. The average ELV feed rate was 19.9% of the gross shredder feed rate, which was consistent with the targeted ELV feed rate of 20%.

PM and Metals emission factors were calculated by dividing the average hourly emission rate by the average hourly shredder gross feed rate. Table 2-9 presents a summary of PM and Metal emission factors.

The PM and Metal emission factors in Table 2-8 can be combined with the past maximum actual annual shredder feed rate identified in Section 2.1.1 above to estimate maximum annual emissions from the shredder.

Table 2-8 Shredder PM/Metals Emission Factors
General Iron Industries - Chicago, Illinois

Parameter	June 13, 2018 Run 1 lb/ton of Feed	June 13, 2018 Run 2 lb/ton of Feed	June 13, 2018 Run 3 lb/ton of Feed	June 14, 2018 Run 4 lb/ton of Feed	June 14, 2018 Run 5 lb/ton of Feed	Average Runs 1, 2, 4, 5 lb/ton of Feed
Shredder Feed Rate (tph)	403.50	404.18		399.00	404.37	402.76
Particulate	3.84E-03	5.17E-03		5.54E-03	4.33E-03	4.72E-03
Antimony	1.65E-07	2.16E-07		1.95E-07	1.25E-07	1.75E-07
Arsenic	7.43E-08	8.68E-08		5.96E-08	5.86E-08	6.99E-08
Barium	1.37E-06	2.70E-06		1.18E-06	1.02E-06	1.56E-06
Beryllium	1.44E-08	1.44E-08		1.49E-08	1.46E-08	1.46E-08
Cadmium	9.86E-07	5.72E-07		5.66E-07	4.65E-07	6.47E-07
Chromium	7.14E-07	9.03E-07		7.24E-07	5.81E-07	7.31E-07
Cobalt	5.77E-08	7.87E-08		5.96E-08	5.86E-08	6.37E-08
Copper	7.81E-07	1.77E-06		9.25E-07	2.70E-06	1.54E-06
Lead	2.60E-06	4.23E-06		2.86E-06	1.80E-06	2.87E-06
Manganese	2.12E-06	2.75E-06		2.86E-06	1.83E-06	2.39E-06
Nickel	8.65E-07	1.45E-06		7.12E-07	4.90E-07	8.80E-07
Phosphorus	9.62E-06	1.12E-05		7.99E-06	7.22E-06	9.00E-06
Selenium	3.69E-07	6.66E-07		5.96E-08	1.07E-07	3.00E-07
Thallium	5.77E-08	5.76E-08		5.96E-08	5.86E-08	5.84E-08
Silver	5.77E-08	5.76E-08		8.45E-07	5.86E-08	2.55E-07
Zinc	1.75E-04	1.97E-04		1.64E-04	1.39E-04	1.69E-04
Mercury	7.21E-05	2.89E-05		9.22E-05	6.01E-06	4.98E-05

2.2.2 Process and Control Equipment Data – PM/Metals Emissions Testing

The following presents the process and control equipment data recorded during the PM/Metals emissions testing.

Shredder Feed Rate:

Table 2-7 above, presents a summary of shredder feed rate. A calibrated belt scale measures the total ferrous metal produced by the shredding operation. Based on recent facility operating data, the ferrous production rate is multiplied by a factor of 1.33 to estimate the gross shredder feed rate.

End of life vehicles (ELVs) were fed to the shredder during this test. Based on recent operating data, the facility estimates that approximately 20% of total shredder feed is comprised of ELVs. The goal during this test was for ELVs to make up approximately 20% of the gross shredder feed rate.

ELVs were stockpiled for these tests. The gross weight and number of ELVs in each incoming load of ELVs placed in the stockpile was recorded.

Ferrous production is electronically monitored in the control room from a totalizer on the calibrated belt scale. The value from the totalizer was manually recorded at the start and end of each test to identify the total mass of ferrous scrap produced. This value was multiplied by the conversion factor of 1.33 to estimate the gross shredder feed rate. During testing, the number of cars fed to the shredder was manually recorded. A total of 320.42 tons of ELVs were fed to the shredder during the four PM/Metals test runs.

The total tons of material shredded during the four PM/Metals tests was 1,611.05 tons, which included 320.42 tons of ELVs. Based on the above, ELVs comprised 19.9% of the total mass of material processed in the shredder. This is consistent with recent ELV processing rates.

Shredder Water Injection:

Water is injected into the shredder as a safety measure. Heat from shredding converts the water to steam. The steam expands to displace ambient air from the interior of the shredder to reduce the volume of oxygen in the shredder to minimize the potential for deflagrations. The water feed rate is manually controlled such that the non-metal material discharged from the shredder contains some moisture. Water feed rate was manually recorded during the PM/Metals emissions tests. The average water injection rates from each PM/metals emission test is shown in Table 2-9 below.

Table 2-9
Shredder Water Injection Rates
PM/Metals Emission Testing
General Iron Industries - Chicago, Illinois

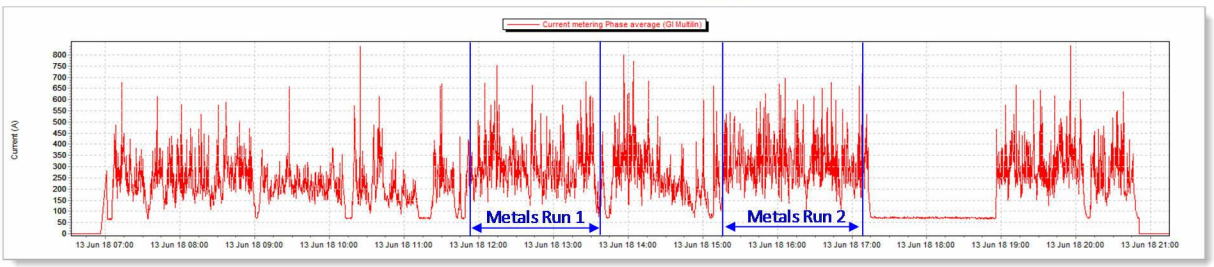
Test	Date	gpm
Run 1	6/13/18	45
Run 2	6/13/18	47
Run 4	6/14/18	45
Run 5	6/14/18	46

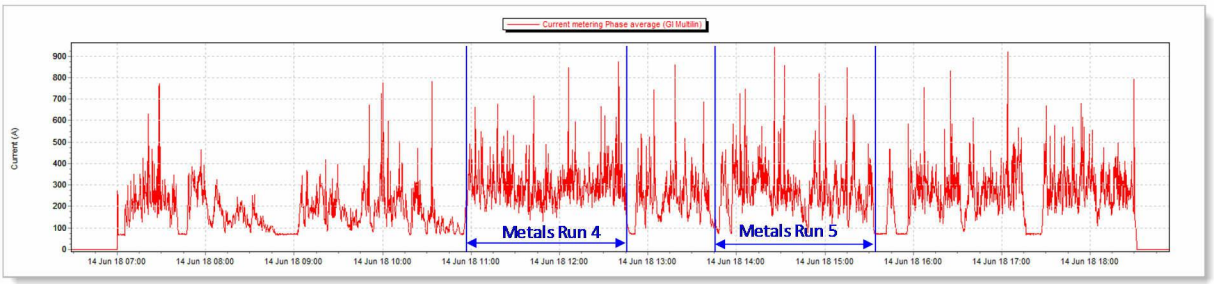
Shredder Motor Amperage:

The amperage of the electric motor that powers the shredder is electronically recorded. Motor amperage is a function of the type and rate of material fed to the shredder. As shown in Table 2-10 below, the motor amperage indicates that the type and rate of material fed to the shredder was consistent during all four PM/Metals test runs.

Table 2-10 Shredder Motor Amperage

PM/Metals Emissions Testing - June 13 & 14, 2018
General Iron Industries - Chicago, Illinois





Shredder Emissions Capture:

An emissions capture hood is suspended over the top of the shredder. The hood is equipped with rubber curtains that extend downward to the top of the shredder to minimize the open area. The only opening to atmosphere is at the shredder feed chute, which is blocked by the feed rolls and incoming material. The placement of the hood and the air flow is maintained to minimize the amount of steam escaping the hood.

Although it is not possible to directly, or indirectly, measure the capture efficiency of the hood, it was the opinion of the USEPA and IEPA inspectors observing the test, that the hood appeared to provide > 95% capture of steam created in the shredder.

2.2.3 Errors During Testing – PM/Metals

There were no process errors or upsets during PM/Metals emissions testing.

During Test Run 2, an operator mistakenly advanced the roll filter material approximately three times further than when the filter material is advanced automatically. Because there were no obvious visual indications that the samples were affected by this error, a decision was made to send the Run 2 samples for analysis and conduct a fourth test run in the event that analytical results confirmed that this error negatively impacted the samples. In the event that analysis confirmed no impacts to Run 2, the test would include the results of all four test runs in the reported average results. The USEPA and IEPA observers present during Run 2 concurred with this decision.

Test Run No. 3 was performed on June 13, 2018, however, the post-test leak check failed due to a broken glass liner in the sampling probe. A failed leak check indicates that ambient air may have been leaking into the sampling apparatus diluting or replacing process exhaust gas. Due to the failed leak check, this run was considered invalid and the samples were not sent for analysis. The IEPA observer, present at the time of the leak check concurred with this conclusion and agreed that the samples should not be sent for analysis.

There were no other errors identified during the PM /Metals emissions testing.

2.2.4 Deviation of Reference Test Methods – PM/Metals

Prior to the initiation of PM/Metals emissions testing, the USEPA and IEPA observers were consulted to request approval to measure PM emissions as part of the Method 29 Metals test to eliminate the need to perform a separate Method 5 test for PM. Combining PM and Metals in a single Method 29 test is done routinely, has no impact on the validity of either test, and is not prohibited by Method 29. When PM and Metals are combined in a Method 29 test, the filter and front half probe are first dried and weighed to obtain the PM emissions data and are then digested and analyzed for metals in accordance with Method 29. Upon receipt of verbal approval from both the USEPA and IEPA observers, a single Method 29 test was performed to measure both PM and Metals. Based on the above, this change was not a deviation from the reference method but was a deviation from the protocol.

There were no other deviations from the reference test methods as described in the approved test protocol.

2.2.5 Production Rates During Testing – PM/Metals

The shredder production rate during PM and Metals emissions testing is presented in Section 2.2.2 above.

2.2.6 Metals Audit Samples

A total selected metals (TSM) audit sample, prepared by ERA, was sent to the laboratory selected for analysis with the metals test samples. The purpose of the audit sample is to evaluate the accuracy of the analytical results. Detailed results from analysis of the audit sample are presented in Montrose Air Quality Services' report in Appendix B of this document.

The results of the audit sample were 'Acceptable' for all metals with the exception of Cadmium. The term 'Acceptable' as used above refers only to the accuracy and reliability of the analytical results and do not infer noncompliance with any applicable limit. The audit sample was prepared with 20.6 ug/filter of cadmium and required an analytical response of 16.5 to 24.7 ug/filter. The reported value from the lab was 16 ug/filter, which is just below the minimum required response. ERA verbally reported the result to Kevin Mattison of IEPA.

It is our understanding that the metals laboratory will conduct additional analyses to determine the potential source of the error. It is possible that the cadmium results reported in this document may be adjusted slightly based on any correction factor that may be identified. In the event that the reported cadmium results require adjustment, a supplemental report will be prepared and submitted to USEPA and IEPA. Because the error was so small, Kevin Mattison of IEPA indicated that any change to the reported cadmium emission rates would be minimal.

All other metals in the audit sample had an "Acceptable Result."

3.0 FACILITY OPERATIONS

The following information presents a process description of the hammermill shredder and roll filter particulate control device operated during THC and Metals emissions testing.

3.1 Hammermill Shredder and Operating Parameters

The actual shredder feed rate is dependent on the type and consistency of the feed material and the ability to consistently feed the mixed recyclable metal to the shredder. Based on monthly shredder operating data (monthly tons of material processed and daily operating hours) previously submitted to USEPA in response to the 114 Information Request, during the period of July 2012 through December 2017, the average gross shredder feed rate was approximately 313.9 tph. This value more accurately represents long term operation of the shredder.

During the limited testing period, General Iron selected a target gross shredder feed rate of 400 tph (with 20% comprised of ELVs). Data presented in Sections 2.1.2 and 2.2.2 of this test report demonstrate that the facility met its targeted feed rate. It should be noted however, that it is not possible to sustain a feed rate of 400 tph over a long period of time because the amount of material entering the facility on a day-to-day basis is not sufficient to sustain this rate.

Based on recent operating data, the facility estimates that shredder feed is comprised of approximately 20% end of life vehicles (ELVs) and 80% mixed recyclable metal. Shredded metal is discharged by conveyor and travels over two drum magnets, to separate ferrous and non-ferrous metal. Ferrous metal is then routed through a Z-Box separator to remove any remaining light materials. Metal discharged from the Z-Box separator is then conveyed to stockpiles. In the Z-Box separator, shredded metal passes through a rising column of air. A fan and ducting system maintains an upward flow of air through the Z-Box (counter current to the direction of the shredded metal). Shredded metal falls downward through the rising column of air and is discharged at the bottom of the Z-Box over a conveyorized belt scale. The belt scale measures the net mass of shredded metal produced (tph). The amount of ferrous metal produced is multiplied by a factor of 1.33, based on recent operating data, to estimate the gross shredder feed rate.

The upward flow of air through the Z-Box removes light material. The air stream carries this light material to an integral cyclone that disengages the material from the air stream. Light material is discharged from the bottom of the cyclone where it is collected for further processing. The majority of the air exiting from the top of the cyclone is recycled through the fan, back to the bottom of the Z-Box.

The shredder is equipped with an integral water injection system to minimize the potential for fires and deflagrations within the shredder. The shredder is located within an enclosure consisting of curtain walls on four sides, and solid plate and metal grating on the roof. The water injection rate is monitored by a flow meter and the flow rate is electronically recorded.

A flow diagram of the shredder is presented in Figure 3.

3.2 Cyclone and Roll Filter PM Control System

An exhaust hood, located above the shredder, is equipped with rubber curtains extending downward to the top of the shredder to enhance emissions capture efficiency. An induced draft fan draws exhaust from the shredder through the exhaust hood, a cyclone and roll media filter for control of particulate matter before being discharged to the atmosphere.

The roll filter is essentially a rectangular section of duct measuring approximately 18 ft by 6 ft. A roll of unused filter material is placed on the supply side of the filter media system and fed through the rectangular section of duct to a take-up roll. The unit is designed so that the air flow passes downward through the filter. The filter periodically advances automatically.

3.3 Shredder Throughput

The feed rate of the shredder is monitored by measuring the production of ferrous metal. A material conversion factor is used to convert ferrous metal produced to gross shredder feed rate. A discussion of the demonstrated shredder feed rate with respect to shredder throughput is presented in Section 3.1 above.

Hammermill Shredder Flow Diagram

A. Shredder Feed Conveyor

B. Shredder Enclosure

C. Z-Box

D. Z-Box Cyclone

E. Shredder Exhaust Cyclone

F. Shredder Exhaust Roll media filter and Induced Draft Fan

G. Test Ports on Horizontal Duct

H. Ferrous Material Belt Scale

I. Shredder Exhaust
(exhaust gases discharge to the interior of the shredder enclosure and are released to the atmosphere through an area of expanded metal grating on the roof of the shredder enclosure)

RK & Associates, Inc. 2S631 ROUTE 59, SUITE B WARRENVILLE, IL 60555 630-393-9000	COMMENTS: Shredder Emissions Test Report Total Hydrocarbons, Particulate, and Metals		Shredder Flow Diagram General Iron Industries, Inc. – Chicago, Illinois			FIGURE 3
	DRAWN BY::	APPROVED BY:: JGP	PROJECT NUMBER R17421-3	DATE DRAWN: 06-2018	REVISED DATE	

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Sampling and analytical procedures are presented in the THC and PM/Metals test reports presented in Appendix A and B of this document.

4.1 THC Emission Testing

The required detailed sampling and analytical data for THC emission testing is presented in Stack Test Group's detailed test reports presented in Appendix A of this document.

4.2 PM/Metals Emissions Testing

The required detailed sampling and analytical data for PM/Metals emissions testing is presented in Montrose Environmental Service' detailed test reports presented in Appendix B of this document.

4.3 Appendices (detailed testing information)

The required detailed sampling and analytical data for the THC and PM/Metals tests are presented in the detailed test reports presented in Appendix A and B of this document respectively.

5.0 HEALTH EFFECTS SCREENING FOR METALS

The test results required by the USEPA information request are presented in Section 2.2 of this report. General Iron has voluntarily decided to surpass the USEPA testing requirements and provide the following impact assessment for the metals emissions on the surrounding community.

There are no IEPA or USEPA regulations limiting emissions of specific metals or requiring an ambient impact analysis. In an effort to identify a standard for metals emissions, regulations from other states in Region V were reviewed. The State of Wisconsin has a rule regulating the emissions of air toxic pollutants (including metals) that is applicable to facilities that are not subject to other state or federal rules for metals emissions. Wisconsin's air toxics rule (NR 445) sets health-based emission standards for about 550 air toxics, also known as hazardous air pollutants (HAPs), to protect people from air emissions that are known or suspected to cause cancer or other serious health problems. These problems include asthma, respiratory damage, kidney failure, heart failure, infertility, and birth defects. Facilities seeking an air emissions permit in Wisconsin must demonstrate compliance with applicable requirements of this rule in a construction permit application.

NR 445 can be used as a screening tool to assess the potential impacts from metals emissions from the shredder. The standards in NR 445 are based on threshold limit values established by American Conference of Governmental Industrial Hygienists (ACGIH) and USEPA or California Air Resources Board risk factors.

The results of this analysis show that metals emissions from the shredder are far below the health-based standards identified in NR 445.

In order to use NR 445 as a screening tool for metals emissions from the shredder, the estimated off-site impacts must be identified. For this purpose, and in accordance with NR 445, an air dispersion modeling analysis was performed as described in Section 5.1 below.

5.1 Air Dispersion Modeling

EPA refined dispersion model, AERMOD (version 16216r), was used to predict maximum off-site concentrations of the metals identified by the recent air emission testing program described herein.

Commercially available hourly meteorological data for the years 2012 through 2016, measured at Midway Airport, was used for modeling to predict the maximum 1-Hr, 24-Hr, and annual average concentrations ($\mu g/m^3$) of each identified organic compound and metals.

Each of General Iron's buildings on the site was set up in the model to take into account building wake effects. Based on the orientation of the shredder exhaust stack, and on advice of IEPA air dispersion

modeling experts, the shredder emissions were modeled as a volume source with a unitized pollutant emission rate of 1 lb/hr. Particulate deposition was not included in this modeling analysis. Modeling of shredder emissions was performed using the average shredder feed rate demonstrated during the period of July 2012 through December 2017.

A total 5,568 receptors were identified in the model by establishing a rectangular receptor, centered on the shredder emission point, with grid with spacing of 25-m from the property line out to 500-m and a spacing of 100-m from a distance of 500-m to 2,500-m from the property line. Receptors were also placed on the property line. Based on our experience, this receptor grid was extended to a distance that would ensure that the maximum off-site impacts would be identified (i.e. a maximum ground level impact would not occur further than 2,500-meters from the property line.)

In all cases, the modeling results identified the point of maximum impact at or near the property line. Based on principles of air dispersion modeling, the mathematical relationship between the mass emission rate (lb/hr) from the stack and the maximum off site impact concentration ($\mu g/m^3$) is identical for all pollutants. Therefore, the off-site impacts for any pollutant can determined simply by multiplying the predicted off-site impact concentration ($\mu g/m^3$) by the measured mass emission rate in lbs/hr. If the measured mass pollution emission rate is 2 lb/hr, the predicted impact would be twice as much as the modeled impact at an emission rate of 1 lb/hr. The predicted pollutant-specific impacts can then be compared to concentration-based standards, such as those in NR 445.

5.2 WDNR's NR 445 Standards for Metals

According to NR 445.08(2)(b)(c), for each hazardous air contaminant, a permittee shall either limit the ambient air concentration off the source property to less than the ambient air standard concentration allowed under column (g) of the Tables A or B of s. NR 445.07; or not cause an ambient air concentration off the source property that results in an inhalation impact greater than 1×10^{-6}. Specific compounds may have more than one standard based on a non-carcinogenic and carcinogenic health effects.

5.2.1 Non-Carcinogenic Metals

According to NR 445.08(2)(b), for acute and chronic non-carcinogens, any air toxic pollutant that has a standard expressed as an ambient air concentration in Table A or B of s. NR 445.07, the off-property ambient air concentration must be less than the maximum allowable concentration identified in column (g) of the tables.

The modeled maximum off-site concentrations were compared with the allowable concentration ($\mu g/m^3$) in column (g) of NR 445 for the corresponding averaging time period listed in column (h). The results of this analysis show that metals emissions from the shredder are far below the health-based standards identified in NR 445.

5.2.2 Carcinogenic Metals

According to NR 445.08(2)(c), emissions of carcinogenic air contaminants having a unit risk factor established by either the EPA or the California Air Resources Board shall not result in an ambient air concentration off the source property corresponding to an inhalation impact (or risk) greater than 1 in 1,000,000 (1×10^{-6}).

The inhalation impact is determined by the following equation:

Inhalation impact = (Inhalation impact concentration annual average) x (Unit risk factor)

where:

inhalation impact concentration annual average is the annual average concentration of a contaminant in ($\mu g/m^3$)

unit risk factor for the contaminant is the unit risk factor value established by either EPA or the California Air Resources Board and is expressed in $(\mu g/m^3)^{-1}$

The predicted (modeled) maximum annual concentrations were multiplied by the compounds corresponding unit risk factor, and then compared to a value of 1 in 1,000,000. The results of this analysis show that metals emissions from the shredder are far below the health-based standards identified in NR 445.

5.3 Comparison of Predicted Off-Site Metals Impacts with NR 445

Table 5-1 identifies the predicted maximum off-site metals impacts (ug/m^3) to the applicable NR 445 standards for non-carcinogenic and carcinogenic metals identified from the recent metals emissions testing. The measured metal emission rates were calculated using the actual average shredder feed rate demonstrated from July 2012 through December of 2017.

NR 445 identifies standards for all of the identified metals except lead, silver and zinc. The predicted maximum off-site concentrations of all other identified metals were far below the applicable NR 445 standards.

5.4 Conclusions

The results of this analysis show that metals emissions from the shredder are far below the health-based standards identified in NR 445.

Table 5-1 Comparison to NR 445 for Metals for Both Carcinogens and Non-Carcinogens
Shredder Metals Emissions from Testing Conducted June 13 & 14, 2018 - General Iron Industries - Chicago, Illinois
Using Average Metal Emission Rates from Runs 1, 2, 4, and 5 (all test runs)

Metals	Shredder Metal Emission Test Results Mass Emission Rates Reflect Actual Average Shredder Feed Rate					Modeled Maximum Results[3]		NR 445 Ambient Air Standard for Non-Carcinogens		NR 445 for Carcinogens			Complies with NR 445
	Run 1 6/13/2018 lb/hr	Run 2 6/13/2018 lb/hr	Run 4 6/14/2018 lb/hr	Run 5 6/14/2018 lb/hr	Average Runs 1,2,4,5 lb/hr	24 Hour (ug/m^3)	Annual (ug/m^3)	24 Hour (ug/m^3)	Annual (ug/m^3)	Unit Risk Factor $(ug/m^3)^{-1}$	Source	Inhalation Impact[4] < 1.0E-06	
	Modeled Maximum Impact for Unit Emission (1 lb/hr)					6.45135	0.64704						
Antimony	0.0000519	0.0000679	0.0000612	0.0000391	0.0000550	0.0004	0.00004	12.00	NA				Yes
Arsenic	0.0000233	0.0000273	0.0000187	0.0000184	0.0000219	0.0001	0.00001	NA	Carcinogen	0.00430	IRIS	6.10E-08	Yes
Barium	0.0004286	0.0008465	0.0003690	0.0003190	0.000491	0.0032	0.0003	12.00	NA				Yes
Beryllium	0.00000454	0.00000453	0.00000468	0.00000460	0.00000458	0.000030	0.000003	NA	Carcinogen	0.00240	IRIS	7.12E-09	Yes
									0.02				Yes
Cadmium	0.0003096	0.0001794	0.0001778	0.0001459	0.000203	0.0013	0.0001	NA	Carcinogen	0.00180	IRIS	2.37E-07	Yes
Chromium [1]	0.000224	0.000283	0.000227	0.000182	0.000229	0.0015	0.0001	12.00	NA				Yes
Cobalt	0.0000181	0.0000247	0.0000187	0.0000184	0.0000200	0.0001	0.0000	0.48	NA				Yes
Copper	0.000245	0.000555	0.000290	0.000846	0.000484	0.0031	0.0003	24.00	NA				Yes
Lead[2]	0.00082	0.00133	0.00090	0.00056	0.00090	0.0058	0.0006	NA	NA				NA
Manganese	0.000667	0.000862	0.000897	0.000573	0.000750	0.0048	0.0005	4.80	NA				Yes
Nickel	0.000272	0.000457	0.000223	0.000154	0.000276	0.0018	0.0002	NA	Carcinogen	0.00026	CAL	4.65E-08	Yes
Phosphorus	0.00302	0.00350	0.00251	0.00227	0.00282	0.0182	0.0018	2.43	NA				Yes
Selenium	0.000116	0.000209	0.000019	0.000034	0.000094	0.0006	0.0001	4.80	NA				Yes
Thallium	0.0000181	0.0000181	0.0000187	0.0000184	0.0000183	0.0001	0.00001	2.40	NA				Yes
Silver[2]	0.0000181	0.0000181	0.0002651	0.0000184	0.0000799	0.0005	0.0001	NA	NA				NA
Zinc[2]	0.0548	0.0617	0.0515	0.0437	0.0529	0.3415	0.0343	NA	NA				NA
Mercury	0.0226	0.0091	0.0290	0.0019	0.0156	0.1009	0.0101	0.60	0.30				Yes