Appendix A – Weight of Evidence

Appendix B – Public Hearing Record

Appendix C – Emissions Data -

Appendix D – SEMI Mobile Data

Appendix E – SEMI Monitoring Strategy

Appendix F – Calculation of Severstal emissions support documentation

Appendix G – Detroit Apportionment Studies

Appendix H – Modeling Data

Appendix I –High PM Final Report

Appendix J – Severstal Permit

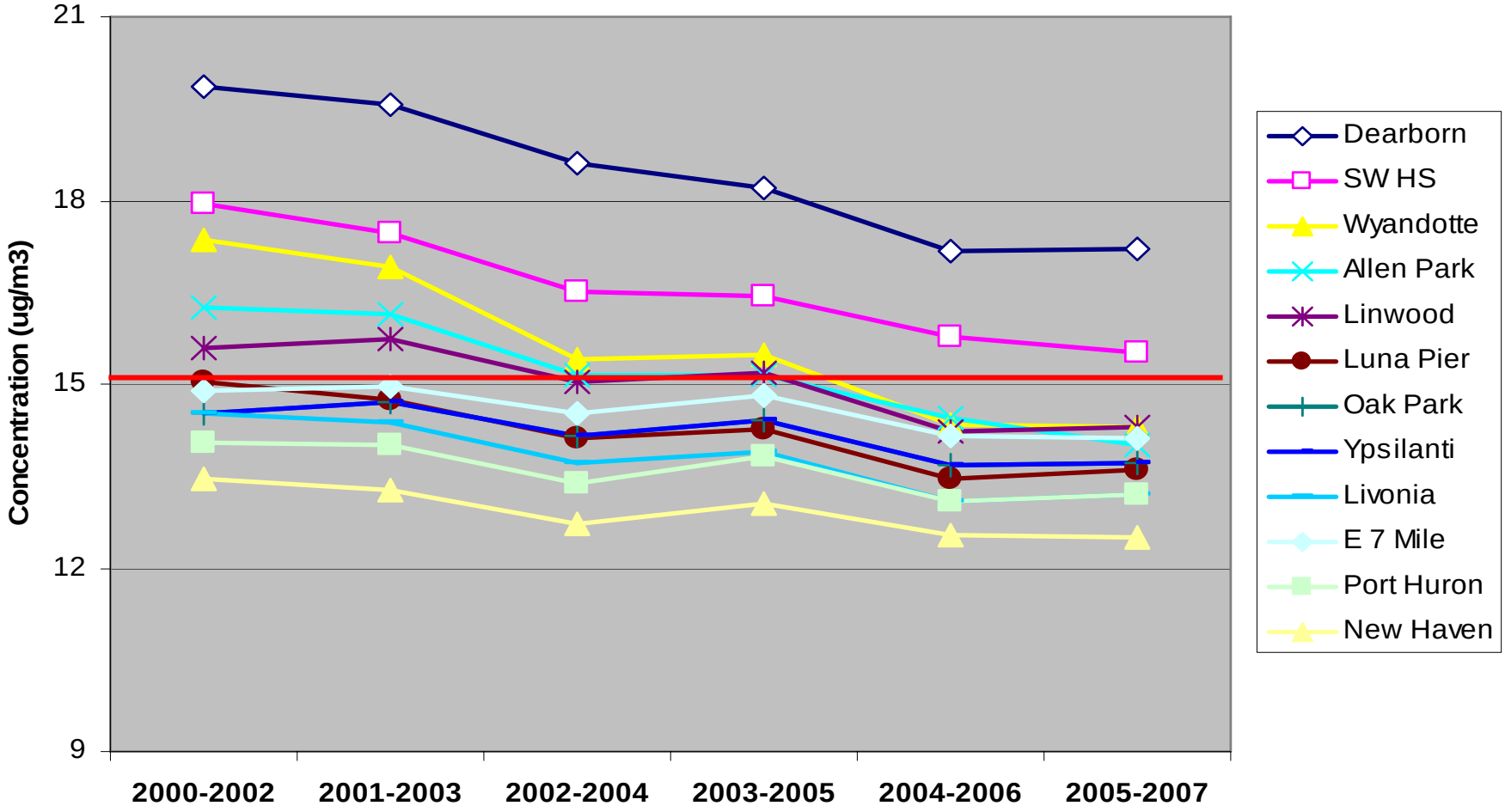
Appendix A: Tables and Figures

MDEQ PM2.5 SIP

Figure 1

3-Year Average PM2.5 Concentrations

Southeast Michigan

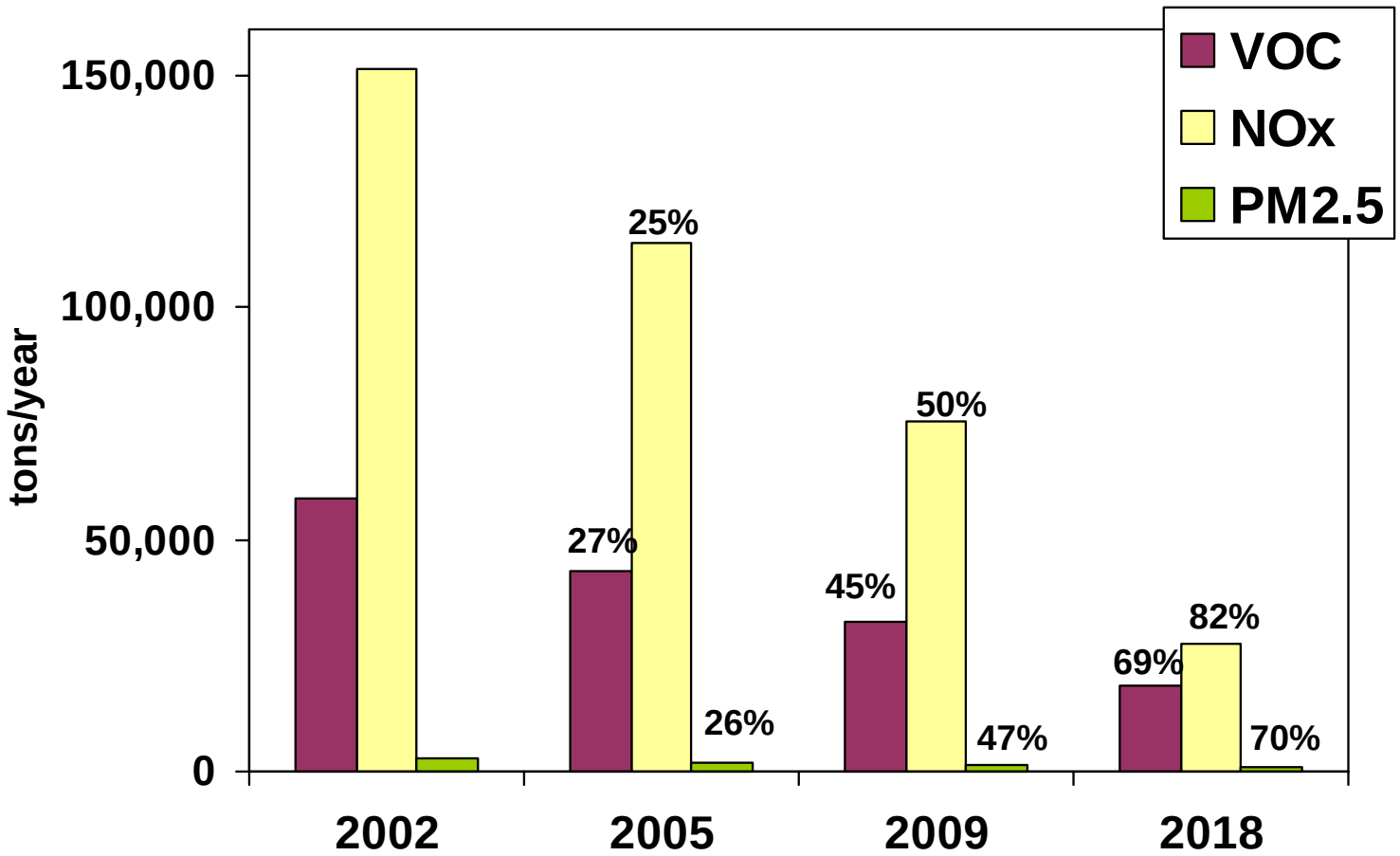


Open symbols indicate monitors that currently violate the annual standard.

Source: SEMCOG

Figure 2

Expected Change in On-Road Mobile Source Emissions due to National Controls



Percentages indicate reduction from 2002

Source: SEMCOG On-Road Mobile Source Emissions Inventory for Southeast Michigan PM2.5 SIP, 2007

Table 1

Forecasted Change in PM2.5 Concentrations Between 2005 and 2009 due to Regional and National On-the-Books Controls

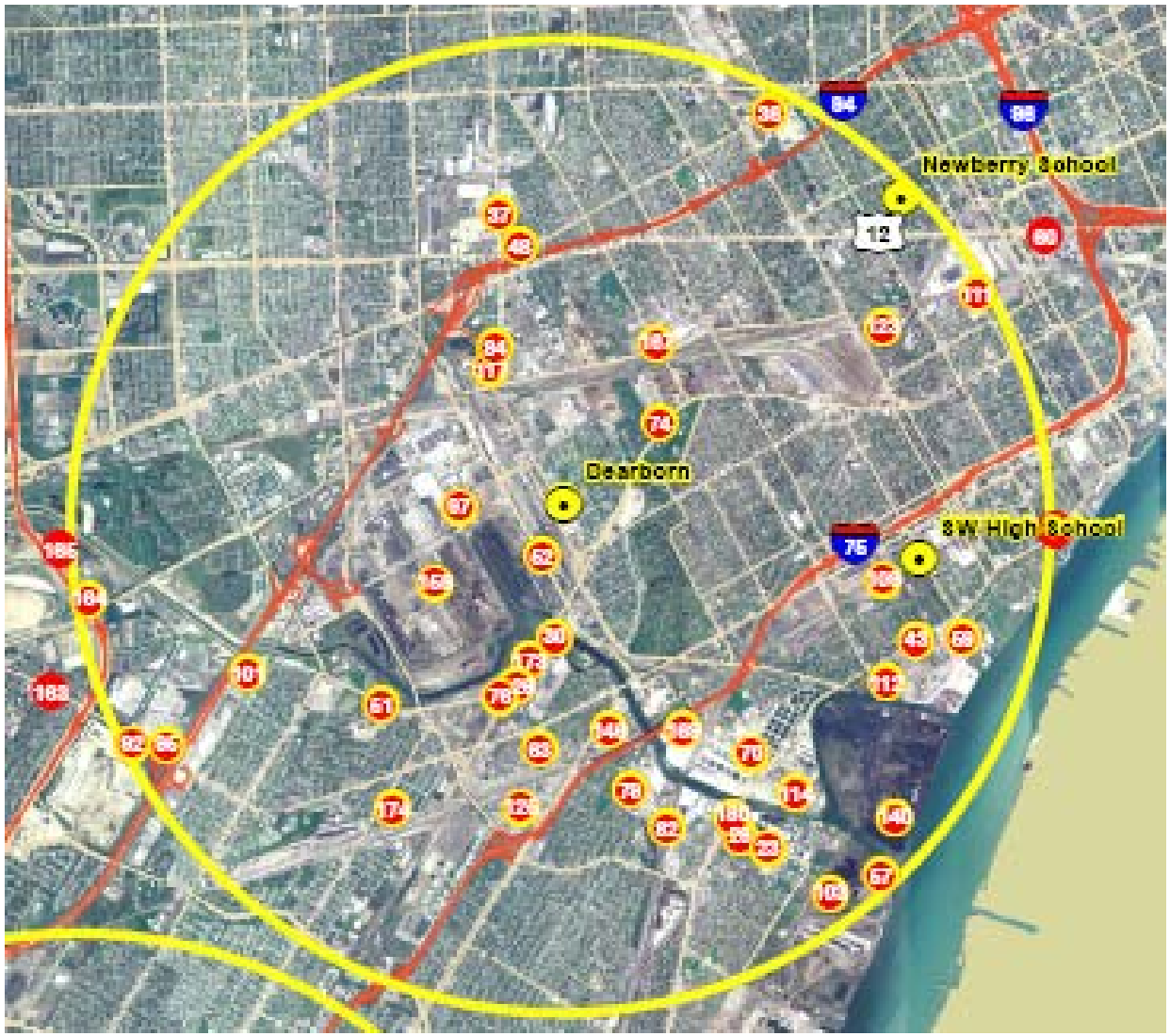
Monitor	County	Site	03-'05	04-'06	05-'07	Base Year Design Value*	2009 Design Value	Decrease
260990009	Macomb	New Haven	13	12.5	12.5	12.7	11.4	-1.3
261150005	Monroe	Luna Pier	14.1	13.8	13.8	13.9	12.2	-1.7
261250001	Oakland	Oak Park	14.3	13.4	13.6	13.8	12.4	-1.4
261470005	St. Clair	Port Huron	13.8	13.1	13.2	13.4	11.8	-1.6
261610008	Washtenaw	Ypsilanti	14.3	13.6	13.7	13.9	12.2	-1.7
261630001	Wayne	Allen Park	15.1	14.5	14	14.5	13	-1.5
261630015	Wayne	Southwest HS	16.4	15.8	15.5	15.9	14.2	-1.7
261630016	Wayne	Linwood	15.2	14.2	14.3	14.6	13.1	-1.5
261630019	Wayne	E. 7 Mile	14.8	14.1	14.1	14.3	12.9	-1.4
261630025	Wayne	Livonia	13.9	13.1	13.2	13.4	11.8	-1.6
261630033	Wayne	Dearborn	18.2	17.2	17.2	17.5	15.8	-1.7
261630036	Wayne	Wyandotte	15.4	14.3	14.3	14.7	13.1	-1.6
						** Average of three 3-year periods centered on 2005*		

Note: Modeling includes regional and national controls, not local controls

Source: LADCO Round 5 Modeling

Figure 3

Industrial Sources Within 3 Miles of Dearborn Monitor



Emissions point sources

3-mile radius around Dearborn

Figure 3: 2002 Annual NOx, PM10, SO2 and VOC, Dearborn Monitor, Wayne County Map, Continued

Data Source:

Monitoring data obtained from the "WayneSites/WUTMSand2002Tons" spreadsheet (State of Michigan).
Last Updates: February 25, 2005

2002 USGS True Color Orthoimagery

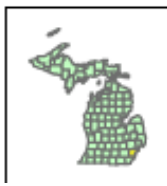
Three Mile Buffer Area
Wayne County Monitors

Wayne County Monitor's

Site Locations Within 3 Mile Buffer

Site Locations Outside 3 Mile Buffer

SITE NUMBER	FACILITY NAME	NOX / tons	PM10 / tons	SO2 / tons	VOC / tons
51	DARLING INTERNATIONAL	19	17	5	12
114	IPMC AQUISITION LLC	128	0	0	4
140	NATIONAL STEEL CORP	3785	698	4746	227
43	CROWN PLATING CO	0	0	0	0
152	REILLY PLATING/ MLOK INC	0	0	0	20
158	ROUGE STEEL CO	1307	267	252	51
97	FORD MOTOR CO ROUGE COMPLEX	41	16	0	244
82	FABRICON PRODUCTS INC	2	0	0	36
101	FRITO LAY INC	5	3	0	1
125	MARATHON ASHLAND PETROLEUM	1323	191	874	606
70	DETROIT WASTEWATER TREATMENT PLANT	276	42	52	52
29	CARMEUSE/ RIVER ROUGE	327	56	111	0
79	EQUILON ENTERPRISES DETROIT	0	0	0	36
59	DETROIT EDISON/ DELRAY POWER PLANT	17	0	0	1
57	DETROIT EDISON RIVER ROUGE	5143	38	16194	48
48	DAIMLERCHRYSLER MCGRAW	8	0	0	5
173	SUNOCO RIVER ROUGE	50	0	0	23
95	FORD MOTOR CO NEW MODEL PROGRAM CTR	2	0	0	0
23	BP PRODUCTS NORTH AMERICA RIVER ROUGE	0	0	0	52
26	CADILLAC ASPHALT PRODUCTS	7	0	1	10
180	UNITED STATES GYPSUM CO	24	6	0	1
30	CARMEUSE/DETROIT LIME	556	47	29	0
74	EDW C LEVY CO PLANT 1	0	1	0	0
169	ST MARY'S CEMENT	0	1	0	0
76	EDW C LEVY CO PLANT 6	0	0	0	0
146	OWENS CORNING TRUMBULL DIVISION	15	8	33	16
117	KASLE STEEL CORP	4	0	0	0
112	HONEYWELL	27	2	50	56
186	VISTEON TECHNICAL CENTER	5	0	0	2
37	COMPREHENSIVE ENVIRONMENTAL SOLUTIONS	0	0	0	0
167	SPARTAN INDUSTRIAL INC	0	0	0	2
109	GUTTER SUPPLIERS INC	1	0	0	16
103	FRITZ PRODUCTS	3	1	0	6
63	DETROIT SALT CO	0	1	0	0
36	COCA COLA BOTTLING CO	2	0	0	0
84	FERROUS ENVIRONMENTAL RECYCLING CORP	0	3	0	0
92	FORD MOTOR CO ALLEN PARK LANDFILL	0	0	0	3
123	MAGNI INDUSTRIES INC	0	0	0	22
111	HISPANIC MFG / GONZALEZ MFG	0	0	0	22
52	DEARBORN INDUSTRIAL GENERATION	484	78	870	5



SEMCOG

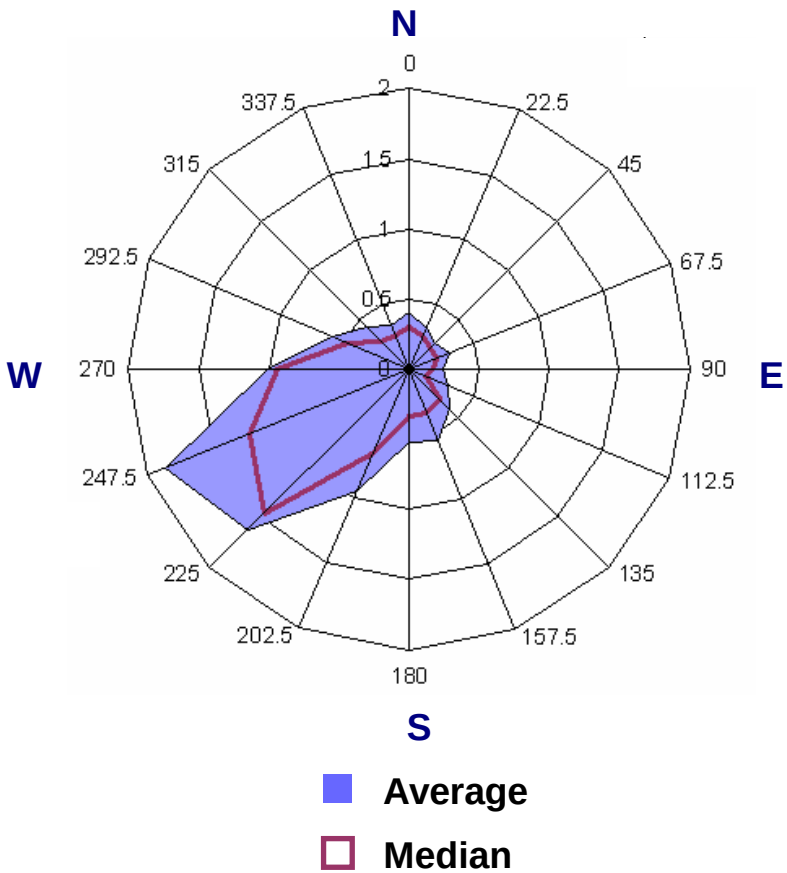
Copyright: SEMCOG, 2005

Figure 4

Location of Severstal in Relation to Dearborn Monitor

Figure 5

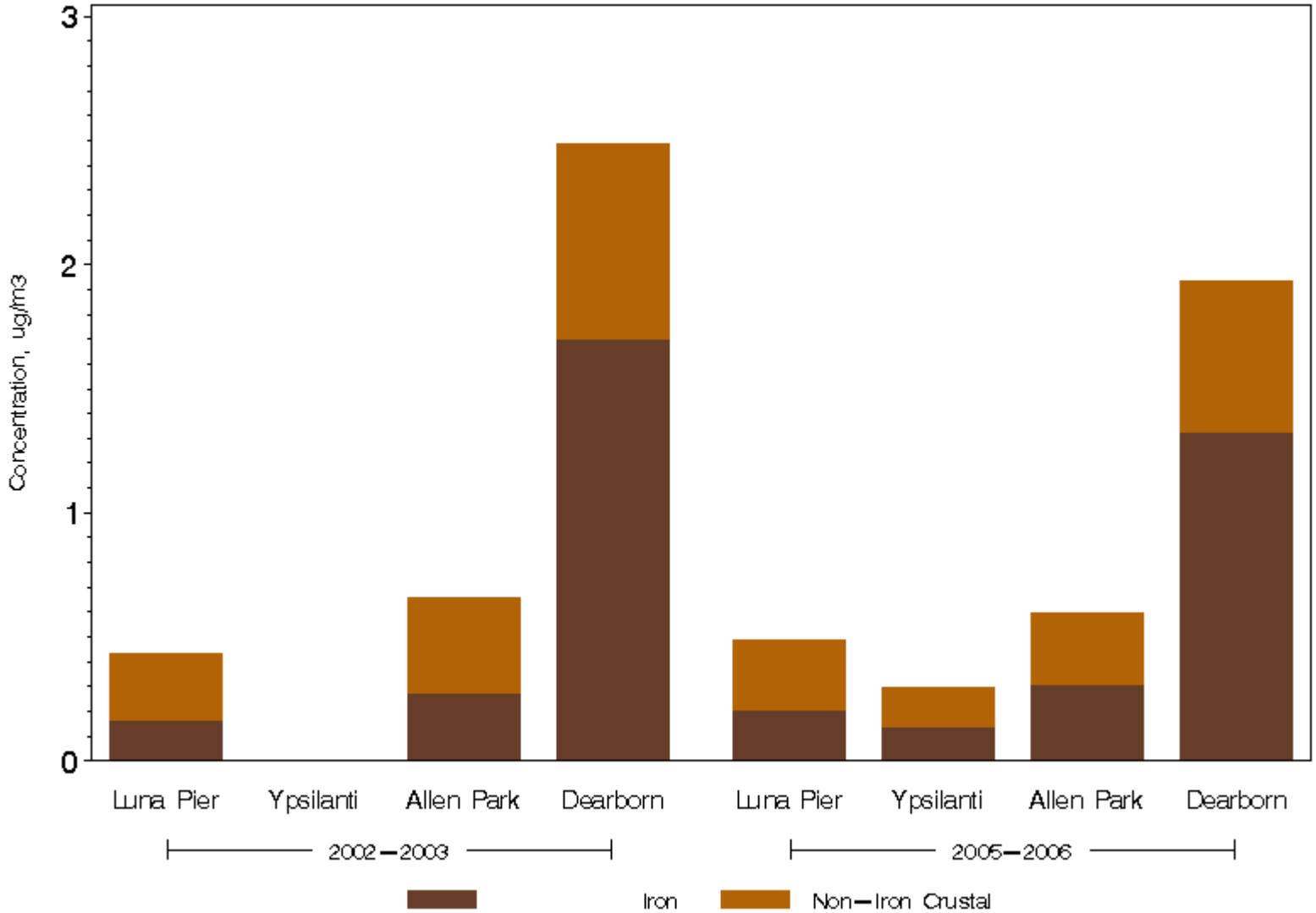
Pollution Rose for Iron at Dearborn 2003-2004



Average is nearly 2 ug/m^3 when winds are from the southwest.

Figure 6

Analysis of Crustal Concentrations in Southeast Michigan Iron vs. Non-Iron



Source: LADCO

Table 2:

Severstal Emissions for PM2.5 in tons per year (2002 Base year versus 2009 Potential)

Source Name	2002 past actual	2009 future potential	Net Change (tpy)
B BF Stoves (BFG)	19.42	21.95	2.53
C BF Stoves (BFG)	34.80	37.84	3.04
B BF Stoves (NG)	1.74	1.84	0.09
C BF Stoves (NG)	1.65	2.49	0.84
B BF Casthouse (Roof Monitor)	15.53	1.31	-14.22
C BF Casthouse (Roof Monitor)	27.11	3.27	-23.83
B BF Bleeders	0.12	0.12	0.01
C BF Bleeders	0.20	0.31	0.10
B BF Taphole Burning	0.14	0.15	0.01
C BF Taphole Burning	0.10	0.15	0.05
BF B Casthouse Baghouse Stack	0.00	5.63	5.63
BF C Casthouse Baghouse Stack	0.00	11.25	11.25
Lime Unloading - BOF Receiving	2.63	2.63	0.00
Reladling South - STACK	3.12	0.00	-3.12
Reladling South - FUGITIVES	1.08	1.45	0.37
Torch Cutting	1.99	0.00	-1.99
BOF Natural Gas	1.98	2.66	0.68
BOF ESP Stack	147.72	162.88	15.16
BOF Secondary Emiss. Baghouse	0.00	6.20	6.20
BOF Tapping (Roof Monitor)	125.27	1.95	-123.32
BOF Slag Tap (Roof Monitor)	8.57	0.13	-8.44
BOF Charging (Roof Monitor)	40.79	2.19	-38.59
Desulfurization - STACK	3.84	3.84	0.00
Desulfurization - FUGITIVES	2.96	3.98	1.02
#1 LRF Stack	29.68	29.68	0.00
#2 LRF Stack	16.96	16.96	0.00
DD Baghouse - Coke Transfer	3.75	3.75	0.00
EE Baghouse - Coke Unloading	4.69	4.69	0.00
EE Baghouse - Natural Gas	0.02	0.03	0.01
Raw Material Handling	4.38	4.38	0.00
Annealing Furnaces	4.42	6.08	1.66
Reheat Furnace #1	11.84	12.97	1.13
Reheat Furnace #2	11.84	12.97	1.13
Reheat Furnace #3	11.84	12.97	1.13
Hand Scarfing	13.14	17.66	4.52
B BF Slag Pit	0.01	0.01	0.00
C BF Slag Pit	0.02	0.04	0.01
Desulfurization Slag Pit	0.07	0.10	0.03
Parts Cleaning	0.00	0.00	0.00
Maintenance Paint Booth	0.00	0.00	0.00
J-9 Dip Tank	0.00	0.00	0.00
Fine Coal Silo Baghouse	0.00	1.16	1.16
Filter #4 (Pulverizer Baghouse)	0.00	3.00	3.00
Rail Unloading Baghouse	0.00	1.88	1.88
Raw Coal Silo Baghouse	0.00	0.34	0.34
Rail Car Building Heater	0.00	0.82	0.82
Pulverizer Hot Gas Generator	0.00	0.82	0.82
Process Fugitives	0.00	1.28	1.28
Severstal Emissions Totals	**553.43**	**405.81**	**-147.62**

- Emissions for PM2.5 calculated using RTI's (2006) PM2.5-fil ratio: PM.
- Highlighted numbers indicate past actual emissions that used RTI (2006) emission factors instead of those reported by Severstal North America (from PTI #182-05B).
- For additional details see Appendix G

Source: MDEQ

Table 3: Emissions reductions near Dearborn and SWHS monitors

Company	Equipement	Change Date	Nox (tpy)	SO2 (tpy)	Filterable PM (tpy)	PM (TPY)	PM10 (tpy)	Filterable PM2.5 (tpy)	HC,CO
Marathon Petroleum Co	CO Boiler[1]	Nov-03		-184.4	-10.11				
	FCCU Controls[1]	Dec-04	-242	-389	-84.04				
	BT Inter Heater[1]	Nov-05	-14						
	BT Charge Heater[1]	Nov-05	-9						
	Crude/Vac Heater[1]	Nov-05	-145						
	Street sweeping[2]					-64.1	-12.9		
	Retired offsets[2]						-71		
	Total		-410	-573.4	-94.2	-64.1	-83.9		
US Steel Corp	Blast furnace B bag house[3]	Sep-05				-76.5			
Severstal North America	Blast furnace C[4,8]	Oct-07	-81.5	702.9	-50.7			-8.5	
	Blast furnace B[4,8]	Jul-08	-31.0	256.6	-34.7			-5.9	
	BOF[4,9]	Oct-07	67.9	0.1	-496.8			-148.3	
	Torch cutting[4]	2007			-2.0			-2.0	
	Reladling[4]	2007			-12.0			-2.8	
	annealing and reheat furnaces[4]	2007	60.6	0.3	5.1			5.0	
	Coal pulverization[4]	2007	21.5	0.1	16.6			9.3	
	other[4]	2007	0.1		15.7			5.6	
	Total		37.6	960.0	-558.8			-147.6	
--	28 Switch yard locomotives anti-idling controls[5]	2007-2008	96			2.8			
--	4 Swith yard locomotives-engine rebuild[6]	2007-2008	66			1.8			
--	School bus (diesel oxidation catalyst and crankcase filter)[7]					20% reduction/ bus			50% reduction/ bus

[1] NSR Settlement Agreement w ith Marathon Petroleum Company (reported in MDEQ PTI #388-07)
[2] MDEQ Permit to Install (PTI) application Heavy Oil Upgrade Project #388-07 for Marathon Petroleum Company
[3] MDEQ Consent Order 1-2005 and ROP 199600123a for United States Steel
[4] MDEQ Permit to Install #182-05B for Severstal North America, Inc.
[5] Supplemental Environmental Project (SEP) for Chrysler
[6] Funding from the Federal Congestion Mitigation Air Quality (CMAQ) Program
[7] Funded by Severstal SEP, Clean School Bus federal grants, and possible additional buses from Marathon PTI application #388-07
[8] Used 0.15 emissions factors (Severstal uses 0.09) for blast furnace cast house roof monitors prior to control retrofits (RTI, 2006)
[9] Used 0.23 emissions factor (Severstal uses 0.046) for BOF tapping and 0.15 emissions factor (Severstal uses 0.030) for BOF charging (RTI, 2006)

Source: MDEQ

Table 4

Recent Plant Closings
Dearborn & SWHS Monitoring areas

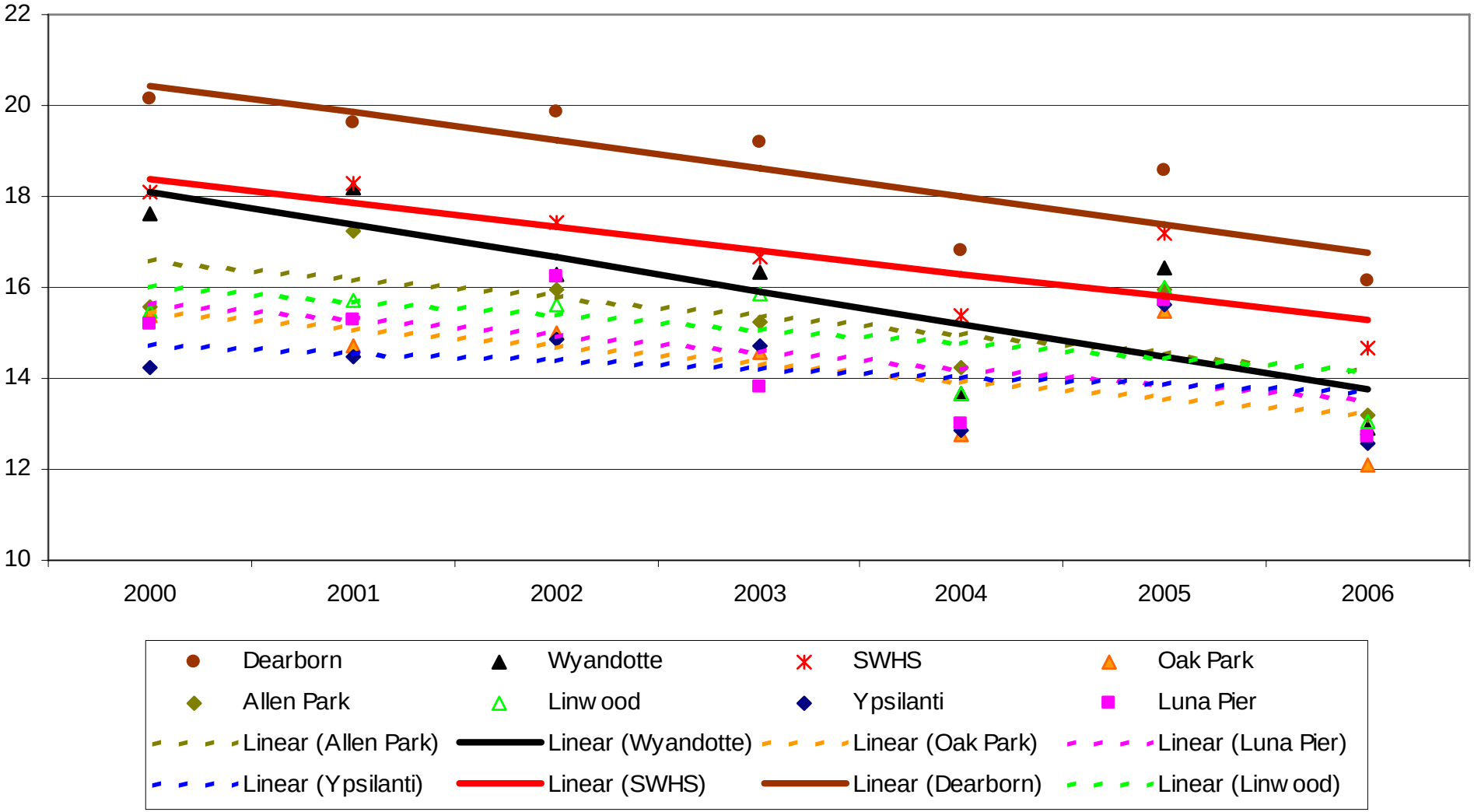
Facility	Last Year Reported	2002 (tons/year)					Current (tons/year)					Difference (tons/year)				
		NOx	SO2	PM25	PM10	VOC	NOx	SO2	PM25	PM10	VOC	NOx	SO2	PM25	PM10	VOC
Carmeuse/ Detroit Lime	2002	555.98	29.14		5.87	0.00						555.98	29.14		5.87	
Daimler Chrystler McGraw Glass	2003	8.25	0.05			5.32						8.25	0.05			5.32
Frito Lay	2003	4.54	0.02		2.13	1.15						4.54	0.02		2.13	1.15
IPMC Acquisition	2003	128.08	0.40			3.71						128.08	0.40			3.71
Gutter Supliers, Inc	2004	0.73	0.00			1.56						0.73	0.00			1.56
Darling International*	2005	19.48	5.25		16.94	12.48	5.54	0.91	0.23	0.51	9.04	13.95	4.34	-0.23	16.43	3.44
Honeywell	2005	39.21	37.60			82.15					0.37	39.21	37.60			81.78
Total												750.74	71.56	-0.23	24.43	96.97

*Partial plant closing

Source: MDEQ

Figure 7

Trends in Southeast Michigan PM2.5 Monitoring Data
Industrial vs. Non-Industrial Sites



Source: LADCO

Table 5

Estimate of Potential Emission Reductions from Diesel Switch Engine Retrofits in Dearborn Area

AERMOD Hot Spot Modeling Results - 2008

Railyard	Switch Engine Locomotives Being Retrofitted				Retrofit of all Switch Locomotives		Estimated Reduction in PM2.5 Concentrations		
	Number of Engines	Type of Retrofit	Funding Source	PM2.5 emission reduction per locomotive	Average PM Reduction (tons/day)[2]	PM Reduction (lb/day)	Dearborn µg/m³	SWHS µg/m³	Wyandotte µg/m³
CSX	4	Retrofit of conventional diesel locomotive with Generator Set (GENSET) engine technology	80% Federal Congestion Mitigation Air Quality (CMAQ) Program, 20% CSX	0.46 tons/year[1]	0.0055	10.99	0.905	0.017	0.002
Norfolk Southern	12	Teleflex Ecotrans APU technology	Chrysler SEP	.07 tons/year[2]	0.0025	5.01	0.006	0.002	0.001
U.S. Steel (River Rouge and Ecorse)	16	Kim HotStart APU's along with the ZTR SmartStart systems	Chrysler SEP	.07 tons/year[2]	0.0033	6.69	0.005	0.013	0.004
Total	32				0.0113	22.69	0.916	0.032	0.007

[1]CSX CMAQ funding application. Submitted to SEMCOG on September 7, 2007.

[2]EPA, Case Study: Chicago Locomotive Idle Reduction Project, March, 2004. 335 average switch engine service days/year, reduction of 2.4 tons NOx and 0.07 tons of PM per retrofitted engine per year.

Source: SEMCOG & MDEQ

Figure 8

Location of Rail Yards and PM2.5 Monitors in Dearborn Area

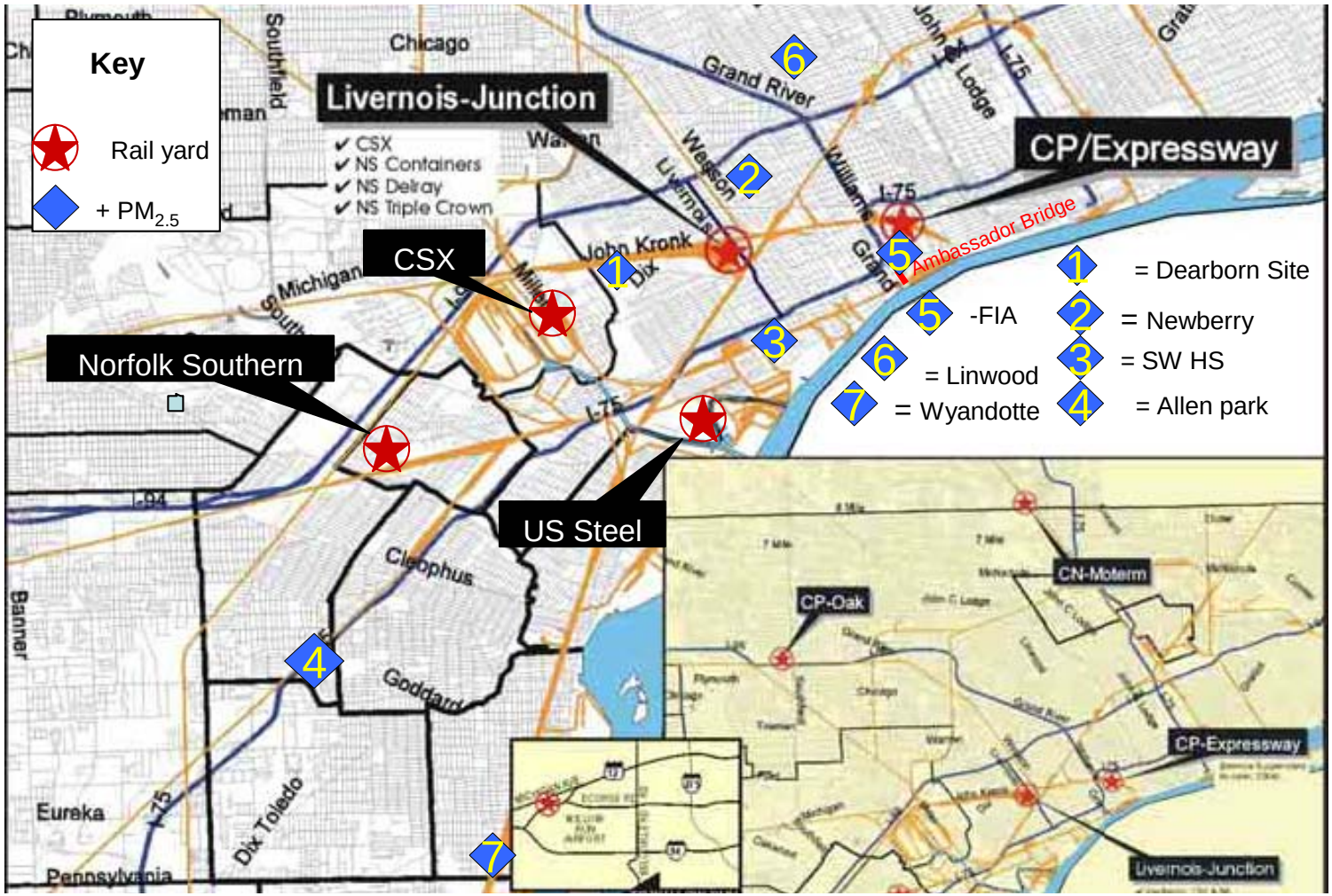
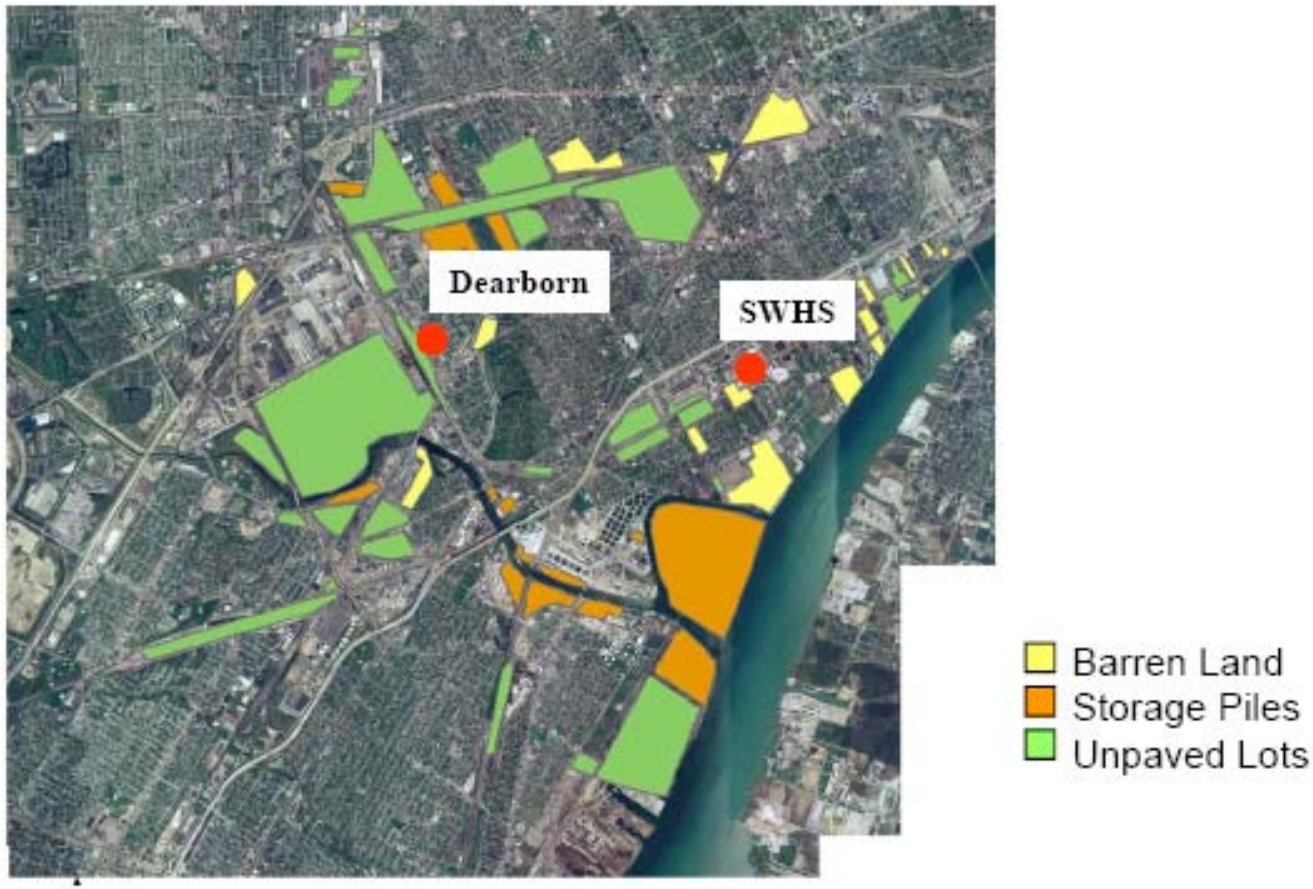


Figure 9

Fugitive Dust Sources

in Vicinity of Dearborn & SWHS Monitors



Source: SEMCOG

Table 6

SO2 and NOx RACT model run for Michigan's seven county non-attainment area.

MICHIGAN RACT-RACM ANALYSIS				
(ASSUMES 100% NOx/SO2 CUTS IN 7-COUNTY SE MICHIGAN - ALL SOURCES)				
	Monitored			
	2005 Base	RRF	2005 RACM	Net Reduction
	ug/m3		ug/m3	ug/m3
Dearborn	**18.55**	**0.945**	**17.54**	**1.01**
West Fort	17.21	0.945	16.27	0.94
Wyandotte	16.41	0.945	15.51	0.90
Linwood	16.01	0.945	15.14	0.87
Port Huron	15.09	0.942	14.22	0.87
Allen Park	15.94	0.945	15.07	0.87
New Haven	14.37	0.942	13.54	0.83
Ypsilanti	15.61	0.950	14.82	0.79
Livonia	14.94	0.950	14.19	0.75
Ann Arbor	13.20	0.950	12.54	0.66
East 7 Mile	16.48	0.960	15.82	0.66
Luna Pier	15.70	0.958	15.05	0.65
Oak Park	15.46	0.960	14.84	0.62
Lansing	13.54	0.959	12.98	0.56
Flint	12.89	0.973	12.54	0.35
Bay City	12.44	0.972	12.09	0.35
Kalamazoo	13.83	0.976	13.50	0.33
Saginaw	11.72	0.972	11.39	0.33
Jenison	13.99	0.978	13.68	0.31
Grand Rapids	13.72	0.978	13.42	0.30
Holland	12.39	0.979	12.13	0.26
Coloma	13.05	0.982	12.81	0.24
Muskegon	13.07	0.982	12.84	0.23
Sault Ste Marie	8.16	0.982	8.01	0.15
STATEWIDE AVERAGE				**0.58**

Source: MDEQ

Table 7

Change in Southeast Michigan PM2.5 Concentrations

Monitoring Site	3 Yr. Average		Change	Percent Change
	2001-2003	2005-2007		
Dearborn	**19.5**	**17.2**	2.3	-12%
SW HS	**17.5**	**15.5**	2.0	-11%
Wyandotte	**16.9**	14.3	2.6	-15%
Allen Park	**16.1**	14.0	2.1	-13%
Linwood	**15.7**	14.3	1.4	-9%
Luna Pier	**15.1**	13.8	1.3	-9%
Oak Park	14.8	13.6	1.2	-8%
Ypsilanti	14.7	13.7	1.0	-7%
Livonia	14.4	13.2	1.2	-8%
E 7 Mile	15.0	14.1	0.9	-6%
Port Huron	14.0	13.2	0.8	-6%
New Haven	13.3	12.5	0.8	-6%
Regional Average	15.6	14.1	1.5	-9%

Source: Compiled by SEMCOG using MDEQ monitoring data

Table 8

PM2.5 Monitoring Data Summary: Annual PM2.5

Lowest concentration at this site

Time Period	Year	Dearborn	SW HS	Wyandotte	Allen Park	Linwood	Luna Pier	Oak Park	Ypsilanti	Livonia	E 7 Mile	Port Huron	New Haven	Newberry	FIA
1st Quarter Average	2000	**22.76**	**20.34**	**19.30**	**16.99**	**17.67**	**16.92**	**18.57**	**16.82**	**16.53**		**17.04**	**16.26**		
	2001	**20.95**	**19.33**	**21.49**	**20.05**	**17.19**	**16.24**	**15.58**	**15.92**	**15.39**	14.58	13.65	14.75		
	2002	**20.99**	**16.80**	**15.40**	**15.32**	**15.04**	14.99	12.73	14.71	13.33	14.39	12.13	11.86		
	2003	**22.59**	**17.41**	**15.07**	**17.37**	**18.36**	**15.93**	**18.39**	**16.70**	**15.96**	**17.05**	**18.73**	14.47		
	2004	**17.71**	14.95	14.48	**15.41**	14.87	13.02	13.73	13.74	12.72	13.23	11.44	11.82		
	2005	**21.50**	**20.20**	**16.96**	**18.45**	**18.92**	**16.50**	**17.49**	**17.49**	**17.86**	**19.82**	**16.76**	**15.21**	**16.38**	
	2006	**18.79**	**16.98**	15.10	13.70	13.04	14.55	13.51	14.80	13.34	**15.20**	**15.52**	13.68		14.78
	2007	**18.84**	**15.15**	13.75	12.92	13.98	12.26	12.48	12.95	12.23	13.20	12.64	12.37	13.63	13.83
	2008*	**16.59**	**16.07**	12.55	13.86	14.59	13.25	13.59	13.23	13.56	13.60	13.66	13.27	14.00	14.26
2nd Quarter Average	2000	**20.13**	**17.04**	**16.52**	13.69	13.82	14.54	14.79	12.85	14.08	13.93	14.65	12.76		
	2001	**18.58**	**20.05**	**17.53**	**16.68**	**15.66**	**16.58**	**17.30**	**15.46**	**15.67**	14.88	**16.26**	14.68		
	2002	**18.15**	**17.42**	**15.98**	**16.15**	**15.61**	**17.77**	**17.29**	14.57	14.26	**15.83**	14.03	13.37		
	2003	**19.03**	**15.39**	**20.37**	**15.25**	**15.33**	12.84	13.79	**15.05**	**15.36**	14.80	13.11	12.92		
	2004	**16.10**	**15.01**	12.74	12.22	12.10	**12.61**	11.26	11.76	11.98	12.47	12.81	11.49		
	2005	**16.57**	14.73	14.93	13.77	14.78	13.40	13.77	14.27	11.74	14.48	14.73	14.21	14.60	
	2006	12.85	12.26	10.95	11.59	11.58	10.91	10.40	10.67	11.23	10.39	10.71	9.65	10.10	11.71
	2007	**15.20**	13.05	12.41	10.28	12.12	11.41	12.27	11.68	10.59	11.16	9.97	9.58	12.85	12.98
	2008														
3rd Quarter Average	2000	**17.56**	**16.29**	**15.64**	14.46	13.52	14.33	11.88	13.21	13.28	13.74	12.83	12.43		
	2001	**18.27**	**17.67**	**18.53**	**17.46**	**16.57**	**15.68**	14.81	14.15	**15.14**	14.76	14.12	13.18		
	2002	**20.22**	**18.27**	**16.51**	**17.33**	**16.78**	**15.96**	**16.07**	**16.43**	**16.47**	**17.86**	**16.28**	**15.19**		
	2003	**17.83**	**16.68**	**16.37**	**15.11**	14.94	14.36	13.66	14.39	13.89	13.98	13.05	13.08		
	2004	**17.46**	**17.69**	**15.91**	**16.18**	14.78	14.83	14.78	14.17	14.13	**15.44**	13.18	14.23		
	2005	**18.22**	**18.73**	**18.58**	**17.15**	**16.62**	**19.78**	**17.61**	**17.69**	**17.45**	**17.43**	**16.47**	**16.14**	**17.66**	**18.20**
	2006	**15.56**	14.93	13.69	13.76	12.58	12.98	10.76	13.12	10.01	11.78	9.09	9.50	14.34	14.20
	2007	**16.02**	15.12	14.60	13.76	14.74	14.87	14.68	13.78	13.76	14.36	14.49	13.33	15.35	14.65
	2008														

***Note**: The first quarter of 2008 for Dearborn, normally the highest quarter of the year, is 2.25 ug/m^3 lower than 2007 first quarter data. All the other monitors except Dearborn and Wyandotte increased from 2007 first quarter data.

Source: MDEQ

Table 8: Continued

Lowest concentration at this site

Time Period	Year	Dearborn	SW HS	Wyandotte	Allen Park	Linwood	Luna Pier	Oak Park	Ypsilanti	Livonia	E 7 Mile	Port Huron	New Haven	Newberry	FIA
4th Quarter Average	2000	**20.06**	**18.71**	**19.07**	**17.08**	**16.94**	14.96	**16.31**	14.16	14.46		12.87	12.22	---	---
	2001	**20.63**	**16.07**	**15.26**	14.79	13.47	12.69	12.23	12.44	12.18	13.79	11.81	11.78	---	---
	2002	**20.00**	**17.20**	**17.24**	**15.02**	14.95	**16.30**	13.90	13.72	13.43	14.48	12.91	12.98	---	---
	2003	**17.34**	**17.26**	13.45	13.17	14.78	12.01	12.48	12.78	11.59	13.01	12.11	10.92	---	---
	2004	**16.06**	13.90	11.52	13.14	13.00	11.47	11.26	11.79	11.45	11.76	10.99	10.29	---	---
	2005	**17.90**	**15.18**	**15.19**	14.38	13.70	13.10	12.99	13.00	12.68	14.20	12.41	11.94	---	14.25
	2006	**17.30**	14.56	11.94	13.70	14.97	12.45	13.78	11.61	12.46	13.46	12.86	12.27	11.98	11.84
	2007	**17.49**	14.82	13.47	14.08	14.61	13.78	13.89	13.51	14.42	13.31	12.64	12.46	14.23	13.86
	2008														
Annual Average	1999	**16.82**	**17.57**	**16.28**	**16.66**	**17.08**		14.16	14.19	13.07		13.16	12.66	---	---
	2000	**20.13**	**18.10**	**17.63**	**15.56**	**15.49**	**15.19**	**15.39**	14.26	14.59	14.51	14.35	13.42	---	---
	2001	**19.61**	**18.28**	**18.20**	**17.25**	**15.72**	**15.30**	14.70	14.49	14.60	14.50	13.96	13.60	---	---
	2002	**19.84**	**17.42**	**16.28**	**15.96**	**15.60**	**16.26**	**15.00**	14.86	14.37	**15.64**	13.84	13.35	---	---
	2003	**19.20**	**16.69**	**16.32**	**15.23**	**15.85**	13.79	14.58	14.73	14.20	14.71	14.25	12.85	---	---
	2004	**16.83**	**15.39**	13.66	14.24	13.69	12.98	12.76	12.87	12.57	13.23	12.11	11.96	---	---
	2005	**18.55**	**17.21**	**16.42**	**15.94**	**16.01**	**15.70**	**15.47**	**15.61**	14.93	**16.48**	**15.09**	14.38	---	---
	2006	**16.13**	14.68	12.92	13.19	13.04	12.72	12.11	12.55	11.80	12.71	12.04	11.28	---	13.13
	2007	**16.89**	14.54	13.59	12.76	13.86	13.08	13.33	12.98	12.75	13.01	12.44	11.94	14.02	13.83
	2008														
3-Year Average	99-01	**18.9**	**18.0**	**17.4**	**16.5**	**16.1**	**15.2**	14.7	14.3	14.1		13.8	13.2	---	---
	00-02	**19.9**	**17.9**	**17.4**	**16.3**	**15.6**	**15.8**	**15.0**	14.5	14.5	14.9	14.0	13.5	---	---
	01-03	**19.5**	**17.5**	**16.9**	**16.1**	**15.7**	**15.1**	14.8	14.7	14.4	**15.0**	14.0	13.3	---	---
	02-04	**18.6**	**16.5**	**15.4**	**15.1**	**15.0**	14.3	14.1	14.2	13.7	14.5	13.4	12.7	---	---
	03-05	**18.2**	**16.4**	**15.5**	**15.1**	**15.2**	14.2	14.3	14.4	13.9	14.8	13.8	13.1	---	---
	04-06	**17.2**	**15.8**	14.3	14.5	14.2	13.8	13.4	13.7	13.1	14.1	13.1	12.5	---	---
	05-07	**17.2**	**15.5**	14.3	14.0	14.3	13.8	13.6	13.7	13.2	14.1	13.2	12.5	13.2	---

Source: MDEQ

Table 9

PM2.5 Speciation Trends

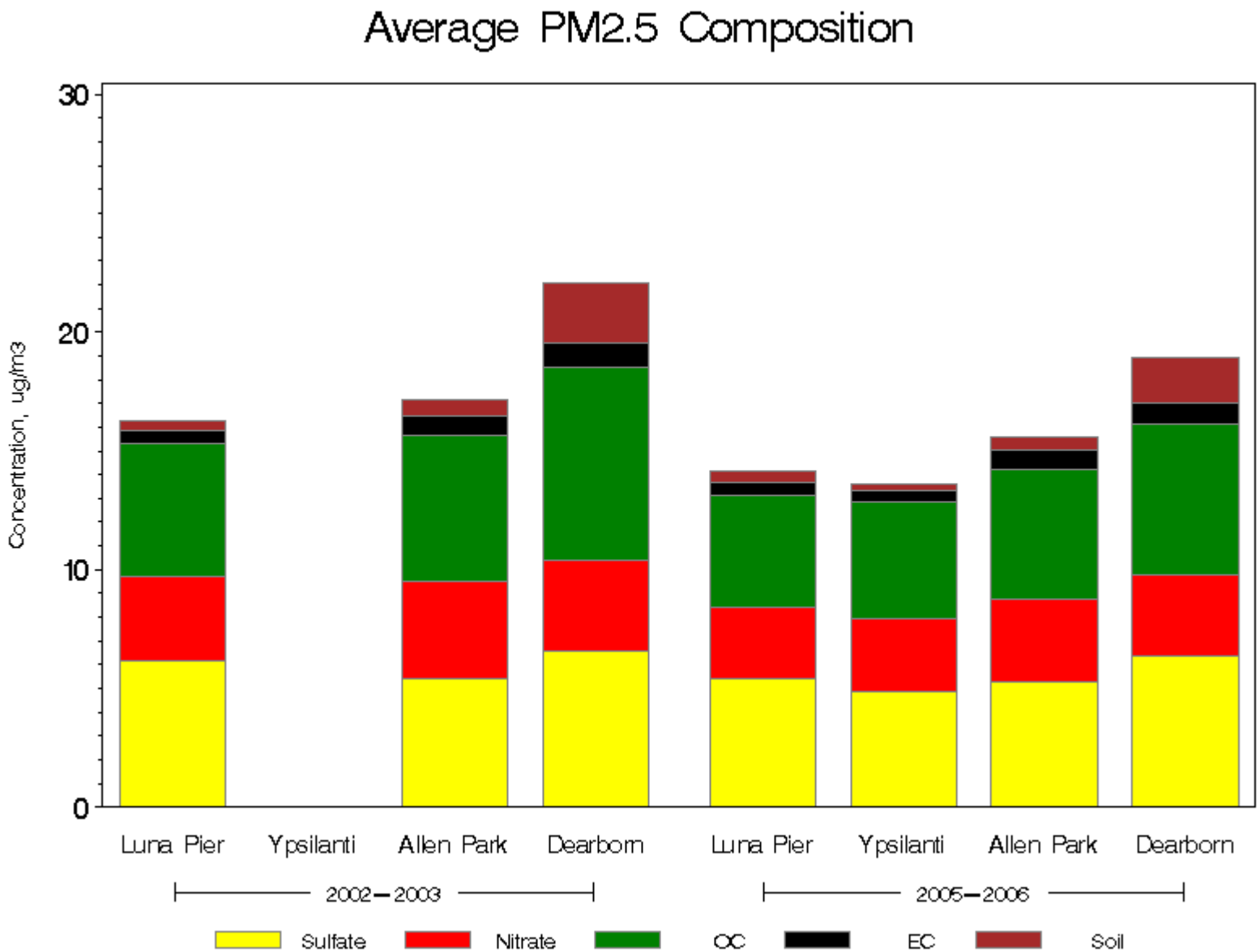
ug/m3/year

Species	Allen Park Jan '01-Dec '06	Dearborn May '02 – Dec '06	Luna Pier May '02 - Dec '06	Ypsilanti June '03 – June '05
Nitrate	**-0.16**	-0.11	-0.19	0.34
Sulfate	**-0.17**	-0.19	-0.22	-0.09
EC	0.01	-0.04	0.007	-0.01
OC	**-0.17**	**-0.54**	**-0.22**	-0.43
Soil	**-0.019**	-0.08	**0.008**	-0.00
FRM PM2.5 (1999-2005)	**-0.32**	**-0.56**	-0.32	**-0.12**

Significant trends in bold.

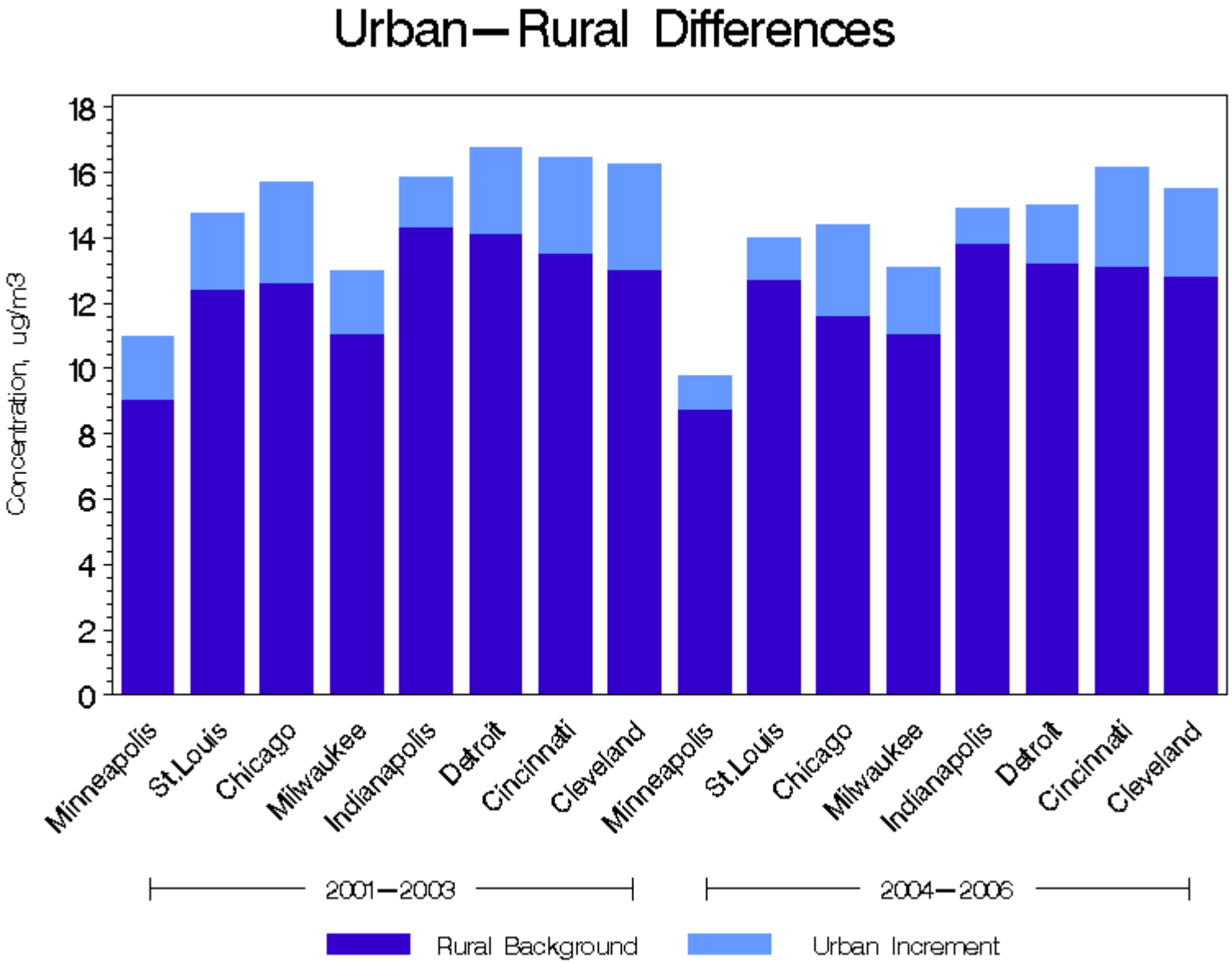
Source: LADCO

Figure 10



Source: LADCO

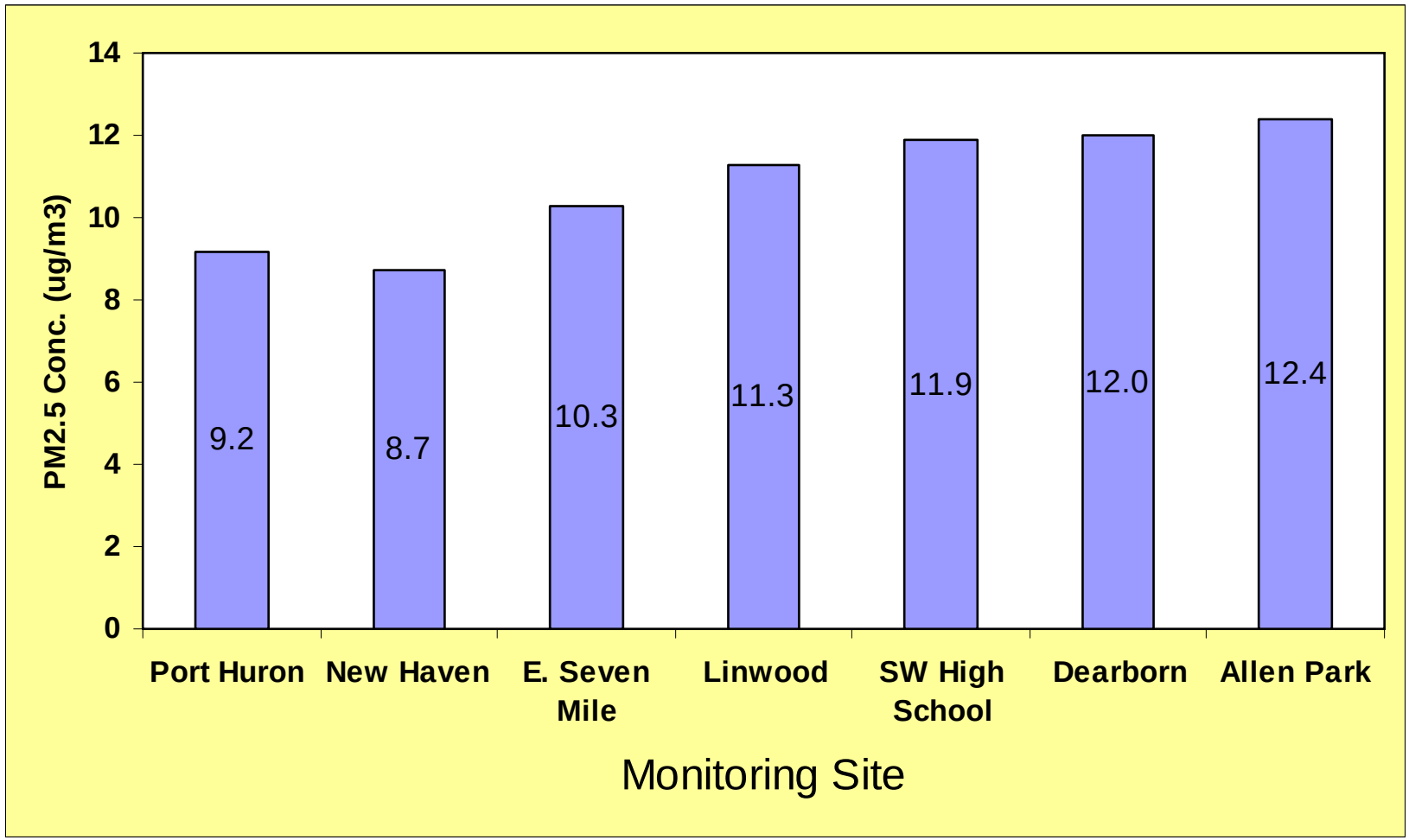
Figure 11



Source: LADCO

Figure 12

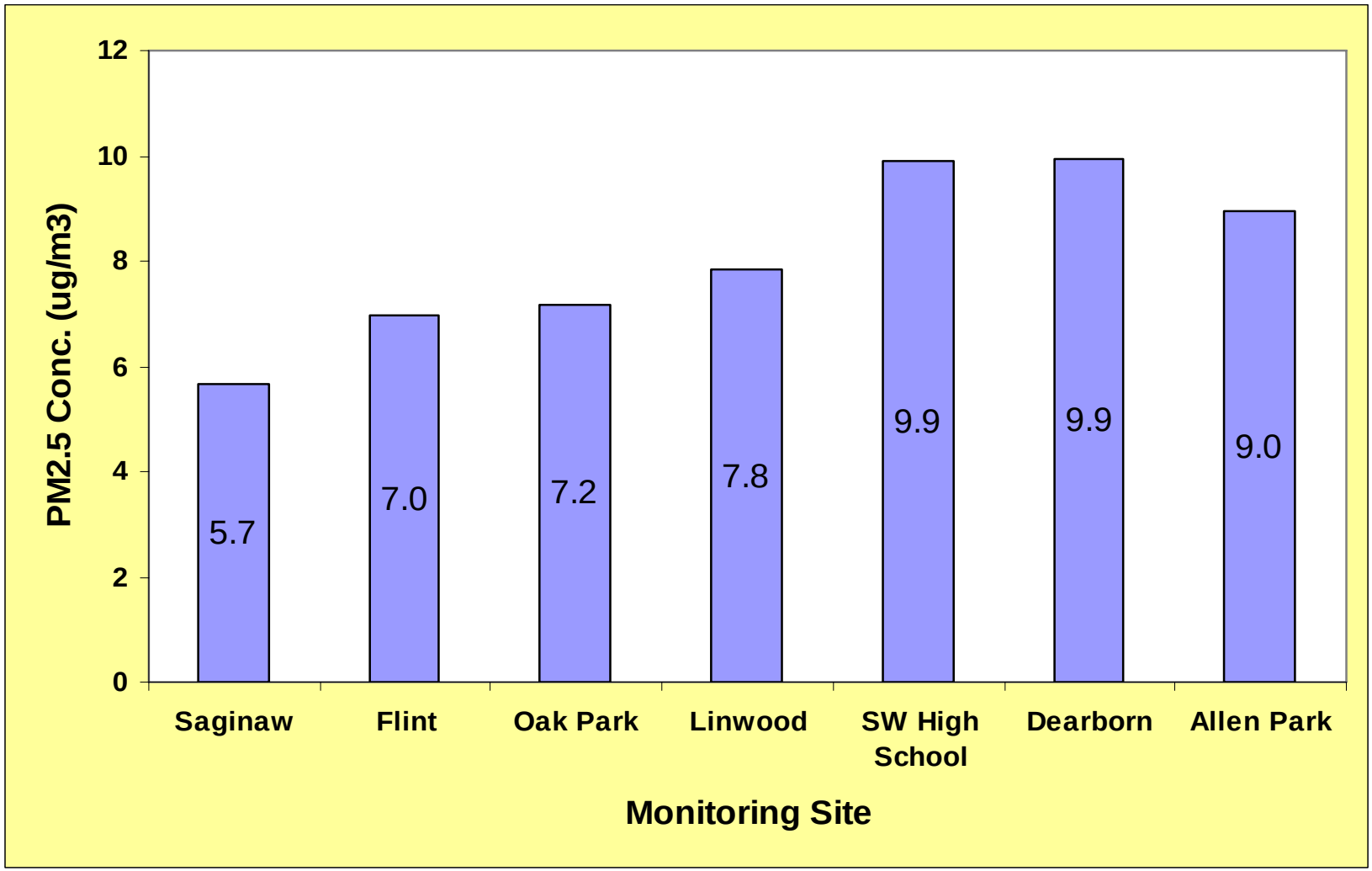
Average PM2.5 Concentrations
When Winds Are From Northeast (0-60°)
2001 - 2006



Source: SEMOS

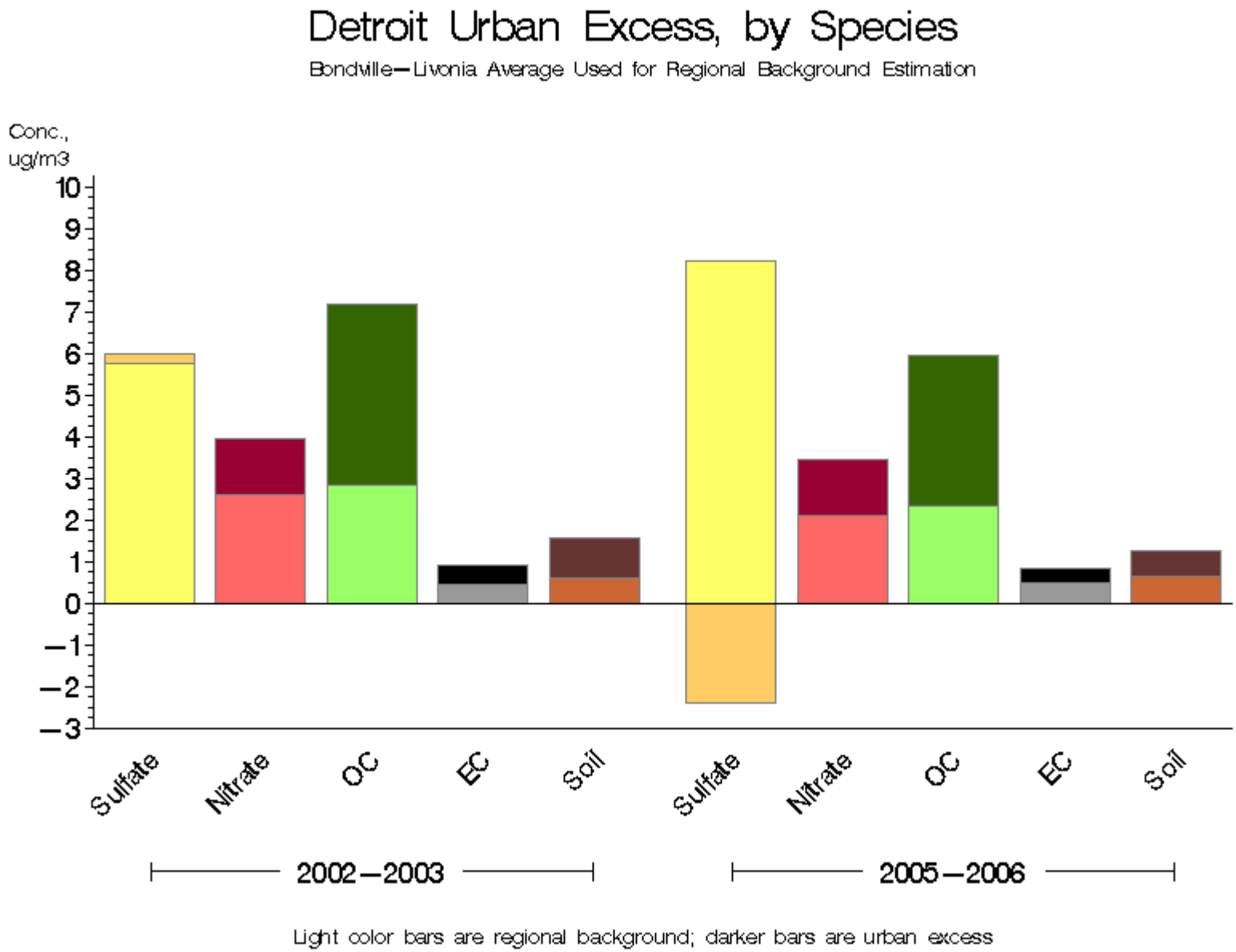
Figure 13

Average PM2.5 Concentrations
When Winds Are From Northwest (300-360º)
2001 - 2006



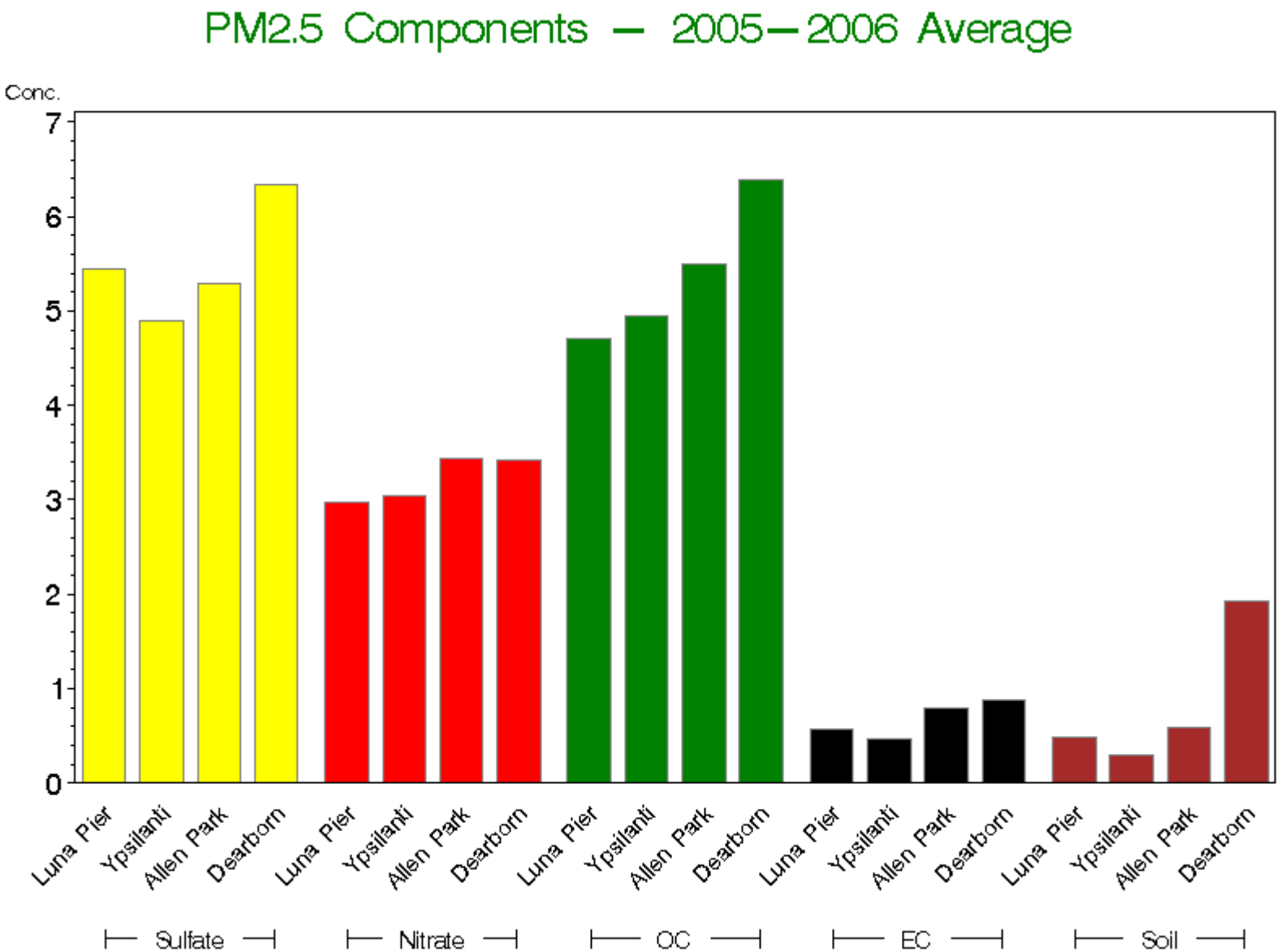
Source: SEMOS

Figure 14



Source: LADCO

Figure 15



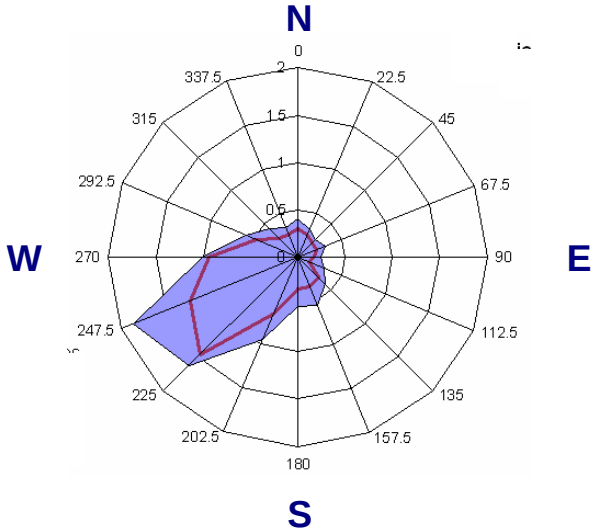
Source: LADCO

Figure 16

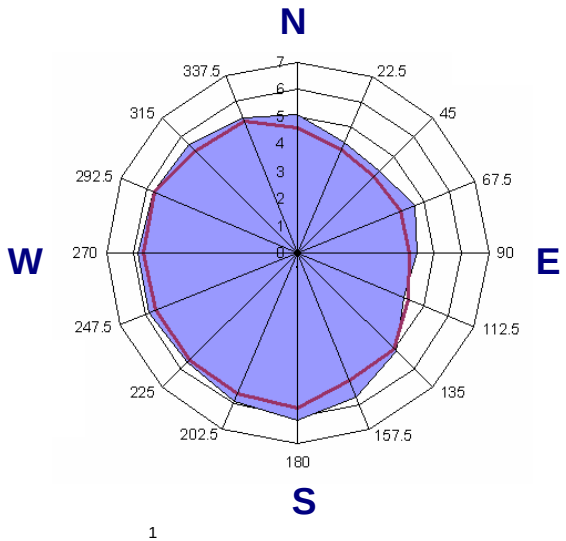
Pollution Roses

2003-2004

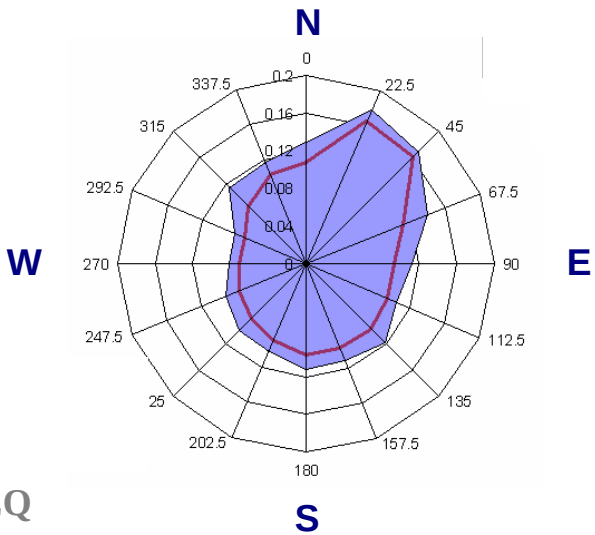
Iron – Dearborn



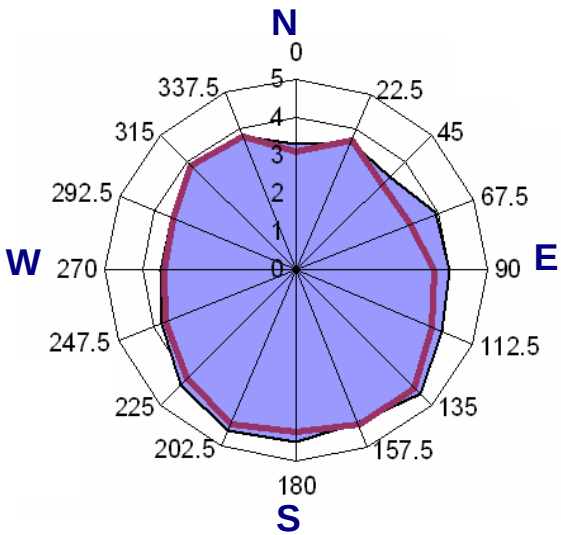
Organic Carbon - Dearborn



Iron – Allen Park



Organic Carbon – Allen Park

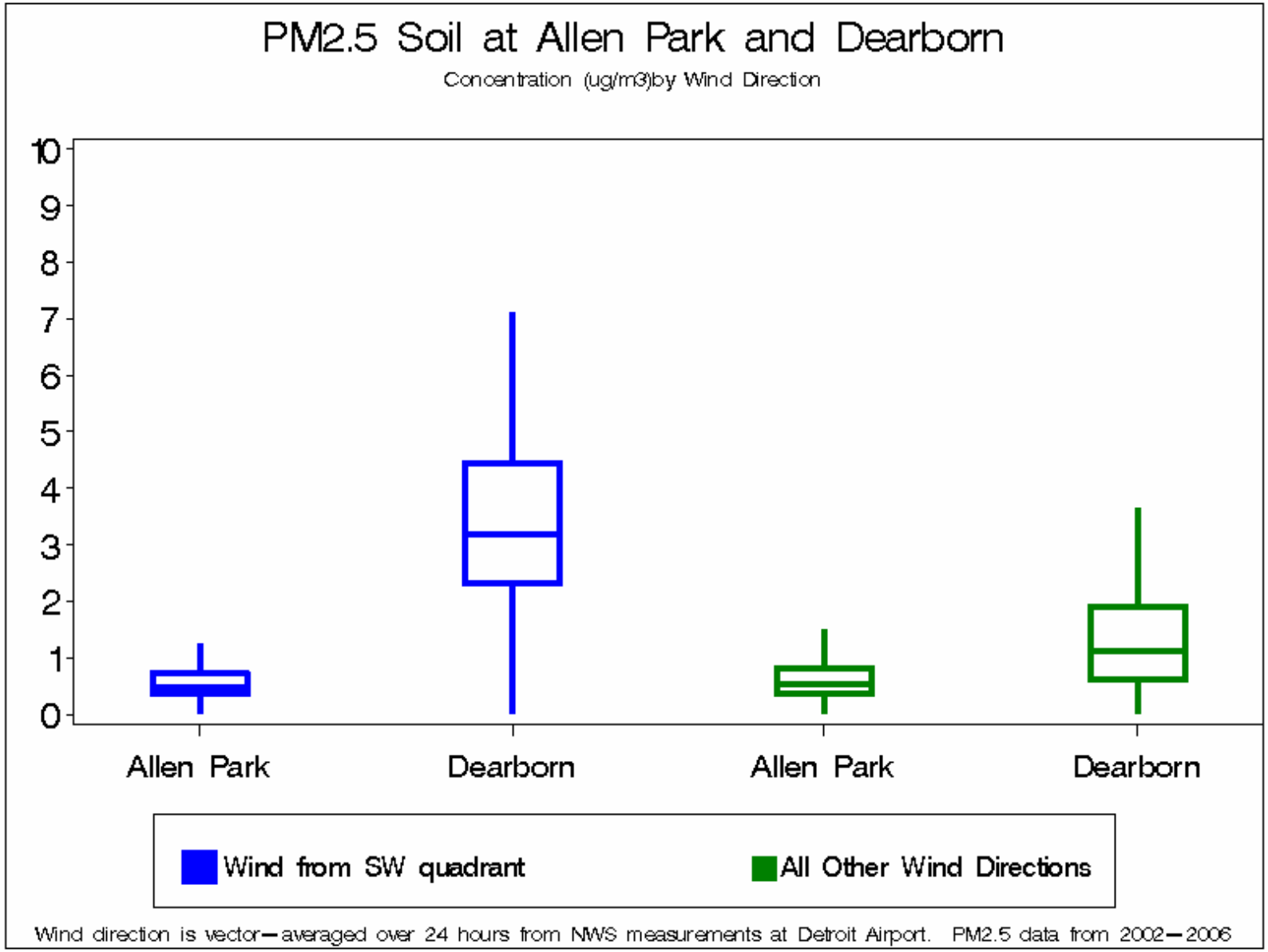


Average

Median

Source: MDEQ

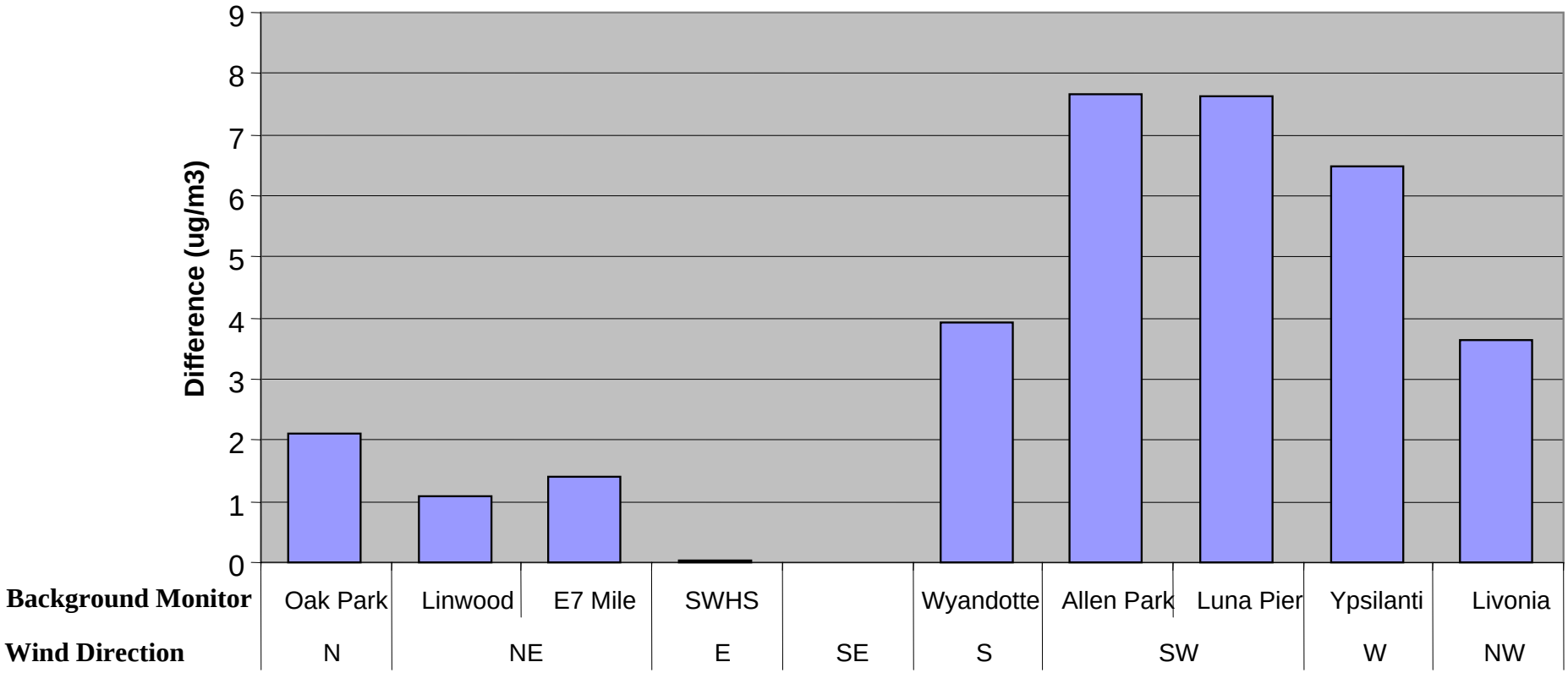
Figure 17



Source: LADCO

Figure 18

Average Difference in Concentrations Between Dearborn and Selected "Background" Monitors



Source: MDEQ

Figure 19

Proximity of Severstal to Air Monitors

Table 10

Organic Carbon Analysis by Wind Direction
Dearborn vs. Allen Park

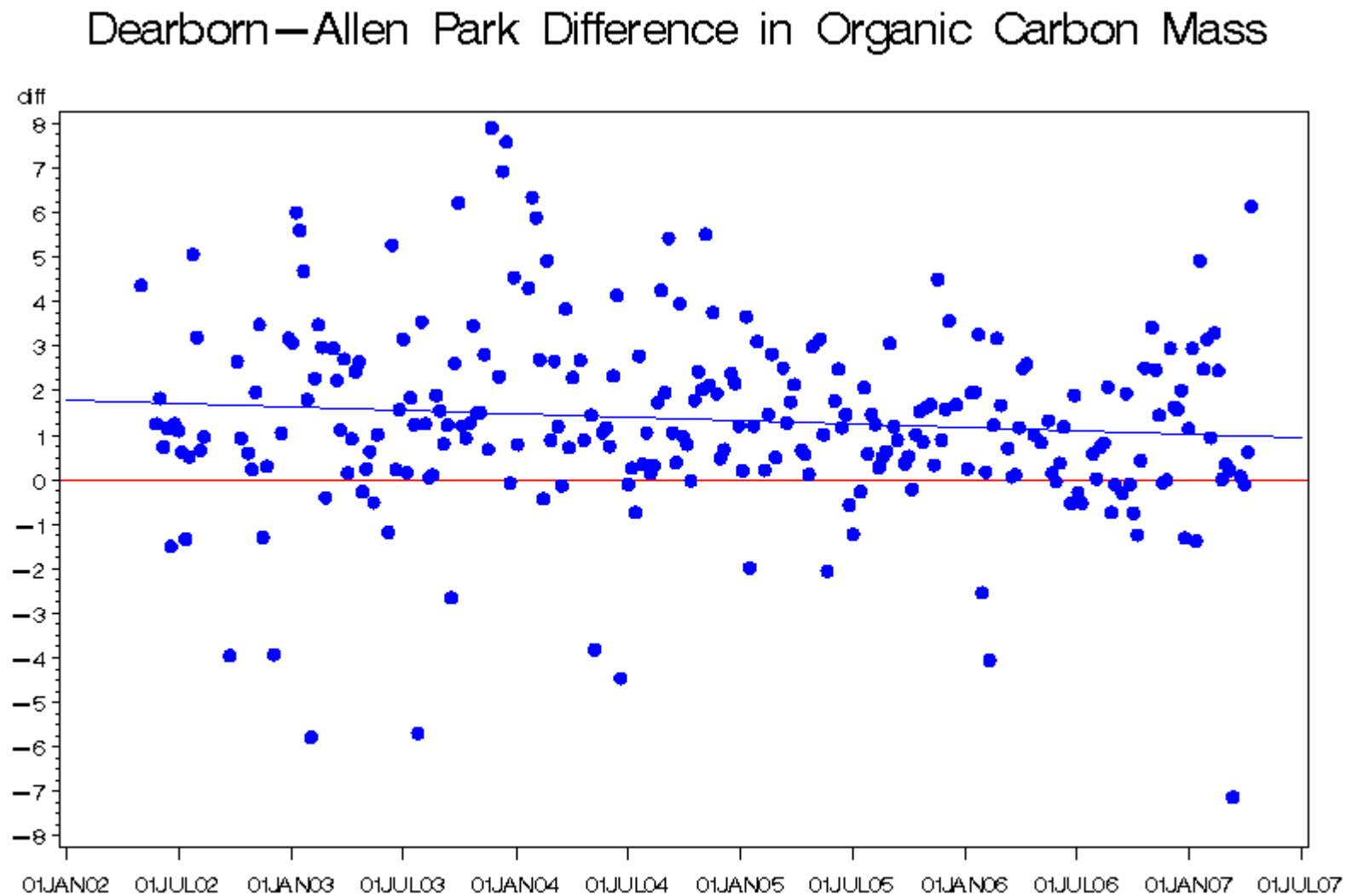
2003-2006

Measurement	Northeast Winds			East Winds			Southeast Winds		
	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference
2003 Average	3.91	3.47	0.44	4.88	5.00	-0.12	6.69	4.91	1.79
2004 Average	2.96	2.75	0.21	4.05	3.10	0.96	5.56	4.52	1.04
2005 Average	3.14	2.69	0.45	4.60	3.96	0.64	5.58	5.11	0.47
2006 Average	3.70	3.67	0.03	3.33	2.66	0.67	5.41	4.75	0.66
4-yr Average	3.42	3.12	0.30	4.45	3.95	0.50	5.84	4.87	0.97
Median	3.39	2.86		4.38	3.56		5.75	4.33	
Std. Deviation	0.87	1.04	0.59	1.78	1.80	1.54	2.13	2.19	1.52

Measurement	Northwest Winds			West Winds			Southwest Winds		
	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference
2003 Average	5.55	4.57	0.98	6.47	3.58	2.89	5.99	4.84	1.15
2004 Average	4.10	3.34	0.76	5.21	3.29	1.92	5.59	4.15	1.44
2005 Average	2.45	2.41	0.04	4.89	3.46	1.43	5.67	4.41	1.26
2006 Average	3.27	2.90	0.36	4.49	3.56	0.92	5.34	5.07	0.27
4-Yr Average	3.62	3.15	0.47	5.18	3.47	1.71	5.70	4.58	1.12
Median	3.65	3.03		4.82	3.21		5.68	4.49	
Std. Deviation	1.30	1.14	0.79	1.42	1.35	1.43	1.61	1.73	1.50

Source: SEMOS

Figure 20



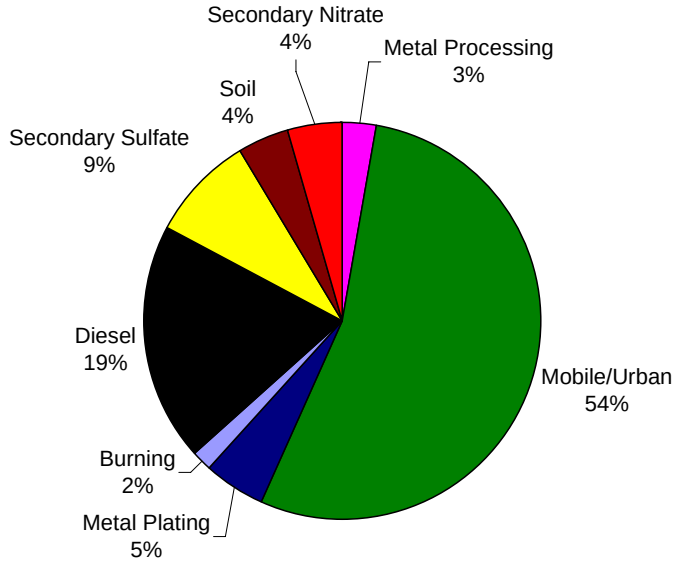
Regression Equation:
diff = 8.205233 − 0.000418*date

Source: LADCO

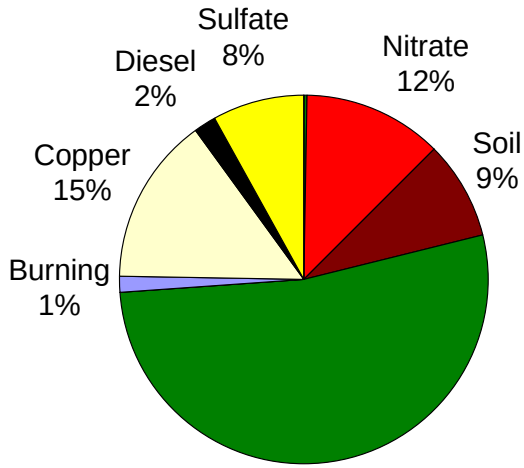
Figure 21

Detroit PMF Results: Organic Mass (OM)

- Mobile/urban factor is ~ 50% of OM at both sites
- Diesel at Allen Park is a large amount of OM
- OM associated with sulfate and nitrate is 13%-20%
- Industrial profiles account for 8%-15% of OM, higher at Dearborn



Allen Park

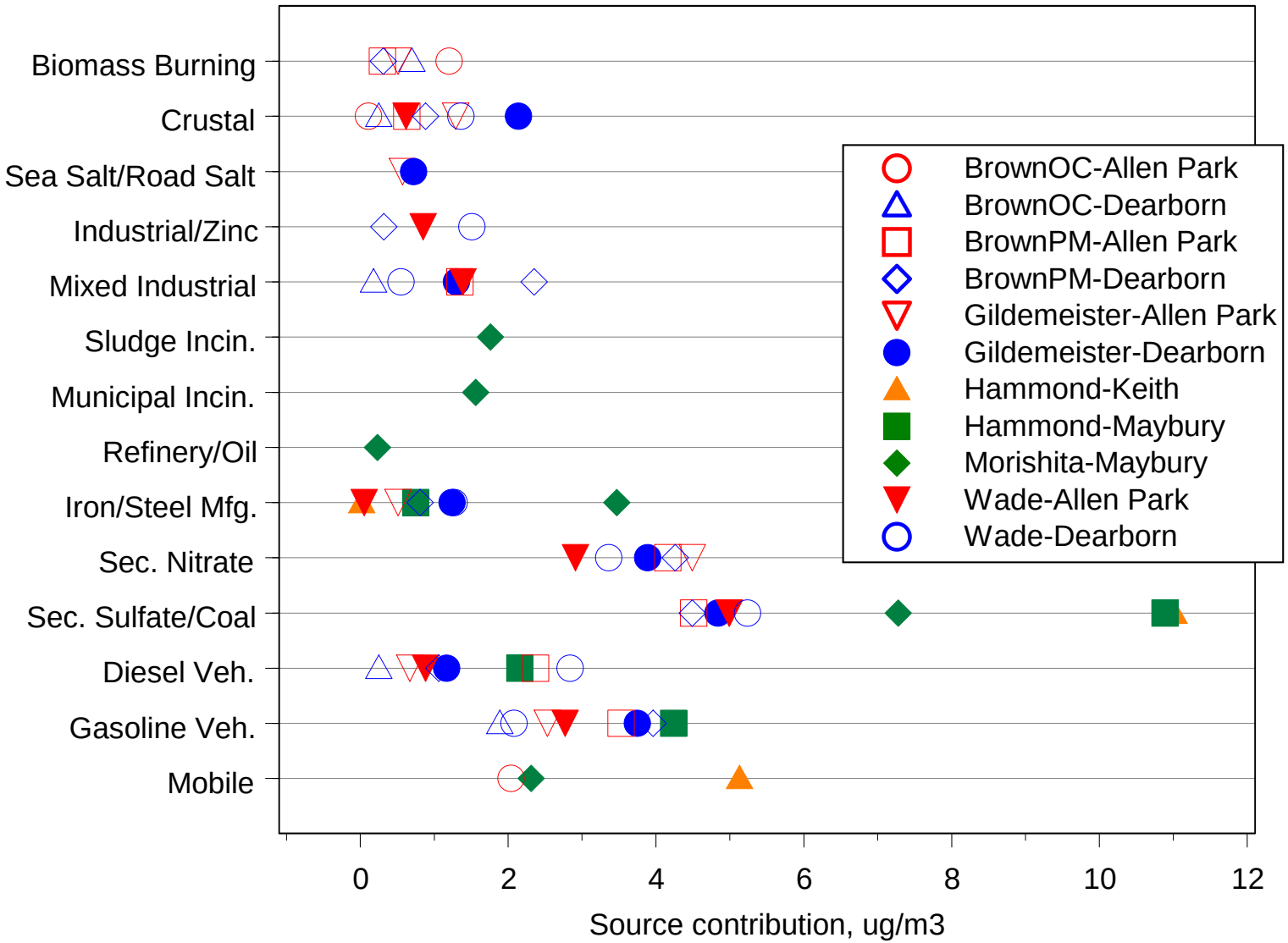


Dearborn

SOURCE: Sonoma Technologies Inc., 2006

Figure 22

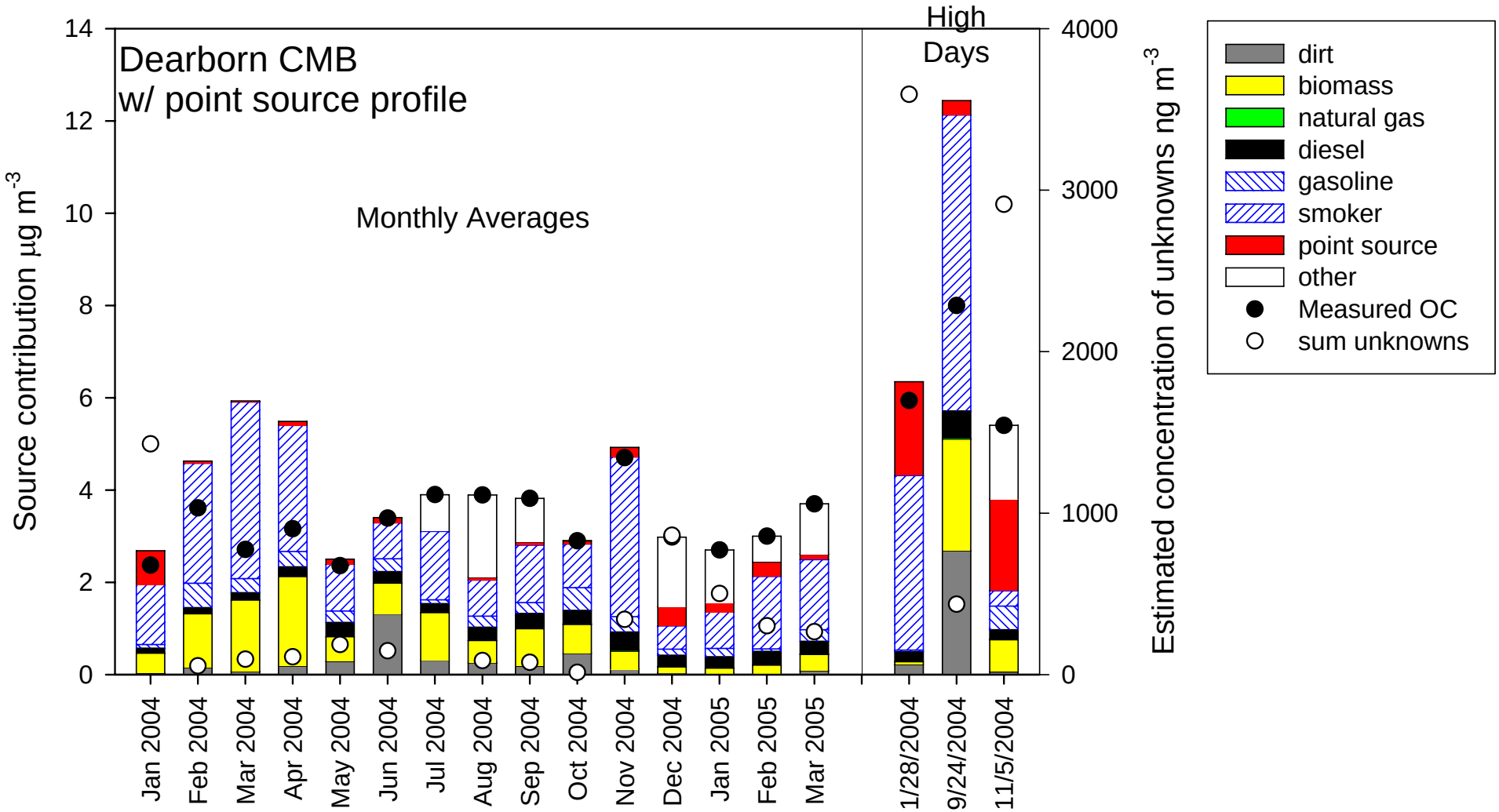
Summary of Source Apportionment Results at Detroit Sites



Source: LADCO

Figure 23

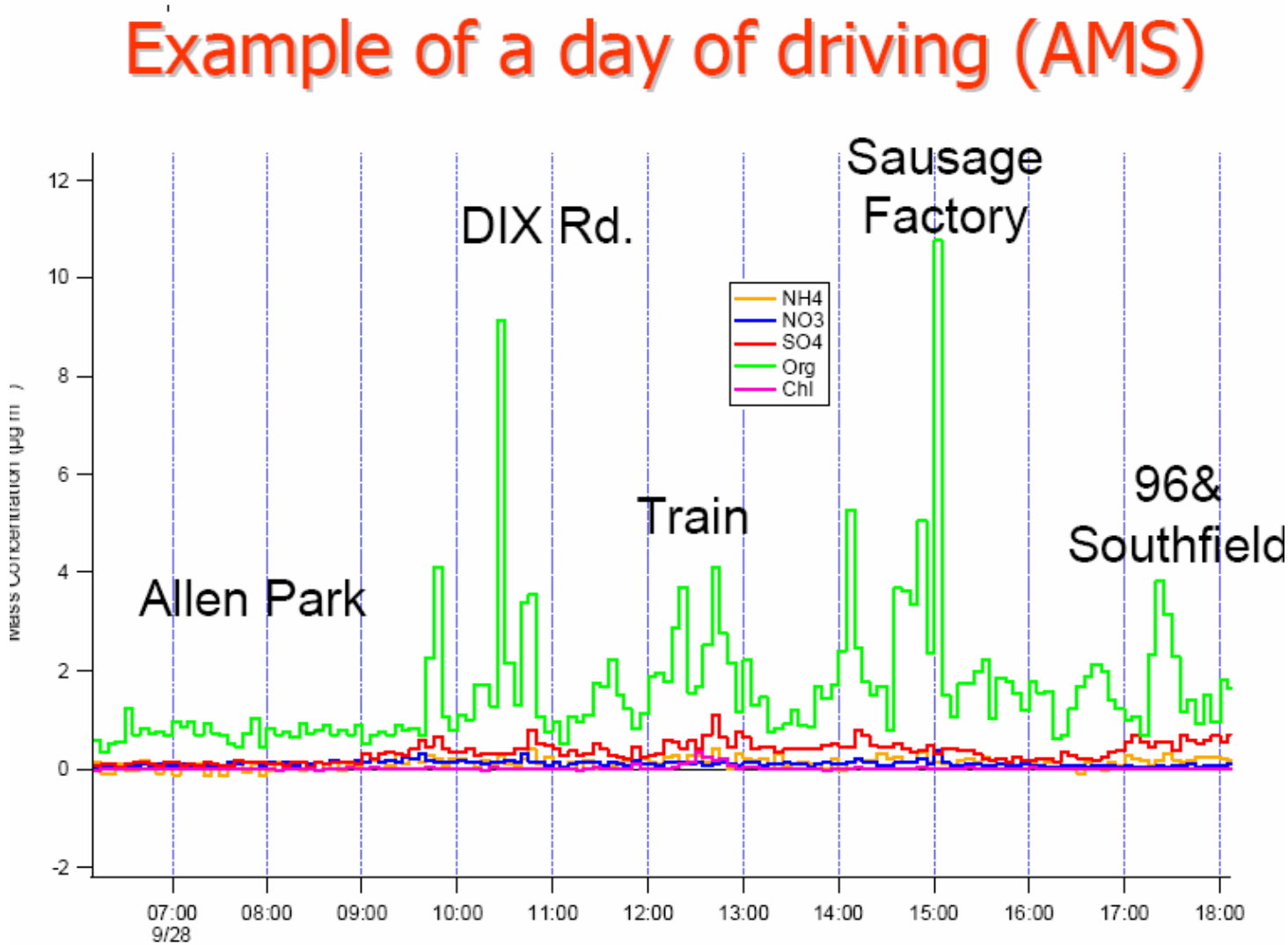
Dearborn CMB Analysis
Source Profile Comparison – Average vs. High PM2.5 Days



Source: LADCO

Figure 24

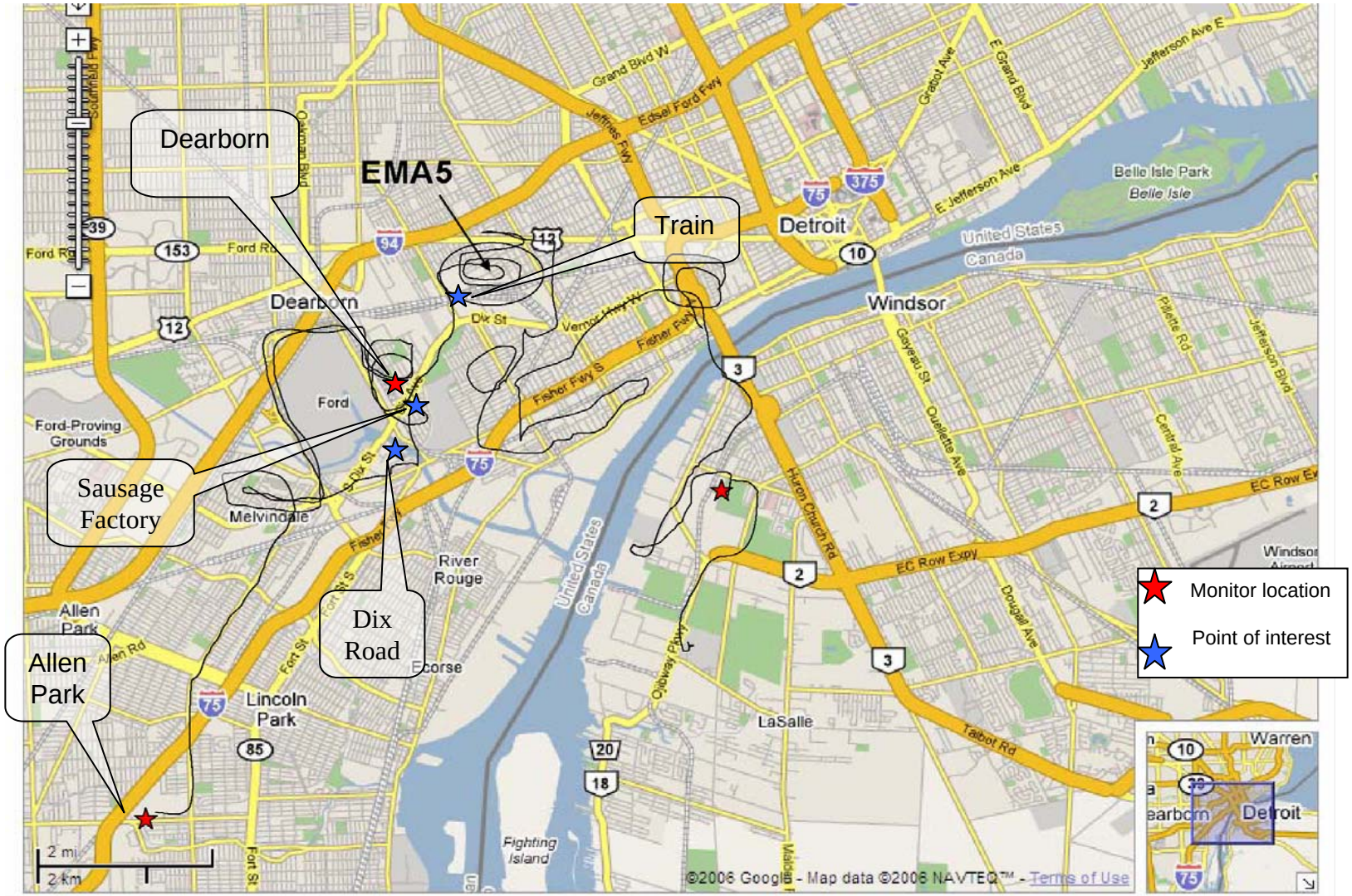
Continuous Monitoring of CRUISER is Detroit Area



Source: "Preliminary Results from the Deployment of an Advanced Mobile Laboratory in Detroit", Jeff Brook, Environment Canada, May 7, 2007.

Figure 25

Route of CRUISER in Detroit Area



Source:

Table 11

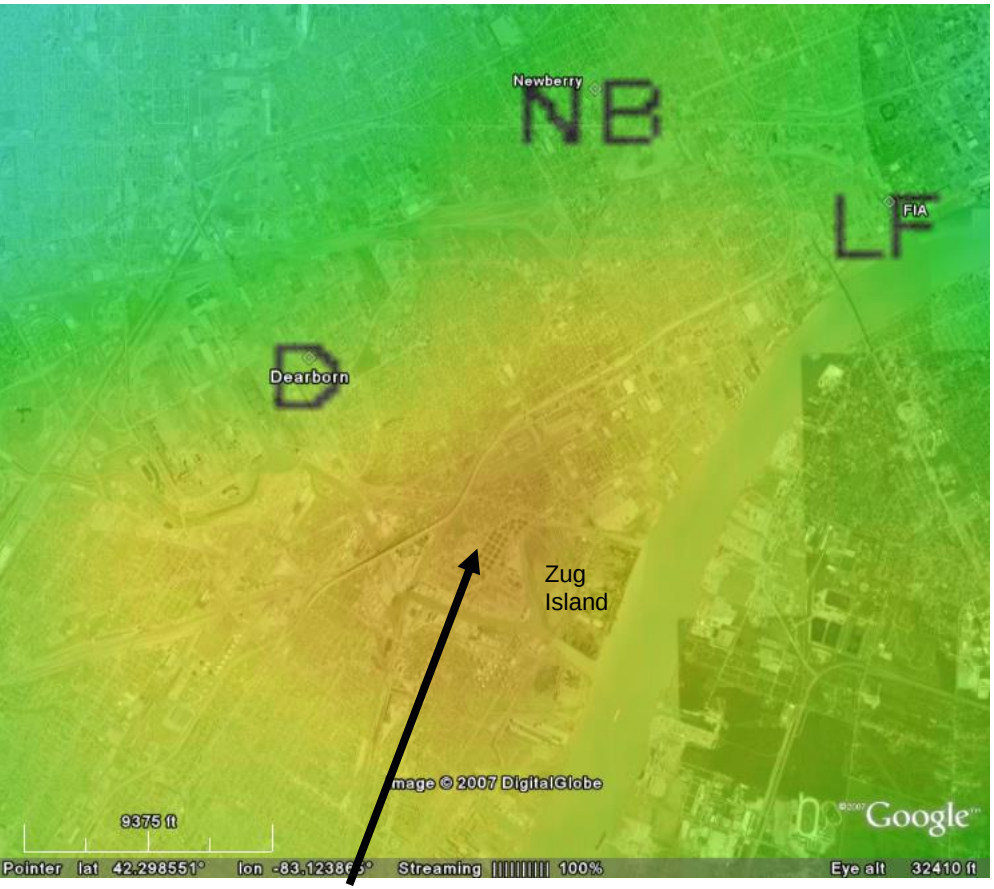
Observed Increase in Pollutant Concentrations Between Locations Immediately Upwind & Downwind of Zug Island

Fall 2006

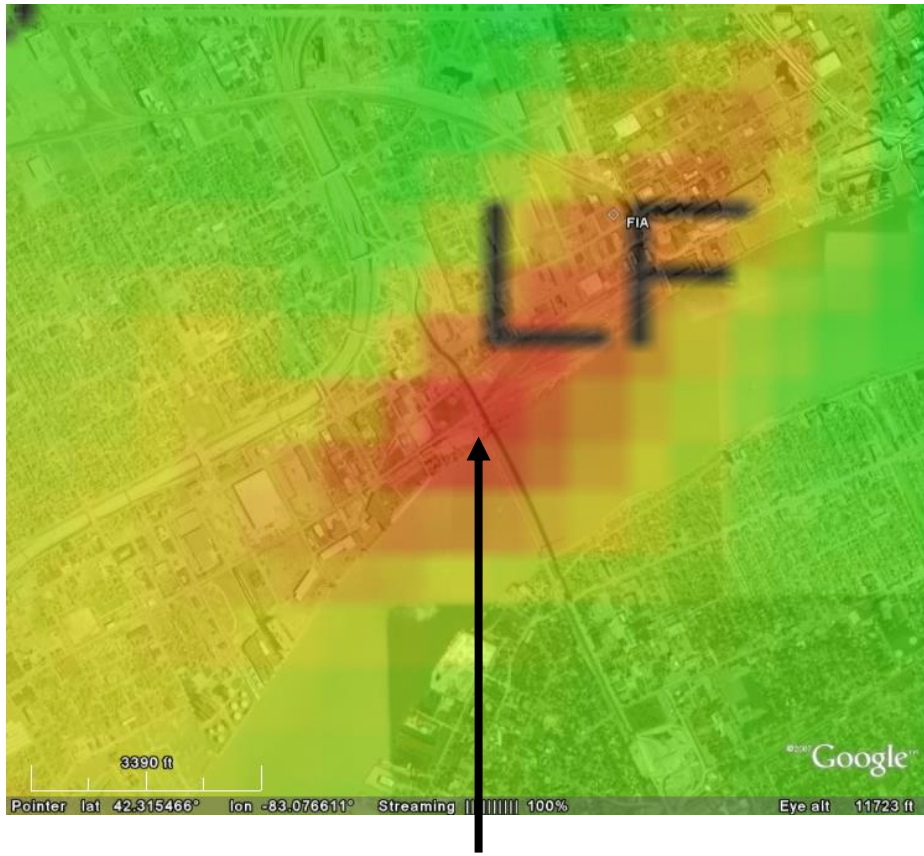
Pol.	Conc.	Unit
NO	28.3	ppb
NOy	45.2	ppb
CO	82.7	ppb
SO2	96.7	ppb
CO2	61.2	ppb
PM2.5	15.8	ug/m3
pSO4	7.8	ug/m3
pOM	0.8	ug/m3
BC	4.9	1/Mm

Source: "Preliminary Results from the Deployment of an Advanced Mobile Laboratory in Detroit",
Jeff Brook, Environment Canada, May 7, 2007.

Figure 26: Black carbon (aethalometer) data for FIA (LF) and combined monitors of Dearborn (D), Newberry (NB), FIA and Allen Park (not shown) (red indicates higher concentrations and green indicates lower concentrations).



Joint surface from aethalometer data at all 4 sites – area of greatest COMBINED influence on all sites. Highly industrialized area



FIA aethalometer data points very specifically to Ambassador Bridge (1-hr data, 2006 annual)

Source: LADCO

Figure 27: Black carbon (aethalometer) and OC data for Newberry monitor (red indicates higher concentrations and green indicates lower concentrations).

Newberry aethalometer data – points very specifically to intermodal freight terminal (1 hr data, 2006)

Newberry continuous OC data – also identifies freight terminal as source of OC

Source: LADCO

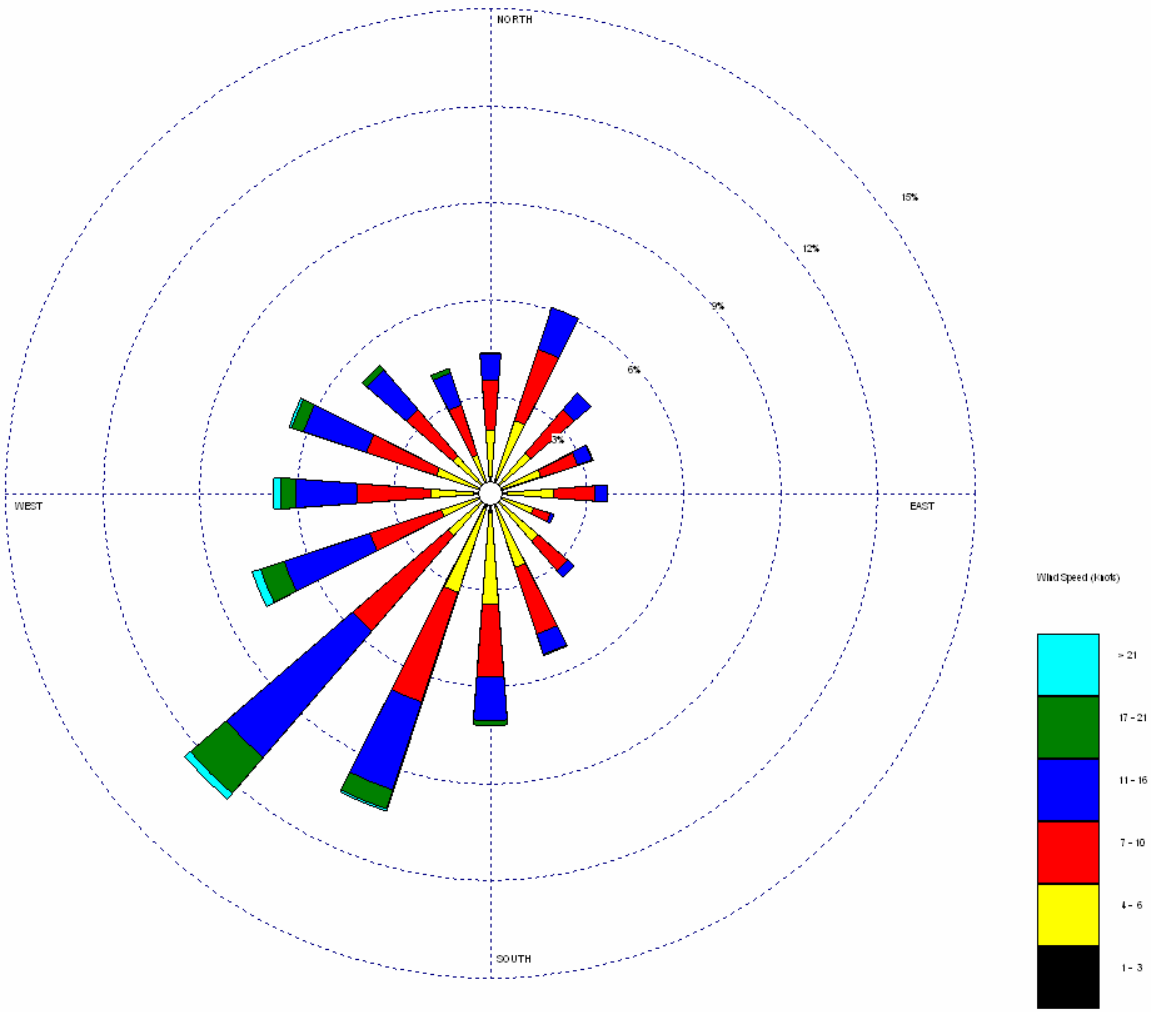
Figure 28

Dearborn Monitor Relative to Severstal Operations

Source: MDEQ

Figure 29

Detroit Metro Airport 2002 Windrose

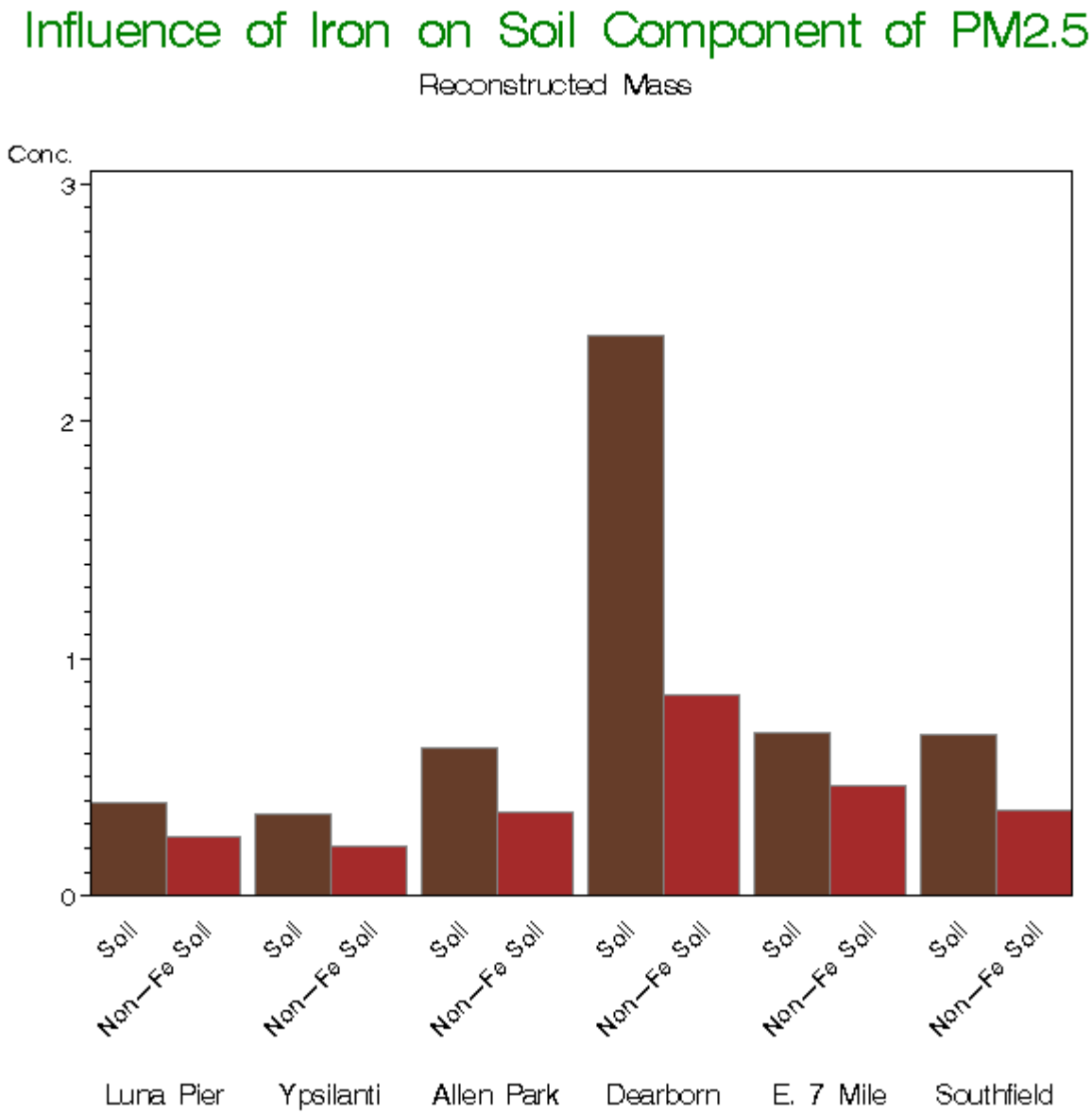


Source: MDEQ

Figure 30
Monitors of Concern Relative to Primary Facilities

Source: MDEQ

Figure 31



Source: "Data Analysis to Support Local Area Modeling" (Kenski, 2007)

TABLE 12				
MONITORED VERSUS MODELED LOCAL IMPACTS				
				Dearborn -
	Dearborn	**Allen Park**		**Allen Park [3]**
Monitored Values	(ug/m3)	(ug/m3)		**(ug/m3)**
2000-2004 Weighted Total Average [1]	19.3	17.3		**2.00**
Monitored Local Primary Values [2]				
Clarkson Report	4.55	2.23		**2.32**
Sonoma Report	4.36	1.98		**2.38**
LADCO Analysis [4]	3.25	0.95		**2.30**
AERMOD Modeled Value (Dearborn only) [2]	4.66			
[1] Total PM-2.5				
[2] Local Industrial Primary PM-2.5 only				
[3] Assumed to be the neighbor scale contribution to Dearborn				
[4] LADCO report assumes Soil-Fe contribution only				

Source: MDEQ

Table 13

Estimated Contribution to $PM_{2.5}$ Concentrations from Local Sources

Hotspot Modeling Results

	MAERS EMISSIONS (tpy)			DEARBORN TOTAL 4.66	µg/m³		SWHS TOTAL 2.35	µg/m³		ALLEN PARK TOTAL 0.50	µg/m³
A8640	479.3	PM-2.5	**SEVERSTAL NORTH AMERICA, INC.**	3.44	µg/m³		0.46	µg/m³		0.24	µg/m³
A7809	666.3	PM-10	**U S STEEL GREAT LAKES WORKS**	0.15	µg/m³		0.97	µg/m³		0.08	µg/m³
A8648	17.0	PM-10	**FORD MOTOR CO ROUGE COMPLEX**	0.39	µg/m³		0.06	µg/m³		0.03	µg/m³
A9831	198.3	PM-10	**MARATHON ASHLAND PETROLEUM**	0.11	µg/m³		0.09	µg/m³		0.05	µg/m³
B2132	12.6	PM-10	**WYANDOTTE DEPT MUNI POWER**	0.00	µg/m³		0.00	µg/m³		0.00	µg/m³
B2169	71.2	PM-10	**CARMEUSE LIME/ RIVER ROUGE**	0.28	µg/m³		0.60	µg/m³		0.06	µg/m³
B2810	42.6	PM-10	**DETROIT EDISON RIVER ROUGE**	0.00	µg/m³		0.00	µg/m³		0.00	µg/m³
B2811	186.8	PM-10	**DETROIT EDISON TRENTON CHANNEL**	0.00	µg/m³		0.00	µg/m³		0.01	µg/m³
B3518	5.5	PM-10	**UNITED STATES GYPSUM CO**	0.01	µg/m³		0.02	µg/m³		0.00	µg/m³
B3533	15.0	PM-10	**EDW C LEVY CO PLANT 1**	0.15	µg/m³		0.08	µg/m³		0.02	µg/m³
B3567	7.3	PM-10	**ST MARY'S CEMENT**	0.06	µg/m³		0.04	µg/m³		0.01	µg/m³
N6631	84.4	PM-10	**DEARBORN INDUSTRIAL GENERATION**	0.05	µg/m³		0.01	µg/m³		0.01	µg/m³

Source: MDEQ

Public Comment Period Record

STATE OF MICHIGAN

DEPARTMENT OF ENVIRONMENTAL QUALITY

AIR QUALITY DIVISION

PROPOSED $PM_{2.5}$

STATE IMPLEMENTATION PLAN

February 4 to March 5, 2008

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APPENDIX A: Proposed PM 2.5 State Implementation Plan, February 4, 2008

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

MICHIGAN'S FINE PARTICULATE MATTER (PM 2.5) STATE IMPLEMENTATION PLAN (SIP): The Air Quality Division is holding a public comment period through March 5, 2008, on a proposed SIP for Southeast Michigan's PM 2.5 nonattainment area, including Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. The public comment period meets the public participation requirements for a SIP submittal.

Written comments should be sent to:

Attention: Mary Ann Halbeisen
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

TENTATIVE PUBLIC HEARING SCHEDULED:
If requested by March 5, 2008, a public hearing will be held on March 11, 2008, at 1:30 p.m., in the Constitution Hall, Lillian Hatcher Conference Room, 3rd Floor North, 525 West Allegan Street, Lansing, Michigan. Those interested may contact the Air Quality Division at 517-335-1059 after March 5, 2008, to determine if a hearing was requested and will be held.

The PM 2.5 SIP can be viewed by clicking on the following links:

- Michigan State Implementation Plan for PM 2.5
- Appendix A
- Appendix C
- Appendix D
- Appendix E
- Appendix F

For further information, contact Cynthia Hodges at 517-335-1059 or Email at hodgesc@michigan.gov.

Decision-maker: ***DEQ Director.***

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30473
LANSING MI 48909-7973

CALENDAR

February 4, 2008

♦ **ENVIRONMENTAL ASSISTANCE CENTER 800-662-9278 E-mail: deq-ead-env-assist@michigan.gov**	The DEQ Environmental Assistance Center (EAC) is available to provide direct access to DEQ environmental programs, answers to environmental questions, referrals to DEQ technical staff, and quick response. Questions on any items listed in the DEQ Calendar can be referred to the EAC.
♦ **PUBLICATION SCHEDULE**	The DEQ Calendar is published every two weeks, on alternate Mondays, by the Michigan Department of Environmental Quality. We welcome your comments.
♦ **CALENDAR LISTSERV**	You may subscribe to receive the DEQ Calendar electronically by sending an Email to the listserv at **LISTSERV@LISTSERV.MICHIGAN.GOV** and in the body of the message type Subscribe, DEQ-CALENDAR, and your name.
♦ **INTERNET ACCESS www.michigan.gov/ deqcalendar**	The DEQ Calendar is available on the DEQ World Wide Web site in pdf and html format. Access the calendar at **www.michigan.gov/deqcalendar**.
♦ **TIMETABLE FOR DECISIONS**	No decision listed in the DEQ Calendar will be made prior to seven days after the initial Calendar publication date.
♦ **TIPS FOR CITIZEN INPUT**	Refer to the “Public Involvement Handbook, A Citizens Guide” to increase the effectiveness of your input into DEQ programs. Access the handbook at **www.michigan.gov/deq** and click on "Get Involved, Programs for Citizens."

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CALENDAR February 4, 2008

PART I:
ENVIRONMENTAL ISSUES, PERMITTING AND RELATED REGULATIONS

Permit Decisions Before the Office of the Director

AIR QUALITY DIVISION
See Map - ❶

DOW CHEMICAL COMPANY – 32 INCINERATOR, MIDLAND, MIDLAND COUNTY, proposed Permit to Install application for changes to permit conditions for the existing hazardous waste incinerator and operation of 32-Incinerator. The facility is located at Midland Operations, Main Street, Midland. Additionally, the new 32-Incinerator will require revisions to Renewable Operating Permit (ROP) No. MI-ROP-A4033-2004a. This public comment period meets the public participation requirements for a future administrative amendment to the ROP. The responsible official for the source is Brad Fedorchak, Michigan Operations, 1261 Building, D-Street, Midland, Michigan. New Source Review and ROP public notice documents can be viewed on the Internet at www.michigan.gov/deqair. Public comment will be taken through February 19, 2008. If a public hearing is requested in writing by February 19, 2008, an informational session and public hearing will be held February 21, 2008, (see February 21 listing in this calendar). Written comments should be sent to the Michigan Department of Environmental Quality, Air Quality Division, P.O. Box 30260, Lansing, Michigan 48909, to the attention of William A. Presson, Acting Permit Section Supervisor. Information Contact: ***Paul Schleusener***, Air Quality Division, 517-335-6828. Decision-maker: ***G. Vinson Hellwig***, Air Quality Division Chief.

WASTE AND HAZARDOUS MATERIALS DIVISION
See Map - ❷

SAUK TRAIL DEVELOPMENT, INC., WAYNE COUNTY. Consideration of a Part 115 Solid Waste Management construction permit application for a type II solid waste landfill modification of an existing permit. A decision is expected by May 8, 2008. Information Contact: **Larry AuBuchon** at 586-753-3840 or, Email at aubuchol@michigan.gov Decision-maker: **DEQ Director.**

Other Decisions Before the Office of the Director

ENVIRONMENTAL SCIENCE AND SERVICES DIVISION
See Map - ❸

CLEAN CORPORATE CITIZEN DESIGNATION, PILGRIM MANOR RETIREMENT COMMUNITY, 2025 LEONARD STREET NE, GRAND RAPIDS, MICHIGAN, KENT COUNTY. The Michigan Department of Environmental Quality has received an application for Clean Corporate Citizen (C3) designation from Pilgrim Manor Retirement Community as provided for under Administrative Rules R324.1508: Clean Corporate Citizen Program. A decision on the C3 designation approval or disapproval will be made on or before March 18, 2008. The C3 program provides incentives for improved environmental protection. Regulated establishments that have demonstrated environmental stewardship can receive C3 designation and public recognition for their efforts and are entitled to certain regulatory benefits. Information Contact: ***Kelie Bond,*** Environmental Science and Services Division, 517-241-7969. Decision-maker: ***DEQ Director***.

AIR QUALITY DIVISION
See Map - ❹

H INDUSTRIES, DETROIT, WAYNE COUNTY. Written comments are being accepted on a proposed Consent Order to administratively resolve alleged air pollution violations. You may obtain copies of the proposed Consent Order and Staff Activity Report on the Web at www.michigan.gov/deqair. Submit written comments to Ronald Pollom, Michigan Department of Environmental Quality, Air Quality Division, P.O. Box 30260, Lansing, Michigan 48909. Written comments must be received by February 20, 2008. If a request is received in writing by February 20, 2008, a public hearing will be scheduled. Information Contact: ***Ronald Pollom***, Air Quality Division, 517-335-4624. Decision-maker: ***G. Vinson Hellwig***, Air Quality Division Chief.

AIR QUALITY DIVISION
See Map - ❺

MICHIGAN'S FINE PARTICULATE MATTER (PM 2.5) STATE IMPLEMENTATION PLAN (SIP) proposed for Southeast Michigan's PM 2.5 nonattainment area, including Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. The Air Quality Division will hold a public comment period through March 5, 2008, that meets the public participation requirements for a SIP submittal. The PM 2.5 SIP can be viewed on the Web at www.michigan.gov/deqair. If requested by March 5, 2008, a hearing will be held March 11, 2008 (see March 11 listing in this calendar). Written comments should be sent to the Michigan Department of Environmental Quality, Air Quality Division, P.O. Box 30260, Lansing, Michigan 48909, to the attention of Mary Ann Halbeisen. Information Contact: ***Cynthia Hodges***, Air Quality Division, 517-335-1059. Decision-maker: ***DEQ Director.***

any air emission changes at the stationary source. The ROP public notice documents can be viewed on the Web at www.michigan.gov/deqair. The responsible official of the stationary source is Tim Schimke, 1525 Miltner Street, Cadillac, Michigan 49601. Comments on the draft permit are to be submitted to Kurt Childs, Michigan Department of Environmental Quality, Air Quality Division, Cadillac District Office, 120 West Chapin Street, Cadillac, Michigan 49601. The decision-maker for the permit is Janis Denman, District Supervisor. If requested in writing by March 5, 2008, a public hearing may be scheduled. Information Contact: ***Kurt Childs***, Air Quality Division, 231-775-3960, extension 6253.

MARCH 5, 2008

DEADLINE FOR PUBLIC COMMENT REGARDING MICHIGAN'S FINE PARTICULATE MATTER (PM 2.5) STATE IMPLEMENTATION PLAN (SIP) proposed for Southeast Michigan's PM 2.5 nonattainment area, including Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. This public comment period meets the public participation requirements for a SIP submittal. The PM 2.5 SIP can be viewed on the Web at www.michigan.gov/deqair. If requested by March 5, 2008, a hearing will be held March 11, 2008 (see March 11 listing in this calendar). Written comments should be sent to the Michigan Department of Environmental Quality, Air Quality Division, P.O. Box 30260, Lansing, Michigan 48909, to the attention of Mary Ann Halbeisen. Information Contact: ***Cynthia Hodges***, Air Quality Division, 517-335-1059.

MARCH 11, 2008
1:30 p.m.

TENTATIVELY SCHEDULED PUBLIC HEARING REGARDING MICHIGAN'S FINE PARTICULATE MATTER (PM 2.5) STATE IMPLEMENTATION PLAN (SIP) proposed for Southeast Michigan's PM 2.5 nonattainment area, including Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. This public comment period meets the public participation requirements for a SIP submittal. The PM 2.5 SIP can be viewed on the Web at www.michigan.gov/deqair. If requested by March 5, 2008, a public hearing will be held in the Constitution Hall, Lillian Hatcher Conference Room, 3rd Floor North, 525 West Allegan Street, Lansing, Michigan. Those interested may contact the Air Quality Division at 517-335-1059 after March 5, 2008, to determine if a hearing was requested and will be held. Information Contact: ***Cynthia Hodges***, Air Quality Division, 517-335-1059.

Division Permit Contacts

For additional information on permits, contact:

Air Quality Division	517-373-7074 517-335-4607	**Pam Blue** **Cari DeBruler**
Land and Water Management Division (land/water interface permits)	517-373-8798	**Wendy Fitzner**
Office of Geological Survey (oil, gas, mineral well, and sand dune mining permits)	517-241-1545	**Thomas Godbold**
Waste & Hazardous Materials Division	517-335-4034	**Wanda Williams**
Water Bureau • Groundwater Permits on Public Notice • NPDES Permits on Public Notice • Certificates of Coverage on Public Notice	517-241-1346	**Susan Ashcraft**

Michigan Manufacturers Association

Attention: Mary Ann Halbeisen
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

Sent via Email: **halbeism@Michigan.gov**

March 5, 2008

Michigan's Fine Particulate Matter (Pm 2.5) State Implementation Plan

The Michigan Manufactures Association appreciates the opportunity to submit comments on the notice for the proposed State Implementation Plan for Fine Particulate Matter (PM 2.5), which requires response by March 5, 2008.

The history on setting the federal standard dates back to 1997, when the EPA issued its PM 2.5 standard. MMA has been concerned about the economic impact of additional federal regulation on Michigan. MMA filed comments with the EPA outlining our concerns as recently as January 30, 2006. The history on setting the federal standard dates back to 1997, when the EPA issued its PM 2.5 standard. The federal courts have deliberated on these issues for years until the DC Circuit Court in 2002, rejected the claim that the agency acted in an arbitrary and capricious manner in setting the standard. Despite our objections, and those of many business organizations across the country, including the National Association of Manufacturers, the EPA has moved forward with changes in the standard, which result in seven counties in southeast Michigan being designated as not meeting the National Ambient Air Quality Standards for Particulate Matter (PM 2.5), including Wayne, Oakland, Macomb, Washtenaw, St. Clair, Monroe, and Livingston.

Given the constraints of the federal regulatory mandate, the state is forced to respond with a state implementation plan or face federal sanctions that include withholding federal transportation dollars.

The proposed SIP forwarded by the DEQ is the product of years of close consultation with Southeast Michigan Council of Governments (SEMCOG), which is the Metropolitan Planning Organization for Southeast Michigan. SEMCOG's Air Quality Task Force has held several meetings over the past several years that have included opportunities for public involvement and comment from interested stakeholders.

With our state economy having a manufacturing concentration seven times greater than the national average, any increase in regulation in Michigan tends to have more impact here than in other states. We believe the SIP addresses the requirements scientifically, and to the extent possible, recognizes the cost implications for Michigan.

We appreciate the work of both the DEQ and SEMCOG in developing this science based approach. Many stakeholders have taken advantage of the opportunities provided in the process

to make contributions to the understanding of PM 2.5. We believe that with the increased monitoring we have learned a great deal about the speciation of the components of PM 2.5. As we learn more, we begin to understand how much more there is to learn in the future. We hope that increased knowledge will help us refine our regulatory approaches to ensure regulatory resources are targeted where they have the most benefit, while not spending economic resources where they do not generate environmental benefit. We are confident we will continue to make significant scientific progress for the benefit Michigan's air quality and our economy.

We believe that Michigan is very close to meeting attainment under the new federal standards, and we look forward to achieving the goal of meeting attainment again. Michigan manufacturers are already spending billions of dollars implementing multiple control strategies that will continue to yield significant co-benefits for air quality in Michigan.

The process used to develop the DEQ's proposed SIP for PM 2.5 has been open and deliberative. Michigan is poised to continue to make significant progress in air quality improvement. MMA supports the proposed SIP for PM 2.5.

Thank you for the opportunity to participate in your processes and comment on the proposed SIP for PM 2.5.

Sincerely,

Michael Johnston
Director of Regulatory Affairs

Pepper Hamilton LLP
Attorneys at Law

Suite 3600
100 Renaissance Center
Detroit, MI 48243-1157
313.259.7110
Fax 313.259.7926

Kurt A. Kissling
Direct: 313.393.7313
kurtkissling@pepperlaw.com

March 5, 2008

Via E-Mail and U.S. Mail
Ms. Mary Ann Halbeisen
MDEQ - Air Quality Division
P.O. Box 30260
Lansing, MI 48909
HalbeisenM@michigan.gov

Re: Michigan's $PM_{2.5}$ State Implementation Plan

Dear Ms. Halbeisen:

This letter provides Oakland County's comments on the State of Michigan's "State Implementation Plan Submittal for Fine Particulate Matter" ("$PM_{2.5}$ SIP"). The $PM_{2.5}$ SIP was proposed on February 4, 2008, and addresses southeast Michigan's nonattainment with the 1997 $PM_{2.5}$ standard. Oakland County is directly affected by the $PM_{2.5}$ SIP because EPA designated Oakland County as nonattainment for $PM_{2.5}$.

Oakland County supports the $PM_{2.5}$ SIP because, based on the best modeling and other evidence available, the $PM_{2.5}$ SIP should result in southeast Michigan meeting the 15 $\mu g/m^3$ standard in 2009. In addition, Oakland County offers the following specific comments:

1. The State of Michigan and its planning partners actively solicited input from $PM_{2.5}$ SIP stakeholders, e.g., environmental organizations, local citizen groups, industry, and local governments. For example, public participation was sought throughout the $PM_{2.5}$ SIP development process at public meetings held by the Southeast Michigan Council of Governments ("SEMCOG"). In addition, input was routinely requested from EPA and the Lake Michigan Air Directors Consortium ("LADCO") in conjunction with the periodic meetings of the SEMOS work group. Accordingly, the $PM_{2.5}$ SIP development process was well-coordinated and readily accessible to interested parties.

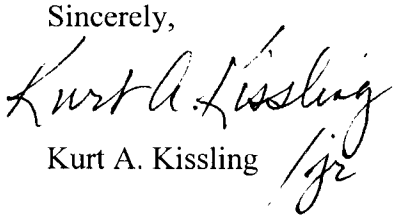
2. In light of the documented technical challenges for testing, monitoring, and modeling $PM_{2.5}$, the weight of evidence ("WOE") approach taken by the State of Michigan represents the best basis for $PM_{2.5}$ SIP planning. $PM_{2.5}$ is somewhat unique in that: (a) speciation sampling data are needed to identify specific $PM_{2.5}$ components; (b) $PM_{2.5}$ components can vary significantly by location and time; (c) $PM_{2.5}$ components are directly emitted as well as the product of secondary formation; (d) EPA has yet to endorse a

$PM_{2.5}$ stack test method for stationary sources; (e) $PM_{2.5}$ inventories are relatively new and less developed than those for other pollutants; and (f) computer models have performed somewhat inconsistently when trying to synthesize the numerous variables associated with $PM_{2.5}$ emissions. In light of these technical issues, the WOE approach provides the best basis for air quality planning because it looks at multiple sources of relevant information for consistencies among the data. Thus, rather than depending heavily on one or two sources of data, the $PM_{2.5}$ SIP conclusions are based on a robust set of information, e.g., $PM_{2.5}$ monitoring data, speciation data, meteorological data, long-term emission trends, the effect of national emission reduction programs, local emission modeling, regional emission modeling, etc. As a result, the State of Michigan's multifaceted approach to understanding $PM_{2.5}$ emissions in southeast Michigan provides the best foundation available for planning an attainment strategy.

3. The $PM_{2.5}$ SIP correctly defers the pursuit of area-wide RACM in favor of focused solutions that directly affect the $PM_{2.5}$ nonattainment. As MDEQ's RACM modeling proved, blanketing southeast Michigan with area-wide RACM requirements would fail to solve the problems evident at the two nonattaining monitors in south-central Wayne County. *See* $PM_{2.5}$ SIP at 36. For example, requiring emission controls in Oakland County would do nothing to resolve the core problem because the northern counties of the nonattainment area do not contribute to $PM_{2.5}$ nonattainment measured in south-central Wayne County. *See* $PM_{2.5}$ SIP at pp. 18-19. This is consistent with Michigan's past PM_{10} nonattainment area and the successful $PM_{2.5}$ attainment strategy, both of which focused on the same area of south-central Wayne County measuring in nonattainment for $PM_{2.5}$. *See* $PM_{2.5}$ SIP at 5, Figure 2.2. In sum, the proposed $PM_{2.5}$ SIP provides an efficient means for addressing $PM_{2.5}$ nonattainment by focusing on the localized problem.

Please contact me with any questions about these comments.

Sincerely,



Kurt A. Kissling /jr

c: Keith Lerminiaux, Oakland County
#9393000 v1

DTE Energy Company
2000 2nd Ave., Detroit, MI 48226-1279

DTE Energy

March 5, 2008 **VIA FAX**

Attention: Mary Ann Halbeisen
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

Comments of DTE Energy on the State of Michigan's
Fine Particulate Matter (PM2.5) State Implementation Plan (SIP)
February 4, 2008

DTE Energy is one of the nation's largest diversified energy companies. With headquarters in Detroit, Michigan, DTE Energy is involved in the development and management of energy related businesses and services, nationwide. Its largest operating units are Detroit Edison, an electric utility serving 2.2 million customers in Southeastern Michigan, and MichCon, a natural gas utility serving 1.3 million customers in Michigan. The DTE Energy portfolio also includes non-utility energy businesses focused in power, industrial projects, coal and gas mid stream, unconventional gas production and energy trading.

DTE Energy is extremely supportive of Michigan's state implementation plan (SIP) which addresses air pollution control measures needed to reach acceptable fine particulate matter (PM2.5) levels in some industrial portions of southeast Michigan. The State, and local agencies involved in developing the SIP, chose to balance region-wide measures with focused controls close to the areas which exceed the annual PM2.5 national ambient air quality standard. DTE Energy appreciates this approach which avoids instituting controls which do not contribute to attainment in the areas which currently exceed the annual PM2.5 ambient standard. This situation is especially evident when wind directions are from the northwest, or northeast. Weight of evidence figures presented in the draft SIP show extremely low PM2.5 levels with these wind directions.

However, DTE Energy does not agree with including additional sulfur dioxide controls on the Edison Energy Service's coke battery as a contingency measure. Even though there is a slight annual average sulfate excess (~0.3 ug/m^3) at the Dearborn site, when it is compared against the Allen Park site, the majority of this excess is associated with wind directions from the southwest. There is a slight sulfate excess with southeast winds, which is the wind direction when the coke battery is upwind of the Dearborn site. However, the magnitude of the excess sulfate and the lower frequency of winds from the southeast indicate the majority of the excess sulfate at Dearborn is due to sources southwest of this site, rather than southeast of it. Recent reductions in sulfur content of locomotive fuel in nearby rail yards will likely reduce this upwind sulfate local contribution to PM2.5 at the Dearborn site.

The contingency plan would benefit from more details regarding how ongoing special monitoring studies at the Dearborn site will be used to identify the source(s) responsible for the organic carbon (OC), and possibly the sulfate excess, when compared against Allen Park data. The current list of sources is too broad and ambiguous. Many of the sources listed in this category have a very small impact on PM2.5 at this critical monitoring site. The term "landfill flares" was probably intended to be different flares from the nearby refinery (i.e., BOF and other refinery flares), which has recently had controls installed on this source. There are no nearby char-broiling restaurants, but there are two smoke houses just south of the monitor. Preliminary OC data indicate that the highest OC levels at Dearborn were when winds were from the south.

The table identified as the "Model Based Projections of Future Year Air Quality" has a misleading title. This table lists the results from regional modeling runs that only account for region-wide controls, and not local controls. This table's title should reflect the true nature of this modeling projection. A new table should include future year predicted impacts accounting for region-wide and local control measures.

Even though Dearborn is clearly the key site, the SIP needs to address other nearby sites that slightly exceed the annual NAAQS, like Southwestern High School (SWHS). The SIP should document why this site is of less concern than Dearborn (i.e., regional modeling shows attainment).

And, finally, wind directions need to be addressed consistently in the document. Sometimes wind directions are separated into 60-degree sectors, and other analyses analyze 10-degree wind sector data. This needs to be clarified in the SIP, especially since some 10-degree sectors clearly identify specific contributing sources that 60-degree sector data cannot resolve. A recent OC presentation showed an OC spike from 180 degrees that would be lumped with other wind directions from the southeast, when other sources in these other directions did not contribute to the OC excess.

Again, DTE Energy is grateful that we were able to participate in the development of this PM2.5 SIP. We feel it meets the requirements established by EPA using some modeling, and a significant amount of weight-of-evidence support for its choice of control measures.

Respectfully submitted,

Michael Lebeis

Michael Lebeis
Environmental Management & Resources
DTE Energy

CC: Chuck Hersey, SEMCOG
Abed Houssari, DTE
Lillian Woolley, DTE

COMMENTS OF CONSUMERS ENERGY

March 5, 2008

Submitted via e-mail to: **halbeism@michigan.gov**

SUBJECT: Comments of Consumers Energy on Michigan Department of Environmental Quality's Proposed State Implementation Plan Submittal for Fine Particulate Matter (PM 2.5)

Ms Halbeisen:

Consumers Energy appreciates this opportunity to comment on the DEQ's Proposed State Implementation Plan Submittal for Regional Haze. Consumers Energy is one of the nation's largest combined gas and electric utilities, ranking fifth among the gas utilities and thirteenth among electric utilities. We serve approximately 6.5 million of Michigan's 9.9 million residents with electricity, or gas, or both. We serve more than 8,600 industrial electric customers.

Consumers Energy is proud of its achievements in meeting or exceeding previous Federal and State air regulatory initiatives. These include, but are not limited to Michigan's 1980 sulfur in fuel limitation rule, the Acid Rain provisions of the 1990 Clean Air Act Amendments, and the NOx SIP Call. We are currently carrying out our plans for the implementation of the first phase of the Clean Air Interstate Rule (CAIR). We have historically been active participants in State Implementation Plan (SIP) development for criteria pollutants in Michigan, particularly when our sources are factors in designing an attainment strategy. Accordingly, we have been active participants in the preparation of this proposed SIP.

GENERAL STATEMENT REGARDING AIR EMISSIONS AND AMBIENT AIR QUALITY

Nationwide, emitting sources, including electric power plants, have been making dramatic reductions in emissions for decades while supplying the nation's ever-increasing demand for energy and consumer products. Since 1970, total emissions of the six criteria air pollutants dropped by 54 percent. Air quality will continue to dramatically improve due to huge emission cuts already in the pipeline, some ordered just within this past year.

Many of the control programs that are producing these successes are still being implemented. For the electric utility industry, this includes CAIR, which will result in significant reductions in PM 2.5 and its precursors, over the course of its implementation.

COMMENTS PERTAINING TO THE PROPOSED STATE IMPLEMENTATION PLAN SUBMITTAL FOR PM 2.5

Consumers Energy supports the DEQ's proposed submittal and plan of action. In particular, we commend the Department and the Southeast Michigan Council of Governments (SEMCOG) for convening a stakeholder group that was well versed in issues related to particulate matter and nonattainment in Southeast Michigan. We believe that the end result is a deliberate, practical, area-specific approach to defining and resolving the issue of nonattainment of the PM 2.5 NAAQS in Southeast Michigan.

We believe that it is important to acknowledge and commend the efforts of the DEQ's Air Quality Division and SEMCOG, with assistance from the Lake Michigan Air Directors Consortium (LADCO), in working to understand the nature of PM 2.5 nonattainment in Southeast Michigan. This included the use of advanced monitoring techniques to detect and quantify the various components of PM 2.5, as well as the efforts put forth to compile a comprehensive emissions inventory. It made use of reasoned application of air quality computer models for PM 2.5. We also acknowledge the strong, open, professional, working interaction with the stakeholder group. The information obtained and ideas exchanged, combined with State and Federal rules that are on the books, the application of local control measures, and the trend analyses for PM 2.5 data, provide the basis for the weight of evidence argument for attaining the standard. The problem was clearly analyzed, debated and defined. The solution presented in this proposed submittal is geared towards resolving the problem at hand.

During this process, the state of the understanding of PM 2.5 was advanced. It also brought the recognition that there is much more that is to be learned, particularly as we head towards addressing nonattainment issues with regard to the next PM 2.5 NAAQS.

Consumers Energy appreciates this opportunity to discuss our views on the DEQ's Proposed State Implementation Plan Submittal for PM 2.5. If you have any questions, please contact Louis Pocalujka at 517-788-2160.

Sincerely,

Louis Pocalujka, Senior Environmental Planner
Environmental & Laboratory Services
Consumers Energy
1945 W. Parnall Road
Jackson, MI 49201

1968-2008 40 SEMCOG . . . Equipping local government leaders for the future
THEN. NOW. NEXT.
Southeast Michigan Council of Governments • 535 Griswold Street, Suite 300 • Detroit, Michigan 48226-3602
313-961-4266 • Fax 313-961-4869 • www.semcog.org

February 20, 2008

RECEIVED
FEB 25 2008
AIR QUALITY DIV.

Attention: Mary Ann Halbeisen
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

Dear Sir or Madam,

The Southeast Michigan Council of Governments (SEMCOG) strongly supports the Michigan Department of Environmental Quality's PM2.5 State Implementation Plan (SIP) for Southeast Michigan. As the region's lead local air quality planning agency under the Clean Air Act, SEMCOG has worked closely with MDEQ and other local stakeholders to analyze the fine particulate problem in Southeast Michigan and identify the most cost-effective strategy for bringing the region into compliance as soon as possible.

As the SIP's weight of evidence demonstrates, extensive analysis of inventory, monitoring and modeling data have been undertaken in the development of Southeast Michigan's PM2.5 attainment strategy. All of these analyses have confirmed that the most effective strategy involves targeted local controls in the area of the region measuring the highest PM2.5 concentrations: southeast Dearborn/southwest Detroit. This is the only area in the region with monitors currently exceeding the annual standard.

While the SIP includes a thorough review of all data available at the time it was written, additional information has, or will soon, become available that further reinforces the State's attainment strategy. We encourage MDEQ to incorporate this new information into the SIP before submitting it to the USEPA.

SEMCOG concurs with MDEQ that expected reductions from national controls, combined with local controls currently being implemented at Severstal, U.S. Steel, and the Marathon refinery, will bring the region into attainment by 2010. Indeed, significant reductions have already taken place over the last five years and monitoring data now shows only one monitor (Dearborn) with an annual average concentration above the standard. Clearly the region is on the right path to attainment.

Sincerely,

Paul E. Tait

Paul Tait
Executive Director

cc: Steven Chester, MDEQ
Vincent Hellwig, MDEQ
Robert Irvine, MDEQ
John Mooney, USEPA
Chuck Hersey, SEMCOG

William T. Roberts Chairperson *Mayor, City of Walled Lake*
Mary Blackmon First Vice Chair *Trustee, Wayne County Regional Education Service Agency*
Robert J. Cannon Vice Chairperson *Supervisor, Clinton Township*
Philip M. Cavanagh Vice Chairperson *Commissioner, Wayne County Board of Commmissioners*
Robert Hison Vice Chairperson *Mayor, City of St. Clair Shores*
Michael Sedlak Vice Chairperson *Clerk, Green Oak Township*
John F. Jones Immediate Past Chair *Supervisor, Ira Township*
Paul E. Tait Executive Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
AIR AND RADIATION DIVISION
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

MAR 17 2008

REPLY TO THE ATTENTION OF:
(AR-18J)

Robert Irvine
Division of Air Quality
Department of Environmental Quality
525 West Allegan Street
P.O. Box 30473
Lansing, MI 48909-7973

Dear Mr. Irvine:

We appreciate the work that the Michigan Department of Environmental Quality has done to address the particulate matter problem in Southeast Michigan. We are pleased to review the draft plan that you have made available for public comment.

The enclosure provides comments on your draft plan. We are particularly concerned that Michigan appears to need to request an extension to the attainment deadline for Southeast Michigan, and in that context that Michigan appears not to have evaluated candidate control measures adequately or implemented a full set of reasonably available control measures.

We look forward to working with you to address these concerns. Please contact John Summerhays at (312) 886-6067 if you have any questions about these comments.

Sincerely yours,

Steve Rosenthal, Acting Chief
Criteria Pollutants Section

cc: Mary Ann Halbeisen, MDEQ

Enclosure

Comments on Draft Michigan SIP
for PM2.5 in Southeast Michigan

Modeling Analyses

Michigan's attainment demonstration for PM2.5 in Southeast Michigan reflects a combination of regional and local modeling. Michigan's draft SIP mostly addresses the local area analysis, and so our comments predominantly apply to this analysis.

A key component of the local area analysis is the concentration, identified through air quality data analyses, that is attributed to local sources. Our guidance for local area analyses recommends using a concentration derived in this manner in conjunction with local area modeling that assess prospective reductions in these local area concentrations. We applaud Michigan for following this general approach. However, we have concerns about several elements of Michigan's draft analysis. We have organized our modeling comments into comments on 1) the magnitude of the estimated impact of local sources, 2) the relationship between the estimated impact of local sources (derived from monitoring data) and the emissions of the sources included in the local source modeling analysis, 3) separating the concentration addressed by regional modeling from the concentration addressed by local source modeling, 4) more specific comments on modeling methods used in the local source modeling, 5) clarifications we would request, and 6) evidence to be considered in the weight of evidence assessment.

1. The most challenging element of a local area analysis is assessing the concentrations attributable to local sources and assuring reasonable correspondence between this impact estimate and the source emissions to which those impacts are being attributed. Source apportionment analyses are often the best means of assessing this impact, and we are pleased that several studies of this type have been conducted. This first comment addresses the overall magnitude of the local source impacts.

a. The local area analysis must address the same time frame as the regional analysis. If Michigan uses regional modeling for years centering on 2005, then Michigan must assure that its local area analysis also represents conditions in the years centered on 2005.

Tables 7 and 9 show a downward trend measured PM2.5 at all monitors. They also show that the difference between Allen Park and Dearborn has gotten smaller over time. This means that presumably, the local contribution to PM2.5 at Dearborn is smaller now than it was 3-5 years ago. Thus, if Michigan's principal analysis of attainment uses data centered on 2005, then a lower local source impact would be warranted.

b. The Sonoma report identifies a "Steel Industry" impact at the Dearborn monitor of 0.81 ug/m3. The failure to note this result is a serious omission from the draft SIP that reduces its credibility. The Sonoma report identifies several other industrial source types with similar or greater impacts. The steel mill impact, which reflects the impact of Severstal and other sources with similar types of emissions, is a better starting point for assessing the impact of local source controls, particularly the controls at Severstal.

EPA has also conducted analyses of the impact of steel mills in this area. EPA estimated that these sources cumulatively contribute 0.48 ug/m3 to this monitor. Further details of EPA's analysis are provided in "Regulatory Impact Analysis (RIA) for the Proposed National Ambient Air Quality Standards for Particulate Matter," dated October 6, 2006, in particular in Appendix B, "Local-Scale Assessment of Primary PM2.5 for Five Urban Areas," at page B-29, Table 17.

We are continuing to examine the various studies that evaluate the impact of various local sources. Nevertheless, it appears that Michigan has substantially overstated the impact of local sources included in its analysis, such that the benefit of the noted local controls is likely to be substantially less than the draft SIP estimates.

2. The validity of the local area analysis depends on assuring that the local source impact determined by monitoring data analysis reflects the impact of a set of sources that reasonably corresponds to the set of sources included in the local area modeling, as well as assuring that the composition (mix of PM2.5 components) included in the estimated local impact reasonably corresponds to the composition of the modeled emissions. We have several comments regarding how well the impact estimate corresponds to the emissions being analyzed.

a. The draft SIP's estimates of local source impacts reflect the results of source apportionment analyses. By their nature, such analyses involve substantial quantities of information regarding the composition of each of the source combinations identified as contributing to the observed concentrations. This information should be presented, along with more information about the studies generally.

This information should indicate the relative proportions of the various PM2.5 components that are included. The draft SIP focuses on the combination of "mixed industrial" and "soil." As noted above, information on the contribution of steel industry sources is more germane to Michigan's local area analysis and would provide a better means of assessing the impact of emission reductions at Severstal.

b. The identified sources for the AERMOD modeling only included point sources. Michigan must either include other relevant sources or use an estimated impact of local sources that excludes the impact of other sources. Other local sources that may be affecting the monitors include locomotives and other non-road vehicles, on-road vehicles, road dust, and other area sources. Since Michigan in particular has not included "soil"-related emissions in its modeling analysis, it is inappropriate to include "soil" in its monitoring-based estimate of local source impacts. If the impact of local rail operations are included in the monitored impact value, it would clearly be important to include those sources in the modeling analysis as well. Excluding important local sources of primary PM from the modeling but including the impact of those emissions in the monitoring-based impact estimate will cause an overstating of the importance of the modeled sources.

c. The AERMOD modeling and post-processing used only total PM2.5 data. Speciation of the PM2.5 data into components (organic particles, elemental carbon, sulfate, nitrate, and other) should be applied to help determine how much of the emissions and emissions reductions (especially from Severstal) may actually be organic particles or elemental carbon. It may not be reasonable to assume that all of the PM2.5 emissions are crustal/metals without documentation of assumed speciation profiles from these facilities. The CAMx modeling speciation profiles are one source of data.

d. Similarly, Michigan should characterize the composition of the estimated impact of local sources to the extent practicable. At least some of this information is available from the source apportionment analyses Michigan is using. This type of information is essential to assess whether the impact estimate appropriately matches the emissions included in the local area modeling.

The evidence available suggests that the ambient impact used in Michigan's analysis includes a significant fraction of organic particles, especially insofar as this impact estimate reflected conditions around 2002. In contrast, the local area modeling appears to include very little organic particle emissions. The result appears to be the application of a reduction percentage derived from principally inorganic particle emissions data to an impact estimate that includes particulate matter (especially organic particulate matter) that is not reduced by that percentage. Thus, more generally, despite the challenges of addressing speciated information, this type of information is necessary to assure that the estimated local impact properly matches the emissions used in the modeling analysis.

3. Conceptually, Michigan is considering some portion of the monitored concentration to be attributable to regional sources and some portion of the monitored concentration to be attributable to local sources. It follows that the regional model would only address prospective changes in the impacts of regional sources, just as the local area analysis only speaks to the impact of local sources. That is, if the 2005-centered total design value at the Dearborn monitor is 17.6 ug/m3, and if the impact of the addressed emissions of local sources is 2.3 ug/m3, then the regional modeling would only address the difference of 15.3 ug/m3.

Since the multiplication by relative response factors is done on a PM2.5 component-by-PM2.5 component basis, we recommend that Michigan estimate the local source impact on a component-by-component basis, subtract these values from the total estimated component concentrations, and thereby obtain an estimate of the portion of the observed concentration for each component that is attributable to regional sources (i.e., sources and emissions not included in the local area analysis). These regional values should then be multiplied times the appropriate relative response factor to estimate the future year concentrations attributable to regional sources.

4. We have several more specific comments on procedures for the local modeling analysis.

a. The greatest impact of PM2.5 from Severstal on Dearborn seems to be due to emissions from roof monitors. The parameters used when modeling these emissions as volume sources in AERMOD suggest that the emissions from the roof monitors have no buoyancy (i.e. are emitted at ambient temperature). In fact these emissions would be quite hot. Consideration of the buoyancy of these emissions in the modeling run could have a large impact on the results.

b. For the AERMOD run which analyzed the impact of Severstal at the Dearborn monitor, the rural setting was used though the sources are clearly in an urban area and would most likely experience the effects of the urban heat island effect at night. Using the urban setting for this analysis would be more appropriate. Given that this rural run does not include the increased turbulence at nighttime due to the simulation of the urban heat island effect that would be included in the urban run, the contribution of the roof monitor emissions from Severstal could be overestimated due to an increased number of simulated stable conditions.

c. On Page 20-21, the last several paragraphs of Section 9.6.2 discuss the guidance for demonstrating attainment for Ozone, PM2.5, and Regional Haze. The text further discusses how several aspects of the guidance were not followed; e.g., quarterly analysis and speciated primary PM2.5. As a general rule, the guidance should be followed. If situations arise where the guidance isn't followed, justification and documentation should be provided to allow the reviewers to assess the validity of the alternative method. It's not clear whether or not quarterly RRF's would result in a significantly different result than use of the annual values. Quarterly RRF's should be developed from the modeling and applied to the local source contribution to the primary quarterly PM2.5 value.

d. No information is presented to discuss how the meteorological data has been processed, for example what surface and upper air stations were used and how the surface characteristics were generated. The meteorological preprocessor for AERMOD, called AERMET, incorporates surface characteristics (i.e., surface roughness, Bowen ratio, albedo). The selection of surface characteristic values can have a significant impact on predicted concentrations. Documentation on these aspects should be included to allow a more comprehensive review.

e. The documentation indicates 1 year of meteorological data was used. The guidance recommends more data be used if available. Five years of met data (e.g., 2002-2006) should be modeled to determine if there is variation in the local sources impact contribution from year to year. This could be particularly important in determining the relative response factor and in Step 2 on page 21 where the percent of the local primary PM2.5 determined to come from Severstal is based on AERMOD results.

f. EPA’s guidance recommends using a receptor grid sufficient to represent local scale impacts at and near the monitor. We recommend applying a 100 meter receptor grid, extending out a distance that would preclude receptors being located on modeled source private property (e.g., 300-400 meters). The receptors should be averaged to obtain a representative value.

5. We would request several types of information that would clarify the nature of the State's analyses.

a. Throughout the main document there are references to modeling and inventories for 2002, 2005, and 2009. The CAMx modeling used 2005 and 2009, and the AERMOD modeling used 2002 and 2009. However, it is difficult to understand what emissions levels were used in various parts of the modeling analyses. Many of the tables in Appendix A have inconsistent inventory numbers and it is not always clear what year the emissions represent. Also, there is limited documentation available for the CAMx modeling inventories. We request the following inventory summary information:

1) Statewide emissions totals (NOx, VOC, SO2, PM2.5, etc.) used for the 2002, 2005, and 2009 CAMx modeling for EGU, non-EGU point, area, on-road mobile, and non-road mobile.
2) The same information for the Detroit nonattainment area.
3) Detailed emissions summaries for 2005 and 2009 for the Detroit area EGUs (by unit).
4) PM2.5 emissions summaries for 2002/2005 and 2009 for all sources modeled with AERMOD.
5) CAMx emissions summaries for 2005 and 2009 for the AERMOD sources.
6) Detailed emissions (by process and/or stack) for the AERMOD sources. (See comment 5.c below)

b. Page 52 of the TSD shows emissions totals by State and by sector. The emissions projections for Michigan for EGU SOX emissions in 2009 projected from 2005 are 667 TPD. The Michigan EGU SOX emissions in 2009 projected from 2002 are 1,022 TPD. The Michigan EGU SOX emissions in 2002 are 1,103 TPD and 1,251 TPD in 2005. There is clearly some change in methodology or some reason that needs to be explained about why Michigan SOX emissions are higher in 2005 than 2002 and so much lower in 2009 when projected from 2005 compared to 2009 projected from 2002.

c. The SIP should also better clarify the inventory of sources used in the local modeling analysis. Further documentation of the inventory should especially be provided for Severstal, including full documentation of the estimates of emissions before and after compliance with the requirements that Michigan has adopted for this company. Given the potential for deterioration of control equipment, this documentation should identify the limits being imposed, so as to reflect the degree of control equipment deterioration which could occur without violating the adopted requirements. The draft SIP should include the complete AERMOD input files for both the base case and the future case runs.

Based on information provided informally to EPA, it appears that Michigan has assumed a reduction of emissions at Severstal that likely represents an overly optimistic capture and control efficiency mandated by the applicable limit. It is also not clear whether the emission estimates for the future case and the current case are based on the same underlying emission factor.

d. The regional modeling indicates PM2.5 reductions of 1.5-1.9 ug/m3 at the Detroit area monitors between 2005 and 2009 (Table 1). Application of the speciated model attainment test involves calculating changes in concentration for each PM species. Therefore, the 1.5-1.9 ug/m3 reduction can be broken down into each of the component species. Please supply a table which shows the changes in PM species to allow a better understanding of where the PM reductions are coming from.

e. There is a discussion of the emissions from switching locomotives, noting that 28 of them will be retrofitted with anti-idling equipment. It is noted that the emissions from these sources are relatively small, but may be important due to their proximity to monitors and the fact that they operate 24 hours per day. From the documentation it is not clear:
1) Where all of these rail yards and locomotives are located.
2) Which ones will be retrofitted or replaced.
3) How these locomotives and other rail yard sources were modeled in the regional modeling and local scale modeling.

f. To help support the modeled conclusions, it would be helpful to include a discussion on the meteorological data used in the AERMOD modeling, including some information that support the fact that the number of calms in the 2002 meteorological data was not unreasonably large. This seems particularly important in this modeling exercise where the greatest impacts are coming from roof monitor emissions close to the receptor that are modeled as non-buoyant.

g. NOx and SO2 RACT modeling is mentioned on page 17 of this section. It is unclear how the impact of the 50% reduction in all NOX emissions across the entire State was evaluated. The term “relative reduction factor” is mentioned but the estimation methodology is not described in any detail.

h. According to the discussion on page 21, the 2009 project design value for Dearborn (15.7) and SWHS (14.2) are based on “on the books” controls after a review of the TSD. The TSD has results for each monitor in 2009 based on “on the books plus will do” controls and has slightly higher 2009 projected design values for Dearborn (15.8) and SWHS. Michigan should clarify whether the “will do” scenario includes the changes in emissions from the 3 local sources in Wayne County that are mentioned in the local scale dispersion modeling. Michigan should also further explain the differences in controls in Southeast Michigan between the “on the books” scenario and the “on the books plus will do” scenario. It is difficult to understand why controls beyond those that are on the books will lead to an increase in the projected design value.

h. It is unclear from the write-up how the primary PM2.5 emissions from Severstal were modeled in CAMx. Michigan should explain whether the full emissions were modeled for both the base and future year CAMx runs, whether the PM2.5 emissions were excluded entirely, or whether the 2009 CAMx run reflects emission controls at this facility. If Michigan has concluded that it has avoided double-counting the effects of

Severstal and its emission changes, Michigan should explain its rationale for this conclusion.

6. We have comments on the supplementary evidence as to whether Southeast Michigan will attain the standard by 2009.

a. Some important evidence, contributing to the weight of evidence, suggests that Southeast Michigan will not attain the standard as early as 2009. First, modeling conducted by LADCO based on 2000 to 2004 data suggests that the area will be at 17.7 ug/m3 (minus any reductions from local source emission controls) in 2009. Second, the modeling described by Michigan assumes full control of the Monroe power plant, whereas the installation of controls at this plant are not expected to occur until mid- to late 2009, so that the significant benefits of this control will mostly not occur in 2009.

For these reasons, and given our concerns about the magnitude of air quality improvement that can be expected from the local source controls, we are concerned about the prospects that Southeast Michigan will not in fact attain the standard in 2009.

b. The draft SIP cites a number of emission reductions, implying that these improve the prospects beyond what would be inferred from the modeling results. However, most of these reductions occurred before 2005, so that these reductions would already be reflected in 2005 air quality and thus would already be reflected in Michigan's modeling analysis.

Most of the plants on the list in Table 4 were closed by 2005. The largest change in emissions from plant closings is with NOx, and we agree with the implication that NOx emission reductions can have significant benefits for PM2.5 air quality. However, use of air quality data centered on 2005 in the modeling analysis inherently already takes credit for these air quality benefits.

Similarly, many of the reductions at Marathon occurred either before or during 2005, and the controls at US Steel were implemented in mid-2005. Thus, these reductions are also inherently already largely reflected in the modeling analysis.

Conversely, some emission increases are expected at relevant local sources. For example, Severstal is expected to increase its NOx emissions by 37.6 tons per year. If the rail yard reductions in NOx (67 and 66 tpy) are significant given their proximity to the monitor of interest, then the increase in Severstal's emissions would also be significant. Severstal is also expected to increase its SO2 emissions. Emission increases between 2005 and 2009 are also expected at Marathon.

<u>Reasonably Available Control Technology (RACT)/Reasonably Available Control Measures (RACM)</u>

1. The comments above suggest significant prospects that Michigan will not attain the PM2.5 standard in 2009. In this context, it appears that Michigan has not provided the

review and implementation of RACT measures that the PM Implementation Rule requires.

Michigan seems to have conducted very little review of candidate control measures. Michigan must address RACT for the range of significant PM2.5 components or their precursors, as applicable for sources throughout the designated nonattainment area. This review must address directly emitted organic and inorganic particles as well as SO2 and NOx.

2. Michigan conducted sensitivity modeling assessing the impact of an arbitrary percentage reduction of NOx and SO2 emissions, including one run assessing the impact of statewide reductions and another run assessing the impact of reductions within the 7-county nonattainment area. While we are not fully clear on the details of Michigan's analysis, Michigan's results suggest to us that reduction of NOx and SO2 emissions in Michigan have the potential to provide significant benefit for air quality in the Detroit area. We do not think the analysis approach in Appendix F can adequately address the RACT/RACM requirement.

Control measures outside the nonattainment area in some cases have less air quality benefit in the nonattainment area and may be less reasonable than control measures within the nonattainment area. Nevertheless, Michigan must evaluate the candidate measures and assess whether any of these measures can reasonably be implemented outside the nonattainment area.

Within the nonattainment area, given the significant air quality problems that exist and appear likely to remain, we believe that Michigan upon further review will identify several measures that will be found to constitute RACT. Two measures in particular that we would highlight are the set of measures known as "NOx RACT" and coke oven gas desulfurization.

Many states in the Midwest and elsewhere that, like Detroit, are violating both the ozone and the PM2.5 standard are adopting rules requiring RACT for NOx. We believe that the benefits of reducing industrial point source NOx are commensurate with the portion of the inventory that these sources emit. The particulate matter problem by nature involves a combination of numerous components, and so the solution to the problem necessarily involves numerous measures, no one of which by itself would solve the problem. (Indeed, particulate matter appears to have even more contributors than ozone, and an even greater variety of control measures may be needed.) It appears that "NOx RACT" would have a significant benefit in the Detroit area at reasonable cost. We would be happy to share information on the limits that other states have adopted or proposed, to provide more information on the limits that they have found to constitute RACT.

Coke oven gas desulfurization is done at most U.S. coke plants. We believe this measure can be expected to provide worthwhile air quality benefits in the Detroit area at reasonable cost. Further discussion of this and other iron and steel plant measures is provided in a report by RTI International, available at

http://www.epa.gov/pm/measures/detroit_steel_recommendations20060207.pdf. This report recommends testing of condensible emissions at the EES coke plant to assess the quantity of these emissions. These emissions presumably are predominantly sulfate emissions, which would be substantially reduced with desulfurization of the coke oven gas. That is, desulfurization of the coke oven gas would make moot what quantity of condensible particulate matter is currently emitted.

3. The draft SIP comments on the length of Michigan's rulemaking process and the difficulty of implementing controls before 2010. Since the SIP submittal schedule has provided the state 3 years after the April 2005 effective date of the PM2.5 designations to complete any necessary rulemaking, the length of the state's rulemaking process does not constitute an acceptable rationale for failing to adopt measures that would facilitate attainment. In addition, Michigan has provided very little information on the timetable for implementing individual measures. A more detailed review must be conducted to identify candidate measures and to evaluate whether each candidate measure is reasonable. Given the prospects for continued nonattainment in Southeast Michigan beyond 2009, we believe that the SIP submittal schedule is providing Michigan ample opportunity to implement additional measures that will assist and expedite attainment.

4. Regarding organic particle impacts, Michigan's draft SIP notes the uncertainties regarding the composition of this impact. We would comment that 0.8 ug/m3 impact attributed to a steel mill, if it all approximates an annual average impact, is a highly significant impact. We also note the work underway under LADCO contract to extend and enhance previous work on organic particle origins in the Detroit area and elsewhere.

Organic particles are a substantial fraction of the PM2.5 concentrations in Southeast Michigan. LADCO has done substantial work to assess contributions to organic particle concentrations in Southeast Michigan and elsewhere. This is important information to provide in the SIP, in part because it has significant relevance to this plan for providing for attainment of the PM2.5 standards.

The draft SIP comments that the Dearborn monitor records an especially high quantity of organic particles, and implicitly suggests that the industrial area has greater than average emissions of these particles. For this reason, it is especially important that Michigan supplement the air quality analyses with work to investigate these emissions, including investigating the industrial sources that would be suspected of emitting this type of particulate matter. Since the area has a number of candidate sources of organic particulate matter, and since these types of sources appear to have a significant effect on air quality, a more thorough investigation of these sources must be conducted. Michigan should request stack tests in cases where potentially significant emissions cannot readily be estimated accurately through available emission factors. We understand that the investigation of candidate measures may need to begin as an investigation of the emissions of candidate sources, but for purposes of this SIP the investigation must then include an investigation of candidate control measures, with implementation of those measures that are reasonable.

5. At various places in the SIP, Michigan identifies source types that appear to be significant. For example, on page 20, the draft SIP notes that fugitive dust from storage piles, unpaved lots, and barren land areas collectively is cause for concern. Michigan needs to identify candidate measures and evaluate whether the measures addressing the source types that have been identified as contributing to the problem constitute RACT/RACM.

6. Some interesting analysis done by LADCO using nonparametric regression shows local area hotspots in Zug Island and at the Ambassador Bridge. The SIP should describe what types of controls are being implemented for these 2 hotspot areas that are clearly impacting local PM2.5.

7. Some parts of the discussion of local controls need clarification. On page 32, Michigan should provide estimates of PM2.5 emission reductions for U.S. Steel, to provide more directly relevant information concerning potential PM2.5 air quality impacts. On pages 32-33, for Marathon, it is not clear how the installation of a new coking unit to process heavy crude oil will affect PM and PM precursor emissions.

Enforceability of Control Measures

1. Michigan's draft SIP does not include copies of any rules, permits, consent decrees or other enforceable documents. Therefore, the draft SIP provides no basis for finding the control measures described in the SIP to be enforceable or creditable. To make these control measures enforceable and creditable, the final SIP must include documents that mandate these control measures, and the limits must be provided in a manner that, upon EPA approval, could be enforced by EPA. We would also encourage Michigan to send us these documents informally for our early review. We intend to examine the limits in these documents, to assess the both the enforceability of the requirements and the quantitative reduction required, including assessing the degree to which equipment for emissions capture and equipment for emissions control might be allowed to deteriorate.

2. Michigan's draft SIP notes emission reductions attributable to several source shutdowns. For these reductions to be creditable, Michigan must assure that the shutdowns are permanent and enforceable, such that the shutdowns will not create offsets that would allow a new source or a major modification to use the emission reductions negate the air quality benefits of the shutdown.

Contingency Measures

Under Clean Air Act and the Implementation Rule, contingency measures must be able to "take effect without significant further action by the State or EPA." Merely having a list of potential measures that would be candidates for future evaluation, adoption and implementation falls well short of this test. Especially given the prospects that Michigan will need to implement its contingency measures relatively soon, Michigan needs to

complete the evaluation work in advance of submitting its contingency measures, so that the submitted contingency measures will be fully defined measures that can be implemented promptly.

Given our concerns about implementation of RACT/RACM in Southeast Michigan, we anticipate that the listed contingency measures will also be evaluated as candidate RACT/RACM measures. We expect that Michigan's work on RACT/RACM measures will also lead to identification of other possible contingency measures, just as we expect that some of the measures on Michigan's contingency measure list will prove to be RACT/RACM. Once Michigan completes the necessary evaluation of candidate RACT/RACM measures, Michigan should from that process obtain sufficient information also to provide better defined contingency measures. For each measure, we then expect the SIP to document exactly how the measure would be implemented and under what schedule and under what circumstances the measure would take effect.

Reasonable Further Progress

If, as appears to be the case, the Detroit area needs an extension of the attainment deadline, then Michigan would need to provide a submittal addressing the requirement for reasonable further progress.

Emissions Inventory

We understand that the final SIP will include more thorough documentation of the emissions inventory, including documentation being prepared by LADCO. We will provide more thorough comments once that documentation becomes available. Nevertheless, we recommend one clarification to the summary information provided here. The table has a category of emissions identified as "nh3." We request further explanation of this category. We then recommend use of a more descriptive label for this category of sources.

Monitoring Analyses

1. The draft SIP, at page 18, states that "counties to the north of Wayne County do not contribute to PM2.5 nonattainment at the monitors showing violation of the standard." The draft SIP then concedes that an increase in concentrations at the violating monitors (characterized as a little increase) "is attributable to Oakland and Macomb Counties." Additional comments on EPA's designation for Southeast Michigan appear at various points throughout the draft SIP. As another example, on pages 4 to 5, the State reiterates arguments that only Wayne County should be designated nonattainment and asserts that EPA's inclusion of other counties in the designated nonattainment area was "arbitrary."

As you know, EPA promulgated designations effective April 5, 2005. That rulemaking included EPA's evaluation of what areas violate the standards, and what areas

"contribute" to violations of the standard in accordance with section 107 of the Clean Air Act. That rulemaking took into consideration the views of the State. Thus, EPA has already addressed the appropriate geographic scope of the area that contributes to violations of the standards in Wayne County. As a result of that designation, the SIP developed for the Southeast Michigan area must meet the statutory and regulatory requirements for nonattainment area plans, most notably the requirement for Michigan to submit a SIP providing for timely attainment and adequate analysis and implementation of RACT and RACM throughout the nonattainment area. While Michigan has latitude to provide for attainment using any of various combinations of measures providing for timely attainment, the nonattainment area, by defining the contributing area, represents the geographic area for which control measures are most likely to be beneficial and necessary.

EPA has previously explained in detail the reasons for the geographic scope of the designated nonattainment area. These reasons were articulated both to the State and to Oakland County in the following documents: (i) a letter from EPA to Governor Jennifer M. Granholm, dated June 29, 2004; (ii) a letter from EPA to Steven E. Chester, Director of MDEQ, dated January 20, 2006; (iii) a letter from EPA to Marc D. Machlin, Esq., also dated January 20, 2006, concerning a petition for reconsideration filed on behalf of Oakland County, Michigan; and (iv) a letter from EPA to Marc D. Machlin, Esq., dated September 25, 2007, concerning a second petition for reconsideration filed on behalf of Oakland County, Michigan. These documents and other information relevant to the designation may be found at: http://www.epa.gov/pmdesignations/.

The inclusion of this commentary in the draft SIP suggests that Michigan has failed to address the requirement for the SIP to examine candidate control measures throughout the designated nonattainment area. Furthermore, of course, we disagree with these statements, having thoroughly examined the pertinent issues in our prior rulemaking. The area violates the annual standard, which reflects a combination of contributions from all wind directions. We have already determined that sources beyond the 3 mile radius referenced in the draft SIP and indeed sources outside of Wayne County contribute to violations of the standards in the area. Accordingly, the area to be addressed by this SIP has already been defined, and the SIP is an inappropriate place to dispute the designation or to suggest that the State prefers to fall short of its SIP obligation.

2. Figure 6 does not suggest that OC is decreasing faster at one location or that it is substantively decreasing at all.

3. Figures 8 and 9 contradict each other. The Detroit urban excess in Figure 8 appears to be around 1 to 1.5 ug/m3. The Detroit urban excess in Figure 9 appears to be around 5 to 7 ug/m3.

4. Section 9.4 and Figure 18 are very confusing. It is very difficult to discern the mobile contribution to OC from Figure 18 because it looks like it contains pie charts of contributions to PM2.5 mass and not OC.

5. A mobile laboratory study is referenced in this section, but the measurement locations relative to Dearborn are not stated and the results are for a single day, so it is difficult to discern information relevant to Dearborn.

General Summary of Comments and MDEQ Responses for the PM2.5 SIP

Comment: Comments were received from several groups that appreciated the opportunity to participate with the SEMOS group in developing this SIP and WOE. Several comments supported the WOE approach that clearly analyzed emissions inventory, monitoring and modeling to develop the attainment strategy. Several comments supported using a focused and cost effective strategy in the attainment demonstration by targeting sources local to the monitors showing non-attainment instead of applying controls to the whole 7-county non-attainment area.

Comment: DTE Energy did not agree with including additional sulfur dioxide controls on the Edison Energy Service's coke battery as a contingency measure since the coke battery is upwind of the Dearborn monitor.

Response: MDEQ disagrees and believes that sulfur controls on the coke battery are a valid contingency measure and likely have some impact on the high monitors.

Comment: DTE Energy indicated several areas that needed clarification:

1. The table identified as the "Model Based Projections of Future Year Air Quality" has a misleading title and should reflect the true nature of this modeling projection.
2. The SIP needs to address other nearby sites that slightly exceed the annual NAAQS, like SWHS and should document why this site is of less concern than Dearborn (i.e., regional modeling shows attainment).
3. Indicated that wind directions need to be addressed consistently in the document. Sometimes wind directions are separated into 60-degree sectors, and other analyses use 10-degree wind sector data.
4. The current list of contingency measure sources is too broad and ambiguous.
5. The contingency plan would benefit from more details regarding how ongoing special monitoring studies at the Dearborn site will be used to identify the source(s) responsible for the organic carbon (OC), and possibly the sulfate excess, when compared against Allen Park data.

Response: MDEQ has made these corrections/clarifications.

Comment: SEMCOG suggested that additional information that has become available should be incorporated into the SIP before submitting to EPA.

Response: MDEQ agrees and has made appropriate updates.

EPA comments

Region V EPA provided extensive comments on Michigan's draft PM2.5 SIP, particularly focusing on the local scale modeling and including several areas where information was lacking or needed updating. MDEQ notes that generally accepted procedures for doing the local scale modeling, as has been discussed for months by state modelers throughout the region as well as EPA modelers, was used in this SIP. The approach taken is conservative in the assumptions and has been thoroughly described in the SIP document. Comments and responses are as follows:

Comment: Local area modeling needed to address the same time frame as the regional modeling.

Response: The local scale modeling was re-run using '05 met data. There was very little change in the final values as a result of this action.

Comment: Results from source apportionment analyses should be noted.

Response: A review of several source apportionment studies was included in Appendix G.

Comment: Modeling could be run using the urban setting.

Response: The local scale modeling was re-run using urban meteorological data.

Comment: Additional information on the MET data used in modeling is needed.

Response: Surface characteristic values have been documented. The guidance (referenced below) specifies "For both base and future year use the same 1 year of met data – the same year as used for the photochemical modeling". The guidance DOES say "if available, use more than 1 year of met data" but gives no additional information. As 2005 was a worse case year (as opposed to 2004 and 2006), using the single year of 2005 met is defensible, and it remains consistent with the photochemical modeling run.

Reference: "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze"; Section 5.3.2

Comment: Additional details and permit limits for Severstal's emissions is needed.

Response: Documentation has been added more completely describing the permitted emission limits at Severstal and the emission values modeled.

Comment: Information on modeling locomotives is needed.

Response: The table describing how locomotives were modeled in the regional and local scale modeling has been updated.

Comment: Additional information on RACT modeling and RACT analysis is needed.

Response: Additional documentation was provided regarding the 50% cut analysis for RACT, including the relative reduction factors, etc. Much more detail has been provided on the likely affected sources and affected emissions under RACT programs.

Comment: Additional information on contingency measures is needed.

Response: MDEQ has added more information on the individual potential measures and has ranked the measures on the ease of implementation.

Comment: Clarification needed on the ‘nh3’ category for the emissions table.

Response: A footnote was added to the table to clarify that the nh3 emission values only apply to the NH3 source category in the table.

Comment: Clarification needed for several figures in the WOE.

Response: MDEQ has clarified the figures, adding and revising headings and making other revisions.

Appendix C

EMISSIONS INVENTORY METHODOLOGY

SUPPORT DOCUMENTATION

FOR THE

FINE PARTICULATE SIP

January 2008

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1. Introduction

Emissions inventory documentation support for the $PM_{2.5}$ Fine Particulate SIP is provided in this appendix. An inventory was prepared for all counties in Michigan. Mobile estimates for the nonattainment counties were prepared by the Southeast Michigan Council of Governments (SEMCOG) and appear in a separate appendix. Mobile emissions for other counties were prepared by the Midwest Regional Planning Organization's (MRPO) contractor using traffic and vehicle information provided by the Michigan Department of Transportation. The Lake Michigan Air Director's Consortium (LADCO) is the MRPO. The focus of the inventory effort was to produce modeling inventories for the base year (2005) and the attainment year (2009). The future year projections take into account existing control measures and measures that are known to be on the way (e.g., CAIR measures). This inventory is referred to as the LADCO Base-M inventory. Procedures used to prepare these inventory products can be found in the "Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Technical Support Document," prepared by LADCO. LADCO has produced numerous summary reports with State and county total emissions and has posted them on their Internet site at:

http://www.ladco.org/tech/emis/basem/baseM_reports.htm

In a related effort, the 2005 Michigan statewide inventory was submitted to the EPA by the Michigan Department of Environmental Quality (MDEQ) pursuant to 40 CFR Part 51, Subpart A – Emissions Inventory Reporting Requirements.

2. EGU Point Sources

2005 EGU Point Source Methodology

The 2005 EGU point source data originated with annual emissions data provided to Michigan DEQ via the Michigan Air Emissions Reporting System (MAERS). Temporal allocation was performed by emission unit, month, day of week and hour using the procedures described in "Temporally Allocating Emissions with CEM Data for Chemical Transport and SIP Modeling," available at:

http://www.epa.gov/ttn/chief/conference/ei15/session4/edick.pdf

In addition to the heat input-based temporal profiles described in the paper, separate temporal profiles were developed based on Continuous Emissions Monitoring (CEM) reported emissions of NOX and SO_2 and these profiles were used instead of heat input to temporalize annual emissions of the respective pollutants. The CEM data used as the basis of the profiles was that for 2004 through 2006 obtained from the EPA Clean Air Markets Division (CAMD) website:

http://cfpub.epa.gov/gdm/index.cfm?fuseaction=iss.progressresults

Growing EGU Point Source to 2009

The 2009 data is obtained from Integrated Planning Model (IPM) results obtained by the EPA and converted to a modeling inventory by LADCO. The following is a LADCO Integrated Planning Model discussion, which details the methodologies used to project the EGU emissions to 2009 using results from the IPM model:

Specifically, future year emissions are based on EPA's IPM3.0 modeling. Three CAIR scenarios were addressed:

- Round 5a: EPA's IPM3.0 was assumed as the future year base for EGUs.
- Round 5b: EPA's IPM3.0, with several "will do" adjustments identified by the States. These adjustments should reflect a legally binding commitment (e.g., signed contract, consent decree, or operating permit).
- Round 5c: EPA's IPM3.0, with several "may do" adjustments identified by the States. These adjustments reflect less rigorous criteria, but should still be some type of public reality (e.g., BART determination or press announcement).

Inter-RPO IPM Global Parameter Decisions (May 11, 2005):

The following summarizes the decisions made by VISTAS, MRPO, CENRAP, and MANE-VU for global assumptions to be used in EGU forecasting with IPM. These decisions and changes are made to IPM version 2.1.9 assumptions, which can be referenced via EPA's IPM website at:

http://www.epa.gov/airmarkets/epa-ipm/

A. Market Assumptions

1. National Electricity and Peak Demand
   Decision: Use unadjusted Energy Information Agency (EIA) Annual Energy Output (AEO) 2005 national electricity and peak demand values.
2. Regional Electricity and Demand Breakout
   Decision: Use the existing IPM region breakdown as conducted in earlier modeling.
3. Natural Gas Supply Curve and Price Forecast
   Decision: Take existing supply curves and scale application to EIA AEO 2005 price point. In this approach, the EPA 2.1.9 gas supply curves will be scaled in such a manner that IPM will solve for AEO 2005 gas prices when the power sector gas demand in IPM is consistent with AEO 2005 power sector gas demand projections. In instances where the power sector gas demand in IPM is lower than that of AEO 2005 projections, IPM will project gas prices that are lower than that in AEO 2005 and vice versa.
4. Oil Price Forecast
   Decision: Use EIA AEO 2005 values.

5. Coal Supply and Price Forecast
   Decision: Take existing supply curves and scale application to EIA AEO 2005 price points, coal supply regions, and coal grades. In this approach, the coal supply curves used in EPA 2.1.9 are scaled in such a manner that the average mine mouth coal prices that the IPM is solving in aggregated coal supply regions are comparable to AEO 2005. Due to the fact that the coal grades and supply regions between AEO 2005 and the EPA 2.1.9 are not directly comparable, this is an approximate approach and has to be performed in an iterative fashion. This approach does not involve updating the coal transportation matrix with EIA assumptions due to significant differences between the EPA 2.1.9 and EIA AEO 2005 coal supply and coal demand regions.

B. Technical Assumptions
   1. Firmly Planned Capacity Assumptions
      Decision: Use revisions and new data as provided by RPOs and stakeholders.
      Decision: Allow North Carolina Clean Smokestacks 2009 data as provided to define "must run" units.
   2. Pollution Control Retrofit Cost and Performance [SO_2, NOx, and Hg] Decision: Retain pollution control retrofit cost and performance values.
   3. New Conventional Capacity cost and performance assumptions
      Decision: Use EIA AEO 2005 cost and performance assumptions for new conventional capacity.
      Decision: Retain existing 2.1.9 framework cost and performance for new renewable capacity.
      Decision: Exclude constraint on new capacity type builds (i.e., no new coal).
   4. SO_2 Title IV Allowance Bank
      Decision: Use existing SO_2 allowance bank value (4.99 million tons) for 2007.
   5. Nuclear Re-licensing and Uprate
      Decision: Use existing IPM configuration with updated EIA AEO 2005 (~$27/kW) incurrence cost for continued operation.

C. Strategy Assumptions
   1. Clear Air Mercury Rule (CAMR)
      Decision: Include CAMR in future rounds of IPM modeling.
   2. Renewable Portfolio Standards
      Decision: Model Renewable Portfolio Standards (RPS) based on the most recent Regional Greenhouse Gas Initiative documentation using a single RPS region for MA, RI, NY, NJ, MD and CT. The RPS requirements within these states can be met by renewable generation from New England, New York and PJM. EPA 2.1.9

methodology and hardwired EIA AEO 2004 projected renewable builds for the remainder of the country.

D. Other Assumptions

1. Run Years
   Decision: Revise runs years to 2008 [2007-08], 2009 [2009], 2012 [2010-13], 2015 [2014-17], 2018 [2018], 2020 [2019-22], and 2026 [2023-2030].
2. Canadian Sources
   Decision: Utilize existing v.2.1.9 configuration (no Canadian site specific sources).

3. Non-EGU Point Sources

2005 Non-EGU Point Source Methodologies

The 2005 point source data have as their original sources the 2005 Michigan point source emission inventory. This section of the document describes the compilation and processing of point source emission data submitted to comply with the Consolidated Emission Reporting Rule (CERR) for the EPA NEI 2005 inventory.

The data originates with the entry of data by the reporting facilities into the MAERS. The electronic data received from the reporting facilities is reviewed and compiled by the MDEQ, and exported to the fixed-width text version of the National Inventory Format (NIF). After the exported data is loaded into a PostgreSQL database patterned after the MS Access version of the NIF, the following processing steps and checks are performed.

Both emissions estimated by default calculations in MAERS and any emissions reported by facility operators are maintained in MAERS. For evaluation and quality assurance purposes, both types of records are included in the exports. To avoid double-counting, where a specific process/pollutant has emission records both reported directly by the facility operator, and estimated via MAERS calculations, the latter are excluded.

Portable facilities, such as asphalt plants, report total throughput and emissions, plus operating percentages for each county in which the portable facility was located during the year. From this information, records are generated for each county of operation, and throughput and emissions are apportioned based on the operating percentages reported by county and process. As geographic coordinates for all operating sites are not reported, coordinates corresponding to the centers of the counties of operation are assigned.

As attention has shifted from total particulate to PM_{10} and $PM_{2.5}$, total particulate records are excluded from the reporting requirements.

Over 99.8 percent of total criteria emissions are accounted for by emissions reported by operator; therefore, exported criteria emissions estimated via MAERS calculations are excluded.

In the site table, where strFacilityCategory is not set in the export, it is set to “01.”

Mandatory geo-coordinate fields were added to the NIF specifications released in December 2003, well after it would have been possible to collect this information from the reporting facilities for 2002 operations. The following values were deemed most often representative and the exported data are updated accordingly for 2002 data:

“strHorizontalCollectionMethodCode” is set to '027'
“strHorizontalAccuracyMeasure” is set to '2000'
“strHorizontalReferenceDatumCode” is set to '001'
“strReferencePointCode” is set to '106'

For 2005, these geographic data elements were requested of the facilities. The defaults above were applied only where data was not provided by the facility.

MAERS tracks emissions of some pollutants that are of interest to the Great Lakes Commission, but which do not have corresponding pollutant codes in the most recent NIF pollutant code table. Emission records for the following pollutant codes are excluded:

7440508; 8052413; DICDD,TOT; DICDF,TOT; HYDFLUORO; PERFLUORO; TRICDD,TO; TRICDF,TO; CH4; CO2; N20; 117840; 7783064.

Emission records for ammonia are exported with the Chemical Abstract Service (CAS) number 7664417, rather than the pollutant code NH3. These pollutant codes are updated to NH3. Likewise, records exported with pollutant codes PAH and POM are updated to pollutant codes 234 and 246, respectively.

All criteria and HAP emissions are reported at the process level, and the export routines reflect that in the strEmissionDataLevel field of the emission table. This field is set to null for criteria pollutant emission records per EPA guidance.

All emissions are exported as pounds of annual emissions. The EPA guidance suggests that criteria pollutant emission be reported in tons. The field strEmissionUnitNumerator is changed to TON and the filed dblEmissionNumericValue is divided by two000 for criteria pollutant emission records.

Null values in the quarterly throughput fields of process records are set to zero.

Where quarterly throughput fields of process records sum to zero, throughput percentages are set to 25% for each quarter.

MAERS recognizes a control device code of '909' for a “Roll Media Fiberglass Tack Filter (Tacky 1 side),” which is not recognized in the NIF code tables. Where this control device code is exported, the “strPrimaryDeviceTypeCode” field of the control equipment table is updated to a value of 058.

Because of the exclusion of emission records as described above, referential integrity of the exported data can be compromised. At this point, it is re-established by deleting records stepwise, in the following order.

CE records without corresponding EM records
PE records without corresponding EM records
EP records without corresponding EM records
ER records without corresponding EP records
EU records without corresponding EP records
SI records without corresponding EU records

The data are then checked again for referential integrity and mandatory fields and then loaded into the MS Access shell version of the NIF via append queries that connect to the PostgreSQL data tables via ODBC. The Basic Content and Format Checker is run and its output is reviewed. Where corrections are needed, to assure consistency among data sources, the corrections are made in the MAERS and a full iteration of the export and post-processing steps are performed.

The 2005 point source inventory was incorporated into the LADCO Base M inventory and serve as the basis for Michigan’s 2005 CERR submittal.

Growing Stationary Non-EGU Point, Stationary Area, Locomotive, Shipping, and Aircraft Categories to 2009

The 2009 emissions are based on work and a follow-up report (E.H. Pechan & Associates, Inc., Development of Growth and Control Factors for Lake Michigan Air Directors Consortium, Final Report, December 14, 2004) done by E.H. Pechan & Associates, Inc. (Pechan). This work supports LADCO’s efforts to forecast anthropogenic emissions for the purpose of assessing progress for air quality goals, including goals related to regional haze and attainment of the ozone NAAQS. The Pechan growth factors were used to estimate the LADCO base M future year emissions posted by LADCO in 2007. The future year emissions represent both emission controls that already exist and those that are known to be on the way (e.g., CAIR control measures).

To assess progress for attaining air quality goals, LADCO requires emission activity growth and control data to forecast emissions from a 2005 base-year inventory to several future years of interest. These future years include 2009, 2012, and 2018 (e.g., 2018 is the first milestone for regional haze reasonable progress demonstrations). Pechan prepared emission control factors to support forecasting for each of these years. Because the incremental level of effort required to develop emission activity

growth factors for each year over the 2003-2018 period was nominal, Pechan prepared non-EGU point and area and non-road source growth factors for each year over this entire period.

The report describes Pechan efforts to develop emission growth and control data to support future year air quality modeling by LADCO. The report is organized into a background chapter and:

Chapter II, which describes the development of the emission activity growth data;
Chapter III, which discusses how the emission control data were compiled;
Chapter IV, which describes the preparation of the growth and control factor files;
Chapter V, which identifies projection issues for future consideration; and
Chapter VI, which presents the references consulted in preparing this report.

The Pechan Growth and Control Factor report is too lengthy to be included in this document, but it can be provided upon request or downloaded at:

http://www.ladco.org/reports/rpo/MWRPOprojects/Strategies/Growth&ControlDraftReportOct26-04.pdf

For sectors non-EGU point source, stationary area source and MAR source sectors, the future year emissions for the LADCO States were derived by applying growth and control factors to the base year inventory. As stated above, these factors were developed by a contractor (E.H. Pechan). Growth factors were based initially on EGAS (version 5.0), and were subsequently modified (for select, priority categories) by examining emissions activity data.

Additional information on the procedures used to project emissions can be found in the "Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Technical Support Document" prepared by LADCO.

4. Stationary Area Sources

2005 Stationary Area Source Emission Inventory

The following is a description of the various area source categories that were inventoried as part of the year 2005 emissions inventory as required by the EPA under the CERR. It also provides documentation as part of the development of a broader emissions inventory (which encompasses point, area, non-road mobile, on-road mobile, and biogenic sources) that is being developed for (SIP requirements for attainment with the 8-hour ozone and $PM_{2.5}$ NAAQS and the regional haze regulations. For the purpose of developing state SIPs to demonstrate compliance with the ozone NAAQS, $PM_{2.5}$ NAAQS and regional haze rule, states are currently required to submit base-year inventories, 3-year cycle update inventories, rate of progress inventories, and modeling inventories. In a November 18, 2002 memorandum – 2002 Base-year Emission

Inventory for SIP Planning Process, EPA identified year 2002 as the base-year for the SIP planning process. Within 3 years after designations are determined, states will need to submit SIP attainment demonstrations for the 8-hour ozone and $PM_{2.5}$ NAAQS. The 2002 base-year inventory serves several purposes in supporting air quality modeling and control measure selection to determine the types and amount of emission reductions needed to meet reasonable further progress (RFP) and rate of progress (ROP) emission reduction targets and demonstrate attainment. Many of the emission inventory planning requirements can be found in the EPA document entitled: Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Subsequent to the submission of the 2002 inventory, there was considerable discussion by LADCO staff with states and the EPA as to the appropriateness of 2002 base-year inventory with respect to using a 2005 base-year inventory. At the time of the preparation of the year 2005 emissions inventory, these discussions were still ongoing between LADCO and EPA. EPA designated nonattainment areas for the 8-hour ozone NAAQS with an effective date of June 15, 2004, while nonattainment designations for the $PM_{2.5}$ NAAQS were published in the *Federal Register* later on January 5, 2005, with an effective date of April 5, 2005. For those states participating in regional planning organizations, there are additional SIP inventory requirements for regional haze. The cascading effect of subsequent nonattainment designations as well as subsequent attainment demonstrations, existing emission reductions from NOx SIP calls, and the appropriateness of the base-years 2002 and 2005 were discussed by LADCO, EPA, and the states. The 2005 inventory was developed to fulfill both a base-year inventory and three-year cycle update inventories that are required by the existing CERR.

The following chart shows the specific air pollutants that must be provided by the CERR and base-year inventories for the 8-hour ozone and $PM_{2.5}$ NAAQS and regional haze regulations.

Required Air Pollutants Emissions

	CO	NH3	NOX	Pb	PM_{10}-PRI	PM25-PRI	SOX	VOC
Consolidated Emissions Reporting Rule (CERR)	√	√	√	√	√	√	√	√
Ozone NAAQS	√		√					√
$PM_{2.5}$ NAAQS		√	√		√	√	√	√
Regional haze		√	√		√	√	√	

In producing the 2005 emission inventory, multiple emission estimates must be provided to reflect temporal resolution that is required by the CERR and base-year inventories for the ozone and $PM_{2.5}$ NAAQS. These requirements are summarized as follows:

Temporal Resolution Requirements for Inventories

	Statewide Inventory	Summer Weekday
Consolidated Emissions Reporting Rule (CERR)	**Required**	
Ozone NAAQS	**Required**	**Required**
$PM_{2.5}$ NAAQS	**Required**	**Optional**
Regional haze	**Required**	**Optional**

Consequently, the statewide year 2005 emission estimates that are being provided reflect the annual and summer weekday for the referenced air pollutants. A list of the 30 area source categories appears on the following page. EPA requires specific data elements to be provided via electronic data transfer using the National Emission Inventory NEI-NIFV3.0 format. A description of data structures can be found in the EPA publication NEI Input Format (NIF) Version 3.0 User's Guide Instructions and Conventions of Use, April 2003.

Summary of Area Sources and Respective Air Pollutants Inventoried for 2005 Inventory

Seq #	Area Source Description	SCCs	SIC	CO	NH3	NOX	PM_{10}-PRI	PM25-PRI	SOX	VOC
1	Crude oil production	2310010000	1311							√
2	Natural gas production	2310020000	1311							√
3	Breweries	2302070001	2082							√
4	Cutback asphalts	2461021000	2951							√
5	Distilleries	2302070010	2085							√
6	Emulsified asphalts	2461022000	2951							√
7	Aircraft refueling	2275900000	4581							√
8	Commercial coal	2103002000	9999	√	√	√	√	√	√	√
9	Commercial distillate oil	2103004000	9999	√	√	√	√	√	√	√
10	Commercial kerosene	2103011005	9999	√	√	√	√	√	√	√
11	Commercial natural gas	2103006000	9999	√	√	√	√	√	√	√
12	Commercial residual oil	2103005000	9999	√	√	√	√	√	√	√
13	Gasoline marketing	2505030120, 2501060100, 2501060051, 2501060052, 2501060053, 2501060200	5541							√
14	Industrial coal	2102002000	3999	√	√	√	√	√	√	√
15	Industrial distillate oil	2102004000	3999	√	√	√	√	√	√	√
16	Industrial kerosene	2102011000	3999	√	√	√	√	√	√	√

17	Industrial natural gas	2102006000	3999	√	√	√	√	√	√	√
18	Industrial residual oil	2102005000	3999	√	√	√	√	√	√	√
19	Residential coal	2104001000	8811	√	√	√	√	√	√	√
20	Residential distillate oil	2104004000	8811	√	√	√	√	√	√	√
21	Residential kerosene	2104011000	8811	√	√	√	√	√	√	√
22	Residential natural gas	2104006000	8811	√	√	√	√	√	√	√
23	Residential propane	2199007000	8811	√		√	√	√	√	√
24	Municipal landfills	2620030000	4953	√		√	√	√		√
25	Vessel ballasting	2505020900	4432							√
26	Vessel loading	2505020120, 2505020030,2505020150, 2505020180, 2505020090, 2505020060	4432							√
27	Remedial action	2660000000	9511	√		√	√		√	√
28	Traffic marking paints	2401008000	1611							√
29	Wineries	2302070005	2084							√
30	Aviation stage I	2501080050	5541							√

Oil and Natural Gas Production

The oil and gas production area source category represents those VOC emissions that result from the exploration, drilling, and the field processing of crude oil and natural gas. Fugitive VOC emissions occur from control valves, relief valves, spills, pipe fittings, pump seals and compressor seals in the production and field processing of crude oil and natural gas. Individual county crude oil and natural gas production data was obtained from the MDEQ, Geological and Land Management Division. VOC emission factors were derived from the EPA publication entitled: Revision of Evaporative Hydrocarbon Emission Factors (EPA – 450/3-76-039). The emission factors are 107 pounds of emitted VOC per thousand barrels of produced crude oil and 175 pounds of emitted VOC per million cubic feet of produced natural gas. For crude oil production, emission controls reflecting NESHAP application of a 45% reduction in VOC were considered. This control level was based on EPA determination of an overall 45% reduction in VOC from oil and natural gas production facilities. This control reduction was obtained from a 5/14/99 EPA fact sheet that was published with the Final Air Toxics Rules for Oil and Natural Gas Production Facilities and Natural Gas Transmission and Storage Facilities. Rule effectiveness of 80% was then applied, and point source deductions were performed to estimate the area source contribution. For natural gas, emission controls from Michigan air pollution control rule R336.1629 of 72% and the federal emission control reduction in VOC of 19% associated with NESHAP application to natural gas transmission and storage were applied. The 19% emission reduction was obtained from the 5/14/99 EPA fact sheet that was published with the Final Air Toxics Rules for Oil and Natural Gas Production Facilities and Natural Gas Transmission and Storage Facilities. The federal NESHAP rule became effective June 17, 1999. Area source emissions were then reported using Source Classification Codes (SCC) of 2310010000 for crude petroleum oil production and 2310020000 for natural gas production.

Vessel Loading/Ballasting

Evaporative VOC occur from Great Lakes ships when being loaded with gasoline and petrochemicals. Vapors are also displaced when cargo tanks are loaded with water for ballasting. In order to estimate VOC from vessel loading/ballasting activities, a list of marine terminals at Michigan based ports handling petroleum products was obtained from the MDOT. Because of the need to acquire information on gasoline and petrochemical handling at each Michigan port and the time frames during vessel loading/ballasting occurred, a survey form was again sent to the marine terminals that were previously surveyed in the 2002 inventory. This State survey approach went beyond the EPA's prescribed inventory procedures in Volume III, Chapter 12 of the Emission Inventory Improvement Program January 2001 guidance for Marine Vessel Loading, Ballasting and Transit. The survey form requested information on days of operation, seasonal fuel transfer information on gasoline, distillate fuel oil, jet naphtha, jet kerosene, kerosene, residual fuel oil, and crude petroleum loading into ship and barge cargo tanks as well as ballast operations. The survey data was then summed to derive individual county totals. The results of this survey revealed that there were only

two fuel types (contaminated gasoline, and residual fuel oil) where loading had occurred. VOC emission factors (0.00009 lbs/1000 gallons of residual fuel oil and 3.4 lbs/1000 gallons of gasoline) were then applied to their respective fuel volumes to obtain the estimated emission losses. Although the EPA, on September 19, 1995, issued Federal Standards for Marine Tank Vessel Loading Operations and National Emission Standards for Hazardous Air Pollutants for Marine Vessel Loading Operations, the respective facilities transferring fuel were exempt from control requirements. Consequently, emissions estimates were based on the respective emission factors without the application of control measures. Individual county VOC emission estimates from loading and ballasting operations were reported using the following SCC codes:

Vessel Loading/Ballasting Operations	Reported SCC Code
Vessel loading, distillate fuel oil	2505020090
Vessel loading, gasoline	2505020120
Vessel loading, residual fuel oil	2505020060
Vessel loading, crude oil	2505020030
Vessel loading, naphtha	2505020150
Vessel loading, jet kerosene	2505020180
Vessel loading, kerosene	2505020180
Vessel ballasting, gasoline	2505020900
Vessel ballasting, crude oil	2505020900

Service Station Loading (Stage I)

Gasoline vapor loss occurs at service stations when gasoline is unloaded from delivery tank trucks into underground storage tanks. The extent of vapor loss is dependent upon the method of filling (splash, submerge, or vapor balanced). In computing VOC emissions from service station loading, year 2005 gasoline throughput estimates were obtained from Energy Information Administration's Petroleum Marketing Monthly data. The monthly data was then summed to derive an estimated statewide gasoline total. County gasoline total estimates were then determined by apportioning the statewide gasoline by the percent of state gasoline sales occurring within each county. County gasoline sales data was obtained from the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. State gasoline throughput consumption was apportioned on a county basis using the following mathematical equation:

$$Ct = St \times Cs/Ss$$

Where:

Ct = Estimated county gasoline consumption for year 2005
St = Statewide gasoline consumption for year 2005
Cs = County gasoline service station retail sales data
Ss = State gasoline service station retail sales data

VOC emission estimates were developed based upon the guidance provided in the EPA prescribed inventory procedures in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) and subsequent September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. Year 2005 and summer weekday emission factors were developed based upon actual temperature, and RVP fuel volatility information for various regions of the State to reflect the applicable RVP control measures. Monthly temperature data was obtained for the year 2005 from the NOAA, National Climatic Center Local Climatological Data that was utilized in determining year and summer day temperatures for the Michigan Upper Peninsula and Michigan Lower Peninsula regions. Reid Vaporr Pressure (RVP) data for marketed gasoline during year 2005 was obtained from the Michigan Department of Agriculture, Motor Fuels Quality, Laboratory Division. VOC mission factors were then developed for splash fill, submerge fill, and vapor balanced gasoline dispensing facilities on a county basis which reflected the actual temperature and RVP of marketed gasoline products.

Year 2005 Temperature Summary

Month	Lower Peninsula Month Avg of Day Maximum	Upper Peninsula Month Avg of Day Maximum
December	33.5	24.8
January	28.0	18.9
February	33.8	29.5
March	38.2	33.2
April	59.7	53.8
May	64.8	59.3
June	82.4	77.1
July	83.5	79.4
August	81.8	77.1
September	77.3	72.5
October	62.1	55.7
November	49.4	37.1
Year Avg	57.9	51.5
Ozone Season Avg	74.9	69.9
Summer Weekday Avg	82.6	77.9

Stage I loading emission factors were determined using the methodology specified in September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. The following equation is presented:

$$L = 12.46 \times SPM/T$$

Where:

L = Loading loss (uncontrolled), pounds per 1000 gal of liquid loaded

S= A saturation factor where S= 0.6 for submerged loading with no vapor balance, S = 1.00 for submerge loading with vapor balance, and S = 1.45 = splash

loading no
vapor balance

P = True vapor pressure of liquid loaded, pounds per square inch absolute (psia)

M = Molecular weight of vapors, pounds per pound-mole
T = Temperature of bulk liquid in degrees F + 460

The quantity of county gasoline throughput that is splash filled, submerge filled, and vapor balanced was estimated on basis of past gasoline surveys, and the applicability of state regulations which require the installation of submerge fill or vapor balanced systems. These percentages were obtained from the year 1999 emissions inventory. The same county fractional percentages of splash filled, submerge filled, and vapor balanced were used in the year 2005 inventory for consistency with respect to prior emission inventory.

The respective emission estimates were reported using the following SCC codes:

Michigan Gasoline Marketing Stage I Emission SCC Codes

Stage I Type	SCC
Submerge filled loading	2501060051
Splash filled loading	2501060052
Vapor balanced loading	2501060053

The EPA on December 19, 2003 issued final rule requirements for Stage I gasoline distribution in Standards of Performance for Bulk Gasoline Terminals and National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations. These NESHAP requirements will be applied in point source inventories for bulk terminals.

Calculation of Stage I Emission Factors for Year 2005

Notes: Gasoline stage I temperatures based on available data as of 5/18/06. Reid vapor pressures were derived from Michigan Dept. of Agriculture analytical data which showed higher than expected averages due to the suspension of RVP restrictions during Hurricane Katrina.

Region	Year 2005 Annual Emission Factor lbs/1000 gal	Ozone Season 4/1/05-9/30/05 Emission Factor lbs/1000 gal	Summer Weekday 6/1/05-8/31/05 Emission Factor lbs/1000 gal	Year 2005 Annual Temperature F	Year 2005 Ozone Season 4/1/05-9/30/05 Temperature F	Year 2005 Summer Weekday 6/1/05-8/31/05 Temperature F	Year 2005 Annual RVP	Ozone Season RVP 4/1/05-9/30/05	Summer Weekday RVP 6/1/05-8/31/05	Year 2005 Annual True Vapor Pressure P	Year 2005 Ozone Season 4/1/05-9/30/05 True Vapor Pressure P	Year 2005 Summer Weekday 6/1/05-8/31/05 True Vapor Pressure P	Saturation Factor S	Year 2005 Annual RVP Molecular Weight	Ozone Season 4/1/05-9/30/05 RVP Molecular Weight	Summer Weekday 6/1/02-8/31/02 RVP Molecular Weight
Vapor Balance Gasoline																
Upper Peninsula	0.76	0.91	0.99	**51.1**	**69.9**	**77.9**	11.2	9.6	9.0	4.82	5.82	6.4	1	64.4	66.2	66.67
Lower Peninsula	0.86	1.00	1.07	**57.9**	**74.9**	**82.6**	11.2	9.6	9.0	5.58	6.5	7	1	64.4	66.2	66.67
SE Michigan	0.86	0.96	0.99	**57.9**	**74.9**	**82.6**	11.2	9.3	8.4	5.58	6.23	6.4	1	64.4	66.47	67.07
Submerge Fill Gasoline																
Upper Peninsula	4.54	5.44	5.93	**51.1**	**69.9**	**77.9**	11.2	9.6	9.0	4.82	5.82	6.4	0.6	64.4	66.2	66.67
Lower Peninsula	5.19	6.01	6.43	**57.9**	**74.9**	**82.6**	11.2	9.6	9.0	5.58	6.5	7	0.6	64.4	66.2	66.67
SE Michigan	5.19	5.79	5.91	**57.9**	**74.9**	**82.6**	11.2	9.3	8.4	5.58	6.23	6.4	0.6	64.4	66.47	67.07
Splash Fill Gasoline																
Upper Peninsula	10.97	13.14	14.33	**51.1**	**69.9**	**77.9**	11.2	9.6	9.0	4.82	5.82	6.4	1.45	64.4	66.2	66.67
Lower Peninsula	12.54	14.53	15.54	**57.9**	**74.9**	**82.6**	11.2	9.6	9.0	5.58	6.5	7	1.45	64.4	66.2	66.67
SE Michigan	12.54	13.99	14.29	**57.9**	**74.9**	**82.6**	11.2	9.3	8.4	5.58	6.23	6.4	1.45	64.4	66.47	67.07

Service Station Unloading/Vehicle Fueling (Stage II)

Motor vehicle fueling at service stations results in evaporative loss of gasoline. VOC emissions are produced during displacement of vaporized hydrocarbons and spillage of gasoline during refueling. EPA guidance in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) recommends the MOBILE model be used to generate refueling (Stage II) emission factors for highway emission inventories. Additional procedures were presented in September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. The MOBILE6 model was used to derive the Stage II emission factor by obtaining monthly emission factors in grams/VOC mile as well as fuel economy as miles per gallon and vehicle miles traveled mix for the different gasoline vehicle types (e.g., LDTV, LDGT, and HDGV). For each vehicle type, the monthly emission factor was multiplied by the fuel economy to obtain an emission factor in unit grams of VOC/gallon.

grams VOC/gallon = Grams/mile x miles/gallon

Stage II grams/gallon refueling emission factor rates were initially prepared by SEMCOG using MOBILE6.2 and then later adjusted for year 2005 state specific RVP and temperature data. The vehicle miles traveled (VMT) mix for each vehicle types was used to calculate a single weighted monthly emission factor. Summer and average annual emission factors were then developed for Southeast Michigan, the rest of the Lower Peninsula, and the Upper Peninsula. SEMCOG's Stage II grams/gallon adjusted emission factors are presented below. It is noted that the Stage II emission rates for year 2005 were greater than year 2002 rates due to the marketing of RVP exempt fuels created by Hurricane Katrina disruption of refinery operations.

Year 2005 Refueling Emission Rates for State of Michigan

Average Type and Geographical Area	**Grams/Gallon**
Summer (Average of monthly refueling emission rates for June, July & August, 2005)	
Southeast Michigan (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne counties)	2.71
Rest of Lower Peninsula (All counties in Lower Peninsula except the 7 Southeast Michigan counties)	3.04
Upper Peninsula (All counties in the Upper Peninsula)	2.85
Average Annual (Average of monthly refueling emission rates)	
Southeast Michigan (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne counties)	2.94
Rest of Lower Peninsula (All counties in Lower Peninsula except the 7 Southeast Michigan counties)	3.05
Upper Peninsula (All counties in the Upper Peninsula)	2.94

All rates were initially calculated using MOBILE6.2 model, and then later adjusted for year 2005 RVP and temperature conditions.

The respective SEMCOG grams VOC/gallon were then converted to lbs/1000 gallons.

Lbs VOC/1000 gallons = Grams VOC/gallon x 1 lb/453 grams x 1000 gallons

Year 2005 gasoline throughput estimates were obtained from Energy Information Administration's Petroleum Marketing Monthly data. The monthly data was then summed to derive an estimated statewide gasoline total. County gasoline total estimates were then determined by apportioning the statewide gasoline by the percent of state gasoline sales occurring within each county. County gasoline sales data was obtained from the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. Total county emissions estimates were based on the county gasoline volume by the corresponding refueling emission factor. Emission rates were reported using the SCC code 2501060100.

Service Station Tank Breathing

Pressure changes occur within underground storage tanks as a result of temperature differences that exist between gasoline vapor and the liquid phases. The exchange of vapor within the storage tank to the atmosphere is commonly described as tank breathing.

Underground gasoline storage tank breathing losses were estimated by applying a 1.0 pound per thousand gallon throughput emission factor using procedures presented in EPA's Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) and September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. Year 2005 county gasoline consumption estimates were obtained by apportionment of the statewide gasoline consumption based on the county percentage of state gasoline retail sales. Statewide gasoline consumption data was obtained from Energy Information Administration's Petroleum Marketing Monthly and county retail gasoline sales information was identified in the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. Emission estimates were reported using the SCC of 2501060200.

Gasoline Tank Truck Transit

Breathing losses from gasoline tank trucks occurs as a result of pressure changes within the containment vessel. The pressure change in the containment vessel is caused by temperature differences between the vapor and liquid phases as well as

agitation during transport. Gasoline tank trucks leak VOC vapors and liquids from gaskets, seals, and seams during transport.

Because some gasoline is delivered to bulk plants rather than delivered directly to service stations from terminals, the amount of gasoline transferred in any area may exceed the total gasoline consumption, due to additional trips involved. Therefore, gasoline tank truck transit evaporation emissions were based on the total volume of gasoline transferred rather than county consumption level.

The total gasoline transferred in a given county was obtained by taking the sum of both the service station volume delivery and the bulk plant gasoline transfer. The bulk plant gasoline transfer volume in a county was obtained from point source data. VOC emissions estimates were developed using the gasoline tank truck transit emission factors identified by EPA procedures presented in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) . In this document, VOC loss from gas filled tank truck emission factor was 0.005 lbs/1000 gallons while empty vapor-filled tank trucks were 0.055 lbs/1000 gallons. A single emission factor of 0.06 lbs/1000 gallons was derived by taking the sum of the two respective factors, and then applying this emission factor to the total transported gasoline volume. Further emission adjustments were then made to the respective emission totals to reflect those delivery vessels in those counties that are subject to Michigan Air Pollution Control Rule R 336.1627. A control efficiency of 76% was considered before subsequent application of an 80% rule effectiveness and 100% rule penetration factors for delivery vessels in those counties subject to R336.1627. Emission estimates were reported using the SCC of 2505030120.

Aviation Fuel Stage I Loading

Gasoline vapor loss occurs at airports when gasoline is unloaded from delivery tank trucks into underground storage tanks. Because of the need to temporally adjust aircraft refueling emissions for all respective fuel types within all Michigan counties, it was determined that local aviation fuel sales information could only be acquired by contacting each fuel distributor serving each airport. Because the fleet of the aircraft varies at each airport, the amount of fuel type consumed will likewise be dependent on the types of aircraft being serviced and not just based upon Landing-Take Offs (LTOs) alone.

A list of those Michigan commercial and private airports where fuels are dispensed was obtained from the MDOT publication 2003 Michigan Airport Directory. A survey form was then mail to each airport operations manager. Total fuels sales information by fuel type(s) and season were obtained from either airport staff or assigned fixed base operators. This information was then summed for each Michigan county to provide an estimate of the total volumes of jet kerosene, jet naphtha, and aviation gasoline handled at each airport facility. Stage I loading VOC emission factors for jet kerosene and jet naphtha were determined using the following equation:

$L = 12.46xSPM/T$

Where:

L = Loading loss (uncontrolled), pounds per 1000 gal of liquid loaded

S= A saturation factor where 1.45 = splash loading

P = True vapor pressure of liquid loaded, pounds per square inch absolute (psia)

M = Molecular weight of vapors, pounds per pound-mole

T = Temperature of bulk liquid in degrees F + 460

For Stage I aviation gasoline VOC emissions, an emission factor was obtained the EPA publication entitled: Documentation for the 2002 Nonpoint Source National Emission Inventory for Criteria and Hazardous Air Pollutants (January 2004 Version). The resultant emission factors were then applied to the total county fuel throughput after considering point source fuel throughput deductions. Because EPA does not have itemized SCC codes by fuel type, VOC emissions were added together and reported using a SCC of 2501080050.

Aircraft Refueling (Stage II)

Aircraft refueling at airports results in the evaporative loss of aviation gasoline, jet kerosene, and jet naphtha. VOC emissions occur when vapor laden air in a partially empty fuel tank is displaced to the atmosphere during refueling. The quantity of the vapor being displaced is dependent upon the fuel temperature, fuel vapor pressure, aircraft fuel tank temperature, and the fuel dispensing rate.

Because of the need to temporally adjust aircraft refueling emissions for each respective fuel type within each Michigan county, it was determined that local aviation fuel sales information could only be acquired by contacting each fuel distributor serving each airport. Because the fleet of the aircraft varies at each airport, the amount of fuel type consumed will likewise be dependent on the types of aircraft being serviced and not just based upon LTOs alone.

A list of those Michigan commercial and private airports where fuels are dispensed was obtained from the MDOT publication 2003 Michigan Airport Directory. A survey form was then mailed to each airport operations manager. Total fuels sales information by fuel type(s) and season were obtained from either airport staff or assigned fixed base operators. This information was then summed for each Michigan county to provide the

total dispensed volumes of jet kerosene, jet naphtha, and aviation gasoline. VOC aviation refueling loss emission factors were obtained from the EPA publication Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42) were then applied to the respective county total fuel volumes.

Aviation Fuel Type	Emission Factor as lbs of VOC/1000 gallons fuel
Jet kerosene	0.08
Jet naphtha	5.58
Aviation gasoline	12.20

Because there is no provision currently to allow for the reporting of emissions by individual fuel type, emissions were then summed for all fuel types and reported using the SCC code 2275900000.

Traffic Marking Coatings

Traffic marking coatings are paints that are used to mark pavement, including dividing lines for traffic lanes, parking space markings, crosswalks, and arrows to direct traffic flow. VOC emissions result from the evaporation of organic solvents during the application and curing of the marking paint.

VOC emissions were estimated for each county using the methodology identified in the EPA's Volume III, Chapter 14 of the Emission Inventory Improvement Program May 1997 Final Guidance for Traffic Markings. The preferred method was to conduct surveys to determine the volume of water and solvent based coating consumption, coating formulation (in terms of pounds of VOC content per applied gallon), and months of year 2005 when the coatings were applied. Survey forms were mailed to all Michigan county road commissions, major municipality road maintenance departments, and to MDOT. In those situations where a county road commission failed to submit such information, emission estimates were based upon results of those counties that had responded to the survey. An average coating application rate (total gallons of coating applied per road miles in county) was first determined from survey respondents. Road length miles were obtained for the counties that failed to respond to the survey. Total coating gallon consumption estimates were estimated for counties that failed to respond by applying the road length miles to the average coating application rate. Similarly, an average VOC content (as lbs/gallon) was obtained by dividing the total mass of VOC emissions by the total coating volume of survey respondents. The result thereof was then applied to the estimated coating volumes for those counties that did not respond to the survey. This average density was reflective of the proportions of solvent and water based coatings by survey respondents. Seasonal coating application was also based

upon county survey results of the months during which the coatings were applied. It should be recognized that year 2002 was a recession year in which Michigan county and local governments had limited budgets. Consequently, it is likely that projected emissions would be greater during better economic times. Traffic marking paint emissions were reported using a SCC of 2401008000

Cutback Asphalts

Cutback asphalt is a bituminous road coating material that is prepared by blending an asphalt cement tar with a petroleum distillate (such as naphtha, kerosene, or other fuel oils). Cutback asphalt is used as a pavement sealant, tack coat, pothole filler, and a bonding agent between layers of paving material. Evaporative loss of the solvent from bitumen cement occurs as the cutback asphalt cures on the road surface. The rate at which VOC emissions occur is dependent both upon the temperature of the applied road surface, and the type of solvent used in the formulation of the cutback asphalt material. Gasoline or naphtha is used as a diluent in the production of "rapid cure" cutback asphalts. Kerosene and other low volatility fuel oils are also used as diluents in the production of "medium cure" and "slow cure" cutback asphalts.

VOC emissions were estimated for each county using the methodology identified in the EPA's Volume III, Chapter 17 of the Emission Inventory Improvement Program January 2001 Final Guidance for Asphalt Paving. In this document, the preferred method was to conduct surveys to determine locally-specific information on cutback asphalt use on Michigan roads.

In order to estimate VOC emissions from the application of cutback asphalt materials (rapid cure, medium cure, and slow cure), a survey was mailed to all Michigan county road commissions, major municipality road maintenance departments, and to MDOT. The survey requested information on:

1. The quantities of rapid cure, medium cure, and slow cure cutback asphalt materials that were applied during year 2005;

2. The type of petroleum distillate and volume that was used as a diluent in the formulation of each cutback paving material; and

3. The months during which cutback asphalt materials were applied.

The EPA has determined that evaporation occurs on about four months with 75 percent by weight of diluent evaporates in the first day for rapid cure materials while it takes about one week for 50 percent by weight of diluent to evaporate from medium cure cutback asphalt materials. Conservative estimates were made by assuming that all the diluent evaporates within the season during which it is applied.

VOC emission estimates were based on the amount of the petroleum based diluent that comprises the cutback asphalt material and then applying their respective solvent density. Emission estimates were reported using a SCC of 2461021000.

Emulsified Asphalts

Emulsified asphalts are a type of liquefied road surfacing material that is used in the same application as cutback asphalts. Instead of blending the asphalt material with a petroleum distillate like their cutback asphalt counterparts, emulsified asphalts use a blend of water with an emulsifier (soap). Emulsified asphalts either rely on water evaporation to cure (anionic-high float emulsions) or ionic bonding of the emulsion and the aggregate surface (cationic emulsions).

In the EPA's Volume III, Chapter 17 of the Emission Inventory Improvement Program January 2001 Final Guidance for Asphalt Paving., the preferred method is conduct a survey of emulsified asphalt application on Michigan roads. Survey forms were mailed to all Michigan county road commissions, major municipality road maintenance departments, and to MDOT. This form requested information on the quantities of asphalt materials (in pounds and barrels) applied to Michigan roadways and the months during which they were applied. Road length miles were also obtained for all Michigan counties. In those situations where a county road commission failed to submit such information, emission estimates were based upon results of those counties that had responded to the survey. An average application rate (total barrels of emulsified asphalts applied per road miles in county) was first determined from survey respondents. Total barrel consumption estimates were estimated for counties that failed to respond by applying the road length miles to the average emulsified asphalt application rate. VOC emissions were obtained by applying an EPA factor of 9.2 lbs VOC/barrel of applied asphalt. It was further assumed that all emissions occur during the season that the asphalt materials were applied and reported using a SCC of 2461022000.

Breweries

Breweries, microbreweries, brewpubs, and contract brewers emit VOC including ethanol, ethyl acetate, myrcene and other higher alcohols from various brewing processes. For the smaller brewers, VOC are lost by the fermentation, in brew kettles, hot wort, mash and lauter tuns, and through spent grain. Microbreweries and brewpubs typically produce beer for patron on-site consumption, although some may have limited keg distribution. These smaller microbreweries and brewpubs typically combine some processes, and canning/bottling operations typically do not exist since the beer is consumed on-site or stored in kegs.

Various trade organization lists were obtained to identify brewers in the State of Michigan along with their beer production. Although there are some regional breweries, the vast majority are brewpubs and microbreweries. These facilities have very small to

insignificant volatile organic compound emissions. Emission estimates were based on a combined emission factor rate obtained from Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42) of 3.0465 lbs VOC per 1000 barrels. Consequently, this small emission factor and Michigan beer production rates didn't justify the need for a survey of such establishments. Emissions were estimated by establishment on the basis of trade reported production and applying the respective emission factor. A SCC of 2302070001 was used in reporting brewery emissions.

Distilleries

Distilleries include ethanol production facilities that are used in the production of gasohol motor fuels, grain alcohol for industrial purposes, and distilled spirits for personal consumption. These products are produced from the fermentation of aged mashed grains with distillation for the capture of desired alcohol based products. The fermentation products use yeast to convert grain sugars into ethanol, ethyl acetate, isomyl alcohol, isobutyl alcohol and carbon dioxide. Grains used in the process may include corn, rye, barley, and wheat. A more detailed description of distilleries and their emissions can be found in the EPA publication entitled: Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42).

During year 2005, there was only one ethanol production facility in operation. The Michigan Ethanol LLC - Caro, Michigan facility was already being reported as a point source. Consequently, the area source contribution from distilleries using SCC 2302070010 had zero emissions for all Michigan counties. A number of new ethanol plants were under construction, but did not operate in the 2005 inventory year.

Wineries

Wineries produce alcohol beverages from the fermentation of fruit juices. The major processes in vinification include fruit harvesting, crushing, pressing, fermentation, clarification, aging, finishing, and bottling. During this fermentation process of both red and white wines, primarily ethanol and smaller quantities of methyl alcohol, n-propyl alcohol, butyl alcohol, isoamyl alcohol, and acetaldehydes are produced along with carbon dioxide. This process involves the reaction of a yeast with glucose and fructose sugars to produce ethanol and carbon dioxide. The EPA emission factors are reflective of VOC evolved during fermentation in vinification.

County estimates of wine production were based upon wine volume information of Michigan Department of Treasury tax receipt information supplied to the Michigan Grape and Wine Industry Council. A VOC emission factor was obtained from Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42).of 4.6263 lbs VOC/ 1000 gallons This emission factor is a sum of ethyl alcohol, methyl alcohol, n-propyl alcohol, n-butyl

alcohol, sec-butyl alcohol, isobutyl alcohol, isoamyl alcohol and acetaldehyde for red wine from AP-42. Emission estimates were reported using a SCC of 230207005

Stationary Source Fossil Fuel Combustion

The combustion of natural gas, propane-LPG, distillate fuel oil, kerosene, and residual fuel oil in small boilers, furnaces, heaters, and stoves are also a source of VOC, NOx, particulates, sulfur dioxide, and ammonia emissions. Because these sources are so numerous to be identified in point source inventories, this area source category attempts to provide a collective estimate of emissions from these smaller energy consumption sources by subtracting all fuel used by point sources from total fuel consumption. Procedures for the estimation of these smaller sources are presented in the EPA's documents entitled:

1. Volume II, Chapter 2 of the Emission Inventory Improvement Program January 2001 Preferred and Alternate Methods for Estimating Air Emissions from Boilers.

2. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Fuel Oil and Kerosene Combustion

3. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Natural Gas and LPG Combustion

4. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Coal Combustion

5. Documentation for the Draft 1999 National Emissions Inventory (Version 3.0) for Criteria Air Pollutants and Ammonia

6. Hanke, B.H, manuscript prepared for U.S Environmental Protection Agency entitled: A National Methodology and Emission Inventory for Residential Fuel Combustion

This documentation involves determination of total fuel consumption over an area with subsequent fuel deductions made for point source fuel consumption, and then applying emissions factors to estimate fuel emissions.

Total fuel consumption information was based on data supplied from U.S. Department of Energy, EIA documents. This unaccounted fuel consumption was then apportioned to individual counties using U.S. Census Bureau information for the individual end use sector fuel types based upon LADCO states methodology. Area source fuel emissions were reported for the following residential, commercial/institutional, and industrial end use sectors. Since utility boilers are accounted as point sources, area source emissions are not reported for this end use sector.

Residential Boilers & Furnaces

County emission estimates for the residential end use sector was based upon the consumption of natural gas, propane-LPG, distillate fuel oil, kerosene, and coal. This energy consumption information was obtained from U.S. Department of Energy, EIA data. Since the EIA merely provides statewide fuel consumption totals, county fuel consumption estimates were obtained by apportioning the fuel consumption based upon the number of year 2000 occupied household census counts using the given fuel. Emission estimates were calculated using the following mathematical equation:

$$Cf = Ch/Sh \times Sf$$

Where

Cf = Estimated county residential sector consumption of a given fuel type for year 2005

Ch = Number of year 2000 census occupied households in a given county that utilize a given fuel type

Sh = Total number of year 2000 census occupied households statewide that utilize a given fuel type

Sf = Total statewide residential sector consumption of a given fuel type

Michigan Residential Fuel Consumption Information Sources

Residential Fuel Type	U.S. Dept of Energy, EIA Data Sources
Natural gas	Natural Gas Annual 2005, Michigan Table 48
Propane LPG	Petroleum Marketing Annual, 2005, Table 49: Prime Supplier Sales Volumes of Aviation Fuels, Propane and Residual Fuel Oil by PAD District and State
Distillate fuel oil	Fuel Oil and Kerosene Sales 2005 Report, Table 19: Adjusted Sales for Residential Use: Distillate Fuel Oil and Kerosene, 2005
Kerosene	Fuel Oil and Kerosene Sales 2005 Report, Table 18: Adjusted Sales of Kerosene by Energy Use
Coal	EIA Annual Coal Report 2005, Table 26 U.S. Coal Consumption by End Use Sector, by Census Division and State 2005, 2004 (Thousand Short Tons)

Upon obtaining county residential fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were obtained by applying an emission factor that is specific to that fuel type. These emission factors were obtained from various EPA publications.

Michigan Residential Fuel Emission Factors

Residential Fuel Type	Units	CO	NH_3	NOx	PM_{10}-PRI	PM25-PRI	SO_2	VOC
Natural gas	Lbs/million cubic feet	40	0.49	94	7.6	7.6	0.6	5.5
Propane LPG	Lbs/1000 gal	3.2		13	0.68	0.68	0.1	0.5
Distillate fuel oil	Lbs/1000 gal	5.0	0.8	18	2.38	2.13	42.60	0.7
Kerosene	Lbs/1000 gal	4.8	0.8	17.4	2.38	2.13	41.1	0.7
Coal	Lbs/ton	275	0.000565	3.0	18.63	4.86	37.83	10

Sources of Emission Factors:

1. U.S. Environmental Protection Agency Documentation for the Draft 1999 National Emissions Inventory (Version 3.0) for Criteria Air Pollutants and Ammonia

2. Hanke, B.H, manuscript prepared for U.S Environmental Protection Agency entitled: A National Methodology and Emission Inventory for Residential Fuel Combustion

3. U.S. Environmental Protection Agency. Final Report on Development and Selection of Ammonia Emission Factors

The resulting emission estimates were reported by individual fuel type using the following SCC codes.

Michigan Residential Combustion Emission SCC Codes

Residential Fuel Type	SCC
Natural gas	2104006000
Propane LPG	2199007000
Distillate fuel oil	2104004000
Kerosene	2104011000
Coal	2104001000

Commercial/Institutional Boilers and Furnaces

Estimation of fuel combustion by the commercial/institutional sector was performed using an adaptation of a methodology presented in the U.S. Environmental Protection Agency publications:

1. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Fuel Oil and Kerosene Combustion

2. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Natural Gas and LPG Combustion

3. Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Coal Combustion

County emission estimates for the commercial/institutional end use sector were based upon the consumption of natural gas, residual fuel oil, distillate fuel oil, kerosene, and coal. This energy consumption information was obtained from U.S. Department of Energy, EIA data. Fuels were subtracted for point sources, and the net area fuel contribution was apportioned or allocated using procedures instructed by LADCO. This procedure involved statewide commercial/ institutional fuel apportionment to a county level using the commercial/institutional employment data as obtained from U.S. Department of Commerce, Bureau of Census publication entitled: County Business Patterns, Michigan: 2003 (CBP/03-24 issued September, 2005). County fuel estimates of individual fuel types were estimated using the following equation:

$$Cf = Ce/Se \times Sf$$

Cf = Estimated county commercial/institutional sector consumption of a given fuel type
Ce= Total county employment in the commercial/institutional sector
Se= Statewide employment in commercial/institutional sector
Sf= Statewide commercial/institutional sector consumption of a given fuel type

Because the Energy Information data includes diesel fuel totals within the distillate fuel oil total, these motor vehicle fuels were deducted to provide only an estimate of #1, #2, and #4 fuel oils.

Michigan Commercial/Institutional Fuel Consumption Information Sources

Fuel Type	U.S. Dept of Energy, EIA Data Sources
Natural gas	Natural Gas Annual 2005, Michigan Table 48
Residual fuel oil	Fuel Oil and Kerosene Sales 2005 Report, Table 17: Adjusted Sales of Residual Oil by Energy Use, 2004 and 2005
Distillate fuel oil	Fuel Oil and Kerosene Sales 2005 Report, Table 20: Adjusted Sales for Commercial Use: Distillate Fuel Oil, Residual Fuel Oil and Kerosene 2005
Kerosene	Fuel Oil and Kerosene Sales 2005 Report, Table 18: Adjusted Sales of Kerosene by Energy Use
Coal	EIA Annual Coal Report 2005, Table 26 U.S. Coal Consumption by End Use Sector, by Census Division and State 2005, 2004 (Thousand Short Tons)

Upon obtaining county commercial/institutional fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were obtained by applying an emission factor that is specific to that fuel type. These emission factors were obtained from various EPA publications.

Michigan Commercial/Institutional Fuel Emission Factors

Commercial/Institutional Fuel Type	Units	CO	NH_3	NOx	PM_{10}-PRI	PM25-PRI	SO_2	VOC
Natural gas	Lbs/million cubic feet	84	0.49	100	7.6	7.6	0.6	5.5
Residual fuel oil	Lbs/1000 gal	5	0.80	55	9.07	3.37	194.05	1.13
Distillate fuel oil	Lbs/1000 gal	5	0.80	20	2.38	2.13	53.96	0.34
Kerosene	Lbs/1000 gal	5	0.80	18	2.38	2.13	41.1	0.713
Coal	Lbs/ton	6	0.000565	7.5	6.0	2.2	36.86	0.05

Sources of Emission Factors:

1. LADCO state uniform adopted emission factors for commercial/institutional natural gas combustion

2. U.S. Environmental Protection Agency. FIRES database

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42)

4. U.S. Environmental Protection Agency. Final Report on Development and Selection of Ammonia Emission Factors

The resulting emission estimates were reported by individual fuel type using the following SCC codes.

Michigan Commercial/Institutional Combustion Emission SCC Codes

Fuel Type	SCC
Natural gas	2103006000
Residual fuel oil	2103005000
Distillate fuel oil	2103004000
Kerosene	2103011005
Coal	2103002000

Industrial Boilers and Furnaces

Estimation of fuel combustion emissions of industrial boilers and furnaces was performed in similar manner as the commercial/institutional sector. Statewide industrial fuel consumption information was obtained from the U.S. Department of Energy, EIA publications. Point source deductions were made for each fuel type to obtain the area contribution which was then apportioned to the county level using LADCO prescribed procedures.

County fuel consumption estimates of natural gas, residual fuel oil, distillate fuel oil, kerosene, and coal were based upon the following mathematical equation:

$$Cf = Ce/Se \times Sf$$

Cf = Estimated county industrial sector consumption of a given fuel type
Ce= Total county employment in the industrial sector
Se= Statewide employment in industrial sector
Sf= Statewide industrial sector consumption of a given fuel type

Michigan Industrial Fuel Consumption Information Sources

Industrial Fuel Type	U.S. Dept of Energy, EIA Data Sources
Natural gas	Natural Gas Annual 2005, Michigan Table 48
Residual fuel oil	Fuel Oil and Kerosene Sales 2005 Report, Table 17: Adjusted Sales of Residual Oil by Energy Use, 2004 and 2005
Distillate fuel oil	Fuel Oil and Kerosene Sales 2005 Report, Table 21 Adjusted Sales for Industrial Use: Distillate Fuel Oil, Residual Fuel Oil, and Kerosene (#1, #2, and #4 fuel oils– excludes diesel oil)
Kerosene	Fuel Oil and Kerosene Sales 2005 Report, , Table 18: Adjusted Sales of Kerosene by Energy Use
Coal	EIA Annual Coal Report 2005, Table 26 U.S. Coal Consumption by End Use Sector, by Census Division and State 2005, 2004 (Thousand Short Tons)

County employment data was obtained from the U.S. Department of Commerce, Bureau of Census publication entitled: County Business Patterns, Michigan: 2003 (CBP/03-24 issued September, 2005). Upon obtaining county industrial fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were obtained by applying an emission factor that is specific to that fuel type. These emission factors were generally based on the LADCO adopted emissions factors.

Michigan Industrial Fuel Emission Factors

Industrial Fuel Type	Units	CO	NH_3	NOx	PM_{10}-PRI	PM25-PRI	SO_2	VOC
Natural gas	Lbs/million cubic feet	84	3.2	100	7.6	7.6	0.6	5.5
Residual fuel oil	Lbs/1000 gal	5.0	0.8	55	7.17	4.67	157	0.28
Distillate fuel oil	Lbs/1000 gal	5.0	0.8	20	2.3	1.55	53.96	0.2
Kerosene	Lbs/1000 gal	5.0	0.8	18	2.38	2.13	41.1	0.713
Coal	Lbs/ton	6	0.00057	7.5	6.0	2.2	38	0.05

Sources of Emission Factors:

1. LADCO state uniform adopted emission factors for industrial natural gas, residual fuel oil, distillate fuel oil, and coal combustion

2. U.S. Environmental Protection Agency. FIRES database
3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42)

4. U.S. Environmental Protection Agency. Final Report on Development and Selection of Ammonia Emission Factors

Emission estimates were reported using the following SCC codes:

Michigan Industrial Combustion Emission SCC Codes

Industrial Fuel Type	SCC
Natural gas	2102006000
Residual fuel oil	2102005000
Distillate fuel oil	2102004000
Kerosene	2102011000
Coal	2102002000

Remedial Action, Site Clean Up & Leaking Storage Tanks

Evaporative VOC emissions occur during remediation and clean up at those sites of environmental contamination. Such remediation activities may include air stripping or sparging of a VOC from contaminated groundwater or incineration of a spoil material removed from a contaminated site. In some instances carbon adsorption may be required to reduce VOC emitted during air stripping or spraying operations.

Estimation of VOC loss from remedial action activities was determined by summing the allowable emissions from permits to those parties that were engaged in such activities as provided by the MDEQ, Air Quality Division, Permit Section. Although site remediation activities are subject to NESHAPs, these requirements did not apply at the time of the year 2005 emissions inventory. Emissions were reported using a SCC of 2660000000.

Municipal Waste Landfills

A municipal solid waste landfill is defined as any facility that is regulated under Subtitle D of the Resource Conservation and Recovery Act (RCRA) which receives primarily household and/or commercial wastes.

VOC are produced from municipal solid waste by: the volatilization of the waste material itself, the microbiological (anaerobic) putrefaction of organic waste materials that result in the formation of organic acids and alcohols that are vaporized, and the chemical reaction of one or more waste materials or chemical decomposition intermediate. The rate at which VOCs are emitted from a landfill is dependent upon the structural design of cells, the waste composition (physical/chemical properties), the moisture content of the waste, the amount of waste disposed, temperature, age of the landfill, the chemical reactivity of the waste, the microbiological toxicity of the waste, and the effectiveness of landfill gas collection systems. Where landfill gas is collected for use in boilers, internal combustion engines (reciprocating and turbines) or flared at the landfill site, there are additional air pollutants such as NOx, particulates ($PM_{2.5}$ and PM_{10}), and carbon monoxide produced from incomplete combustion.

Estimation of VOC emissions from municipal landfills were based on the revised technical procedures presented in the EPA publication entitled: Volume III, Chapter 15 of the Emission Inventory Improvement Program January 2001 Revised Final Guidance for Landfills. In this publication, the preferred method for the estimation of area source emissions is to use the LandGem model or the equations from the Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42) section on landfills. LandGem is a computer based model that uses the same equations as that of AP-42. The emissions calculation for the estimation of landfill gas requires site specific information including: landfill design capacity, accumulated waste totals from operation of the landfill, and existing control requirements from landfill gas collection systems. Landfills may be subject to either

new source performance standards (40 Code of Federal Regulations part 60 Subpart WWW) or emission guidelines (40 Code of Federal Regulations, part 60, Subpart Cc). Landfills are now also subject to NESHAPs which became effective on January 16, 2003. For those landfills that were not being reported in the point source inventory, area emission estimates were reported on the basis on LandGem model simulations using the SCC of 2620030000. These simulations reflected total waste receipts under the prior year 1999 inventory with addition made for waste receipts for years 2000-2005 as obtained from annual reports by the MDEQ, Waste and Hazardous Division Report of Solid Waste Landfilled in Michigan. For those landfills that operated landfill gas collection/combustion systems, emission estimates considered tables 2.4-3 and 2.4-5 of AP-42 with adjustments considered for a landfill gas methane collection efficiency of 75% of LandGem model predicted methane generation at a given landfill site.

Non-Methane Organic Compound Control Efficiencies for Landfill Gas Combustion from AP-42

Combustion Control Device	Typical Control Efficiency (%)
Boilers	98
Flares	99.2
Gas Turbines	94.4
IC Engine	97.2

Emission Rates for Secondary Compounds from Landfill Gas Combustion (Based upon lbs/ Million Cubic Feet of Landfill Gas Combusted)

Combustion Control Device	NOX	$PM_{2.5}$-PRI	PM_{10}-PRI	CO
Flare	40	17	17	750
IC Engine	250	48	48	470
Boiler	33	8.2	8.2	5.7
Gas Turbines	87	22	22	230

Architectural Surface Coating, 2005

Alternative method one was chosen from the guidance document *Emission Inventory Improvement Program (EIIP), Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating*. Data was readily available for the use of per capita emission factors.

MDEQ, Air Quality Division staff determined per capita usage factors by dividing the 2004 national total architectural surface quantities for solvent and water based coatings (U.S. Census Bureau MA325F, Paint and Allied Products) by the U.S. population for 2004 (U.S. Census Bureau, http://www.census.gov).

http://www.census.gov/industry/1/ma325f04.pdf

http://www.census.gov/popest/national/files/NST_EST2005_ALLDATA.csv

Solvent-Based Paint

Solvent-based paints produced and shipped in the U.S. in 2004, the most recent available year, were totaled (includes architectural lacquers and architectural coatings, n.s.k.). The resulting number was divided by the 2005 U.S. population to produce a per capita solvent-based paint usage factor of 0.5265 gallons per person.

The resulting solvent paint use, in gallons per county, was multiplied by a VOC emission factor of 3.87 lb/gal, from Table 5-2 of the EIIP guidance, *Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating.* This produced total VOC emissions from solvent-based paint. The VOC was then speciated for toxics, utilizing speciation factors from Table 5-4 from the EIIP guidance. Acetone, listed in the methodology prepared by the Great Lakes states, was removed because it is not a toxic.

Water-Based Paint

Water-based paints produced and shipped in the U.S. in 2004 were totaled. The resulting number was divided by the 2005 U.S. population to produce a per capita water-based paint usage factor of 2.2473 gallons per person.

The resulting water-based paint use in gallons per county was multiplied by a VOC emission factor of 0.74 lb/gal, from Table 5-2 from the EIIP guidance, *Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating.* This produced total VOC emissions from water-based paint. The VOC was speciated for toxics, utilizing speciation factors from Table 5-3 from the EIIP guidance.

No point source deductions were performed, as none were needed for this category.

Autobody Refinishing in Michigan, 2005

Alternate method 3 of the EIIP document, *Volume III, Area Sources Preferred and Alternative Methods, Chapter 13: Auto Body Refinishing* was followed by Michigan. National emissions for the category were allocated to the county level based on census data.

79,429.59 tons of VOC were estimated nationally for this category based on 1997, 1998 and 1999 data, as indicated within the GLC methodology. The estimate of national VOC emissions from autobody refinishing was divided by a 2005 national population estimate of 296,410,404 to produce a VOC emission factor of 0.54 lbs/person.

Area source estimations were adjusted by deducting point source VOC emissions.

A seasonal adjustment factor of 1.0 was made for this category for the ozone season. The category of auto refinishing was considered to be uniform throughout the year, per Table 5.8.1 of the EPA document *Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources*. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated. 5 activity days per week were selected, per Table 5.8.1. Annually, 260 days of operation were assumed. NOx and CO emissions were not calculated, as this category is not considered a source of NOx or CO.

References

1. Emission Inventory Improvement Program, Volume 3, Chapter 13, *Auto Body Refinishing, January 2000*.
2. Fire 6.23 database
3. U.S. Census Bureau, Population Division. 2006. Population Estimates Program. Washington, DC 20233.
4. Annual County Business Patterns data are available through U.S. census at http://www.census.gov/epcd/cbp/view/cbpview.html
5. Section 3.8 of Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I (1991)

Estimating Emissions from Consumer and Commercial Solvent Use

The GLC methodology, a portion of which is included below, was based on the EIIP guidance document, *Volume III, Area Sources Preferred and Alternative Methods, Chapter 5: Consumer and Commercial Solvent Use.* Michigan used the EIIP and GLC guidance for the estimation of criteria and toxic pollutants for this category for 2005. Michigan chose to use the preferred method with per capita emission factors, adjusted for the federal VOC reduction rule as provided in Table 2 of the EIIP guidance.

SCCs

The following SCCs were utilized by Michigan, per LADCO's recommendations:

2460100000	personal care products
2460200000	household Products
2460400000	automotive aftermarket
2460600000	adhesives and sealants
2460800000	FIFRA-regulated products
2460500000	coatings and related products
2460900000	miscellaneous products

From GLC methodology**:**

Overview

All quotes and information contained within are from the source, Emission Inventory Improvement Program, Volume 3, Chapter 5, *Consumer and Commercial Solvent Use, August 1996*. The consumer and commercial solvent source category includes a wide array of products including personal care products, household cleaning products and household pesticides. However, all VOC emitting products used by businesses, institutions and numerous industrial manufacturing operations are also included. A detailed list of products included in this category can be found on page 5.2-3 of the 1996 EIIP document. The majority of VOCs introduced into the atmosphere from this category is a result of evaporation of the solvent contained in the product or from the propellant released during product use.

Dry cleaning Area Source Emissions for Michigan, 2005

Standard Industrial Classification (SIC) 7215 (coin-operated dry cleaning establishments) was not considered for this inventory. The AQD's dry cleaning staff in the Technical Programs Unit indicated that virtually all coin-operated dry cleaning machines in Michigan have been discontinued due to the large cost of keeping them supplied with perchloroethylene (per Elden Dickinson, AQD). SIC 7216 (dry cleaning establishments, excluding coin-operated facilities) was considered instead. Under the North American Industrial Classification System (NAICS), SIC 7216 is known as NAICS 812320.

To calculate 2002 VOC emissions, Michigan utilized alternative method two, per employee emission factor. 2003 county employment data was obtained from the U.S. Census Bureau's document, *2003 Michigan County Business Patterns*. 2005 data was not available, and was not expected for some time.

Dry cleaning has a uniform seasonal adjustment factor (1.0), remaining constant during the ozone season, per EPA's *Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources.*

2003 employment data, the latest from the U.S. Census Bureau's County Business Patterns, was obtained for NAICS 812320, for each county where it was available. Where available, employment data for the broader category of NAICS 812 was also obtained.

The next step was to determine a ratio between the number of employees under NAICS 812320, and the number of employees under NAICS 812. For counties that had employment numbers for NAICS 812, this ratio was used to estimate how many of the employees would fall under the code 812320.

The next task was to develop an employment number for those counties where drycleaner employment numbers were not available from the County Business Patterns. Using population numbers for those counties where employment data was available, a per capita number of dry cleaning employees was calculated. As certain counties have no perchloroethylene drycleaners (per lists of perc dry cleaners from Randy Johnson, AQD), values of zero were entered for those counties.

Reports from Michigan's 2005 point source emission inventory (the latest complete inventory) were reviewed to determine if any counties had point source employment for SIC 7216 (NAICS 812320). Berrien, Ingham and Jackson (NAICS 8123) counties did have point sources under SIC 7216, and the number of employees at each source was obtained from the emission inventory. Each source's employment number was subtracted from the appropriate county's employment number.

Once estimates of employment for SIC 7216 were available for each county, an emission factor for VOC of 1,800 lb/yr/employee was obtained from Table 4.5-1 of EIIP Vol. III, Chapter 4.

From EIIP

Subcategory	Reactive VOC (lb/year/employee)	Total Organics (lb/year/employee)
All solvents (total)	1,800	2,300
Halogenated Solvents PERC, TCA and CFC 113 Coin Operated Commercial/Industrial		 980 52 1,200
Mineral Spirits and Other Unspecified Solvents	1,800	1,800

On a per-unit basis: 0.8 tons/facility-year (assumes that average coin-op facility has two dry cleaning units and each emits 0.4 tons of PERC per year).

From AP-42

Commercial: 1.3 lb/year/person (all nonmethane VOC)
Coin Operated: 0.4 lb/year/person (all nonmethane VOC)

A rule for perchloroethylene dry cleaning air emissions became effective late 1996 (58FR49354. National Emission Standards for Hazardous Air Pollutants for Source Categories: Perchloro-ethylene Dry Cleaning Facilities. Final Rule. September 22, 1993.). EPA estimates the rule reduces perchloroethylene emissions from dry cleaning operations by 44%. Depending on the methodology used to estimate air emissions from perchloroethylene dry cleaning operations the effectiveness of this rule may need to be factored into the calculation.

References:

U.S. Census Bureau, *2003 Michigan County Business Patterns*

Emission Inventory Improvement Program Vol. III, *Area Sources: Preferred and Alternative Methods*, Chapter 4, Dry cleaning. May 1996.

Elden Dickinson, Dry Cleaning Unit, Drinking Water and Radiological Protection Division, Michigan DEQ. Personal communication, 5/07/01.

US EPA. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. May 1991. EPA –450/4-91-016.

Graphic Arts Criteria and Toxics, 2005

The EIIP area source guidance document, dated November 18, 1996, was followed.

The EIIP preferred method was not utilized, as it required a survey of facilities. Alternative Method 1, ink sales emission factor method, was found to be not feasible for Michigan, as (during calculation of the 1999 inventory) point sources used more ink than the state proportion of national ink production was calculated to be.

Per Alternative Method 2, the population of the inventory region was obtained from state data for 2005, and multiplied by the per capita emission factor provided in the EIIP guidance. This produced total uncontrolled emissions from all graphic arts facilities with less than 100 tons per year of VOC emissions, for the entire state. This method used a 1991 EPA emission factor of 0.00065 tons VOC per capita.

Total uncontrolled VOC emissions from area source graphic arts facilities (those with less than 100 tons per year of VOC emissions) was then estimated for each county. This was done by obtaining uncontrolled VOC emissions from point sources with less than 100 tons per year of VOC, from the 2005 EI. SICs 2711, 2721, 2752 and 2754 (NAICS 51111, 511112, 323114, and 323111) were the SIC codes queried. This number was then subtracted from total uncontrolled emissions from graphic arts facilities, on a county by county basis. The remaining number is the area source VOC emissions per year.

Solvent Cleaning 2005 (criteria)

In this category, the use of solvents is broken into two broad classifications. The classifications are solvent cleaning (which is composed of cold cleaning and vapor/in-line cleaning), and solvent cleanup (predominantly wipe cleaning of external surfaces).

EIIP Alternative Method

Solvent Cleaning Equipment (both Cold Cleaners and Vapor/In-line Cleaners):

Emission factors:

EIIP Table 6.5-2 provides per capita and per employee emission factors, as reproduced below.

Recommended Method for Solvent Cleaning Equipment

Michigan chose to use the per employment factors available in Table 6.5-2 from *Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume I: General Guidance for Stationary Sources* (EPA, 1991), for the 2005 emissions inventory. Employee data was obtained from the U.S. Bureau

of the Census document, *County Business Patterns, Michigan: 2003*, which was the most recent version at the time the category was estimated. Area source emissions were then determined by subtracting point source emissions from total emissions. When the result was a negative number, area source emissions were set to zero.

The following SCCs, per email from Grant Hetherington, WI DNR on 9/19/05, were utilized for reporting the emissions to be consistent with the other LADCO states:

2415360000 - Auto Repair Services (SIC 75): Cold Cleaning

2415345000 - Miscellaneous Manufacturing (SIC 39): Cold Cleaning

2415245000 - Miscellaneous Manufacturing (SIC 39): Conveyerized Degreasing

241523000 - Electronic and Other Elec. (SIC 36): Conveyerized Degreasing

Table 6.5-2: Per Capita and Per Employee Solvent Cleaning Emission Factors (EPA, 1991)

Subcategory	SIC Codes	Per Capita Factor (lb/yr/person)		Per Employee Factor (lb/yr/person)	
		VOCs	Organics	VOCs	Organics
Solvent cleaning (total)	25, 33-39, 417 423, 551, 552, 554-556, 753	4.3	7.2	87	144
Cold Cleaning					
Automobile Repair	417, 423, 551, 552, 554-556, 753	2.5	2.5	270	270
Manufacturing	25, 33-39	1.1	1.1	24	24
Vapor and In-Line Cleaning					
Electronics and Electrical	36	0.21	1.1	29	150
Other	25, 33-39, 417, 423, 551, 552, 554-556, 753	0.49	25	9.8	49

2005 point source employment data was obtained from MAERS. These values were then deducted from the total emissions estimated by using the per capita emission factor and 2005 Michigan county population data.

References

EPA. *Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume I: General Guidance for Stationary Sources* (May 1991).

EPA. *STAPPA-ALAPCO-EPA Emission Inventory Improvement Program (EIIP).* Volume III - Area Sources Preferred and Alternative Methods. Chapter 6, Solvent Cleaning. September 1997.

US Department of Commerce, Bureau of the Census. *County Business Patterns, Michigan: 2003*. September 2005.

Industrial Surface Coatings, Toxics, 2005

The GLC methodology was followed by Michigan for estimating toxics for 2005. The GLC methodology is based on EIIP, *Volume III, Area Sources Preferred and Alternative Methods, Chapter 8: Industrial Surface Coating*. In most cases alternative method one, default per employee factors, were used, except for SCCs where the per employee-based emission factors yielded unrealistically high values of pollutants. The MDEQ, Air Quality Division staff believe that the point source employee deductions performed for each affected SCC (based on NAICS information from U.S. Census Bureau's *County Business Patterns*, and the Air Quality Division's point source inventory) do not account for all of the point source employees, resulting in the high values.

For the SCCs 2401050000 (miscellaneous finished metal) and 2401070000 (motor vehicles), it was decided that per capita based emission estimates would be utilized instead of the per employment based methods which yielded large values of 486 million lbs VOC (935 tons per summer weekday) and 57 million lbs VOC, respectively. The per capita methods yielded more realistic numbers of 4.6 million and 10.9 million lbs VOC.

For the SCC 2401020000 (furniture and fixtures), the employment based method resulted in an estimate of 31 million lbs (60 tons per summer weekday). The per capita method resulted in an estimate of 20 million lbs. As the estimates for 2401020000 appeared unrealistically large with either method, this category was omitted from the inventory.

Total area source VOC emissions for industrial surface coating for 2005 were approximately 50 million lbs.

From the GLC methodology:

> **Source Identification**
>
> Searching through the Standard Industrial Classification Code List (SIC), the North American Industry Classification System (NAICS), through the Factor Information Retrieval System (FIRE 6.23) and table 8.5-1 of the Volume III Chapter 8 Industrial Surface Coating September 1997 publication of EPA, the following codes were identified for each of the fifteen industrial surface coating category.
>
> **Factory Finished Wood** - **A2401015000**
> **SIC** 2426-2429, 243-245, 2492, 2499
> **NAICS** 321113, 321912, 32192, 321911, 321918, 33711, 321212, 321214, 321213, 321991, 321992, 33999, 333414, 321999, 321211

Wood Furniture - **A2401020000**
SIC 25
NAICS 337122, 337121, 337124, 337214, 33791, 337129, 337125, 337211, 33636, 339942,
337127, 337212, 337215, 33792,

Metal Cans - A2401040000
SIC 3411
NAICS 332431

Misc Finished Metals - **240105000**
SIC 34xx(exclude 341 and 3498)
NAICS 332211, 332212, 332213, 332999, 332722, 332117, 332912, 332611, 332998, 332913, 332439, 33251, 332919, 332312, 322225, 332618, 332321, 332313, 33242, 332612, 332322, 332311, 339911, 333924, 332114, 332721, 332994, 334518, 332111, 332112, 33637, 332115, 332116, 332214, 332813, 339914, 339912, 332812, 332992, 332993, 332995, 332911

Machinery and Equipment - A2401055000
SIC 35
NAICS 333611, 333618, 333111, 332323, 333312, 333112, 33312, 333131, 336311, 333995
333132, 333921, 333922, 333923, 333924, 333513, 332997, 333514, 333511, 333515, 333516, 333992, 333518, 333292, 33321, 333291, 333293, 333294, 33322, 33241, 333295, 333911, 332991, 333912, 333411, 333993, 333612, 333994, 333613, 314999, 334418, 333996, 333997, 33271, 333999, 334119, 334518, 333512, 333991, 333412, 336391, 333415, 333913,

Large Appliances - A240106000
SIC 363
NAICS 335221, 335222, 335224, 335211, 339999, 333414, 335212, 333298, 335228,

Electronic and Other Electrical - 2401065000
SIC 36,123,357
NAICS 334111, 334112, 334113, 33422, 334418, 334613, 333992, 335129, 333311, 333313, 339942, 51222, 335311, 335313, 335312, 335991, 335314, 335999, 33511, 335931, 335932, 335121, 335122, 334613, 336321, 335129, 33431, 334612, 334419, 335911, 335912, 333319,
334411, 334412, 334414, 336322, 334415, 334416, 334417, 333618, 33429, 33421,

Motor Vehicles - 240107000
SIC 3711

NAICS 33611, 336112, 33612, 336211

Other Transportation Coatings - 2401075000
SIC 37(not 3711,373)
NAICS 336213, 336312, 336322, 33633, 33634, 33635, 336399, 336212, 336415, 336411, 336412, 54171, 332912, 336999, 336413, 333911, 333924, 33651, 336991, 336414, 336419, 336214, 336992

Marine Coatings - 240108000
SIC 373
NAICS 48839, 336611, 336612, 81149

Misc. Product Coatings Manufacturing - 240109000
SIC
NAICS 339

Industrial High Performance Maintenance Coatings- 2401100000
SIC
NAICS 811

Other Special Purpose Coatings - 2401200000
SIC
NAICS

VOC factors from Table 8.5-1 of the EIIP guidance were applied to employment estimates based on the U.S. Bureau of the Census document, County Business Patterns: Michigan, 2003, which was the most recent data available at the time the estimates were created.

References

EPA. STAPPA-ALAPCO-EPA Emission Inventory Improvement Program (EIIP). Volume III: Chapter 8 Industrial Surface Coating September 1997.

U. S. Census web site http://www.census.gov/

Open Burning: Municipal Solid Waste, 2005 Criteria Pollutants

For the category of open burning of municipal solid waste (MSW), EPA's methodology from Appendix A of *Documentation for the Final 2002 Nonpoint Sector (Feb 06 Version) National Emission Inventory for Criteria and Hazardous Air Pollutants* was followed. The ratio of urban to rural population was obtained from 2000 U.S. Census data, per the EPA's method, then multiplied by a 2005 U.S. Census Bureau estimate of the county population in Michigan to obtain an estimate of rural population in 2005. Per capita emission factors were used, after first excluding those counties where the population was greater than 80% urban under EPA's presumption that open burning of MSW would not occur there.

Outdoor Wood Boilers, 2005 criteria pollutant estimates

The Wisconsin methodology distributed by Bart Sponseller was followed. Per that methodology, the MARAMA emission factor of 13.82 g/kg wood burned was used.

An estimate of 11.68 cords/yr/unit in Michigan was obtained from Brian Brady, MDEQ Air Quality Division. Brian serves as the MDEQ, Air Quality Division's outdoor wood boiler expert.

Michigan estimated an average weighted density of 1.65 tons/cord of wood, based on information contained within Table 8 of the USDA survey report "Residential Fuelwood Consumption and Production in Michigan, 1992."

Per the Wisconsin methodology, it was assumed that 90% of outdoor wood boilers are used in rural areas and 10% are used in urban areas. To determine which counties were urban and which were rural, staff reviewed the list of counties, which are part of Michigan's Consolidated Statistical Areas (metropolitan areas) and determined that the 22 affected counties should be considered as urban. Ten percent of the 29,568 Michigan outdoor wood boilers were apportioned to the urban counties by population. The remaining 90% of the outdoor wood boilers were apportioned to the 61 rural counties by population.

Residential Wood Burning, 2005

Michigan utilized the EIIP methodology's alternative method for estimating emissions from residential woodburning, by apportioning data from the U.S. Census Bureau and the EIA.

Two options were available to estimate woodburning households per county.

- Housing Units with Wood Heat by County was determined by using 1990 U.S. Census Data, Database C90STF3C1, Summary Level State, for House Heating Fuel for Occupied Housing Units (http://venus.census.gov/cdrom/lookup). Although this data is for the 1990 year, it did provide a value for each county.

- Housing Units with Wood Heat by County was determined by using the U.S. Census Bureau's DP-4, Profile of Selected Housing Characteristics: 2000, Data Set: Census 2000 Summary File 3 (SF 3) for Michigan. This file provided a *total* value of households using wood heating. However, no breakdown was given by county.

The MDEQ, Air Quality Division staff used the 2000 number of total wood burning households in Michigan, and used the 1990 county proportions of the 1990 total to apportion the 2000 value to the county level.

Then, based on county value for number of wood burning households, the value for state wood use in cords was apportioned to each county. The 2003 state wood use in cords data came from the US

MAP States Page, *Table 8, Residential Energy Consumption Estimates, Selected Years 1960-2003, Michigan*, from the U.S. Department of Energy, EIA:

http://www.eia.doe.gov/emeu/states/sep_use/res/use_res_mi.html

Data for 2005 was not yet available.

Once county wood use in cords was produced, the next step was to determine the wood weight in tons for each county. Wood weight was determined by estimating a weighted average wood weight of 1.65 tons per cord, from species and consumption data from Table 8 of the USDA report, "Residential Fuelwood Consumption and Production in Michigan, 1992."

Michigan did not have data available on the number of catalytic and non-catalytic woodstoves in Michigan, but did utilize 1993 survey data which showed the proportions of fireplaces to woodstoves by county in Michigan. This was used to apportion wood weight per county between wood stoves and fireplaces. SCCs and emission factors were selected for fireplaces – cordwood (2104008001), and woodstoves – general (2104008010).

No ozone season activity was estimated, as staff felt it was unlikely that residents would utilize their fireplaces or wood stoves between June 1 and August 31 of each year.

FIRE 6.23 (Factor Information Retrieval System Version 6.23) and Source Summary Database (SSD) list the following Area Mobile Source Codes (AMS):

A2104008000: Total wood stoves and fireplaces
A2104008001: (lb/ton dry wood burned): Fireplaces - general
A2104008010: (mg/Mg dry wood burned): Wood stoves - general
A2104008030: (lb/ton dry wood burned): Catalytic wood stoves - general
A2104008050: (lb/ton dry wood burned): Non-catalytic wood stoves - general
A2104008051: (lb/ton dry wood burned): Non-catalytic wood stoves - conventional
A2104008052: (lb/ton dry wood burned): Non-catalytic wood stoves - low emitting
A2104008053: (lb/ton dry wood burned): Non-catalytic wood stoves - pellet fired

Michigan selected AMS codes A2104008001 and A2104008010. These were the most appropriate codes, as data exists for the proportion of woodstoves to fireplaces per county in Michigan, but data was not available on numbers of catalytic or non-catalytic wood stoves. Emission factors for A2104008010 were converted from mg/Mg to lb/ton by multiplying by the conversion factor of 2.00E-06.

References

1. USEPA, “Factor Information Retrieval System Version 6.23”, U.S. Environmental Protection Agency, 2000.

2. EPA, STAPPA, ALAPCO, Emission Inventory Improvement Program (EIIP), Volume III, July 1997, Chapter 2.

Structure Fires, 2005 Criteria Emissions

The EIIP guidance from EIIP Volume III, Chapter 18: *Structure Fires*, was followed. The preferred method for estimating emissions was used, due to the availability of county level structure fire data for 2002. More recent data was not available; the fire statistics data, which was originally kept by the Michigan State Police Fire Marshall Division, is now kept by the Michigan Department of Labor and Economic Growth. DLEG staff were unable to locate more recent county level data on structure fires. The 2002 data was re-used from the 2002 area source submittal. However, it did not provide any detail on the extent of each structure fire, or indicate if the structure was residential or commercial.

The default fuel loading factor provided in the EIIP guidance (1.15 tons of fuel per structure fire) was used. Emission factors for VOC, CO, and NOx were obtained from Table 18.4-1.

Year 2009 Stationary Area Source Emission Inventory Projections:

See **Growing Stationary Non-EGU Point, Stationary Area, Locomotive, Shipping, and Aircraft Categories for the Years 2009** in the **Non-EGU Point Sources** section for reference and methodology for projecting the Stationary Area Source inventory.

5. Non-Road Mobile

Non-Road Emissions Estimation exclusive of Locomotive, Shipping, and Aircraft Emissions

Non-road emission estimates for 2005 and 2009 were obtained from the EPA’s National Mobile Inventory Model (NMIM). The model uses a database to store the information about individual counties, referred to as the NMIM County Database (NCD); the current version is NCD20051207.

Recent updates to the model were made by the EPA and can be found at: www.epa.gov/omswww/models/nonrdmdl/nonrdmdl2005/readme.htm, (NON-ROAD2005 Update Chronology).

One of the updates included in this modeling was a correction in the NON-ROAD.EXE file that includes modifications for permeation. Changes were also made in the external files (15 files) to incorporate recommendations of SEMCOG and LADCO consultants regarding fuel data. Program files for emissions and population data were modified. These changes were made to improve the accuracy of the model estimates and to produce emission values that will be consistent with those that will be used for future ozone and fine particulate SIP demonstrations.

The Non-road emissions estimates were prepared by Wisconsin for all LADCO States, including Michigan. Additional details on the procedures used to prepare these inventory products can be found in the "Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Technical Support Document" prepared by LADCO.

2005 Aircraft Emissions Estimation

In order to estimate aircraft emissions, aircraft activity was obtained for Michigan airports. Historically this information was obtained from MDOT. However MDOT was unable to provide updated information for year 2005. In the absence of updated MDOT 2005 aircraft activity data, commercial aircraft and commercial air freight departure information by aircraft model type was obtained from FAA airport records. For determining airport LTO cycles, the Air Traffic Activity Data System (ATADS) air traffic count database of larger towered airports, Terminal Area Forecast (TAF) air traffic operations database of towered and non-towered airports, and G.C.R. & Associates airport activity data were used. Since ATADS provides aircraft operations for a limited number of the States' airports, TAF aircraft operations estimates were considered where ATADS information was unavailable. G.C.R. & Associates, Inc. consultant data was used for the smaller airports of which FAA aircraft operations information was unavailable. The following information from the respective sources was considered in the development of emission estimates:

1. Commercial scheduled and non-scheduled aircraft air carrier activity and commercial air freight activity by aircraft model types,

2. General aviation and air taxi annual local and itinerant operations for year 2005,

3. Military annual local and itinerant operations for year 2005. Due to need to have aircraft operations information expressed as LTO cycles, the following assumptions were made:

a. For commercial aircraft and commercial air freight activity, the number of annual aircraft annual LTO cycles was assumed to be equal to the number of departures. The daily LTO cycle frequency was then obtained by dividing the yearly LTO cycles by 365.

b. For general aircraft annual local and itinerant airport operations, each respective operations total was divided by two to obtain the corresponding year local and itinerant LTO cycles. The expected daily local and itinerant LTO cycles then were obtained by dividing these annual totals by 365.

c. For military annual local and itinerant operations, each respective operations total was divided by two to obtain the corresponding year local and itinerant LTO cycles. The expected military daily local and itinerant LTO cycles then were obtained by dividing these annual totals by 365.

Airport LTO cycles were further categorized into commercial aircraft by plane and engine type, general aviation itinerant aircraft of unknown aircraft type, general aviation local aircraft of unknown aircraft type, and military aircraft. This was necessary in order to utilize the U.S. Department of Transportation, FAA EDMS 4.5 Emissions and Dispersion Modeling System. A description of this model can be found in the FAA publication entitled: Emissions and Dispersion Modeling System (EDMS) User Manual (September 2004). Commercial and air freight aircraft emission factors per LTO cycle were determined using EDMS 4.5 for each commercial aircraft type models where possible were used at each towered airport. Default commercial aircraft engine type, and EPA default time in mode values for takeoff, approach, and landing roll times were used in the EDMS 4.5 model simulations.

For those aircraft types that could not be determined using the EDMS 4.5 emissions model, aircraft emission factors based upon EPA alternative fleet average procedures were then used to estimate their emissions. These included general aviation and air taxi itinerant aircraft of unknown aircraft type, general aviation local aircraft of unknown aircraft type, and military aircraft. Conversion from total hydrocarbons to VOC was performed and based upon the EPA guidance.

Aircraft emissions were then obtained by adding emissions contributions from commercial, itinerant general, and local general aircraft, and were reported using the following SCC codes.

Michigan Aircraft Emission SCC Codes

Aircraft Type	SCC
Military	2275001000
Commercial	2275020000
General Aviation	2275050000

2005 Locomotive and Shipping Emissions Estimation

The 2005 non-road shipping and Locomotive emissions were prepared using the same techniques used for the 2002 emissions. These estimates are based on work and a follow-up report (Environ Report for LADCO, April 2004, 2002 Shipping Emissions Sources) completed by Environ to support LADCO's efforts to prepare a 2002 Air Emissions Inventory. The report describes Environ efforts to develop a shipping 2002 air emissions estimates to support air quality modeling. The Environ report is too long to be included in this document, but it can be provided upon request or downloaded at:

http://ladco.org/reports/rpo/MWRPOprojects/Emissions/Environ_Final_Report_non-road.pdf

The estimate of 2005 locomotive and shipping emissions was made by LADCO in the same manner as the 2002 inventory described above. The 2005 estimates are part of LADCO's base M inventory.

Non-Road Mobile Source Emission Inventory Projections to 2009

The non-road source categories exclusive of locomotive, shipping, and aircraft were grown in the EPA Mobile source model NMIM. The locomotive, shipping, and aircraft non-NMIM source categories were grown using growth factors provided in the report (E.H. Pechan & Associates, Inc., Development of Growth and Control Factors for Lake Michigan Air Directors Consortium, Final Report, December 14, 2004) done by E.H. Pechan & Associates, Inc. for LADCO and available upon request.

See **Growing Stationary Non-EGU Point, Stationary Area, Locomotive, Shipping, and Aircraft Categories for the Years 2009** in the **Non-EGU Point Sources** section for references and methodology for projecting the Locomotive, Shipping and Aircraft emissions inventory.

6. On-Road Mobile

For the 2005 base year, the emissions model CONCEPT was run by a LADCO contractor (Environ) using transportation data (e.g., VMT and vehicle speeds) supplied by the state (MDOT) and local planning agencies (SEMCOG) in the LADCO States and Minnesota for 24 networks. These data were first processed with T3 (Travel Demand Modeling [TDM] Transformation Tool) to provide input files for CONCEPT to calculate link specific, hourly emission estimates. CONCEPT was run with meteorological data for a July and January weekday, Saturday, and Sunday (July 15 – 17 and January 16 – 18). The mobile emissions derived from the SEMCOG network, which include all the Michigan nonattainment counties, are detailed in Appendix D.

Similar to the base year modeling, CONCEPT was run using transportation data (e.g., VMT and vehicle speeds) supplied by the state and local planning agencies for 2009 and 2018. CONCEPT was only run with meteorological data for a weekday. The emissions for Saturday and Sunday were derived by using scaling factors based on the 2005 emissions.

Additional details on the procedures used to prepare these inventory products can be found in the "Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Technical Support Document" prepared by LADCO.

7. Area Source Ammonia and Biogenic Emissions

Ammonia Emissions

LADCO estimated area source ammonia emissions for all member states, including Michigan. The CMU-based 2002 (Base K) ammonia emissions were projected to 2005 using growth factors from the Round 4 emissions modeling. These emissions were then adjusted by applying temporal factors by month based on the process-based ammonia emissions model.

Biogenic Emissions

A LADCO contractor (Alpine) provided an updated version of the CONCEPT/MEGAN4 (Model of Emissions of Gases and Aerosols from Nature) biogenics model, which was used to produce 2005 base year biogenic emission estimates. Model improvements included: (a) reduced model run times, (b) improved ability to run successive days, and (c) enhanced meteorological input processing5.

Compared to the previous (EMS/BIOME) emissions, there is more regional isoprene using MEGAN compared to the BIOME estimates used for Base K. Also, with the

secondary organic aerosol updates to the CAMx air quality model, Base M includes emissions for monoterpenes and sesquiterpenes, which are pre-cursors of secondary $PM_{2.5}$ organic carbon mass.

Additional details on the procedures used to prepare these inventory products can be found in the “Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Technical Support Document” prepared by LADCO.

Appendix D

MOBILE EMISSIONS

USED FOR THE CONFORMITY BUDGET

SUPPORT DOCUMENTATION

FOR THE

FINE PARTICULATE SIP

January 2008

Southeast Michigan On-Road Mobile Source Emissions Inventory

Developed for the 2008 $PM_{2.5}$ State Implementation Plan Submittal

January 28, 2008

Prepared by the
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Southeast Michigan
$PM_{2.5}$ On-Road Mobile Source Emissions Inventory
Developed for the 2008 $PM_{2.5}$ State Implementation Plan

The Southeast Michigan Council of Governments (SEMCOG) is the Metropolitan Planning Organization (MPO) and lead local air quality planning agency for a seven-county region that comprises Southeast Michigan's $PM_{2.5}$ nonattainment area (Livingston, Macomb, Monroe, Oakland, Washtenaw, and Wayne counties). Under an agreement with the State of Michigan, SEMCOG is responsible for developing the on-road mobile source emissions inventories for this region.

This document provides detailed information on the air quality emissions modeling process used by SEMCOG to develop the on-road mobile source emissions inventory for the Southeast Michigan $PM_{2.5}$ State Implementation Plan (SIP).

I. Overview of On-Road Mobile Modeling Process

The general process for developing on-road mobile source emissions inventories involves applying emission factors to estimates of vehicle miles of travel (VMT) within the Southeast Michigan nonattainment area. The emission factors are generated by the U.S. Environmental Protection Agency's (EPA) Mobile6 model. The VMT is estimated using SEMCOG's Travel Demand Forecast Model. Actual emissions calculation is done using a post-processing model, developed by SEMCOG. The post-processor multiplies the travel model VMT by the appropriate Mobile6 emission to calculate link-level emissions of volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxides (NOx), fine particulate ($PM_{2.5}$), sulfur dioxide (SO_2), and ammonia (NH3).

Emission inventories were developed for four different analysis years: 2002, 2005, 2009 and 2018. In keeping with EPA guidance on the preparation of annual inventories, the analysis involved the development of seasonal inventories that were then summed to create an annual inventory for each analysis year.

II. Modeling Inputs and Assumptions

The following paragraphs explain the various model inputs and assumptions used to create the emissions inventories.

A. Mobile6.2 Input Parameters

As required by the U.S. Environmental Protection Agency (EPA), the inventory was developed using emission rates generated by EPA's Mobile6.2 emission factor model. It also used the updated PM rate table for heavy-duty vehicles, which EPA released on March 17, 2006. This rate table corrects an over estimation of PM_{10} and $PM_{2.5}$ heavy-duty vehicle emissions by the previous version of the model for years 2007 and beyond.

The Mobile6.2 model allows for input of certain localized data in order to provide better emissions estimates for a given region. Six localized data inputs were used in SEMCOG's analysis:

- **Minimum & Maximum Daily Temperatures:** Table 1 shows the temperatures used to simulate an average day in each of the four seasons. The values were derived from National Weather Service local climatological data reports, provided by the Michigan Department of Environmental Quality (MDEQ). 2002 values were calculated by averaging the monthly minimum and maximum temperatures between 2001 and 2003. Values for years 2005 through 2018, used the average monthly minimum and maximum temperatures observed between 2004 and 2006.

Table 1
Minimum and Maximum Daily Temperatures Used in Mobile6

Analysis Year	Season							
	Winter		Spring		Summer		Fall	
	Min	Max	Min	Max	Min	Max	Min	Max
2002	22.8	35.6	38.1	56.8	62.5	81.9	44.6	61.8
2005-2018	22.3	35.2	39.8	58.7	62.8	81.7	45.1	62.6

- **Reid Vapor Pressure (RVP):** Mobile6 summer runs for years 2002 and 2005 used an RVP of 7.8 pounds per square inch (psi), which was the maximum level allowed by law in Southeast Michigan during the summer months until 2007. In 2007, a new law went into affect, requiring 7.0 psi vapor pressure gasoline between June 1st and September 15th of each year. Thus, an RVP of 7.0 was used for summer runs in years 2009 and 2018.

  For the other three seasons, 2002 fuel sample data, obtained from the Michigan Department of Agriculture, were used to compute the average RVP for each season in each year. The averages were 12.3 psi for winter, 11.1 psi for spring, and 10.7 psi for fall. These values were used for all analysis years.

- **Gasoline Sulfur Values:** The 2002 values were derived from Alliance of Automobile Manufacturers North American Fuel Survey data for Wayne County, Michigan. The summer value was 439 ppm. The value for the other three seasons was 424 ppm. As new gasoline sulfur standards should be phased-in by 2009 in Midwest states, the Mobile6 default value of 30 ppm was used for all seasons in years 2009 and 2018.

- **Diesel Sulfur Values**: As with gasoline, the 2002 diesel sulfur level was derived from the 2002 Alliance of Automobile Manufacturers fuel survey. This value was 380 ppm. As data on seasonal variation was not available, the same value was used for all 2002 runs. For future years, the new diesel sulfur standard of 15 ppm, which begins phasing in during 2006, was used. A value of 106.3 was used for 2005, which was derived through linear interpolation of the 2002 and 2006 values.

- **Oxygenated Fuels Inputs**: In addition to providing the local gasoline sulfur values, the 2002 North American Fuel Survey data showed that approximately 25% of the fuel sold in Southeast Michigan contained an oxygenate. The vast majority of this oxygenate was ethanol. A small fraction was MTBE. The observed values from the fuel survey were used in SEMCOG's 2002 base year modeling. For 2005 and all future years, SEMCOG assumed that oxygenate would continue to be present in 25% of the region's gasoline. However, as use of MTBE was banned in Michigan in 2003, it was assumed that all of the oxygenate in these years would be ethanol. Table 6 shows the specific oxygenate inputs used in Mobile6.

Table 2
Oxygenated Fuel Inputs Used in Mobile6

Year	Oxygenate	% Market Share	% Weight
2002	Ethanol	20.7	3.2
	MTBE	3.5	1.9
2005 - 2018	Ethanol	25.0	3.2
	MTBE	0.0	0.0

- **Age Distribution of Vehicle Fleet:** Table 3 shows the vehicle fleet age distribution data used in Mobile6. The light-duty distribution was developed by the Lake Michigan Air Directors Consortium (LADCO), using 2004 vehicle registration data for Southeast Michigan. The heavy-duty distribution was developed from national data, using EPA guidance.

Table 3
Age Distribution of Southeast Michigan Fleet

Vehicle Age (Years)	Vehicle Class							
	Light Duty Vehicle	Light Duty Truck 1	Light Duty Truck 2	Light Duty Truck 3	Light Duty Truck 4	Heavy Duty Truck	Heavy Duty Bus	Motorcycle
1	0.0919	0.1267	0.1563	0.1325	0.1375	0.031	0.029	0.017
2	0.1225	0.1689	0.2084	0.1767	0.1833	0.082	0.078	0.098
3	0.1262	0.1740	0.2147	0.1820	0.1888	0.068	0.065	0.088
4	0.0866	0.0421	0.1114	0.0940	0.1255	0.077	0.074	0.071
5	0.0438	0.0207	0.0500	0.0383	0.0567	0.065	0.062	0.072
6	0.0452	0.0155	0.0455	0.0500	0.0757	0.082	0.097	0.063
7	0.0359	0.0166	0.0370	0.0256	0.0429	0.062	0.069	0.052
8	0.0345	0.0123	0.0278	0.0233	0.0351	0.047	0.059	0.040
9	0.0337	0.0210	0.0225	0.0228	0.0256	0.037	0.044	0.027
10	0.0419	0.0260	0.0217	0.0300	0.0252	0.036	0.046	0.020
11	0.0401	0.0391	0.0213	0.0296	0.0289	0.042	0.051	0.020
12	0.0409	0.0357	0.0204	0.0248	0.0087	0.048	0.053	0.432
13	0.0390	0.0290	0.0160	0.0227	0.0115	0.045	0.048	0.000
14	0.0374	0.0435	0.0112	0.0175	0.0041	0.041	0.046	0.000
15	0.0351	0.0390	0.0080	0.0208	0.0069	0.038	0.042	0.000
16	0.0338	0.0426	0.0075	0.0228	0.0045	0.031	0.034	0.000
17	0.0270	0.0322	0.0084	0.0179	0.0050	0.026	0.028	0.000
18	0.0194	0.0354	0.0022	0.0140	0.0037	0.014	0.013	0.000
19	0.0174	0.0279	0.0026	0.0132	0.0071	0.010	0.011	0.000
20	0.0133	0.0201	0.0019	0.0101	0.0056	0.010	0.010	0.000
21	0.0094	0.0115	0.0018	0.0075	0.0028	0.010	0.007	0.000
22	0.0049	0.0054	0.0011	0.0040	0.0016	0.018	0.008	0.000
23	0.0027	0.0041	0.0005	0.0021	0.0007	0.017	0.007	0.000
24	0.0026	0.0030	0.0004	0.0012	0.0002	0.014	0.005	0.000
25+	0.0148	0.0078	0.0016	0.0168	0.0125	0.049	0.015	0.000

B. Vehicle Miles of Travel (VMT) Estimation & Emissions Calculation

- **Demographic Data:** Travel forecasts used in the conformity analysis are based on demographic data from SEMCOG's 2030 Regional Development Forecast (RDF), which was published in 2001.

- **Description of SEMCOG's travel forecasting model**: VMT forecasts for the conformity analysis were developed using SEMCOG's TransCAD travel forecasting model (version E4-enhanced). A more detailed description of the model is available from SEMCOG upon request.

- **HPMS Normalization Factors:** EPA and FHWA guidance stipulates that VMT used to construct mobile source emissions inventories be consistent with that reported through the Highway Performance Monitoring System (HPMS), In accordance with this guidance, SEMCOG developed factors to normalize the TransCAD travel model VMT to the Michigan Department of Transportation (MDOT) HPMS VMT. The factors were developed in a four-step process:

  1. 2002 HPMS universe data, aggregated by county and functional class, were obtained from MDOT.
  2. 2002 average weekday TransCAD model VMT were also aggregated by county and functional class.
  3. TransCAD VMT was converted to average annual daily VMT (AADVMT) using day-of-week adjustment factors from MDOT's publication *Seasonal Analysis of Michigan's Permanent Traffic Recorder (PTR) Data For 2001, 2002, 2003.*
  4. Normalization factors for each county and functional class were computed by dividing the HPMS VMT by the corresponding TransCAD AADVMT.

  The daily adjustment factors used in step 3, along with the resulting normalization factors, are provided in tables 4 and 5. These factors were applied to all travel model VMT, in both current and future years, prior to calculating vehicle emissions.

Table 4
Average Annual Daily Travel Adjustment Factors

Area Type[1]	Urban	Urban Area Limit	Rural
AADT Adj. Factor	0.8597	0.9214	1.0209

[1] Urban includes the city of Detroit; Urban Area Limit includes Macomb, Oakland and Wayne counties (excluding Detroit); Rural includes Livingston, Monroe, St. Clair and Washtenaw counties.

Table 5
HPMS Normalization Factors

County	Freeway	Principal Arterial	Minor Arterial	Collector
Livingston	0.688099	1.585526	1.015991	0.535365
Macomb	1.040133	1.204916	1.136826	0.855788
Monroe	0.855686	1.007290	1.093279	0.689459
Oakland	1.074974	1.043694	1.009170	0.697480
St. Clair	0.867815	1.066117	1.363675	1.033534
Washtenaw	0.829980	0.930350	0.900897	0.793497
Wayne				
Detroit	1.137798	1.184245	1.372235	1.784939
Outer-Wayne	1.061630	1.344744	1.280373	1.665449

- **VMT Seasonal Adjustment**: Once the travel model VMT had been normalized to HPMS data, seasonal adjustment factors were applied to generate average daily VMT for each of the four seasons. The factors are shown in Table 6 below. They were developed using data from the MDOT report *Seasonal Analysis of Michigan's Permanent Traffic Recorder (PTR) Data for 2001, 2002, 2003.*

Table 6
VMT Seasonal Adjustment Factors

Area Type[1]	Season			
	Winter	Summer	Spring	Fall
Urban	0.9417	1.0384	1.0080	1.0172
Urban Area Limit	0.9491	1.0095	1.0528	0.9940
Rural	0.8685	1.1682	0.9737	1.0357

[1] Urban include the city of Detroit; Urban Area Limit includes Macomb. Oakland and Wayne counties (excluding Detroit); Rural includes Livingston, Monroe, St. Clair and Washtenaw counties.

- **VMT Distribution by Vehicle Class**: SEMCOG's emissions post-processor apportions each roadway link's hourly VMT among the eight different vehicle classes contained in the Mobile6 default "descriptive" emissions rate tables. This is done by multiplying the hourly VMT by the appropriate vehicle mix factors, listed in Table 7.

  The factors were developed using vehicle classification count data for Southeast Michigan. Freeway factors were computed from year 2000 MDOT PTR data. Arterial factors were developed from 1999 and 2000 screen line traffic counts taken by SEMCOG. The conversion of traffic count data from the standard 13 FHWA bins to the eight vehicle classes in Mobile6 was done using vehicle sales and mileage accumulation data from EPA's technical memorandum: *Fleet Characterization Data for Mobile6*[1]. Table 8 shows this apportionment.

Table 7
Southeast Michigan VMT Vehicle Mix Factors for Typical Weekday - Freeways

Road Type	Hour	Vehicle Type								
		LDGV	LDDV	LDGT 1&2	LDGT 3&4	LDDT	HDGV	HDDV	MC	Total
Freeway	1	46.05	0.34	26.37	9.36	0.25	5.38	12.25	0.00	100.00
	2	43.18	0.32	24.47	8.68	0.23	7.05	16.07	0.00	100.00
	3	39.97	0.30	24.63	8.74	0.23	7.66	17.46	0.00	98.99
	4	37.94	0.28	24.76	8.79	0.23	8.54	19.46	0.00	100.00
	5	40.14	0.30	26.98	9.58	0.26	7.17	16.33	0.00	100.76
	6	44.87	0.33	30.45	10.82	0.29	4.04	9.21	0.00	100.00
	7	45.71	0.34	30.83	10.95	0.29	3.36	7.65	0.87	100.00
	8	49.01	0.36	28.31	10.05	0.26	3.39	7.73	0.87	99.99
	9	46.39	0.34	26.67	9.47	0.25	4.88	11.12	0.87	100.00
	10	41.91	0.31	26.50	9.40	0.25	6.37	14.51	0.87	100.13
	11	40.56	0.30	25.94	9.21	0.24	6.98	15.90	0.87	100.00
	12	40.56	0.30	25.94	9.21	0.24	7.02	15.99	0.87	100.13
	13	41.15	0.30	26.06	9.25	0.24	6.75	15.38	0.87	100.00
	14	41.83	0.31	26.93	9.56	0.25	6.44	14.68	0.87	100.87
	15	42.50	0.31	27.89	9.91	0.27	5.57	12.68	0.87	100.01
	16	43.85	0.32	29.18	10.37	0.27	4.65	10.60	0.87	100.13
	17	46.39	0.34	28.69	10.18	0.27	3.74	8.51	0.87	99.00
	18	48.42	0.36	28.11	9.98	0.26	3.39	7.73	0.87	99.12
	19	48.42	0.36	28.11	9.98	0.26	3.39	7.73	0.87	99.12
	20	47.74	0.35	27.87	9.89	0.26	3.97	9.04	0.87	99.99
	21	48.33	0.36	28.08	9.97	0.26	3.70	8.43	0.87	99.99
	22	48.33	0.36	27.99	9.93	0.26	3.70	8.43	0.00	98.99
	23	48.25	0.36	27.87	9.89	0.26	4.08	9.30	0.00	99.99
	24	47.40	0.35	27.39	9.72	0.25	4.77	10.86	0.00	100.74

Table 7 continued
Southeast Michigan VMT Vehicle Mix Factors for Typical Weekday - Arterials

Road Type	Hour	Vehicle Type								
		LDGV	LDDV	LDGT 1&2	LDGT 3&4	LDDT	HDGV	HDDV	MC	Total
Arterial	1	53.71	0.40	29.24	10.38	0.27	1.53	3.48	1.00	100.00
	2	53.04	0.39	29.51	10.47	0.28	1.57	3.58	1.15	100.00
	3	51.58	0.38	29.97	10.64	0.27	1.88	4.28	1.15	100.15
	4	50.23	0.37	30.97	10.99	0.29	1.88	4.28	1.00	100.00
	5	49.08	0.36	31.08	11.04	0.29	2.18	4.97	1.00	100.01
	6	47.42	0.35	31.45	11.17	0.29	2.53	5.77	1.00	100.00
	7	47.63	0.35	30.57	10.86	0.29	3.05	6.95	1.00	100.70
	8	47.94	0.35	28.59	10.15	0.26	3.61	8.23	1.00	100.15
	9	46.59	0.34	28.12	9.98	0.26	3.97	9.04	1.00	99.30
	10	45.70	0.34	29.29	10.39	0.28	4.01	9.14	1.00	100.16
	11	45.70	0.34	29.79	10.58	0.28	3.75	8.55	1.00	100.01
	12	46.28	0.34	29.49	10.46	0.28	3.71	8.45	1.00	100.00
	13	46.95	0.35	28.99	10.29	0.27	3.71	8.45	1.00	100.00
	14	46.95	0.35	28.99	10.29	0.27	3.66	8.34	1.00	99.85
	15	47.16	0.35	28.95	10.27	0.27	3.61	8.23	1.00	99.85
	16	47.16	0.35	29.06	10.31	0.27	3.87	8.82	1.00	100.85
	17	47.84	0.35	28.67	10.18	0.26	3.82	8.71	1.00	100.84
	18	48.72	0.36	28.13	9.98	0.26	3.52	8.02	1.00	100.00
	19	49.87	0.37	28.64	10.17	0.27	2.91	6.63	1.00	99.85
	20	51.11	0.38	29.07	10.32	0.27	2.39	5.45	1.15	100.15
	21	52.26	0.39	29.47	10.46	0.28	2.09	4.76	1.00	100.69
	22	53.14	0.39	28.93	10.27	0.27	1.83	4.17	1.00	100.00
	23	53.82	0.40	29.17	10.35	0.27	1.53	3.48	1.00	100.00
	24	54.60	0.40	29.44	10.45	0.27	1.22	2.78	0.85	100.00

Table 8
Vehicle Class Conversion Process: FHWA to Mobile6

FHWA Class (Count Bin)	General Vehicle Class	Mobile6 Vehicle Class	Proportion Assigned to M6 Class
Bin 1	Motorcycle	Motorcycle	100.0
Bin 2	Light Duty Vehicle	Light Duty Gas Vehicle	67.6
		Light Duty Diesel Vehicle	0.5
		Light Duty Gas Truck 1&2	23.4
		Light Duty Gas Truck 3&4	8.3
		Light Duty Diesel Truck	0.2
Bin 3	Light Duty Truck	Light Duty Gas Truck 1&2	73.2
		Light Duty Gas Truck 3&4	26.0
		Light Duty Diesel Truck	0.8
Bins 4-13	Heavy Duty	Heavy Duty Gas Truck	30.5
		Heavy Duty Diesel Truck	69.5

- **Time of Day and Directional Split Apportioning:** SEMCOG's emission estimation process is designed to capture the temporal variation in emissions. This is accomplished through the application of hour-of-day (K) and directional split (D) factors, developed from 1985 traffic survey data[2]. Table 9 provides both the hourly distribution and directional split factors, by functional class.. The factors are applied at the link level. Thus, the daily VMT for each two-way link is divided into 48 separate values (24 hours x 2 directions for each hour). In the case of one-way links/streets, only the hourly factors are applied, creating 24 hourly VMT values per link.

Table 9
Time of Day & Directional Split Factors for Typical Weekday

Hour Ending	Time of Day Volume Factors		Directional Split Factors	
	Freeways	Arterials	Freeways	Arterials
1:00 a.m.	0.015	0.014	0.59	0.60
2:00	0.009	0.007	0.58	0.59
3:00	0.007	0.005	0.58	0.60
4:00	0.006	0.003	0.56	0.58
5:00	0.009	0.004	0.59	0.61
6:00	0.022	0.012	0.62	0.67
7:00	0.051	0.031	0.64	0.67
8:00	0.075	0.056	0.61	0.65
9:00	0.064	0.058	0.58	0.60
10:00	0.052	0.048	0.56	0.57
11:00	0.049	0.050	0.54	0.55
12:00	0.051	0.057	0.53	0.54
1:00 p.m.	0.051	0.062	0.53	0.54
2:00	0.052	0.060	0.53	0.54
3:00	0.060	0.065	0.53	0.54
4:00	0.073	0.076	0.55	0.56
5:00	0.079	0.081	0.58	0.58
6:00	0.077	0.079	0.57	0.58
7:00	0.054	0.061	0.56	0.56
8:00	0.038	0.048	0.54	0.55
9:00	0.031	0.040	0.55	0.56
10:00	0.030	0.035	0.55	0.57
11:00	0.026	0.026	0.55	0.61
12:00	0.021	0.021	0.55	0.57

Source: *Survey of Regional Traffic Volume Patterns in Southeast Michigan,* SEMCOG, September 1985.

- **Travel Speed Estimation:** Because of recognized limitations with speeds generated from most travel demand models, SEMCOG's emissions estimation process does not use link speeds from TransCAD. Instead a post-processing equation is used, based on research conducted by Richard Dowling and Alexander Skabardonis in the early 1990's[3]. Their findings, along with speed data collected by SEMCOG in 1992[4], were used to develop the following speed equation[5]:

  Avg. Link Speed = Avg. Queue Speed * (Avg. Queue Length/Length) + Uncongested Speed * (1 – (Avg. Queue Length/Length))

  where: Uncongested Speed = $1.24 * \text{Survey Speed}_{(fc,h)}/(1 + (V/C_i)^{11})$
  fc = functional class
  h = hour of day
  Avg. Queue Speed = capacity/lane * 25 ft./vehicle
  Avg. Queue Length = average Queue * 25 ft./vehicle
  Avg. Queue = (Q1 + Q2)/2
  Q1 = queue at start of time slice
  Q2 = queue at end of time slice
  = Q1 + (1-hour traffic/lane – 1-hour capacity/lane)

  Separate link speeds are calculated for each hour of the day and direction of travel (48 speeds for each two-way link, 24 speeds for each one-way link).

- **Local VMT Estimation and Emissions Calculation:** Because SEMCOG's travel model does not include local (residential) streets, the emissions post-processor uses gross level local road VMT data from MDOT's HPMS to calculate base-year local road emissions. This VMT is allocated among the different vehicle classes using the vehicle mix distribution for arterials during the noon hour (see Table 4 of Appendix G). A single set of local road emission factors, based on the Mobile6.2 default speed of 12.9 mph, is applied to the local VMT (for each vehicle class) to calculate emissions. This process can be expressed as follows:

  $$LRE = \sum_{cv} \text{Local } VMT_c * \%VMT_v * EF_v$$

  where: LRE = local road emissions
  %VMT = % VMT occurring on an urban arterial at noon hour
  c = county
  v = vehicle class
  EF = emission factor for local road at 12.9 mph

- **Emissions from Freeway and Arterial Travel:** As noted above, SEMCOG's post-processing model (EMIS_FC_M6PM) follows EPA's *Quality Review Guidelines for 1990 Base Year Inventories*. However, the program does not use the approach of assigning one emission factor for each vehicle type and road type, at a single speed. Instead emissions are calculated at the link level, based on the directional speed and VMT for each hour, on each link. The process can

be expressed by the following equation:

$$E_{a\text{-}b} = \sum_{k,d,v} VMT_{a\text{-}b}\ \textit{(in hour k, direction d)} * EF_{fc,s,v} * \%VMT_{fc,v}$$

where: $E_{a\text{-}b}$ = emissions for link a-b
k = hour of day
d = direction of travel
v = vehicle class
EF = emissions factor
fc = functional class/facility type
s = average link speed in hour k, direction d

- **Daily Emissions Summation for Each Season:** Once link-level emissions have been calculated, they are aggregated by pollutant, vehicle class, functional class and county. Summary reports are then generated showing total daily emissions of each pollutant by county, road type and vehicle type. Information on VMT and average speed is also provided. A separate post-processing run is performed for each season of each analysis year.

- **Annual Emissions Calculation**: Once average daily emissions have been calculated for each season in a given analysis year. These emissions are multiplied by the number of days in that season, then summed to obtain the annual inventory. Emissions are reported in tons per year.

II. Resulting On-Road Mobile Source Emissions Inventory

Tables 10-13 contain the on-road mobile source emissions inventories resulting from the modeling process described above. Each table lists the annual emissions of six different pollutants, by county, for a given analysis year (2002, 2005, 2009 or 2018). The six pollutants are those specified in the EPA's 2007 Clean Air Fine Particle Implementation Rule. They include volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxide (NOx), directly emitted $PM_{2.5}$, sulfur dioxide (SO_2), and ammonia (NH3).

Table 10
2002 On-Road Mobile Source Emissions

County	Tons/Year					
	VOC	CO	NOx	Primary $PM_{2.5}$*	SO_2	NH3
Livingston	2,273	41,619	7,032	118	295	189
Macomb	7,893	131,842	18,736	359	945	624
Monroe	2,372	42,803	7,124	121	305	195
Oakland	16,351	275,611	41,379	760	1,960	1,279
St. Clair	2,091	34,038	4,997	95	250	165
Washtenaw	4,536	80,205	13,071	226	575	370
Wayne	23,457	391,446	59,052	1,087	2,793	1,821
Reg. Total	58,972	997,564	151,390	2,767	7,122	4,642

* Primary $PM_{2.5}$, which includes all exhaust emissions as well as those from brake and tire wear.

Table 11
2005 On-Road Mobile Source Emissions

County	Tons/Year					
	VOC	CO	NOx	Primary $PM_{2.5}$*	SO_2	NH3
Livingston	1,697	31,039	5,418	89	71	201
Macomb	5,785	97,334	14,121	265	221	646
Monroe	1,743	31,635	5,454	91	73	206
Oakland	11,918	202,301	31,088	560	458	1,319
St. Clair	1,551	25,240	3,813	71	59	172
Washtenaw	3,350	59,242	9,962	170	137	388
Wayne	16,931	284,801	43,981	792	647	1,859
Reg. Total	42,974	731,593	113,838	2,039	1,667	4,790

* Primary $PM_{2.5}$, which includes all exhaust emissions as well as those from brake and tire wear.

Table 12
2009 On-Road Mobile Source Emissions

County	Tons/Year					
	VOC	CO	NOx	Primary $PM_{2.5}$*	SO_2	NH3
Livingston	1,303	23,364	3,650	65	20	209
Macomb	4,364	72,675	9,434	193	63	666
Monroe	1,339	23,958	3,703	67	21	215
Oakland	8,965	150,463	20,682	404	130	1,355
St. Clair	1,177	18,988	2,559	52	17	178
Washtenaw	2,580	45,167	6,801	125	40	410
Wayne	12,449	207,581	28,657	559	179	1,870
Reg. Total	32,177	542,196	75,486	1,465	469	4,903

* Primary $PM_{2.5}$, which includes all exhaust emissions as well as those from brake and tire wear.

Table 13
2018 On-Road Mobile Source Emissions

County	Tons/Year					
	VOC	CO	NOx	Primary $PM_{2.5}$*	SO_2	NH3
Livingston	802	20,339	1,375	39	23	237
Macomb	2,521	59,542	3,502	113	67	705
Monroe	802	20,286	1,357	39	23	236
Oakland	5,107	120,939	7,386	228	134	1,409
St. Clair	702	16,100	980	31	19	195
Washtenaw	1,548	38,146	2,501	74	43	449
Wayne	7,030	166,315	10,270	314	185	1,932
Reg. Total	18,511	441,665	27,372	837	493	5,164

*Primary $PM_{2.5}$, which includes all exhaust emissions as well as those from brake and tire wear.

[1] U.S. Environmental Protection Agency, *Fleet Characterization Data for Mobile6: Development and Use of Age Distributions, Average Annual Mileage Accumulation Rates, and Projected Vehicle Counts for Use in MOBILE6*, September 2001.
[2] SEMCOG, *Survey of Regional Traffic Volume Patterns in Southeast Michigan*, tables 3–7, 1985.

[3] Dowling, Richard and Alexander Skabardonis, *Improving the Average Travel Speeds Estimated by Planning Models*, Transportation Research Board, January 1992.
[4] SEMCOG, *Survey of Roadway Speeds in Southeast Michigan*, January 1993.
[5] More complete documentation of the use of SEMCOG speed survey data in the development of this equation can be found in the document *Redesignation of Southeast Michigan to Attainment for Ozone: Technical Support Document*, jointly published by MDNR, MDOT and SEMCOG in November 1993.

Appendix E

SOUTHEASTERN MICHIGAN $PM_{2.5}$ CONTROL PLAN:

MONITORING STRATEGY

SUPPORT DOCUMENTATION

FOR THE

FINE PARTICULATE SIP

May 2008

Southeastern Michigan $PM_{2.5}$ Control Plan: Monitoring Strategy

The purpose of this document is to propose a monitoring strategy as part of the southeastern Michigan $PM_{2.5}$ control plan. The strategy consists of ambient measurements both from the existing monitoring network (with a few changes) and new special purpose monitoring, and associated data analyses. The ability to implement this strategy, especially changing the existing network and conducting new monitoring, is dependent on the availability of additional funding. (Note, the strategy will need to be reviewed and, as necessary, revised based on the final set of emission reduction programs selected for the $PM_{2.5}$ control plan.)

Monitoring Objectives

The objectives of the monitoring strategy include:

- assess attainment of National Ambient Air Quality Standard,
- provide real-time measurements (to support public outreach),
- improve understanding of the $PM_{2.5}$ nonattainment problem (including to help identify the contribution of source types and source regions to $PM_{2.5}$ levels),
- track progress towards attainment (and assess effectiveness of emission reduction programs).

Measurements

A summary of existing and suggested additional measurements is provided in Table 1. A map of the existing monitoring sites is shown in Figure 1.

Figure 1. $PM_{2.5}$ Monitoring Sites in Southeastern Michigan (Note: although not shown, there are two other sites – Newberry and FIA – located near Dearborn and Fort Street (SWHS))

Two changes to the existing monitoring network (pending the availability of funding) are recommended:

- Establish a TEOM monitor at SWHS[1].

- Establish an STN monitor at SWHS – either by moving the Luna Pier STN monitor or siting an available STN monitor (which would require additional resources for lab support).

It should also be noted that in light of pending budget cuts by USEPA, the State may need to reduce the number of FRM (and, perhaps, STN) sites in the network. Further discussion is needed on any specific proposed reductions.

New special purpose monitoring (pending the availability of funding) is desirable to improve understanding of the $PM_{2.5}$ nonattainment problem, especially for organic carbon. General suggestions for organic carbon-related monitoring and data analyses are discussed in the Appendix. Of these suggestions, serious consideration should be given to the following activities in southeastern Michigan:

- Collect continuous OC/EC data at Dearborn and, if possible, Allen Park. (Note, these data should be reviewed regularly to assess the adequacy of the existing 1-in-6-day STN sampling schedule at Dearborn.)

- Collect speciated OC data at Dearborn. High time resolution data are important. One approach is to analyze existing or new filters for many high OC concentration days, similar to what University of Wisconsin did earlier this year.

- Following analysis of the continuous measurements (see below) and the subsequent identification of important local sources, source sampling should be conducted for the important sources in the vicinity of the Dearborn monitor to develop improved source profiles for source apportionment analyses.

Although lesser priority, additional lab analyses of existing filters would also be desirable to support source apportionment analyses and improve understanding of $PM_{2.5}$ sources:

- ICP/MS to determine metals concentrations - ICP/MS yields lower minimum detection limits (MDLs) than the standard XRF protocol, but also has disadvantages, including poorer resolution for some species and it is a destructive method. While ICP/MS is technically feasible and yields good quality data, it is more expensive than XRF (i.e., about $28K for 40 elements on 100 FRM Teflon samples, or about $19K for 20 elements on 100 FRM Teflon samples).

- Scanning electron microscopy to assess sources of certain elements (note: this type of analysis was recently done using filters collected in the vicinity of Granite City Steel near St. Louis)

[1] As noted in Table 1, Dr. Jerry Keeler has operated a TEOM at SW High School, but these data are not currently available.

Data Analysis

Near-term activities include additional analysis of existing measurements, including a review of continuous measurements to assess plume hits, and an examination of burning sources, as discussed in the Appendix. On-going activities include quarterly review of FRM and STN data, and periodic source apportionment studies using the latest measurement (e.g., assess trends in source contributions). These activities can be conducted by in-house personnel (e.g., MDEQ and LADCO).

Table 1. $PM_{2.5}$-Related Air Quality Measurements in Southeastern Michigan

Monitoring Type		**FRM**	**TEOM**	**Aethalometer**	**STN**	**Other/New Measurements**
Pollutant/Species		$PM_{2.5}$ mass	$PM_{2.5}$ mass	Black (elemental) carbon	Sulfates, nitrates, organic carbon, elemental carbon, soil	
Sampling Frequency		1-in-3 day, 1-in-6 day	continuous	continuous	1-in-3 day, 1-in-6 day	
Purpose		Assess attainment of NAAQS	Provide real-time measurements	Provide data for SIP development	Provide data for SIP development (improve understanding of $PM_{2.5}$)	
Allen Park	261630001	x	x	x	x	***Continuous OC/EC Measurements (if available)***
SW High School	261630015	x	x (Keeler short-term study)			***Establish STN monitor (use existing equipment of move Luna Pier STN)*** ***Establish TEOM***
Linwood	261630016	x				
E. 7 Mile	261630019	x				
Livonia	261630025	x				
Dearborn	261630033	x	x	x	x	***Continuous OC/EC Measurements*** ***Speciated OC Data (w/ source apportionment analyses)***
Wyandotte	261630036	x				
Newberry	261630038	x	x	x	x (Schauer short-term study)	
FIA	261630039	x	x			
New Haven	260990009	x				
Luna Pier	261150005	x			x ***(move to SWHS?)***	
Oak Park	261250001	x				
Port Huron	261470005	x	x			
Ann Arbor	261610005	x				
Ypsilanti	261610008	x	x		x	

APPENDIX

Organic Carbon Monitoring and Data Analysis Activities

Overview: The purpose of this paper is to suggest ambient measurements and data analyses for organic carbon (OC) to address the following objectives:

Near-Term (by early 2007):	(1)	better define burning source(s)
	(2)	better identify local OC sources
	(3)	justify emissions inventory adjustment factors
Longer-Term (2008 and beyond):	(1)	improve understanding of mobile sources
	(2)	improve understanding of OC sources
	(3)	assess effectiveness of control programs in reducing OC concentrations

These monitoring and data analysis activities are intended to provide a better understanding of organic carbon and support possible regulatory efforts for $PM_{2.5}$ in the Upper Midwest.

Background: In 2004 – 2005, LADCO supported the Urban Organics Study, with contractor assistance study by the University of Wisconsin and Sonoma Technology, Inc. (STI). The purpose of this study was to provide ambient measurement-based information on sources of $PM_{2.5}$ organic carbon concentrations (e.g., anthropogenic v. biogenic, urban v. rural, and primary v. secondary). It was hoped that this information would be sufficient to identify organic carbon sources and to determine possible control programs.

Special OC measurements were made at five urban sites (Chicago, St. Louis, Detroit, Cincinnati, and Indianapolis) and one rural site (Bondville, IL)[2]. Source apportionment analyses were then conducted using these measurements. The study results indicated four major OC source types (mobile, burning, industrial, and secondary), but were unable to provide any further definition. Consequently, the resulting control strategy implications were rather general, and numerous suggestions were made for further work.

Monitoring and Data Analysis Activities: To meet the near-term and longer-term objectives, the following activities should be considered:

(1) Maintain STN Network: Speciated $PM_{2.5}$ measurements need to be continued at a core set of existing sites. (Due to funding cuts and periodic network reviews, it may not be possible or necessary to maintain all original STN sites.) On-going measurements are needed to define trends in $PM_{2.5}$ species and improve understanding of organic carbon sources.

(2) Continuous Data Collection: Continuous EC/OC (Sunset method) and BC (aethelometer) measurements at multiple locations are needed to further explore plumes and diurnal behavior. Such data are desirable in one or more of the expected $PM_{2.5}$ residual nonattainment areas: Detroit, Chicago, Cleveland, Granite City (St. Louis), and Steubenville.

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[2] In the case of Detroit, STI focused on measurements collected at Allen Park, while UW analyzed measurements from both Allen Park and Dearborn.

While we are awaiting these data, follow-up analyses to the Urban Organics Study should be conducted. For example, available continuous air quality and meteorological measurements should be reviewed to look for plume “hits”. This analysis may help identify nearby sources.

(3) Speciated OC Data Collection: Special measurements, such as hi-vol sampling with analysis of individual organic species to identify specific chemical markers to support source apportionment studies. Such measurements were collected in the Urban Organics Study, and a special study in the Seney National Wildlife Refuge (see “Source Apportionment of Atmospheric Fine Particulate Matter Collected at the Seney National Wildlife Refuge”, May 2004). In the Seney study, chemical markers associated with biogenic emissions were identified.

(4) Analysis of Burning Source: Levoglucosan analysis is needed to determine biomass burning (independent of OC analysis). The Jeff Collett method (anion-exchange chromatography with pulsed amperometric detection) is very specific for levoglucosan and can be done more cheaply. This is typically done on high-vol filters and has not been attempted on archived STN or FRM filters, but Jeff thinks it is possible and is interested in such a project. (Neil Frank is also interested in a multi-regional program to look at ways to estimate biomass using levoglucosan and, perhaps, potassium and may have money that could be leveraged.)

While we are awaiting these data, follow-up analyses to the Urban Organics Study should be conducted. For example, back trajectories should be prepared for all days identified as having a high burning source impact in the initial source apportionment analyses. This information may help determine source regions and burning activities.

(5) Examination of Old and New Carbon: C14 analysis could be conducted to determine fossil/modern carbon split. New carbon is mostly associated with biogenic Secondary Organic Aerosol (SOA) and biomass burning, while old carbon is associated with mobile source, stationary fossil fuel combustion, and fossil fuel source SOA. Together with the levoglucosan data above, this would allow us to develop a more certain bound on anthropogenic and biogenic contributions (i.e., biomass burning is a fraction of modern carbon -- whatever is left of modern carbon after biomass burning is subtracted is the biogenic contribution). This is an expensive analysis -- ~$500/sample.

(6) Characterize Intra-City Spatial Variability (Jamie Schauer methodology): Routine sampling along a transect in the prevailing wind direction with at least three sites to quantify upwind, center city or industry, and downwind. Detroit would be an ideal location; for example, select Allen Park, Dearborn, and Linwood. Combining this with continuous data (EC/OC) would help discern some source patterns (mobile, industrial plumes) in the much higher resolution data.

(7) Development of Source Profiles: Source sampling is critical in light of the significant uncertainties we have discovered in numerous source apportionment studies. Most important are steel mills, especially the different processes within the mills, locomotives, and other off-road mobile sources. Data on on-road mobile sources would be helpful as well. (Note, these data may be EPA’s Kansas City study.)

Would also be useful to have resuspended dust (road dust and soil) for various cities -- this would help interpret some profiles that can confuse common crustal signatures with those of industrial processes and develop some knowledge of geological variability in the Midwest. Need to find Gary Casuccio's report on CCSEM at a Pennsylvania steel mill -- supposedly this characterizes various processes.

(8) Additional Data Analyses (using existing data): Besides the two follow-up data analysis activities noted above (i.e., analysis of available continuous data and trajectory analyses of burning source), additional recommended analyses include: (a) evaluate the emissions inventory in the context of the source apportionment results (note, this analysis is likely to lead to an adjustment factor for primary organic carbon emissions from on-road mobile sources), and (b) assess trends in source contributions (note, this analysis may help determine the effectiveness of certain control programs).

The table below identifies the relevant objectives for these activities:

	Near-Term Objectives				Long-Term Objectives		
	Better Define Burning Source	***Better Identify Local Sources***	***Justify EI Adjustment Factors***		***Improve Understanding of Mobile Sources***	***Improve Understanding of OC Sources***	***Assess Effectiveness of Control Programs***
Monitoring/Data Analysis Activities							
Maintain STN Network						X	X
Continuous Data Collection		X				X	
Analysis of Burning Source	X						
Source Profile Development		X			X	X	
Speciated OC Data Collection/Analysis						X	
Examination of Old-New Carbon		X				X	
Characterize Intra-City Spatial Variability						X	
Additional Data Analyses							
* Evaluate EI			X				
* Assess trends in source contribution							X

Next Steps: This paper will be shared with federal, state, academic, and stakeholder representatives to ensure that the recommended activities are relevant and appropriate. In addition, available funding options need to be explored (e.g., private foundations, special federal appropriation, and stakeholder contributions). Once we have a good idea of how much new money will be available, then the activities will be prioritized and LADCO will proceed with a competitive contract process.

Appendix F

CALCULATION OF SEVERSTAL EMISSIONS

SUPPORT DOCUMENTATION

FOR THE

FINE PARTICULATE SIP

May 2008

Determining the emissions from Severstal North America steel mill for Michigan's AERMOD modeling evaluation was complicated process that involved using: 1)PM emissions reported from MDEQ permit #182-05B (Severstal permit) and 2)emissions and calculation from the steel mill study done by RTI (2006) to determine $PM_{2.5}$. This appendix gives the details in how the emissions estimates for modeling were developed.

Table 1 shows how PM was calculated for the Severstal permit showing the throughput and emissions factors used by Severstal in their permit. The 2009 future potential limits for PM are the maximum emission limits allowed in the Severstal permit once controls are installed (fall 2007 for most emission sources).

Table 2 compares the 2002 PM emissions and emissions factors used in the Severstal permit, the RTI report, and MDEQ that were used to develop the AERMOD modeling emissions. MDEQ used a hybrid between the Severstal permit emissions and the RTI report, based on recommendations of MDEQ permit engineers. The RTI report indicated that Severstal has a local hood to capture charging and tapping emissions from the BOF and send the emissions to the ESP for control. Severstal uses an estimated capture efficiency of 95 percent for charging and tapping emissions (emission factors of 0.03 and 0.046 lb/ton, respectively). RTI research indicated that 95 percent capture is more appropriate for hoods designed and dedicated to capture fugitive emissions, not for a local hood like Severstal had. Furthermore, Severstal had several exceedances of the 20 percent opacity limit for the BOF shop, which supported a lower capture efficiency as in the RTI report.

There is no emission factor for the type of blast furnace casthouse roof monitor as used at Severstal. Severstal uses 85 percent capture efficiency, however, one study, as indicated in the RTI report, found a 74 percent reduction using a similar system. RTI used a75 percent reduction which would also be supported by the opacity exceedences reported for the casthouses as well.

Since the Severstal permit does not contain $PM_{2.5}$ emissions numbers, they had to be calculated using the $PM_{2.5}$-FIL:PM-FIL ratio provided in the RTI report. Table 3 shows the generic source types and ratios used to calculate $PM_{2.5}$ from PM (this table is Table 5-2 in the RTI report). Table 4 show the ratio used for each Severstal specific emission sources to calculate the 2002 actual $PM_{2.5}$ emissions and the 2009 $PM_{2.5}$ future potential emissions used for MDEQs AERMOD modeling.

Table 1. PM calculations from Severstal permit.

Source	2002 ACTUAL		2009 PROJECTED		PM						
	Throughput	Value	Throughput	Value	2009 Emission Factor Value	Units	2009 Potential Emissions (tpy)	2002 Emission Factor	Units	2002 Emissions (tpy)	Net Change (tpy)
B BF Stoves (BFG)	13,392.0	MMSCF	15,136.6	MMSCF	2.9	lb/MMSCF	21.95	2.9	lb/MMSCF	19.42	2.53
C BF Stoves (BFG)	24,003.0	MMSCF	37,841.1	MMSCF	2	lb/MMSCF	37.84	2.9	lb/MMSCF	34.80	3.04
B BF Stoves (NG)	459.0	MMSCF	483.7	MMSCF	7.6	lb/MMSCF	1.84	7.6	lb/MMSCF	1.74	0.09
C BF Stoves (NG)	434.0	MMSCF	655.3	MMSCF	7.6	lb/MMSCF	2.49	7.6	lb/MMSCF	1.65	0.84
B BF Casthouse (Roof Monitor)	900,533.0	TPY	949,000.0	TPY	0.012	lb/ton	5.69	0.09	lb/ton	40.52	-34.83
C BF Casthouse (Roof Monitor)	1,571,337.0	TPY	2,372,500.0	TPY	0.012	lb/ton	14.24	0.09	lb/ton	70.71	-56.48
B BF Bleeders	80.5	MMSCF	84.9	MMSCF	2.9	lb/MMSCF	0.12	2.9	lb/MMSCF	0.12	0.01
C BF Bleeders	140.5	MMSCF	212.2	MMSCF	2.9	lb/MMSCF	0.31	2.9	lb/MMSCF	0.20	0.10
B BF Taphole Burning	1,440.0	ft. of pipe	1,517.5	ft. of pipe	0.5	lb Fe/lb fume	0.15	0.5	lb Fe/lb fume	0.14	0.01
C BF Taphole Burning	1,020.0	ft. of pipe	1,540.1	ft. of pipe	0.5	lb Fe/lb fume	0.15	0.5	lb Fe/lb fume	0.10	0.05
BF B Casthouse Baghouse Stack			250,000	ACFM	0.003	gr/dscf	24.46				24.46
BF C Casthouse Baghouse Stack			500,000	ACFM	0.003	gr/dscf	48.93				48.93
Lime Unloading - BOF Receiving	14,000	ACFM	14,000	ACFM	0.005	gr/dscf	2.63	0.600	lb/hr	2.63	0.00
Reladling South - STACK	130,000	ACFM						0.010	gr/dscf	13.58	-13.58
Reladling South - FUGITIVES	2,471,870.0	TPY	3,321,500.0	TPY	0.0038	lb/ton	6.31	0.0038	lb/ton	4.697	1.61
Torch Cutting	39,745.2	TPY			0.1	lb/ton	0.00	0.1	lb/ton	1.987	-1.99
BOF Natural Gas	520.0	MMSCF	698.7	MMSCF	7.6	lb/MMSCF	2.66	7.6	lb/MMSCF	1.98	0.68
BOF ESP Stack	841,000	ACFM	841,000	ACFM	0.0152	gr/dscf	223.12	0.0152	gr/dscf	202.35	20.77
BOF Secondary Emiss. Baghouse			1,000,000	ACFM	0.003	gr/dscf	32.62				32.62
BOF Tapping (Roof Monitor)	2,944,089.0	TPY	4,052,230.0	TPY	0.0026	lb/ton	5.27	0.046	lb/ton	67.71	-62.45
BOF Slag Tap (Roof Monitor)	372,502.0	TPY	500,538.2	TPY	0.0026	lb/ton	0.65	0.046	lb/ton	8.57	-7.92
BOF Charging (Roof Monitor)	2,471,870	TPY	3,321,500.0	TPY	0.0060	lb/ton	9.96	0.030	lb/ton	37.08	-27.11
Desulfurization - STACK	94,500	ACFM	94,500	ACFM	0.010	gr/dscf	9.15	0.010	gr/dscf	9.15	0.00
Desulfurization - FUGITIVES	2,471,870.0	TPY	3,321,500.0	TPY	0.0218	lb/ton	36.20	0.0218	lb/ton	26.94	9.26
#1 LRF Stack	175,000	ACFM	175,000	ACFM	0.0052	gr/dscf	29.68	0.0052	gr/dscf	29.68	0.00
#2 LRF Stack	100,000	ACFM	100,000	ACFM	0.0052	gr/dscf	16.96	0.0052	gr/dscf	16.96	0.00
Vacuum Degasser	EMISSIONS RESTRICTED BY LIMITS IN EXISTING PERMIT										
DD Baghouse - Coke Transfer	20,000.0	ACFM	20,000.0	ACFM	0.005	gr/dscf	3.75	0.005	gr/dscf	3.75	0.00
EE Baghouse - Coke Unloading	25,000.0	ACFM	25,000.0	ACFM	0.005	gr/dscf	4.69	0.005	gr/dscf	4.69	0.00
EE Baghouse - Natural Gas	5.0	MMSCF	6.7	MMSCF	7.6	lb/MMSCF	0.03	7.6	lb/MMSCF	0.02	0.01
Raw Material Handling	RULE 290 EXEMPT EMISSION UNIT				1.00	PPH	4.38	1.00	PPH	4.38	0.00
Annealing Furnaces	883.2	MMSCF	1,215.7	MMSCF	10	lb/MMSCF	6.08	10	lb/MMSCF	4.42	1.66
Reheat Furnace #1	2,367.0	MMSCF	2,593.4	MMSCF	10	lb/MMSCF	12.97	10	lb/MMSCF	11.84	1.13
Reheat Furnace #2	2,367.0	MMSCF	2,593.4	MMSCF	10	lb/MMSCF	12.97	10	lb/MMSCF	11.84	1.13
Reheat Furnace #3	2,367.0	MMSCF	2,593.4	MMSCF	10	lb/MMSCF	12.97	10	lb/MMSCF	11.84	1.13
Hand Scarfing	262,805.0	TPY	353,136.0	TPY	0.1	lb/ton	17.66	0.1	lb/ton	13.14	4.52
B BF Slag Pit	156,692.7	TPY	165,126.0	TPY	0.0088	lb/ton	0.73	0.0088	lb/ton	0.69	0.04
C BF Slag Pit	273,412.6	TPY	412,815.0	TPY	0.0088	lb/ton	1.82	0.0088	lb/ton	1.20	0.61
Desulfurization Slag Pit	81,571.7	TPY	109,609.5	TPY	0.09	lb/ton	4.93	0.09	lb/ton	3.67	1.26
Parts Cleaning	2,131.0	Gallons	2,131.0	Gallons							
Maintenance Paint Booth	70.0	Gallons	70.0	Gallons							
J-9 Dip Tank	1,210.0	Gallons	1,210.0	Gallons	0.1	lb/1000lb	0.00				0.00
Equipment and Emissions from On-Site Coal Pulverization											
Fine Coal Silo Baghouse			6,200.0	ACFM	0.005	gr/dscf	1.16				1.16
Filter #4 (Pulverizer Baghouse)			16,000.0	ACFM	0.005	gr/dscf	3.00				3.00
Rail Unloading Baghouse			30,000.0	ACFM	0.005	gr/dscf	1.88				1.88
Raw Coal Silo Baghouse			1,800.0	ACFM	0.005	gr/dscf	0.34				0.34
Rail Car Building Heater			214.7	MMSCF	7.6	lb/MMSCF	0.82				0.82
Pulverizer Hot Gas Generator			214.7	MMSCF	7.6	lb/MMSCF	0.82				0.82
Process Fugitives							8.56				8.56
Totals							573.14			664.20	-36.84

Table 2. 2002 PM emissions and emissions factors comparisons used in the Severstal permit, RTI report and MDEQ AERMOD modeling. Numbers in red used RTI values instead of Severstal permit numbers.

Source	Severstal 2002 Emission Factor	Severstal 2002 Emissions (tpy)	RTI 2002 Emission Factor	RTI 2002 Emissions (tpy)	MDEQ 2002 Emission Factor	MDEQ 2002 Emissions (tpy)	Units for emissions factors
B BF Stoves (BFG)	2.9	**19.42**	2.9	19.42	2.9	**19.42**	lb/MMSCF
C BF Stoves (BFG)	2.9	**34.80**	2.9	34.80	2.9	**34.80**	lb/MMSCF
B BF Stoves (NG)	7.6	**1.74**	1.9	0.44	7.6	**1.74**	lb/MMSCF
C BF Stoves (NG)	7.6	**1.65**	1.9	0.41	7.6	**1.65**	lb/MMSCF
B BF Casthouse (Roof Monitor)	0.09	**40.52**	0.15	67.54	0.15	67.54	lb/ton
C BF Casthouse (Roof Monitor)	0.09	**70.71**	0.15	117.85	0.15	117.85	lb/ton
B BF Bleeders	2.9	**0.12**	2.9	0.12	2.9	**0.12**	lb/MMSCF
C BF Bleeders	2.9	**0.20**	2.9	0.20	2.9	**0.20**	lb/MMSCF
B BF Taphole Burning	0.5	**0.14**	inventory	0.14	0.5	**0.14**	lb Fe/lb fume
C BF Taphole Burning	0.500	**0.10**	inventory	0.10	0.5	**0.10**	lb Fe/lb fume
BF B Casthouse Baghouse Stack							
BF C Casthouse Baghouse Stack							
Lime Unloading - BOF Receiving	0.600	**2.63**	0.005	2.63	0.600	**2.63**	lb/hr
Reladling South - STACK	0.01	**13.58**	0.010	13.58	0.010	**13.58**	gr/dscf
Reladling South - FUGITIVES	0.0038	**4.697**	0.0095	11.74	0.0038	**4.697**	lb/ton
Torch Cutting	0.1	**1.987**	0.1	1.99	0.1	**1.987**	lb/ton
BOF Natural Gas	7.6000	**1.98**	1.9	0.49	7.6	**1.98**	lb/MMSCF
BOF ESP Stack	0.0152	**202.35**	39.9 lb/hr	174.80	0.0152	**202.35**	gr/dscf
BOF Secondary Emiss. Baghouse							
BOF Tapping (Roof Monitor)	0.046	**67.71**	0.230	338.57	0.230	338.57	lb/ton
BOF Slag Tap (Roof Monitor)	0.046	**8.57**			0.230	42.84	lb/ton
BOF Charging (Roof Monitor)	0.030	**37.08**	0.150	185.39	0.150	185.39	lb/ton
Desulfurization - STACK	0.01	**9.15**	0.010	9.15	0.010	**9.15**	gr/dscf
Desulfurization - FUGITIVES	0.0218	**26.94**	0.055	67.98	0.0218	**26.94**	lb/ton
#1 LRF Stack	0.0052	**29.68**	0.0052	29.68	0.0052	**29.68**	gr/dscf
#2 LRF Stack	0.0052	**16.96**	0.0052	16.96	0.0052	**16.96**	gr/dscf
Vacuum Degasser							
DD Baghouse - Coke Transfer	0.005	**3.75**	inventory	3.75	0.005	**3.75**	gr/dscf
EE Baghouse - Coke Unloading	0.005	**4.69**			0.005	**4.69**	gr/dscf
EE Baghouse - Natural Gas	7.60	**0.02**			7.6	**0.02**	lb/MMSCF
Raw Material Handling	1	**4.38**	inventory	4.38	1.00	**4.38**	PPH
Annealing Furnaces	10	**4.42**	1.9	0.84	10	**4.42**	lb/MMSCF
Reheat Furnace #1	10	**11.84**	1.9	2.25	10	**11.84**	lb/MMSCF
Reheat Furnace #2	10	**11.84**	1.9	2.25	10	**11.84**	lb/MMSCF
Reheat Furnace #3	10	**11.84**	1.9	2.25	10	**11.84**	lb/MMSCF
Hand Scarfing	0.1	**13.14**	0.1	13.14	0.1	**13.14**	lb/ton
B BF Slag Pit	0.0088	**0.69**	0.0088	0.69	0.0088	**0.69**	lb/ton
C BF Slag Pit	0.0088	**1.20**	0.0088	1.20	0.0088	**1.20**	lb/ton
Desulfurization Slag Pit	0.09	**3.67**	0.09	3.67	0.09	**3.67**	lb/ton
Parts Cleaning							
Maintenance Paint Booth							
J-9 Dip Tank							
Equipment and Emissions from On-Site Coal Pulverization							
Fine Coal Silo Baghouse							
Filter #4 (Pulverizer Baghouse)							
Rail Unloading Baghouse							
Raw Coal Silo Baghouse							
Rail Car Building Heater							
Pulverizer Hot Gas Generator							
Process Fugitives							
Emissions reported in RTI report only							
Storage piles			tpy PM10	3.10			
Unpaved roads			inventory	75.00			
Paved roads			tpy PM10	34.00			
Parking lots, open areas			inventory	22.00			
CC baghouse coke transfer			inventory	4.70			
Totals		664.20		1267.21		1191.80	

Table 3. Ratios to calculate $PM_{2.5}$-Fil from the RTI report (Table 5.2 in RTI report)

Source	$PM_{2.5}$-FIL: PM-FIL	Basis	PM-CON: PM-FIL	Basis
Blast furnace stove (NG)	1	AP-42	3	AP-42
Boiler (NG)	1	AP-42	3	AP-42
Boiler (BFG)	1	AP-42	0.55	Average from Geneva Steel and Allegheny County
Boiler (COG)	1	AP-42	0.55	Average from Geneva Steel and Allegheny County
Blast furnace casthouse	0.23	AP-42	0.7	Allegheny County inventory
Desulfurization fugitives	0.11	AP-42	0.7	Assume same as casthouse
Desulfurization baghouse	0.42	AP-42	0.045	Allegheny County inventory
BOF ESP stack	0.73	Rouge Steel test average	0.29	LTV Steel, WCI Steel
BOF charging fugitives	0.22	AP-42	0.7	Assume same as casthouse
BOF charging baghouse	0.22	AP-42	0.77	Average from Geneva Steel and Allegheny County
BOF tapping fugitives	0.37	AP-42	0.7	Assume same as casthouse
BOF tapping baghouse	0.16	AP-42	0.77	Average from Geneva Steel and Allegheny County
Ladle metallurgy baghouse	0.16	Assume same as tapping baghouse	0.05	LTV Steel
Slag	0.2	AP-42 (aggregate storage)	0	Allegheny County inventory
Raw material and slag storage and handling	0.2	AP-42 (aggregate storage)	0	Allegheny County inventory
Coke pushing baghouse	0.74	AP-42	0.08	Allegheny County inventory
Pushing fugitives	0.17	AP-42	0.002	Allegheny County inventory
Combustion stack	0.935	AP-42	159 lb/hr	Site-specific test results for Battery 5
Storage piles	0.4	AP-42 ratio to PM_{10}	0	Allegheny County inventory
Unpaved roads	0.15	AP-42 ratio to PM_{10}	0	Allegheny County inventory
Paved roads	0.25	AP-42 ratio to PM_{10}	0	Allegheny County inventory
Quenching emissions	0.06	AP-42 (baffles, clean water)	0.48	Based on 0.15 lb/ton (see text)
Coal Charging	0.39	AP-42	0.8	AP-42
Door, lid, offtake leaks	1	AP-42	0.9	AP-42

Table 4. Ratio used from the RTI report to determine $PM_{2.5}$ fraction of PM reported in Severstal permit. Numbers in red were not in Appendix B-2 in the RTI report.

Source Name (from Severstal permit)	Sources in RTI Report in Appendix B-2 (unless otherwise noted)	PM2.5 fil ratio: PM	MDEQ 2002 PM2.5 Emissions	MDEQ 2009 Potential PM2.5 Emissions	Net Change (tpy)
B BF Stoves (BFG)	B BF Stoves (BFG)	1.00	19.42	21.95	2.53
C BF Stoves (BFG)	C BF Stoves (BFG)	1.00	34.80	37.84	3.04
B BF Stoves (NG)	B BF Stoves (NG)	1.00	1.74	1.84	0.09
C BF Stoves (NG)	C BF Stoves (NG)	1.00	1.65	2.49	0.84
B BF Casthouse (Roof Monitor)	B BF Casthouse (Roof Monitor)	0.23	15.53	1.31	-14.22
C BF Casthouse (Roof Monitor)	C BF Casthouse (Roof Monitor)	0.23	27.11	3.27	-23.83
B BF Bleeders	BF bleeder stacks	1.00	0.12	0.12	0.01
C BF Bleeders	BF bleeder stacks	1.00	0.20	0.31	0.10
B BF Taphole Burning	Tapehole burning	1.00	0.14	0.15	0.01
C BF Taphole Burning	Tapehole burning	1.00	0.10	0.15	0.05
BF B Casthouse Baghouse Stack	Blast furnace casthouse*	0.23	0.00	5.63	5.63
BF C Casthouse Baghouse Stack	Blast furnace casthouse*	0.23	0.00	11.25	11.25
Lime Unloading - BOF Receiving	Lime unloading	1.00	2.63	2.63	0.00
Reladling South - STACK	Reladling South - Stack	0.23	3.12	0.00	-3.12
Reladling South - FUGITIVES	Reladling South - Fugatives	0.23	1.08	1.45	0.37
Torch Cutting	Torch Cutting	1.00	1.99	0.00	-1.99
BOF Natural Gas	BOF (NG)	1.00	1.98	2.66	0.68
BOF ESP Stack	BOF ESP Stack	0.73	147.72	162.88	15.16
BOF Secondary Emiss. Baghouse	avg of BOF charge/tap baghouse*	0.19	0.00	6.20	6.20
BOF Tapping (Roof Monitor)	BOF Tapping (Roof Monitor)	0.37	125.27	1.95	-123.32
BOF Slag Tap (Roof Monitor)	Slag*	0.20	8.57	0.13	-8.44
BOF Charging (Roof Monitor)	BOF Charging (Roof Monitor)	0.22	40.79	2.19	-38.59
Desulfurization - STACK	Desulfurization - STACK	0.42	3.84	3.84	0.00
Desulfurization - FUGITIVES	Desulfurization - FUGITIVES	0.11	2.96	3.98	1.02
#1 LRF Stack	#1 LRF Stack	1.00	29.68	29.68	0.00
#2 LRF Stack	#2 LRF Stack	1.00	16.96	16.96	0.00
Vacuum Degasser	EMISSIONS RESTRICTED BY LIMITS IN EXISTING PERMIT				
DD Baghouse - Coke Transfer	DD Baghouse - Coke Transfer	1.00	3.75	3.75	0.00
EE Baghouse - Coke Unloading	assumed same as DD Baghouse	1.00	4.69	4.69	0.00
EE Baghouse - Natural Gas	assumed same as DD Baghouse	1.00	0.02	0.03	0.01
Raw Material Handling	Raw Material Handling	1.00	4.38	4.38	0.00
Annealing Furnaces	Annealing Furnaces (NG)	1.00	4.42	6.08	1.66
Reheat Furnace #1	Reheat Furnace #1 (NG)	1.00	11.84	12.97	1.13
Reheat Furnace #2	Reheat Furnace #2 (NG)	1.00	11.84	12.97	1.13
Reheat Furnace #3	Reheat Furnace #3 (NG)	1.00	11.84	12.97	1.13
Hand Scarfing	Hand Scarfing	1.00	13.14	17.66	4.52
B BF Slag Pit	B BF Slag Pit	0.02	0.01	0.01	0.00
C BF Slag Pit	C BF Slag Pit	0.02	0.02	0.04	0.01
Desulfurization Slag Pit	Desulfurization Slag Pit	0.02	0.07	0.10	0.03
Parts Cleaning			0.00	0.00	0.00
Maintenance Paint Booth			0.00	0.00	0.00
J-9 Dip Tank			0.00	0.00	0.00
Equipment and Emissions from On-Site Coal Pulverization					
Fine Coal Silo Baghouse	assumed same as DD Baghouse	1	0.00	1.16	1.16
Filter #4 (Pulverizer Baghouse)	assumed same as DD Baghouse	1	0.00	3.00	3.00
Rail Unloading Baghouse	assumed same as DD Baghouse	1	0.00	1.88	1.88
Raw Coal Silo Baghouse	assumed same as DD Baghouse	1	0.00	0.34	0.34
Rail Car Building Heater	assumed same as DD Baghouse	1	0.00	0.82	0.82
Pulverizer Hot Gas Generator	assumed same as DD Baghouse	1	0.00	0.82	0.82
Process Fugitives	AP-42, aggregate handling (2006)**	0.15	0.00	1.28	1.28
Totals			553.43	405.81	-147.62

* from Table 5-2 in RTI report (see Table 3 above)

**from revisions to AP-42, 5th edition

Appendix G

OVERVIEW OF RECENT DETROIT PM SOURCE APPORTIONMENT STUDIES SUPPORT DOCUMENTATION FOR THE FINE PARTICULATE SIP

May 2008

Overview of Recent Detroit PM Source Apportionment Studies

Donna Kenski
Lake Michigan Air Directors Consortium
November 26, 2007

Concentrations of $PM_{2.5}$ in the Detroit metropolitan area currently exceed the National Ambient Air Quality Standard (NAAQS) at 2 of 11 monitoring sites and are within 1 ug of the NAAQS at 4 others (Fig. 1). Modeling studies show that federal controls are expected to bring all but the Dearborn monitor into attainment by 2012(?). Additional local control measures will be needed to achieve the NAAQS at Dearborn. To ensure effective controls, it is imperative that the state and local air programs understand the current composition of $PM_{2.5}$ at each site and also the sources that contribute significant mass to them.

For general background, Fig. 2 shows the chemical components averaged over several years at the speciation trends network (STN) sites in Detroit and upwind. Organic carbon is the largest component of $PM_{2.5}$ on an annual average basis, followed by ammonium sulfate and ammonium nitrate. Concentrations of ammonium sulfate are similar among sites, indicating its regional origin. Organic carbon (OC) and ammonium nitrate, in contrast, have significant site-to-site variability. It is these site differences in concentration, as well as temporal differences, that the source apportionment models use to extract information on the sources that contribute to $PM_{2.5}$ mass.

Six recently published source apportionment studies have examined data from Detroit monitors. These studies are summarized here and a few key findings are drawn from the group as a whole. The studies varied in the number of samples analyzed, the locations of sample collection, the species chosen for study, the source apportionment models applied, and the time periods of sample collection, so conclusions here are necessarily qualitative and somewhat general. Nevertheless, similarities can be drawn despite the variety of approaches and data used. The two most robust studies, Wade et al. (2007) and Gildemeister et al. (2007), both used STN data from the Allen Park and Dearborn sites. The remaining four studies reviewed here collected data independent of the STN network, although one (Brown et al., 2006) used the Allen Park site to collect samples. Figure 3 shows the monitoring sites where data were collected for the studies presented here and Fig. 4 shows the sampling dates for the studies.

Study Summaries

Wade et al. (2007): In the most comprehensive and most recent source apportionment analysis to date, Sonoma Technology examined STN data from

Allen Park (12/2000-12/2006, 662 samples) and Dearborn (5/2002-12/2006, 253 samples). Similar sources were identified at both sites, and contributions were similar for the major sources: secondary sulfate, secondary nitrate, and organic mass. The organic mass factor is described as distinct from elemental carbon (diesel) but is not necessarily only gasoline vehicles. Instead it probably includes some mass from other non-vehicle combustion sources, and is influenced by photochemistry and transport. The two sites are distinguished by the mass allocated to a steel source (1.27 ug at Dearborn vs. 0.05 ug at Allen Park), diesel vehicles (2.84 ug at Dearborn vs. 0.88 ug at Allen Park), and crustal species (1.36 ug at Dearborn vs. 0.62 at Allen Park). Additional mixed industrial factors were identified at each site as well, accounting for about 2 ug. The mixed industrial factors include some sulfate, indicating that local sulfate controls may be effective. Table 1 gives the source allocations for this study and the others, and Figure 5 shows the contributions by source, site, and study authors.

Gildemeister et al. (2007): In a study very similar to Wade et al., Gildemeister et al. examined STN data from Allen Park (12/2000-4/2005) and Dearborn (5/2002-4/2005). PMF was used to distinguish seven sources common to both sites: Secondary sulfate, secondary nitrate, gasoline, diesel, mixed sea/road salt, iron/steel, and soil. A mixed industrial factor was also identified at Dearborn and a biomass burning factor was identified at Allen Park. Contributions to total $PM_{2.5}$ mass are given in Table 1 and Fig. 5. Mass contributions from the secondary sulfate, secondary nitrate, and sea salt were similar at both sites, and also similar to those derived by Wade et al. The influence of local iron and steel industrial sources, mobile sources (gasoline and diesel), and soil was higher at Dearborn than Allen Park. Interestingly, gasoline sources were well correlated but diesel sources were not. The authors suggest that the diesel factor is a combination of sources with both area and point source characteristics. The wind analysis for diesel showed distinct directionality toward the port of Detroit and Ambassador Bridge.

Brown et al. (2006): Like Wade et al. and Gildemeister et al., Brown et al. applied PMF to STN data from Allen Park and Dearborn. Seven sources were detected at Allen Park and nine at Dearborn. The allocations to secondary sulfate and nitrate were similar at both sites and also similar to those in Wade and Gildemeister. Mobile sources were about twice as high at Allen Park, but similar at Dearborn. Industrial sources accounted for about 1.3 ug/m3 at Allen Park and 3.5 ug/m3 at Dearborn. A biomass burning source accounted for 0.3 ug/m3 at both sites.

In addition, this study collected samples at Allen Park from Feb. 2004-Feb. 2005 on a 1-in-6-day schedule. These samples were analyzed for speciated organic carbon and elemental carbon in monthly composites and the resulting dataset was analyzed using the chemical mass balance (CMB) method of source apportionment. Eight sources were modeled. The mass apportioned was total organic carbon, rather than $PM_{2.5}$ as in the studies above. Using the organic species allows more precise identification of source contributions from carbon

sources such as motor vehicles. In this study, mobile sources were apportioned to gasoline, diesel, and smoking vehicles. In Detroit, more than half of the OC allocated to mobile sources was attributed to smoking vehicles. Other sources included biomass burning, vegetative detritus, and dirt. Natural gas combustion was included in the model but its contribution was negligible. A significant portion of OC mass during the summer months was not allocated to any source and was presumed to be of secondary biogenic origin. This study is included in Table 1 and Fig. 5 despite the difference in the basis for allocating mass (OC vs $PM_{2.5}$), because the sources it modeled are dominated by OC.

Morishita et al (2006): This study made speciated $PM_{2.5}$ measurements during 4 summers (2000-2003) at the Maybury school near the Ambassador Bridge (see Fig. 3). Maybury school is not a Michigan DEQ site but is close to the West Fort St. site. PMF was applied to 96 samples, using 15 species: S, Se, Mn, Fe, Ni, Zn, Rb, Mo, Cd., Ba, La, Sm, Pb, EC, and OC. Notably, nitrate was excluded from the analysis, although since these were summer samples the nitrate fraction would likely be small. The important crustal species Ca and Si were also excluded, which may have hindered the model's ability to detect a soil or road dust source. Six sources were identified and quantified, as given in Table 1 below: Secondary sulfate/coal combustion, motor vehicles, municipal waste incineration, oil refining/combustion, sewage sludge incineration, and iron/steel manufacturing. This study also evaluated two distinct periods during 2000 more intensively and found that elevated local source emissions, including incinerator and refinery emissions, were associated with adverse health effects during accompanying toxicological studies.

Hammond et al. (2007): Another special measurement study, in which researchers collected speciated $PM_{2.5}$ samples for 11 2-week periods between October 1999 and May 2002. Samples were collected at Maybury School (as in Morishita, above), and also at Keith School in east Detroit. A total of 154 samples from the two sites were used in a PMF analysis. Species included were: PM25 mass, OC, EC, La, Sm, Ce, Pb, Al, P, S, V, Cr, Mn, Fe, Ni, Cu, Zn, K, and Se. As in the previous study, nitrate, Ca, and Si were not included. In East Detroit (Keith School) 5 sources were identified: Secondary sulfate/coal combustion, motor vehicles, refinery/oil combustion, automotive electroplating, and a mixed industrial factor including iron/steel manufacturing and waste incineration. At Maybury School, 7 sources were identified. These included the same factors found at Keith School, except the motor vehicles were split into two separate factors distinguished by gasoline combustion and diesel combustion, and an additional sewage sludge incineration source was identified.

Pere-Trepat et al. (2007): This analysis applied PMF to DRUM samples collected over a 6 week period at the Allen Park site between February and April 2002. The DRUM sampler collects particles in 3 different size modes ($2.5>D_p>1.15$, $1.15>D_p>0.34$, and $0.34>D_p>0.1$um) and in 3 hour time increments. Each size mode was analyzed for metals, PM mass, and optical

absorption. Carbon and nitrate cannot be quantified from this type of sampler, so a large fraction of $PM_{2.5}$ mass was not represented in the species modeled. Misaligned time stamps plagued the analysis, but once discovered were able to be corrected. Nine factors were resolved with PMF: road salt, a mixed industrial factor with iron and zinc, 2 metal works factors (one with iron in all sizes and Zn, Ti, Cu, and Mn, and the other with intermediate size Fe, small size sulfur, and Zn, Al, Si, and Ca), road dust, and 4 sulfur-dominated sources. The authors suggest that some of the metal-dominated profiles may represent different processes or batch operations at the same facilities, because the wind direction analysis indicated similar origins for each. The sulfur profiles were distinguished by size fraction and temporal behavior and the authors concluded that one was of local origin because of its irregular peaks at random time intervals and one was transported from distant sources long range because of its slowly evolving temporal pattern. Of the other 2 sulfur factors, one may represent dry or wet deposition of sulfate on local soils which are subsequently resuspended, and the other may be associated with industrial activity in the Rouge complex, because it had peaks in the southerly direction. The study did not include quantitative estimates of $PM_{2.5}$ mass associated with each source factor, so it is not included in Table 1 or Fig. 4.

Key Findings and Synthesis:

- The Wade et al., Gildemeister, and Brown studies made very similar allocations to major sources at Allen Park and Dearborn. The data and modeling approach in these 2 studies were almost identical, which no doubt was an important factor in their similar findings.
- The Morishita and Hammond studies differed from Wade, Gildemeister, and Brown in that data were collected at different locations and the species included in the models were somewhat different. Important crustal components Ca and Si were not included as fitting species. Compared to the Wade, Gildemeister, and Brown studies, contributions from vehicles were about the same, secondary sulfate was about twice as high, and industrial contributions were highly variable, ranging from inconsequential at Keith School to a total of 7 ug at Maybury School. The very high allocation to secondary sulfate and low allocation to industry in Hammond et al. may indicate that mass from industrial sources is being assigned incorrectly to secondary sulfate.
- At Dearborn, the source apportionment results indicate that local industrial sources, including steel manufacturing but also other metal industries, likely contribute 2.5-3.5 ug/m3 to annual average $PM_{2.5}$.
- Dearborn also experiences higher vehicle impacts than Allen Park (1.3 to 1.7 ug greater), and much of the increase is from diesel sources.
- Contributions from secondary sulfate and nitrate do not differ much between Allen Park and Dearborn, evidence that these categories are not being influenced by local sources. Some of the industrial source

fingerprints did include sulfate mass, however, which indicates that local sources of sulfate are present and may be suitable targets for control.

References

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2. Gildemeister, A.E., P.K. Hopke, E. Kim, Sources of fine urban particulate matter in Detroit, MI, Chemosphere 69(2007):1064-1074.
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4. Morishita, M., G.J. Keeler, J.G. Wagner, and J.R. Harkema, Source Identification of ambient $PM_{2.5}$ during summer inhalation exposure studies in Detroit, MI, Atmos. Env. 40(2006): 3823-3834.
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6. Wade, K.S., J.R. Turner, S.B. Brown, J. Garlock, and H.R. Hafner, Data Analysis and Source Apportionment of $PM_{2.5}$ in Selected Midwestern Cities, Sonoma Technology Draft Final Report STI-907018.03-3264-DFR (Nov. 2007).

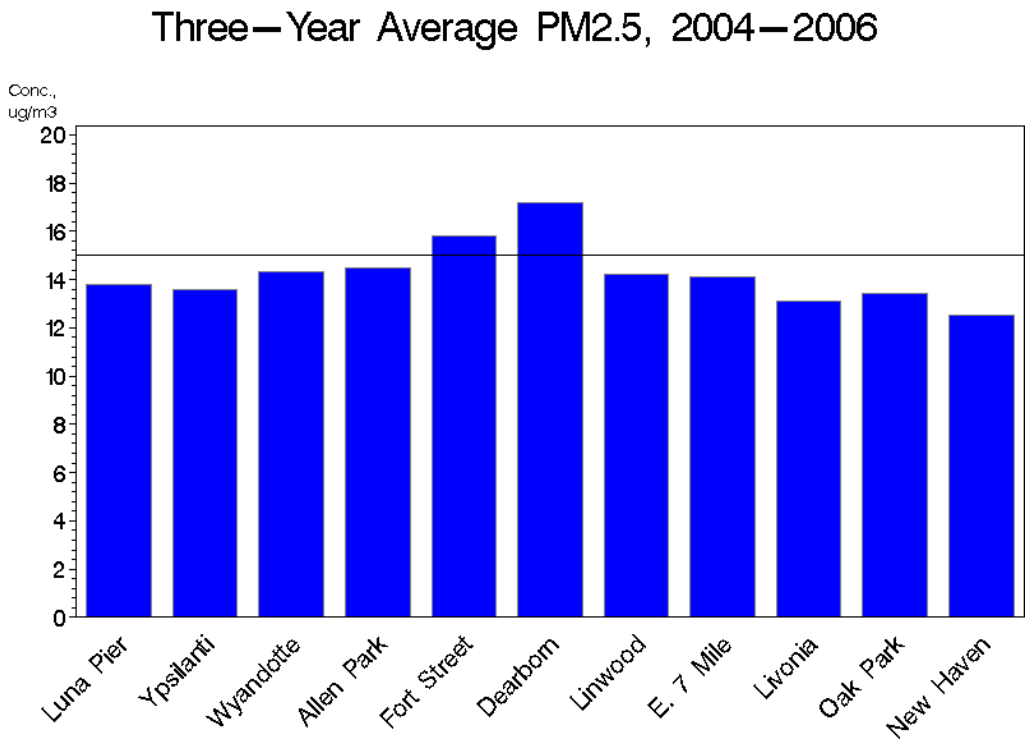

Fig. 1. Current Design Values for Detroit-Area $PM_{2.5}$ FRM Monitors

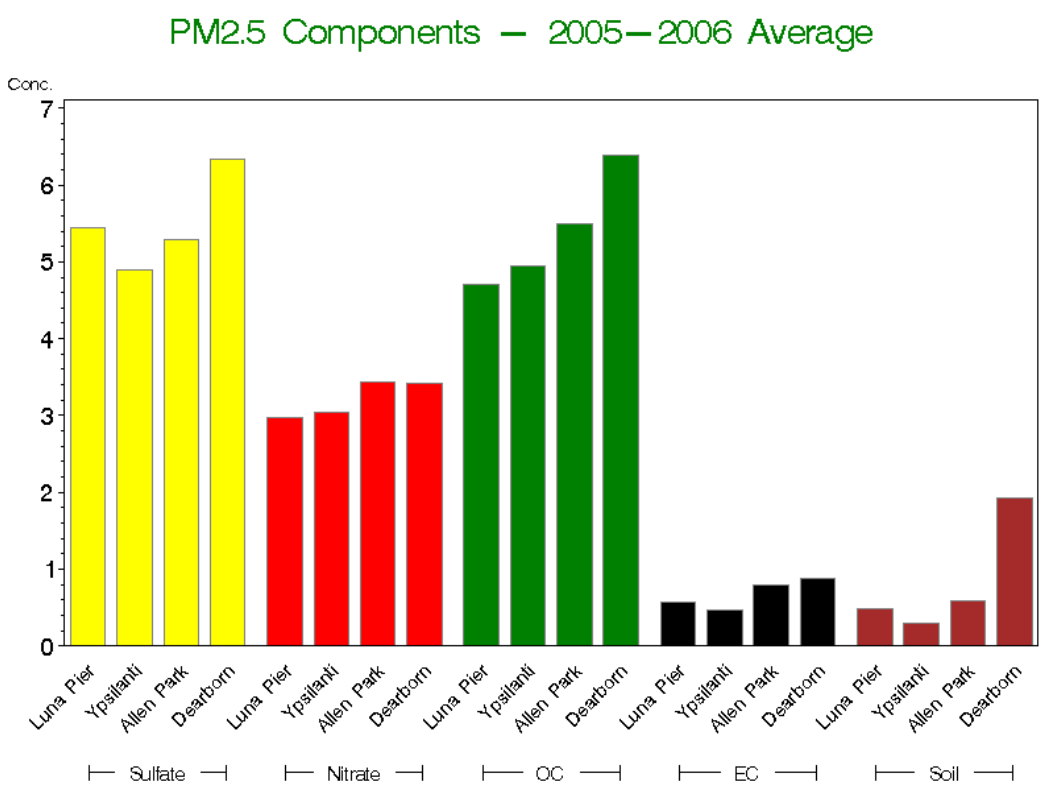

Fig. 2 Chemical Composition of $PM_{2.5}$ at Speciation Trends Network Sites

Fig. 3 Monitoring Sites in Detroit Where Source Apportionment Studies Have Been Performed

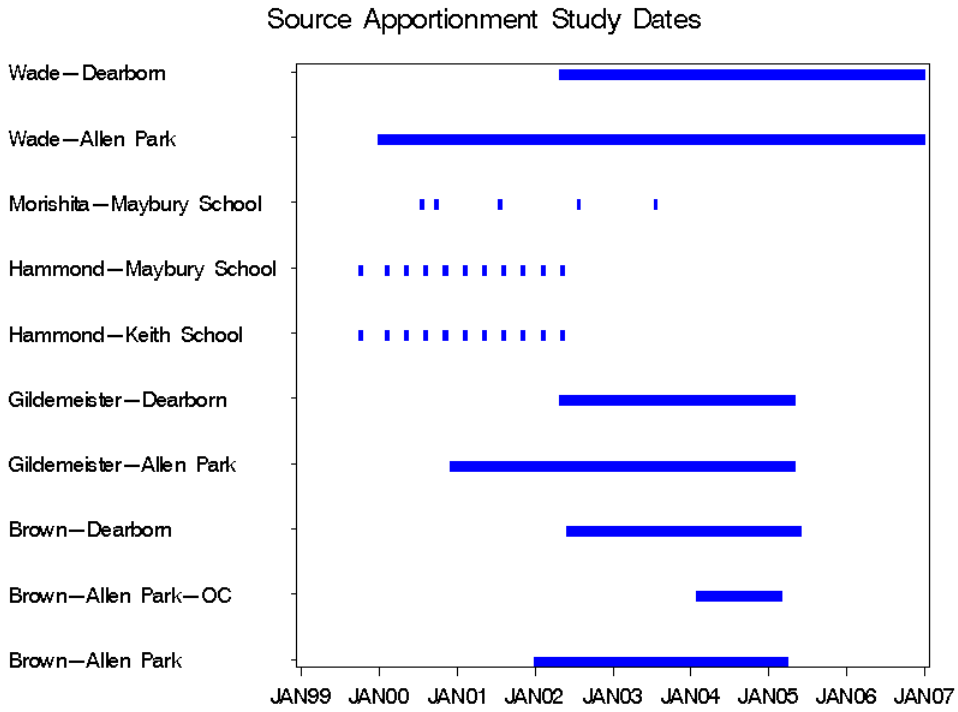

Fig. 4 Dates of Source Apportionment Studies

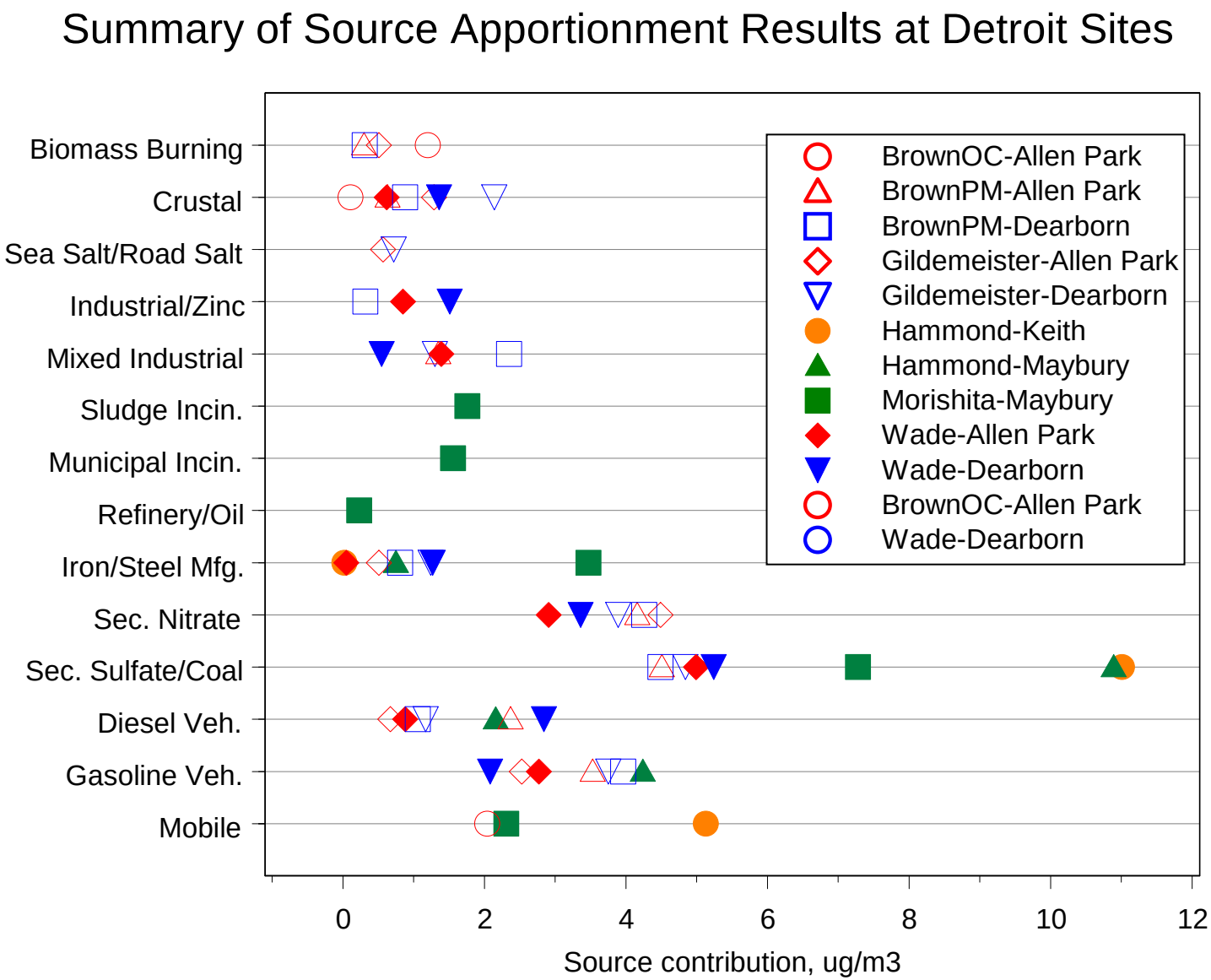

Fig. 5 Summary of Source Contributions from Various Studies and Sites (contributions less than 0.05 ug/m3 are not plotted). Unique symbols are used for each study and site; colors indicate sites—i.e., red=Allen Park, blue=Dearborn, orange=Keith School, een=Maybury School.

Table 1 Summary of Source Contributions to $PM_{2.5}$ by Study and Site

Source Category	Wade et al.		Gildemeister et al.		Brown et al.[a]			Morishita et al.[b]	Hammond et al.	
	Allen Park	Dearborn	Allen Park	Dearborn	Allen Park(OC)	Allen Park(PM)	Dearborn (PM)	Maybury School	Maybury School	Keith School
Vehicles					2.04			2.31		5.13
Gasoline	2.77	2.08	2.53	3.75		3.53	3.96		4.24	
Diesel	0.88	2.84	0.67	1.17		2.37	1.06		2.16	
Secondary sulfate/coal	4.99	5.24	4.99	4.84		4.51	4.49	7.28	10.89	11.01
Secondary nitrate	2.91	3.36	4.49	3.89		4.16	4.26			
Industrial						1.35	2.35			
Iron/steel mfg.	0.05	1.27	0.51	1.24			0.81	3.47	0.75	0.02
Mixed industry/zinc	0.85	1.51		1.30			0.32			
Mixed industry/lead	1.39	0.55								
Municipal incinerator								1.56		
Sludge incinerator								1.76	0.02	
Refinery/oil combustion								0.23	0.06	0.06
Electroplating									0.03	0.03
Sea/road salt			0.57	0.72						
Crustal/soil	0.62	1.36	1.29	2.14	0.11	0.63	0.88			
Biomass burning			0.51		1.20	0.30	0.31			

[a]Brown et al. apportioned $PM_{2.5}$ using STN data and organic carbon mass using speciated organic data.
[b]Morishita data are averaged over 5 different sampling periods and weighted by number of samples.

Table 1 (Alternate version) Summary of Source Contributions to $PM_{2.5}$ by Study and Site

	Allen Park				Dearborn			Maybury School		Keith School
	Wade	Gildemeister	Brown(PM)[a]	Brown(OC)	Wade	Gildemeister	Brown(PM)	Morishita[b]	Hammond	Hammond
Vehicles				2.04				2.31		5.13
Gasoline	2.77	2.53	3.53		2.08	3.75	3.96		4.24	
Diesel	0.88	0.67	2.37		2.84	1.17	1.06		2.16	
Secondary sulfate/coal	4.99	4.99	4.51		5.24	4.84	4.49	7.28	10.89	11.01
Secondary nitrate	2.91	4.49	4.16		3.36	3.89	4.26			
Industrial			1.35				2.35			
Iron/steel mfg.	0.05	0.51			1.27	1.24	0.81	3.47	0.75	0.02
Mixed industry/zinc	0.85				1.51	1.30	0.32			
Mixed industry/lead	1.39				0.55					
Municipal incinerator								1.56		
Sludge incinerator								1.76	0.02	
Refinery/oil combustion								0.23	0.06	0.06
Electroplating									0.03	0.03
Sea/road salt		0.57				0.72				
Crustal/soil	0.62	1.29	0.63	0.11	1.36	2.14	0.88			
Biomass burning		0.51	0.30	1.20			0.31			

[a]Brown et al. apportioned $PM_{2.5}$ using STN data and organic carbon mass using speciated organic data.
[b]Morishita data are averaged over 5 different sampling periods and weighted by number of samples.

Appendix H

MODELING INPUT FILES

SUPPORT DOCUMENTATION

FOR THE

FINE PARTICULATE SIP

April 2008

2005 AERMOD SUMMARY – DEARBORN MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2005 MONITOR IMPACTS ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.60870E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	YES	NO	
BF_C_SS	0	0.10486E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	YES	NO	
BFCCH_BS	0	0.00000E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	YES	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	YES	NO	
HMTRN_BH	0	0.89800E-01	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	YES	NO	
BOF_ESP	0	0.42495E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	YES	NO	
BOF_BH	0	0.00000E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	YES	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	YES	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	YES	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	YES	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	YES	NO	
ANEAL_1S	0	0.11600E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2S	0	0.11600E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3S	0	0.11600E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4S	0	0.11600E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5S	0	0.11600E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_6S	0	0.11600E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_1N	0	0.11600E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2N	0	0.11600E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3N	0	0.11600E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4N	0	0.11600E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5N	0	0.11600E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
RFURN1_1	0	0.17030E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN1_2	0	0.17030E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_1	0	0.17030E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_2	0	0.17030E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_1	0	0.17030E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_2	0	0.17030E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
EU0099	0	0.59750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	YES	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	YES	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	YES	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	YES	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	YES	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	YES	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	YES	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	YES	NO	
A9831	0	0.57000E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	YES	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	YES	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	YES	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	YES	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	YES	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	YES	NO	

*** VOLUME SOURCE DATA ***

SOURCE	NUMBER PART.	EMISSION RATE (GRAMS/SEC)	X	Y	BASE ELEV.	RELEASE HEIGHT	INIT. SY	INIT. SZ	URBAN SOURCE	EMISSION RATE SCALAR VARY

ID	CATS.		(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	BY
B_CH_RM1	0	0.89400E-01	322245.7	4685529.0	192.0	23.17	6.55	10.77	YES
B_CH_RM2	0	0.89400E-01	322239.4	4685541.5	192.0	23.17	6.55	10.77	YES
B_CH_RM3	0	0.89400E-01	322233.0	4685554.0	192.0	23.17	6.55	10.77	YES
B_CH_RM4	0	0.89400E-01	322226.5	4685567.0	192.0	23.17	6.55	10.77	YES
B_CH_RM5	0	0.89400E-01	322220.4	4685579.5	192.0	23.17	6.55	10.77	YES
C_CH_RM1	0	0.19500E+00	322190.4	4685634.5	192.0	29.26	6.59	13.61	YES
C_CH_RM2	0	0.19500E+00	322184.1	4685647.0	192.0	29.26	6.59	13.61	YES
C_CH_RM3	0	0.19500E+00	322177.7	4685659.5	192.0	29.26	6.59	13.61	YES
C_CH_RM4	0	0.19500E+00	322171.4	4685672.5	192.0	29.26	6.59	13.61	YES
BOF_RMW1	0	0.31400E+00	322007.2	4685043.5	192.0	65.53	8.62	30.20	YES
BOF_RMW2	0	0.31400E+00	321998.8	4685060.0	192.0	65.53	8.62	30.20	YES
BOF_RMW3	0	0.31400E+00	321990.5	4685076.5	192.0	65.53	8.62	30.20	YES
BOF_RMW4	0	0.31400E+00	321982.3	4685093.0	192.0	65.53	8.62	30.20	YES
BOF_RMW5	0	0.31400E+00	321973.8	4685109.5	192.0	65.53	8.62	30.20	YES
BOF_RMW6	0	0.31400E+00	321965.7	4685126.0	192.0	65.53	8.62	30.20	YES
BOF_RME1	0	0.31400E+00	322043.5	4685061.0	192.0	65.53	7.66	30.20	YES
BOF_RME2	0	0.31400E+00	322036.2	4685075.5	192.0	65.53	7.66	30.20	YES
BOF_RME3	0	0.31400E+00	322028.7	4685090.0	192.0	65.53	7.66	30.20	YES
BOF_RME4	0	0.31400E+00	322021.3	4685105.0	192.0	65.53	7.66	30.20	YES
BOF_RME5	0	0.31400E+00	322013.9	4685119.5	192.0	65.53	7.66	30.20	YES
BOF_RMN1	0	0.31400E+00	321991.2	4685164.5	192.0	57.61	4.47	26.51	YES
BOF_RMN2	0	0.31400E+00	321986.9	4685173.0	192.0	57.61	4.47	26.51	YES
BOF_RMN3	0	0.31400E+00	321982.7	4685181.5	192.0	57.61	4.47	26.51	YES
BOF_RMN4	0	0.31400E+00	321978.3	4685190.0	192.0	57.61	4.47	26.51	YES
BOF_RMN5	0	0.31400E+00	321973.8	4685199.0	192.0	57.61	4.47	26.51	YES
HND_SCF1	0	0.75600E-01	321254.4	4684513.0	192.0	31.39	7.10	14.60	YES
HND_SCF2	0	0.75600E-01	321247.6	4684527.0	192.0	31.39	7.10	14.60	YES
HND_SCF3	0	0.75600E-01	321240.7	4684540.5	192.0	31.39	7.10	14.60	YES
HND_SCF4	0	0.75600E-01	321233.8	4684554.0	192.0	31.39	7.10	14.60	YES
HND_SCF5	0	0.75600E-01	321227.0	4684568.0	192.0	31.39	7.10	14.60	YES

GROUP ID	SOURCE IDs
ALL	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,
A8640	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,
A7809	EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A ,
A8648	A8648 ,
A9831	A9831 ,
B2132	B2132 ,
B2169	B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       4.60659 AT (  322805.00,  4685985.00
 A8640    1ST HIGHEST VALUE IS       2.95616 AT (  322805.00,  4685985.00
 A7809    1ST HIGHEST VALUE IS       0.26618 AT (  322805.00,  4685985.00
 A8648    1ST HIGHEST VALUE IS       0.56898 AT (  322805.00,  4685985.00
 A9831    1ST HIGHEST VALUE IS       0.19489 AT (  322805.00,  4685985.00
 B2132    1ST HIGHEST VALUE IS       0.00403 AT (  322805.00,  4685985.00
 B2169    1ST HIGHEST VALUE IS       0.25617 AT (  322805.00,  4685985.00
 B2810    1ST HIGHEST VALUE IS       0.00447 AT (  322805.00,  4685985.00
 B2811    1ST HIGHEST VALUE IS       0.01419 AT (  322805.00,  4685985.00
 B3518    1ST HIGHEST VALUE IS       0.01233 AT (  322805.00,  4685985.00
 B3533    1ST HIGHEST VALUE IS       0.22609 AT (  322805.00,  4685985.00
 B3567    1ST HIGHEST VALUE IS       0.04949 AT (  322805.00,  4685985.00
 N6631    1ST HIGHEST VALUE IS       0.04971 AT (  322805.00,  4685985.00
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2005 AERMOD SUMMARY – SWHS MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2005 MONITOR IMPACTS ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	EMIS RATE CAP/ SCALAR HOR VARY BY
BF_B_SS	0	0.60870E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	YES	NO
BF_C_SS	0	0.10486E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	YES	NO
BFCCH_BS	0	0.00000E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	YES	NO
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	YES	NO
HMTRN_BH	0	0.89800E-01	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	YES	NO
BOF_ESP	0	0.42495E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	YES	NO
BOF_BH	0	0.00000E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	YES	NO
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	YES	NO
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	YES	NO
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	YES	NO
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	YES	NO
ANEAL_1S	0	0.11600E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_2S	0	0.11600E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_3S	0	0.11600E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_4S	0	0.11600E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_5S	0	0.11600E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_6S	0	0.11600E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_1N	0	0.11600E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_2N	0	0.11600E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_3N	0	0.11600E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_4N	0	0.11600E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
ANEAL_5N	0	0.11600E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO
RFURN1_1	0	0.17030E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
RFURN1_2	0	0.17030E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
RFURN2_1	0	0.17030E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
RFURN2_2	0	0.17030E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
RFURN3_1	0	0.17030E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
RFURN3_2	0	0.17030E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO
EU0099	0	0.59750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	YES	NO
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	YES	NO
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	YES	NO
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	YES	NO
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	YES	NO
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	YES	NO
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	YES	NO
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	EMIS RATE CAP/ SCALAR HOR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	YES	NO
A9831	0	0.57000E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	YES	NO
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	YES	NO
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	YES	NO
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	YES	NO
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	YES	NO
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	YES	NO

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY

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B_CH_RM1	0	0.89400E-01	322245.7	4685529.0	192.0	23.17	6.55	10.77	YES
B_CH_RM2	0	0.89400E-01	322239.4	4685541.5	192.0	23.17	6.55	10.77	YES
B_CH_RM3	0	0.89400E-01	322233.0	4685554.0	192.0	23.17	6.55	10.77	YES
B_CH_RM4	0	0.89400E-01	322226.5	4685567.0	192.0	23.17	6.55	10.77	YES
B_CH_RM5	0	0.89400E-01	322220.4	4685579.5	192.0	23.17	6.55	10.77	YES
C_CH_RM1	0	0.19500E+00	322190.4	4685634.5	192.0	29.26	6.59	13.61	YES
C_CH_RM2	0	0.19500E+00	322184.1	4685647.0	192.0	29.26	6.59	13.61	YES
C_CH_RM3	0	0.19500E+00	322177.7	4685659.5	192.0	29.26	6.59	13.61	YES
C_CH_RM4	0	0.19500E+00	322171.4	4685672.5	192.0	29.26	6.59	13.61	YES
BOF_RMW1	0	0.31400E+00	322007.2	4685043.5	192.0	65.53	8.62	30.20	YES
BOF_RMW2	0	0.31400E+00	321998.8	4685060.0	192.0	65.53	8.62	30.20	YES
BOF_RMW3	0	0.31400E+00	321990.5	4685076.5	192.0	65.53	8.62	30.20	YES
BOF_RMW4	0	0.31400E+00	321982.3	4685093.0	192.0	65.53	8.62	30.20	YES
BOF_RMW5	0	0.31400E+00	321973.8	4685109.5	192.0	65.53	8.62	30.20	YES
BOF_RMW6	0	0.31400E+00	321965.7	4685126.0	192.0	65.53	8.62	30.20	YES
BOF_RME1	0	0.31400E+00	322043.5	4685061.0	192.0	65.53	7.66	30.20	YES
BOF_RME2	0	0.31400E+00	322036.2	4685075.5	192.0	65.53	7.66	30.20	YES
BOF_RME3	0	0.31400E+00	322028.7	4685090.0	192.0	65.53	7.66	30.20	YES
BOF_RME4	0	0.31400E+00	322021.3	4685105.0	192.0	65.53	7.66	30.20	YES
BOF_RME5	0	0.31400E+00	322013.9	4685119.5	192.0	65.53	7.66	30.20	YES
BOF_RMN1	0	0.31400E+00	321991.2	4685164.5	192.0	57.61	4.47	26.51	YES
BOF_RMN2	0	0.31400E+00	321986.9	4685173.0	192.0	57.61	4.47	26.51	YES
BOF_RMN3	0	0.31400E+00	321982.7	4685181.5	192.0	57.61	4.47	26.51	YES
BOF_RMN4	0	0.31400E+00	321978.3	4685190.0	192.0	57.61	4.47	26.51	YES
BOF_RMN5	0	0.31400E+00	321973.8	4685199.0	192.0	57.61	4.47	26.51	YES
HND_SCF1	0	0.75600E-01	321254.4	4684513.0	192.0	31.39	7.10	14.60	YES
HND_SCF2	0	0.75600E-01	321247.6	4684527.0	192.0	31.39	7.10	14.60	YES
HND_SCF3	0	0.75600E-01	321240.7	4684540.5	192.0	31.39	7.10	14.60	YES
HND_SCF4	0	0.75600E-01	321233.8	4684554.0	192.0	31.39	7.10	14.60	YES
HND_SCF5	0	0.75600E-01	321227.0	4684568.0	192.0	31.39	7.10	14.60	YES

GROUP ID SOURCE IDs

ALL BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3,
C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6,
BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S ,
LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N,
ANEAL_5N, RFURN1_1,

RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099
, EU0096 ,

EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A
, RG0130A ,

RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631
,

A8640 BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3,
C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6,
BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S ,
LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N,
RFURN1_1, RFURN1_2,

RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,

A7809 EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118
, EU0076 ,

EU0076A , RG0130A , RG0132A ,

A8648 A8648 ,

A9831 A9831 ,

B2132 B2132 ,

B2169 B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       2.59188 AT (  326344.00,  4685318.00
 A8640    1ST HIGHEST VALUE IS       0.50181 AT (  326344.00,  4685318.00
 A7809    1ST HIGHEST VALUE IS       1.32983 AT (  326344.00,  4685318.00
 A8648    1ST HIGHEST VALUE IS       0.05653 AT (  326344.00,  4685318.00
 A9831    1ST HIGHEST VALUE IS       0.12335 AT (  326344.00,  4685318.00
 B2132    1ST HIGHEST VALUE IS       0.00528 AT (  326344.00,  4685318.00
 B2169    1ST HIGHEST VALUE IS       0.37947 AT (  326344.00,  4685318.00
 B2810    1ST HIGHEST VALUE IS       0.00836 AT (  326344.00,  4685318.00
 B2811    1ST HIGHEST VALUE IS       0.01458 AT (  326344.00,  4685318.00
 B3518    1ST HIGHEST VALUE IS       0.01348 AT (  326344.00,  4685318.00
 B3533    1ST HIGHEST VALUE IS       0.09325 AT (  326344.00,  4685318.00
 B3567    1ST HIGHEST VALUE IS       0.04027 AT (  326344.00,  4685318.00
 N6631    1ST HIGHEST VALUE IS       0.02793 AT (  326344.00,  4685318.00
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2005 AERMOD SUMMARY – ALLEN PARK MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2005 MONITOR IMPACTS ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.60870E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	YES	NO	
BF_C_SS	0	0.10486E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	YES	NO	
BFCCH_BS	0	0.00000E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	YES	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	YES	NO	
HMTRN_BH	0	0.89800E-01	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	YES	NO	
BOF_ESP	0	0.42495E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	YES	NO	
BOF_BH	0	0.00000E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	YES	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	YES	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	YES	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	YES	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	YES	NO	
ANEAL_1S	0	0.11600E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2S	0	0.11600E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3S	0	0.11600E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4S	0	0.11600E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5S	0	0.11600E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_6S	0	0.11600E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_1N	0	0.11600E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2N	0	0.11600E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3N	0	0.11600E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4N	0	0.11600E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5N	0	0.11600E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
RFURN1_1	0	0.17030E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN1_2	0	0.17030E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_1	0	0.17030E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_2	0	0.17030E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_1	0	0.17030E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_2	0	0.17030E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
EU0099	0	0.59750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	YES	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	YES	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	YES	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	YES	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	YES	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	YES	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	YES	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	YES	NO	
A9831	0	0.57000E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	YES	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	YES	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	YES	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	YES	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	YES	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	YES	NO	

*** VOLUME SOURCE DATA ***

	NUMBER	EMISSION RATE			BASE	RELEASE	INIT.	INIT.	URBAN	EMISSION RATE

SOURCE ID	PART. CATS.	(GRAMS/SEC)	X (METERS)	Y (METERS)	ELEV. (METERS)	HEIGHT (METERS)	SY (METERS)	SZ (METERS)	SOURCE	SCALAR VARY BY
B_CH_RM1	0	0.89400E-01	322245.7	4685529.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM2	0	0.89400E-01	322239.4	4685541.5	192.0	23.17	6.55	10.77	YES	
B_CH_RM3	0	0.89400E-01	322233.0	4685554.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM4	0	0.89400E-01	322226.5	4685567.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM5	0	0.89400E-01	322220.4	4685579.5	192.0	23.17	6.55	10.77	YES	
C_CH_RM1	0	0.19500E+00	322190.4	4685634.5	192.0	29.26	6.59	13.61	YES	
C_CH_RM2	0	0.19500E+00	322184.1	4685647.0	192.0	29.26	6.59	13.61	YES	
C_CH_RM3	0	0.19500E+00	322177.7	4685659.5	192.0	29.26	6.59	13.61	YES	
C_CH_RM4	0	0.19500E+00	322171.4	4685672.5	192.0	29.26	6.59	13.61	YES	
BOF_RMW1	0	0.31400E+00	322007.2	4685043.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW2	0	0.31400E+00	321998.8	4685060.0	192.0	65.53	8.62	30.20	YES	
BOF_RMW3	0	0.31400E+00	321990.5	4685076.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW4	0	0.31400E+00	321982.3	4685093.0	192.0	65.53	8.62	30.20	YES	
BOF_RMW5	0	0.31400E+00	321973.8	4685109.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW6	0	0.31400E+00	321965.7	4685126.0	192.0	65.53	8.62	30.20	YES	
BOF_RME1	0	0.31400E+00	322043.5	4685061.0	192.0	65.53	7.66	30.20	YES	
BOF_RME2	0	0.31400E+00	322036.2	4685075.5	192.0	65.53	7.66	30.20	YES	
BOF_RME3	0	0.31400E+00	322028.7	4685090.0	192.0	65.53	7.66	30.20	YES	
BOF_RME4	0	0.31400E+00	322021.3	4685105.0	192.0	65.53	7.66	30.20	YES	
BOF_RME5	0	0.31400E+00	322013.9	4685119.5	192.0	65.53	7.66	30.20	YES	
BOF_RMN1	0	0.31400E+00	321991.2	4685164.5	192.0	57.61	4.47	26.51	YES	
BOF_RMN2	0	0.31400E+00	321986.9	4685173.0	192.0	57.61	4.47	26.51	YES	
BOF_RMN3	0	0.31400E+00	321982.7	4685181.5	192.0	57.61	4.47	26.51	YES	
BOF_RMN4	0	0.31400E+00	321978.3	4685190.0	192.0	57.61	4.47	26.51	YES	
BOF_RMN5	0	0.31400E+00	321973.8	4685199.0	192.0	57.61	4.47	26.51	YES	
HND_SCF1	0	0.75600E-01	321254.4	4684513.0	192.0	31.39	7.10	14.60	YES	
HND_SCF2	0	0.75600E-01	321247.6	4684527.0	192.0	31.39	7.10	14.60	YES	
HND_SCF3	0	0.75600E-01	321240.7	4684540.5	192.0	31.39	7.10	14.60	YES	
HND_SCF4	0	0.75600E-01	321233.8	4684554.0	192.0	31.39	7.10	14.60	YES	
HND_SCF5	0	0.75600E-01	321227.0	4684568.0	192.0	31.39	7.10	14.60	YES	

GROUP ID	SOURCE IDs
ALL	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,
A8640	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,
A7809	EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A ,
A8648	A8648 ,
A9831	A9831 ,
B2132	B2132 ,
B2169	B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.65418 AT (  317758.00,  4677306.00
 A8640    1ST HIGHEST VALUE IS       0.30438 AT (  317758.00,  4677306.00
 A7809    1ST HIGHEST VALUE IS       0.12431 AT (  317758.00,  4677306.00
 A8648    1ST HIGHEST VALUE IS       0.02034 AT (  317758.00,  4677306.00
 A9831    1ST HIGHEST VALUE IS       0.08876 AT (  317758.00,  4677306.00
 B2132    1ST HIGHEST VALUE IS       0.00370 AT (  317758.00,  4677306.00
 B2169    1ST HIGHEST VALUE IS       0.05075 AT (  317758.00,  4677306.00
 B2810    1ST HIGHEST VALUE IS       0.00364 AT (  317758.00,  4677306.00
 B2811    1ST HIGHEST VALUE IS       0.01773 AT (  317758.00,  4677306.00
 B3518    1ST HIGHEST VALUE IS       0.00303 AT (  317758.00,  4677306.00
 B3533    1ST HIGHEST VALUE IS       0.01187 AT (  317758.00,  4677306.00
 B3567    1ST HIGHEST VALUE IS       0.00617 AT (  317758.00,  4677306.00
 N6631    1ST HIGHEST VALUE IS       0.01956 AT (  317758.00,  4677306.00
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2005 AERMOD SUMMARY – WYANDOTTE MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2005 MONITOR IMPACTS ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.60870E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	YES	NO	
BF_C_SS	0	0.10486E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	YES	NO	
BFCCH_BS	0	0.00000E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	YES	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	YES	NO	
HMTRN_BH	0	0.89800E-01	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	YES	NO	
BOF_ESP	0	0.42495E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	YES	NO	
BOF_BH	0	0.00000E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	YES	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	YES	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	YES	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	YES	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	YES	NO	
ANEAL_1S	0	0.11600E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2S	0	0.11600E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3S	0	0.11600E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4S	0	0.11600E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5S	0	0.11600E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_6S	0	0.11600E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_1N	0	0.11600E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_2N	0	0.11600E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_3N	0	0.11600E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_4N	0	0.11600E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
ANEAL_5N	0	0.11600E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	YES	NO	
RFURN1_1	0	0.17030E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN1_2	0	0.17030E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_1	0	0.17030E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN2_2	0	0.17030E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_1	0	0.17030E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
RFURN3_2	0	0.17030E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	YES	NO	
EU0099	0	0.59750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	YES	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	YES	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	YES	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	YES	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	YES	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	YES	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	YES	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	YES	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	YES	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	YES	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	YES	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	YES	NO	
A9831	0	0.57000E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	YES	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	YES	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	YES	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	YES	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	YES	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	YES	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	YES	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
B_CH_RM1	0	0.89400E-01	322245.7	4685529.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM2	0	0.89400E-01	322239.4	4685541.5	192.0	23.17	6.55	10.77	YES	
B_CH_RM3	0	0.89400E-01	322233.0	4685554.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM4	0	0.89400E-01	322226.5	4685567.0	192.0	23.17	6.55	10.77	YES	
B_CH_RM5	0	0.89400E-01	322220.4	4685579.5	192.0	23.17	6.55	10.77	YES	
C_CH_RM1	0	0.19500E+00	322190.4	4685634.5	192.0	29.26	6.59	13.61	YES	
C_CH_RM2	0	0.19500E+00	322184.1	4685647.0	192.0	29.26	6.59	13.61	YES	
C_CH_RM3	0	0.19500E+00	322177.7	4685659.5	192.0	29.26	6.59	13.61	YES	
C_CH_RM4	0	0.19500E+00	322171.4	4685672.5	192.0	29.26	6.59	13.61	YES	
BOF_RMW1	0	0.31400E+00	322007.2	4685043.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW2	0	0.31400E+00	321998.8	4685060.0	192.0	65.53	8.62	30.20	YES	
BOF_RMW3	0	0.31400E+00	321990.5	4685076.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW4	0	0.31400E+00	321982.3	4685093.0	192.0	65.53	8.62	30.20	YES	
BOF_RMW5	0	0.31400E+00	321973.8	4685109.5	192.0	65.53	8.62	30.20	YES	
BOF_RMW6	0	0.31400E+00	321965.7	4685126.0	192.0	65.53	8.62	30.20	YES	
BOF_RME1	0	0.31400E+00	322043.5	4685061.0	192.0	65.53	7.66	30.20	YES	
BOF_RME2	0	0.31400E+00	322036.2	4685075.5	192.0	65.53	7.66	30.20	YES	
BOF_RME3	0	0.31400E+00	322028.7	4685090.0	192.0	65.53	7.66	30.20	YES	
BOF_RME4	0	0.31400E+00	322021.3	4685105.0	192.0	65.53	7.66	30.20	YES	
BOF_RME5	0	0.31400E+00	322013.9	4685119.5	192.0	65.53	7.66	30.20	YES	
BOF_RMN1	0	0.31400E+00	321991.2	4685164.5	192.0	57.61	4.47	26.51	YES	
BOF_RMN2	0	0.31400E+00	321986.9	4685173.0	192.0	57.61	4.47	26.51	YES	
BOF_RMN3	0	0.31400E+00	321982.7	4685181.5	192.0	57.61	4.47	26.51	YES	
BOF_RMN4	0	0.31400E+00	321978.3	4685190.0	192.0	57.61	4.47	26.51	YES	
BOF_RMN5	0	0.31400E+00	321973.8	4685199.0	192.0	57.61	4.47	26.51	YES	
HND_SCF1	0	0.75600E-01	321254.4	4684513.0	192.0	31.39	7.10	14.60	YES	
HND_SCF2	0	0.75600E-01	321247.6	4684527.0	192.0	31.39	7.10	14.60	YES	
HND_SCF3	0	0.75600E-01	321240.7	4684540.5	192.0	31.39	7.10	14.60	YES	
HND_SCF4	0	0.75600E-01	321233.8	4684554.0	192.0	31.39	7.10	14.60	YES	
HND_SCF5	0	0.75600E-01	321227.0	4684568.0	192.0	31.39	7.10	14.60	YES	

GROUP ID	SOURCE IDs
ALL	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,
	LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,
	BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,
	ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1,
	RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 ,
	EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A ,
	RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,
A8640	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,
	LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,
	BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,
	ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2,
	RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,
A7809	EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 ,
	EU0076A , RG0130A , RG0132A ,
A8648	A8648 ,
A9831	A9831 ,
B2132	B2132 ,

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 B2169     B2169   ,

 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.59903 AT (  322122.00,  4672602.00
 A8640    1ST HIGHEST VALUE IS       0.14990 AT (  322122.00,  4672602.00
 A7809    1ST HIGHEST VALUE IS       0.23338 AT (  322122.00,  4672602.00
 A8648    1ST HIGHEST VALUE IS       0.00868 AT (  322122.00,  4672602.00
 A9831    1ST HIGHEST VALUE IS       0.05830 AT (  322122.00,  4672602.00
 B2132    1ST HIGHEST VALUE IS       0.00978 AT (  322122.00,  4672602.00
 B2169    1ST HIGHEST VALUE IS       0.07196 AT (  322122.00,  4672602.00
 B2810    1ST HIGHEST VALUE IS       0.00581 AT (  322122.00,  4672602.00
 B2811    1ST HIGHEST VALUE IS       0.03137 AT (  322122.00,  4672602.00
 B3518    1ST HIGHEST VALUE IS       0.00397 AT (  322122.00,  4672602.00
 B3533    1ST HIGHEST VALUE IS       0.00798 AT (  322122.00,  4672602.00
 B3567    1ST HIGHEST VALUE IS       0.00612 AT (  322122.00,  4672602.00
 N6631    1ST HIGHEST VALUE IS       0.01227 AT (  322122.00,  4672602.00
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2009 AERMOD SUMMARY – DEARBORN MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2009 MONITOR IMPACTS (from Severstal, Marathon and U.S. reductions o ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.68440E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	NO	NO
BF_C_SS	0	0.11602E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	NO	NO
BFCCH_BS	0	0.48560E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	NO	NO
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	NO	NO
HMTRN_BH	0	0.00000E+00	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	NO	NO
BOF_ESP	0	0.46856E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	NO	NO
BOF_BH	0	0.17840E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	NO	NO
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	NO	NO
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	NO	NO
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	NO	NO
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	NO	NO
ANEAL_1S	0	0.15900E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_2S	0	0.15900E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_3S	0	0.15900E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_4S	0	0.15900E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_5S	0	0.15900E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_6S	0	0.15900E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_1N	0	0.15900E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_2N	0	0.15900E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_3N	0	0.15900E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_4N	0	0.15900E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
ANEAL_5N	0	0.15900E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO
RFURN1_1	0	0.18660E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
RFURN1_2	0	0.18660E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
RFURN2_1	0	0.18660E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
RFURN2_2	0	0.18660E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
RFURN3_1	0	0.18660E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
RFURN3_2	0	0.18660E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO
EU0099	0	0.40750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	NO	NO
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	NO	NO
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	NO	NO
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	NO	NO
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	NO	NO
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	NO	NO
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	NO	NO
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	NO	NO
A9831	0	0.28200E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	NO	NO
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	NO	NO
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	NO	NO
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	NO	NO
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	NO	NO
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	NO	NO

*** VOLUME SOURCE DATA ***

SOURCE	NUMBER PART.	EMISSION RATE (GRAMS/SEC)	X	Y	BASE ELEV.	RELEASE HEIGHT	INIT. SY	INIT. SZ	URBAN SOURCE	EMISSION RATE SCALAR VARY

ID	CATS.		(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	(METERS)	BY
B_CH_RM1	0	0.75000E-02	322245.7	4685529.0	192.0	23.17	6.55	10.77	NO
B_CH_RM2	0	0.75000E-02	322239.4	4685541.5	192.0	23.17	6.55	10.77	NO
B_CH_RM3	0	0.75000E-02	322233.0	4685554.0	192.0	23.17	6.55	10.77	NO
B_CH_RM4	0	0.75000E-02	322226.5	4685567.0	192.0	23.17	6.55	10.77	NO
B_CH_RM5	0	0.75000E-02	322220.4	4685579.5	192.0	23.17	6.55	10.77	NO
C_CH_RM1	0	0.23500E-01	322190.4	4685634.5	192.0	29.26	6.59	13.61	NO
C_CH_RM2	0	0.23500E-01	322184.1	4685647.0	192.0	29.26	6.59	13.61	NO
C_CH_RM3	0	0.23500E-01	322177.7	4685659.5	192.0	29.26	6.59	13.61	NO
C_CH_RM4	0	0.23500E-01	322171.4	4685672.5	192.0	29.26	6.59	13.61	NO
BOF_RMW1	0	0.77000E-02	322007.2	4685043.5	192.0	65.53	8.62	30.20	NO
BOF_RMW2	0	0.77000E-02	321998.8	4685060.0	192.0	65.53	8.62	30.20	NO
BOF_RMW3	0	0.77000E-02	321990.5	4685076.5	192.0	65.53	8.62	30.20	NO
BOF_RMW4	0	0.77000E-02	321982.3	4685093.0	192.0	65.53	8.62	30.20	NO
BOF_RMW5	0	0.77000E-02	321973.8	4685109.5	192.0	65.53	8.62	30.20	NO
BOF_RMW6	0	0.77000E-02	321965.7	4685126.0	192.0	65.53	8.62	30.20	NO
BOF_RME1	0	0.77000E-02	322043.5	4685061.0	192.0	65.53	7.66	30.20	NO
BOF_RME2	0	0.77000E-02	322036.2	4685075.5	192.0	65.53	7.66	30.20	NO
BOF_RME3	0	0.77000E-02	322028.7	4685090.0	192.0	65.53	7.66	30.20	NO
BOF_RME4	0	0.77000E-02	322021.3	4685105.0	192.0	65.53	7.66	30.20	NO
BOF_RME5	0	0.77000E-02	322013.9	4685119.5	192.0	65.53	7.66	30.20	NO
BOF_RMN1	0	0.77000E-02	321991.2	4685164.5	192.0	57.61	4.47	26.51	NO
BOF_RMN2	0	0.77000E-02	321986.9	4685173.0	192.0	57.61	4.47	26.51	NO
BOF_RMN3	0	0.77000E-02	321982.7	4685181.5	192.0	57.61	4.47	26.51	NO
BOF_RMN4	0	0.77000E-02	321978.3	4685190.0	192.0	57.61	4.47	26.51	NO
BOF_RMN5	0	0.77000E-02	321973.8	4685199.0	192.0	57.61	4.47	26.51	NO
HND_SCF1	0	0.10160E+00	321254.4	4684513.0	192.0	31.39	7.10	14.60	NO
HND_SCF2	0	0.10160E+00	321247.6	4684527.0	192.0	31.39	7.10	14.60	NO
HND_SCF3	0	0.10160E+00	321240.7	4684540.5	192.0	31.39	7.10	14.60	NO
HND_SCF4	0	0.10160E+00	321233.8	4684554.0	192.0	31.39	7.10	14.60	NO
HND_SCF5	0	0.10160E+00	321227.0	4684568.0	192.0	31.39	7.10	14.60	NO

GROUP ID	SOURCE IDs
ALL	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,
A8640	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS, LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2, BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC, ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,
A7809	EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A , RG0132A ,
A8648	A8648 ,
A9831	A9831 ,
B2132	B2132 ,
B2169	B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       2.90616 AT (  322805.00,  4685985.00
 A8640    1ST HIGHEST VALUE IS       1.46937 AT (  322805.00,  4685985.00
 A7809    1ST HIGHEST VALUE IS       0.20107 AT (  322805.00,  4685985.00
 A8648    1ST HIGHEST VALUE IS       0.40983 AT (  322805.00,  4685985.00
 A9831    1ST HIGHEST VALUE IS       0.04845 AT (  322805.00,  4685985.00
 B2132    1ST HIGHEST VALUE IS       0.00198 AT (  322805.00,  4685985.00
 B2169    1ST HIGHEST VALUE IS       0.44433 AT (  322805.00,  4685985.00
 B2810    1ST HIGHEST VALUE IS       0.00163 AT (  322805.00,  4685985.00
 B2811    1ST HIGHEST VALUE IS       0.00469 AT (  322805.00,  4685985.00
 B3518    1ST HIGHEST VALUE IS       0.00573 AT (  322805.00,  4685985.00
 B3533    1ST HIGHEST VALUE IS       0.19010 AT (  322805.00,  4685985.00
 B3567    1ST HIGHEST VALUE IS       0.07665 AT (  322805.00,  4685985.00
 N6631    1ST HIGHEST VALUE IS       0.04956 AT (  322805.00,  4685985.00
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2009 AERMOD SUMMARY – SWHS MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2009 MONITOR IMPACTS (from Severstal, Marathon and U.S. reductions o ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.68440E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	NO	NO	
BF_C_SS	0	0.11602E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	NO	NO	
BFCCH_BS	0	0.48560E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	NO	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	NO	NO	
HMTRN_BH	0	0.00000E+00	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	NO	NO	
BOF_ESP	0	0.46856E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	NO	NO	
BOF_BH	0	0.17840E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	NO	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	NO	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	NO	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	NO	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	NO	NO	
ANEAL_1S	0	0.15900E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2S	0	0.15900E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3S	0	0.15900E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4S	0	0.15900E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5S	0	0.15900E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_6S	0	0.15900E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_1N	0	0.15900E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2N	0	0.15900E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3N	0	0.15900E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4N	0	0.15900E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5N	0	0.15900E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
RFURN1_1	0	0.18660E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN1_2	0	0.18660E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_1	0	0.18660E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_2	0	0.18660E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_1	0	0.18660E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_2	0	0.18660E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
EU0099	0	0.40750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	NO	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	NO	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	NO	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	NO	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	NO	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	NO	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	NO	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	NO	NO	
A9831	0	0.28200E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	NO	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	NO	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	NO	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	NO	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	NO	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	NO	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY

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B_CH_RM1	0	0.75000E-02	322245.7	4685529.0	192.0	23.17	6.55	10.77	NO
B_CH_RM2	0	0.75000E-02	322239.4	4685541.5	192.0	23.17	6.55	10.77	NO
B_CH_RM3	0	0.75000E-02	322233.0	4685554.0	192.0	23.17	6.55	10.77	NO
B_CH_RM4	0	0.75000E-02	322226.5	4685567.0	192.0	23.17	6.55	10.77	NO
B_CH_RM5	0	0.75000E-02	322220.4	4685579.5	192.0	23.17	6.55	10.77	NO
C_CH_RM1	0	0.23500E-01	322190.4	4685634.5	192.0	29.26	6.59	13.61	NO
C_CH_RM2	0	0.23500E-01	322184.1	4685647.0	192.0	29.26	6.59	13.61	NO
C_CH_RM3	0	0.23500E-01	322177.7	4685659.5	192.0	29.26	6.59	13.61	NO
C_CH_RM4	0	0.23500E-01	322171.4	4685672.5	192.0	29.26	6.59	13.61	NO
BOF_RMW1	0	0.77000E-02	322007.2	4685043.5	192.0	65.53	8.62	30.20	NO
BOF_RMW2	0	0.77000E-02	321998.8	4685060.0	192.0	65.53	8.62	30.20	NO
BOF_RMW3	0	0.77000E-02	321990.5	4685076.5	192.0	65.53	8.62	30.20	NO
BOF_RMW4	0	0.77000E-02	321982.3	4685093.0	192.0	65.53	8.62	30.20	NO
BOF_RMW5	0	0.77000E-02	321973.8	4685109.5	192.0	65.53	8.62	30.20	NO
BOF_RMW6	0	0.77000E-02	321965.7	4685126.0	192.0	65.53	8.62	30.20	NO
BOF_RME1	0	0.77000E-02	322043.5	4685061.0	192.0	65.53	7.66	30.20	NO
BOF_RME2	0	0.77000E-02	322036.2	4685075.5	192.0	65.53	7.66	30.20	NO
BOF_RME3	0	0.77000E-02	322028.7	4685090.0	192.0	65.53	7.66	30.20	NO
BOF_RME4	0	0.77000E-02	322021.3	4685105.0	192.0	65.53	7.66	30.20	NO
BOF_RME5	0	0.77000E-02	322013.9	4685119.5	192.0	65.53	7.66	30.20	NO
BOF_RMN1	0	0.77000E-02	321991.2	4685164.5	192.0	57.61	4.47	26.51	NO
BOF_RMN2	0	0.77000E-02	321986.9	4685173.0	192.0	57.61	4.47	26.51	NO
BOF_RMN3	0	0.77000E-02	321982.7	4685181.5	192.0	57.61	4.47	26.51	NO
BOF_RMN4	0	0.77000E-02	321978.3	4685190.0	192.0	57.61	4.47	26.51	NO
BOF_RMN5	0	0.77000E-02	321973.8	4685199.0	192.0	57.61	4.47	26.51	NO
HND_SCF1	0	0.10160E+00	321254.4	4684513.0	192.0	31.39	7.10	14.60	NO
HND_SCF2	0	0.10160E+00	321247.6	4684527.0	192.0	31.39	7.10	14.60	NO
HND_SCF3	0	0.10160E+00	321240.7	4684540.5	192.0	31.39	7.10	14.60	NO
HND_SCF4	0	0.10160E+00	321233.8	4684554.0	192.0	31.39	7.10	14.60	NO
HND_SCF5	0	0.10160E+00	321227.0	4684568.0	192.0	31.39	7.10	14.60	NO

GROUP ID SOURCE IDs

ALL BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1,

RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 ,

EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A ,

RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,

A8640 BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2,

RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,

A7809 EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 ,

EU0076A , RG0130A , RG0132A ,

A8648 A8648 ,

A9831 A9831 ,

B2132 B2132 ,

B2169 B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       1.87622 AT (  326344.00,  4685318.00
 A8640    1ST HIGHEST VALUE IS       0.24373 AT (  326344.00,  4685318.00
 A7809    1ST HIGHEST VALUE IS       0.87434 AT (  326344.00,  4685318.00
 A8648    1ST HIGHEST VALUE IS       0.08392 AT (  326344.00,  4685318.00
 A9831    1ST HIGHEST VALUE IS       0.04044 AT (  326344.00,  4685318.00
 B2132    1ST HIGHEST VALUE IS       0.00264 AT (  326344.00,  4685318.00
 B2169    1ST HIGHEST VALUE IS       0.44840 AT (  326344.00,  4685318.00
 B2810    1ST HIGHEST VALUE IS       0.00293 AT (  326344.00,  4685318.00
 B2811    1ST HIGHEST VALUE IS       0.00483 AT (  326344.00,  4685318.00
 B3518    1ST HIGHEST VALUE IS       0.00962 AT (  326344.00,  4685318.00
 B3533    1ST HIGHEST VALUE IS       0.11624 AT (  326344.00,  4685318.00
 B3567    1ST HIGHEST VALUE IS       0.03397 AT (  326344.00,  4685318.00
 N6631    1ST HIGHEST VALUE IS       0.01533 AT (  326344.00,  4685318.00
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2009 AERMOD SUMMARY – ALLEN PARK MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2009 MONITOR IMPACTS (from Severstal, Marathon and U.S. reductions o ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.68440E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	NO	NO	
BF_C_SS	0	0.11602E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	NO	NO	
BFCCH_BS	0	0.48560E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	NO	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	NO	NO	
HMTRN_BH	0	0.00000E+00	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	NO	NO	
BOF_ESP	0	0.46856E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	NO	NO	
BOF_BH	0	0.17840E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	NO	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	NO	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	NO	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	NO	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	NO	NO	
ANEAL_1S	0	0.15900E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2S	0	0.15900E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3S	0	0.15900E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4S	0	0.15900E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5S	0	0.15900E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_6S	0	0.15900E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_1N	0	0.15900E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2N	0	0.15900E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3N	0	0.15900E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4N	0	0.15900E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5N	0	0.15900E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
RFURN1_1	0	0.18660E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN1_2	0	0.18660E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_1	0	0.18660E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_2	0	0.18660E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_1	0	0.18660E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_2	0	0.18660E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
EU0099	0	0.40750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	NO	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	NO	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	NO	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	NO	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	NO	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	NO	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	NO	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	NO	NO	
A9831	0	0.28200E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	NO	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	NO	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	NO	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	NO	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	NO	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	NO	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
B_CH_RM1	0	0.75000E-02	322245.7	4685529.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM2	0	0.75000E-02	322239.4	4685541.5	192.0	23.17	6.55	10.77	NO	
B_CH_RM3	0	0.75000E-02	322233.0	4685554.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM4	0	0.75000E-02	322226.5	4685567.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM5	0	0.75000E-02	322220.4	4685579.5	192.0	23.17	6.55	10.77	NO	
C_CH_RM1	0	0.23500E-01	322190.4	4685634.5	192.0	29.26	6.59	13.61	NO	
C_CH_RM2	0	0.23500E-01	322184.1	4685647.0	192.0	29.26	6.59	13.61	NO	
C_CH_RM3	0	0.23500E-01	322177.7	4685659.5	192.0	29.26	6.59	13.61	NO	
C_CH_RM4	0	0.23500E-01	322171.4	4685672.5	192.0	29.26	6.59	13.61	NO	
BOF_RMW1	0	0.77000E-02	322007.2	4685043.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW2	0	0.77000E-02	321998.8	4685060.0	192.0	65.53	8.62	30.20	NO	
BOF_RMW3	0	0.77000E-02	321990.5	4685076.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW4	0	0.77000E-02	321982.3	4685093.0	192.0	65.53	8.62	30.20	NO	
BOF_RMW5	0	0.77000E-02	321973.8	4685109.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW6	0	0.77000E-02	321965.7	4685126.0	192.0	65.53	8.62	30.20	NO	
BOF_RME1	0	0.77000E-02	322043.5	4685061.0	192.0	65.53	7.66	30.20	NO	
BOF_RME2	0	0.77000E-02	322036.2	4685075.5	192.0	65.53	7.66	30.20	NO	
BOF_RME3	0	0.77000E-02	322028.7	4685090.0	192.0	65.53	7.66	30.20	NO	
BOF_RME4	0	0.77000E-02	322021.3	4685105.0	192.0	65.53	7.66	30.20	NO	
BOF_RME5	0	0.77000E-02	322013.9	4685119.5	192.0	65.53	7.66	30.20	NO	
BOF_RMN1	0	0.77000E-02	321991.2	4685164.5	192.0	57.61	4.47	26.51	NO	
BOF_RMN2	0	0.77000E-02	321986.9	4685173.0	192.0	57.61	4.47	26.51	NO	
BOF_RMN3	0	0.77000E-02	321982.7	4685181.5	192.0	57.61	4.47	26.51	NO	
BOF_RMN4	0	0.77000E-02	321978.3	4685190.0	192.0	57.61	4.47	26.51	NO	
BOF_RMN5	0	0.77000E-02	321973.8	4685199.0	192.0	57.61	4.47	26.51	NO	
HND_SCF1	0	0.10160E+00	321254.4	4684513.0	192.0	31.39	7.10	14.60	NO	
HND_SCF2	0	0.10160E+00	321247.6	4684527.0	192.0	31.39	7.10	14.60	NO	
HND_SCF3	0	0.10160E+00	321240.7	4684540.5	192.0	31.39	7.10	14.60	NO	
HND_SCF4	0	0.10160E+00	321233.8	4684554.0	192.0	31.39	7.10	14.60	NO	
HND_SCF5	0	0.10160E+00	321227.0	4684568.0	192.0	31.39	7.10	14.60	NO	

GROUP ID SOURCE IDs

ALL BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1,

RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 ,

EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A ,

RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,

A8640 BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,

LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,

BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,

ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2,

RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,

A7809 EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 ,

EU0076A , RG0130A , RG0132A ,

A8648 A8648 ,

A9831 A9831 ,

B2132 B2132 ,

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 B2169     B2169   ,

 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.42555 AT (  317758.00,  4677306.00
 A8640    1ST HIGHEST VALUE IS       0.14868 AT (  317758.00,  4677306.00
 A7809    1ST HIGHEST VALUE IS       0.08436 AT (  317758.00,  4677306.00
 A8648    1ST HIGHEST VALUE IS       0.03304 AT (  317758.00,  4677306.00
 A9831    1ST HIGHEST VALUE IS       0.02178 AT (  317758.00,  4677306.00
 B2132    1ST HIGHEST VALUE IS       0.00156 AT (  317758.00,  4677306.00
 B2169    1ST HIGHEST VALUE IS       0.08669 AT (  317758.00,  4677306.00
 B2810    1ST HIGHEST VALUE IS       0.00159 AT (  317758.00,  4677306.00
 B2811    1ST HIGHEST VALUE IS       0.00585 AT (  317758.00,  4677306.00
 B3518    1ST HIGHEST VALUE IS       0.00177 AT (  317758.00,  4677306.00
 B3533    1ST HIGHEST VALUE IS       0.01993 AT (  317758.00,  4677306.00
 B3567    1ST HIGHEST VALUE IS       0.01052 AT (  317758.00,  4677306.00
 N6631    1ST HIGHEST VALUE IS       0.00899 AT (  317758.00,  4677306.00
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2009 AERMOD SUMMARY – WYANDOTTE MONITOR LOCATION

*** AERMOD - VERSION 07026 *** *** 2009 MONITOR IMPACTS (from Severstal, Marathon and U.S. reductions o ***
04/28/08

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
BF_B_SS	0	0.68440E+00	322263.4	4685504.0	192.0	57.91	672.04	9.60	2.52	YES	NO	NO	
BF_C_SS	0	0.11602E+01	322221.8	4685586.5	192.0	64.01	672.04	13.70	2.74	YES	NO	NO	
BFCCH_BS	0	0.48560E+00	322262.1	4685580.0	192.0	60.96	338.71	19.96	2.74	YES	NO	NO	
LM_UL_BH	0	0.75700E-01	322184.0	4684950.0	192.0	10.97	294.26	22.64	0.61	YES	NO	NO	
HMTRN_BH	0	0.00000E+00	322024.8	4685203.0	192.0	8.23	352.60	0.05	1.75	YES	NO	NO	
BOF_ESP	0	0.46856E+01	321932.5	4685047.5	192.0	64.92	422.04	18.84	5.18	YES	NO	NO	
BOF_BH	0	0.17840E+00	322004.8	4685285.0	192.0	60.96	338.71	18.95	4.88	YES	NO	NO	
DESLF_BH	0	0.11050E+00	321971.5	4685217.5	192.0	11.28	380.37	0.05	1.68	YES	NO	NO	
LRF#1_S	0	0.85380E+00	321983.0	4684947.0	192.0	45.11	297.04	13.97	2.74	YES	NO	NO	
LRF2_FLX	0	0.48790E+00	322097.1	4684808.5	192.0	45.72	433.15	17.97	1.83	YES	NO	NO	
COKE_REC	0	0.24280E+00	322127.2	4684707.5	192.0	5.49	294.26	21.38	0.71	YES	NO	NO	
ANEAL_1S	0	0.15900E-01	321846.1	4685170.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2S	0	0.15900E-01	321826.2	4685209.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3S	0	0.15900E-01	321806.3	4685249.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4S	0	0.15900E-01	321786.4	4685288.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5S	0	0.15900E-01	321766.5	4685328.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_6S	0	0.15900E-01	321746.6	4685367.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_1N	0	0.15900E-01	321726.0	4685387.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_2N	0	0.15900E-01	321713.8	4685412.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_3N	0	0.15900E-01	321701.4	4685436.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_4N	0	0.15900E-01	321689.1	4685461.0	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
ANEAL_5N	0	0.15900E-01	321676.7	4685485.5	192.0	21.34	1060.93	0.05	0.76	YES	NO	NO	
RFURN1_1	0	0.18660E+00	320999.0	4685172.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN1_2	0	0.18660E+00	321004.0	4685162.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_1	0	0.18660E+00	321009.0	4685152.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN2_2	0	0.18660E+00	321014.0	4685141.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_1	0	0.18660E+00	321020.0	4685131.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
RFURN3_2	0	0.18660E+00	321025.0	4685120.0	192.0	63.40	922.04	4.39	4.27	YES	NO	NO	
EU0099	0	0.40750E+01	326027.0	4682852.0	192.0	96.01	477.60	4.28	5.03	NO	NO	NO	
EU0096	0	0.26820E+01	326192.0	4683221.0	192.0	20.73	294.30	15.16	3.30	NO	NO	NO	
EU0095	0	0.26310E+01	326475.0	4683520.0	192.0	19.81	294.30	10.35	3.05	NO	NO	NO	
RG0130	0	0.23970E+01	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
EU0096A	0	0.12010E+01	326192.0	4683221.0	192.0	70.10	560.90	13.53	2.82	NO	NO	NO	
RG0133	0	0.98900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
RG0132	0	0.87100E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
EU0095A	0	0.84500E+00	326475.0	4683520.0	192.0	60.96	383.20	13.37	2.84	NO	NO	NO	
EU0120	0	0.34600E+00	326309.0	4683644.0	192.0	33.22	544.30	21.15	1.40	NO	NO	NO	
RG0133A	0	0.29900E+00	326299.0	4683107.0	192.0	26.82	560.90	7.48	2.97	NO	NO	NO	
EU0118	0	0.24100E+00	326059.0	4683063.0	192.0	37.49	422.00	9.27	0.91	NO	NO	NO	
EU0076	0	0.21800E+00	325960.0	4683058.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
EU0076A	0	0.16500E+00	326087.0	4683007.0	192.0	31.09	477.60	1.62	4.27	NO	NO	NO	
RG0130A	0	0.15900E+00	326323.0	4683637.0	192.0	60.96	416.50	15.63	5.33	NO	NO	NO	
RG0132A	0	0.14700E+00	326305.0	4683579.0	192.0	20.73	560.90	17.11	1.68	NO	NO	NO	
A8648	0	0.49000E+00	321801.0	4686168.0	192.0	12.31	295.70	10.14	0.31	NO	NO	NO	
A9831	0	0.28200E+01	322000.0	4683150.0	192.0	49.43	455.50	10.24	1.91	NO	NO	NO	
B2132	0	0.36000E+00	322800.0	4675000.0	192.0	46.94	415.70	8.71	2.44	NO	NO	NO	
B2169	0	0.20500E+01	324525.0	4682560.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B2810	0	0.12300E+01	325800.0	4682000.0	192.0	123.80	427.30	47.00	3.82	NO	NO	NO	
B2811	0	0.53700E+01	319700.0	4665600.0	192.0	162.69	419.70	41.04	4.34	NO	NO	NO	
B3518	0	0.16000E+00	324200.0	4682800.0	192.0	29.01	344.70	17.80	0.71	NO	NO	NO	
B3533	0	0.43000E+00	323800.0	4686900.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
B3567	0	0.21000E+00	323850.0	4683450.0	192.0	12.19	294.30	10.00	0.30	NO	NO	NO	
N6631	0	0.24300E+01	322513.0	4685652.0	192.0	55.27	416.40	17.46	3.37	NO	NO	NO	

*** VOLUME SOURCE DATA ***

NUMBER	EMISSION RATE	BASE	RELEASE	INIT.	INIT.	URBAN	EMISSION RATE

SOURCE ID	PART. CATS.	(GRAMS/SEC)	X (METERS)	Y (METERS)	ELEV. (METERS)	HEIGHT (METERS)	SY (METERS)	SZ (METERS)	SOURCE	SCALAR VARY BY
B_CH_RM1	0	0.75000E-02	322245.7	4685529.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM2	0	0.75000E-02	322239.4	4685541.5	192.0	23.17	6.55	10.77	NO	
B_CH_RM3	0	0.75000E-02	322233.0	4685554.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM4	0	0.75000E-02	322226.5	4685567.0	192.0	23.17	6.55	10.77	NO	
B_CH_RM5	0	0.75000E-02	322220.4	4685579.5	192.0	23.17	6.55	10.77	NO	
C_CH_RM1	0	0.23500E-01	322190.4	4685634.5	192.0	29.26	6.59	13.61	NO	
C_CH_RM2	0	0.23500E-01	322184.1	4685647.0	192.0	29.26	6.59	13.61	NO	
C_CH_RM3	0	0.23500E-01	322177.7	4685659.5	192.0	29.26	6.59	13.61	NO	
C_CH_RM4	0	0.23500E-01	322171.4	4685672.5	192.0	29.26	6.59	13.61	NO	
BOF_RMW1	0	0.77000E-02	322007.2	4685043.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW2	0	0.77000E-02	321998.8	4685060.0	192.0	65.53	8.62	30.20	NO	
BOF_RMW3	0	0.77000E-02	321990.5	4685076.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW4	0	0.77000E-02	321982.3	4685093.0	192.0	65.53	8.62	30.20	NO	
BOF_RMW5	0	0.77000E-02	321973.8	4685109.5	192.0	65.53	8.62	30.20	NO	
BOF_RMW6	0	0.77000E-02	321965.7	4685126.0	192.0	65.53	8.62	30.20	NO	
BOF_RME1	0	0.77000E-02	322043.5	4685061.0	192.0	65.53	7.66	30.20	NO	
BOF_RME2	0	0.77000E-02	322036.2	4685075.5	192.0	65.53	7.66	30.20	NO	
BOF_RME3	0	0.77000E-02	322028.7	4685090.0	192.0	65.53	7.66	30.20	NO	
BOF_RME4	0	0.77000E-02	322021.3	4685105.0	192.0	65.53	7.66	30.20	NO	
BOF_RME5	0	0.77000E-02	322013.9	4685119.5	192.0	65.53	7.66	30.20	NO	
BOF_RMN1	0	0.77000E-02	321991.2	4685164.5	192.0	57.61	4.47	26.51	NO	
BOF_RMN2	0	0.77000E-02	321986.9	4685173.0	192.0	57.61	4.47	26.51	NO	
BOF_RMN3	0	0.77000E-02	321982.7	4685181.5	192.0	57.61	4.47	26.51	NO	
BOF_RMN4	0	0.77000E-02	321978.3	4685190.0	192.0	57.61	4.47	26.51	NO	
BOF_RMN5	0	0.77000E-02	321973.8	4685199.0	192.0	57.61	4.47	26.51	NO	
HND_SCF1	0	0.10160E+00	321254.4	4684513.0	192.0	31.39	7.10	14.60	NO	
HND_SCF2	0	0.10160E+00	321247.6	4684527.0	192.0	31.39	7.10	14.60	NO	
HND_SCF3	0	0.10160E+00	321240.7	4684540.5	192.0	31.39	7.10	14.60	NO	
HND_SCF4	0	0.10160E+00	321233.8	4684554.0	192.0	31.39	7.10	14.60	NO	
HND_SCF5	0	0.10160E+00	321227.0	4684568.0	192.0	31.39	7.10	14.60	NO	

GROUP ID	SOURCE IDs
ALL	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,
	LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,
	BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,
	ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, ANEAL_5N, RFURN1_1,
	RFURN1_2, RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5, EU0099 , EU0096 ,
	EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 , EU0076A , RG0130A ,
	RG0132A , A8648 , A9831 , B2132 , B2169 , B2810 , B2811 , B3518 , B3533 , B3567 , N6631 ,
A8640	BF_B_SS , BF_C_SS , B_CH_RM1, B_CH_RM2, B_CH_RM3, B_CH_RM4, B_CH_RM5, C_CH_RM1, C_CH_RM2, C_CH_RM3, C_CH_RM4, BFCCH_BS,
	LM_UL_BH, HMTRN_BH, BOF_ESP , BOF_BH , BOF_RMW1, BOF_RMW2, BOF_RMW3, BOF_RMW4, BOF_RMW5, BOF_RMW6, BOF_RME1, BOF_RME2,
	BOF_RME3, BOF_RME4, BOF_RME5, BOF_RMN1, BOF_RMN2, BOF_RMN3, BOF_RMN4, BOF_RMN5, DESLF_BH, LRF#1_S , LRF2_FLX, COKE_REC,
	ANEAL_1S, ANEAL_2S, ANEAL_3S, ANEAL_4S, ANEAL_5S, ANEAL_6S, ANEAL_1N, ANEAL_2N, ANEAL_3N, ANEAL_4N, RFURN1_1, RFURN1_2,
	RFURN2_1, RFURN2_2, RFURN3_1, RFURN3_2, HND_SCF1, HND_SCF2, HND_SCF3, HND_SCF4, HND_SCF5,
A7809	EU0099 , EU0096 , EU0095 , RG0130 , EU0096A , RG0133 , RG0132 , EU0095A , EU0120 , RG0133A , EU0118 , EU0076 ,
	EU0076A , RG0130A , RG0132A ,
A8648	A8648 ,
A9831	A9831 ,
B2132	B2132 ,
B2169	B2169 ,

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 B2810     B2810   ,

 B2811     B2811   ,

SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.44447 AT (  322122.00,  4672602.00
 A8640    1ST HIGHEST VALUE IS       0.06301 AT (  322122.00,  4672602.00
 A7809    1ST HIGHEST VALUE IS       0.17178 AT (  322122.00,  4672602.00
 A8648    1ST HIGHEST VALUE IS       0.01306 AT (  322122.00,  4672602.00
 A9831    1ST HIGHEST VALUE IS       0.01817 AT (  322122.00,  4672602.00
 B2132    1ST HIGHEST VALUE IS       0.00662 AT (  322122.00,  4672602.00
 B2169    1ST HIGHEST VALUE IS       0.12625 AT (  322122.00,  4672602.00
 B2810    1ST HIGHEST VALUE IS       0.00191 AT (  322122.00,  4672602.00
 B2811    1ST HIGHEST VALUE IS       0.00793 AT (  322122.00,  4672602.00
 B3518    1ST HIGHEST VALUE IS       0.00275 AT (  322122.00,  4672602.00
 B3533    1ST HIGHEST VALUE IS       0.01534 AT (  322122.00,  4672602.00
 B3567    1ST HIGHEST VALUE IS       0.01134 AT (  322122.00,  4672602.00
 N6631    1ST HIGHEST VALUE IS       0.00632 AT (  322122.00,  4672602.00
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2005 AERMOD SUMMARY – DEARBORN MONITOR LOCATION RAILYARD REDUCTIONS

*** AERMOD - VERSION 07026 *** *** DEARBORN MONITOR IMPACTS ***
04/29/08

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CSX_01	0	0.36060E-02	322524.0	4686057.0	192.0	4.25	23.26	3.95	NO	
CSX_02	0	0.36060E-02	322545.0	4686012.0	192.0	4.25	23.26	3.95	NO	
CSX_03	0	0.36060E-02	322566.0	4685966.0	192.0	4.25	23.26	3.95	NO	
CSX_04	0	0.36060E-02	322587.0	4685921.0	192.0	4.25	23.26	3.95	NO	
CSX_05	0	0.36060E-02	322607.9	4685876.0	192.0	4.25	23.26	3.95	NO	
CSX_06	0	0.36060E-02	322628.9	4685830.0	192.0	4.25	23.26	3.95	NO	
CSX_07	0	0.36060E-02	322649.9	4685785.0	192.0	4.25	23.26	3.95	NO	
CSX_08	0	0.36060E-02	322670.9	4685740.0	192.0	4.25	23.26	3.95	NO	
CSX_09	0	0.36060E-02	322691.9	4685694.0	192.0	4.25	23.26	3.95	NO	
CSX_10	0	0.36060E-02	322712.9	4685649.0	192.0	4.25	23.26	3.95	NO	
CSX_11	0	0.36060E-02	322733.9	4685603.0	192.0	4.25	23.26	3.95	NO	
CSX_12	0	0.36060E-02	322754.8	4685558.0	192.0	4.25	23.26	3.95	NO	
CSX_13	0	0.36060E-02	322775.8	4685513.0	192.0	4.25	23.26	3.95	NO	
CSX_14	0	0.36060E-02	322796.8	4685467.0	192.0	4.25	23.26	3.95	NO	
CSX_15	0	0.36060E-02	322817.8	4685422.0	192.0	4.25	23.26	3.95	NO	
CSX_16	0	0.36060E-02	322838.8	4685377.0	192.0	4.25	23.26	3.95	NO	
SEVER_01	0	0.29250E-03	321271.3	4686627.0	192.0	4.25	23.26	3.95	NO	
SEVER_02	0	0.29250E-03	321240.7	4686588.0	192.0	4.25	23.26	3.95	NO	
SEVER_03	0	0.29250E-03	321210.1	4686548.0	192.0	4.25	23.26	3.95	NO	
SEVER_04	0	0.29250E-03	321179.5	4686509.0	192.0	4.25	23.26	3.95	NO	
SEVER_05	0	0.29250E-03	321148.9	4686469.0	192.0	4.25	23.26	3.95	NO	
SEVER_06	0	0.29250E-03	321118.3	4686430.0	192.0	4.25	23.26	3.95	NO	
SEVER_07	0	0.29250E-03	321087.7	4686390.0	192.0	4.25	23.26	3.95	NO	
SEVER_08	0	0.29250E-03	321057.1	4686350.0	192.0	4.25	23.26	3.95	NO	
SEVER_09	0	0.29250E-03	321026.5	4686311.0	192.0	4.25	23.26	3.95	NO	
SEVER_10	0	0.29250E-03	320995.8	4686271.0	192.0	4.25	23.26	3.95	NO	
SEVER_11	0	0.29250E-03	320965.3	4686232.0	192.0	4.25	23.26	3.95	NO	
SEVER_12	0	0.29250E-03	320934.7	4686192.0	192.0	4.25	23.26	3.95	NO	
SEVER_13	0	0.29250E-03	320904.0	4686153.0	192.0	4.25	23.26	3.95	NO	
SEVER_14	0	0.29250E-03	320873.4	4686113.0	192.0	4.25	23.26	3.95	NO	
SEVER_15	0	0.29250E-03	320842.8	4686074.0	192.0	4.25	23.26	3.95	NO	
CONLV_01	0	0.73150E-03	324682.3	4687492.0	192.0	4.25	23.26	3.95	NO	
CONLV_02	0	0.73150E-03	324731.7	4687500.0	192.0	4.25	23.26	3.95	NO	
CONLV_03	0	0.73150E-03	324781.0	4687508.0	192.0	4.25	23.26	3.95	NO	
CONLV_04	0	0.73150E-03	324830.4	4687516.0	192.0	4.25	23.26	3.95	NO	
CONLV_05	0	0.73150E-03	324879.8	4687524.0	192.0	4.25	23.26	3.95	NO	
CONLV_06	0	0.73150E-03	324929.1	4687532.0	192.0	4.25	23.26	3.95	NO	
CONLV_07	0	0.73150E-03	324978.4	4687540.0	192.0	4.25	23.26	3.95	NO	
CONLV_08	0	0.73150E-03	325027.8	4687548.0	192.0	4.25	23.26	3.95	NO	
CONLV_09	0	0.73150E-03	325077.2	4687556.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CONLV_10	0	0.73150E-03	325126.5	4687564.0	192.0	4.25	23.26	3.95	NO	
CONLV_11	0	0.73150E-03	325175.9	4687572.0	192.0	4.25	23.26	3.95	NO	
CONLV_12	0	0.73150E-03	325225.2	4687580.0	192.0	4.25	23.26	3.95	NO	
CONLV_13	0	0.73150E-03	325274.6	4687588.0	192.0	4.25	23.26	3.95	NO	
CONLV_14	0	0.73150E-03	325323.9	4687596.0	192.0	4.25	23.26	3.95	NO	
CONLV_15	0	0.73150E-03	325373.3	4687604.0	192.0	4.25	23.26	3.95	NO	
CONLV_16	0	0.73150E-03	325422.7	4687612.0	192.0	4.25	23.26	3.95	NO	
CONLV_17	0	0.73150E-03	325472.0	4687620.0	192.0	4.25	23.26	3.95	NO	
CONLV_18	0	0.73150E-03	325521.4	4687628.0	192.0	4.25	23.26	3.95	NO	
NORFK_01	0	0.59770E-03	319338.3	4682375.0	192.0	4.25	23.26	3.95	NO	
NORFK_02	0	0.59770E-03	319386.9	4682387.0	192.0	4.25	23.26	3.95	NO	
NORFK_03	0	0.59770E-03	319435.4	4682399.0	192.0	4.25	23.26	3.95	NO	
NORFK_04	0	0.59770E-03	319484.0	4682411.0	192.0	4.25	23.26	3.95	NO	
NORFK_05	0	0.59770E-03	319532.5	4682423.0	192.0	4.25	23.26	3.95	NO	
NORFK_06	0	0.59770E-03	319581.1	4682435.0	192.0	4.25	23.26	3.95	NO	
NORFK_07	0	0.59770E-03	319629.6	4682447.0	192.0	4.25	23.26	3.95	NO	
NORFK_08	0	0.59770E-03	319678.2	4682459.0	192.0	4.25	23.26	3.95	NO	
NORFK_09	0	0.59770E-03	319726.8	4682471.0	192.0	4.25	23.26	3.95	NO	
NORFK_10	0	0.59770E-03	319775.3	4682483.0	192.0	4.25	23.26	3.95	NO	
NORFK_11	0	0.59770E-03	319823.8	4682495.0	192.0	4.25	23.26	3.95	NO	
NORFK_12	0	0.59770E-03	319872.4	4682507.0	192.0	4.25	23.26	3.95	NO	
NORFK_13	0	0.59770E-03	319921.0	4682518.0	192.0	4.25	23.26	3.95	NO	
NORFK_14	0	0.59770E-03	319969.5	4682530.0	192.0	4.25	23.26	3.95	NO	
NORFK_15	0	0.59770E-03	320018.1	4682542.0	192.0	4.25	23.26	3.95	NO	
NORFK_16	0	0.59770E-03	320066.6	4682554.0	192.0	4.25	23.26	3.95	NO	

NORFK_17	0	0.59770E-03	320115.2	4682566.0	192.0	4.25	23.26	3.95	NO
NORFK_18	0	0.59770E-03	320163.8	4682578.0	192.0	4.25	23.26	3.95	NO
NORFK_19	0	0.59770E-03	320212.3	4682590.0	192.0	4.25	23.26	3.95	NO
NORFK_20	0	0.59770E-03	320260.8	4682602.0	192.0	4.25	23.26	3.95	NO
NORFK_21	0	0.59770E-03	320309.4	4682614.0	192.0	4.25	23.26	3.95	NO
NORFK_22	0	0.59770E-03	320358.0	4682626.0	192.0	4.25	23.26	3.95	NO
NORFK_23	0	0.59770E-03	320406.5	4682638.0	192.0	4.25	23.26	3.95	NO
NORFK_24	0	0.59770E-03	320455.1	4682650.0	192.0	4.25	23.26	3.95	NO
NORFK_25	0	0.59770E-03	320503.6	4682662.0	192.0	4.25	23.26	3.95	NO
NORFK_26	0	0.59770E-03	320552.2	4682674.0	192.0	4.25	23.26	3.95	NO
NORFK_27	0	0.59770E-03	320600.7	4682686.0	192.0	4.25	23.26	3.95	NO
NORFK_28	0	0.59770E-03	320649.3	4682698.0	192.0	4.25	23.26	3.95	NO
NORFK_29	0	0.59770E-03	320697.8	4682709.0	192.0	4.25	23.26	3.95	NO
NORFK_30	0	0.59770E-03	320746.4	4682721.0	192.0	4.25	23.26	3.95	NO
NORFK_31	0	0.59770E-03	320794.9	4682733.0	192.0	4.25	23.26	3.95	NO

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
NORFK_32	0	0.59770E-03	320843.5	4682745.0	192.0	4.25	23.26	3.95	NO	
NORFK_33	0	0.59770E-03	320892.1	4682757.0	192.0	4.25	23.26	3.95	NO	
NORFK_34	0	0.59770E-03	320940.6	4682769.0	192.0	4.25	23.26	3.95	NO	
NORFK_35	0	0.59770E-03	320989.2	4682781.0	192.0	4.25	23.26	3.95	NO	
NORFK_36	0	0.59770E-03	321037.7	4682793.0	192.0	4.25	23.26	3.95	NO	
NORFK_37	0	0.59770E-03	321086.3	4682805.0	192.0	4.25	23.26	3.95	NO	
NORFK_38	0	0.59770E-03	321134.8	4682817.0	192.0	4.25	23.26	3.95	NO	
NORFK_39	0	0.59770E-03	321183.4	4682829.0	192.0	4.25	23.26	3.95	NO	
NORFK_40	0	0.59770E-03	321231.9	4682841.0	192.0	4.25	23.26	3.95	NO	
NORFK_41	0	0.59770E-03	321280.5	4682853.0	192.0	4.25	23.26	3.95	NO	
NORFK_42	0	0.59770E-03	321329.1	4682865.0	192.0	4.25	23.26	3.95	NO	
NORFK_43	0	0.59770E-03	321377.6	4682877.0	192.0	4.25	23.26	3.95	NO	
NORFK_44	0	0.59770E-03	321426.2	4682888.0	192.0	4.25	23.26	3.95	NO	
CONRV_01	0	0.33760E-03	323622.3	4682108.0	192.0	4.25	23.26	3.95	NO	
CONRV_02	0	0.33760E-03	323608.6	4682060.0	192.0	4.25	23.26	3.95	NO	
CONRV_03	0	0.33760E-03	323594.9	4682012.0	192.0	4.25	23.26	3.95	NO	
CONRV_04	0	0.33760E-03	323581.2	4681964.0	192.0	4.25	23.26	3.95	NO	
CONRV_05	0	0.33760E-03	323567.5	4681916.0	192.0	4.25	23.26	3.95	NO	
CONRV_06	0	0.33760E-03	323553.8	4681868.0	192.0	4.25	23.26	3.95	NO	
CONRV_07	0	0.33760E-03	323540.1	4681820.0	192.0	4.25	23.26	3.95	NO	
CONRV_08	0	0.33760E-03	323526.4	4681772.0	192.0	4.25	23.26	3.95	NO	
CONRV_09	0	0.33760E-03	323512.7	4681724.0	192.0	4.25	23.26	3.95	NO	
CONRV_10	0	0.33760E-03	323498.9	4681675.0	192.0	4.25	23.26	3.95	NO	
CONRV_11	0	0.33760E-03	323485.3	4681627.0	192.0	4.25	23.26	3.95	NO	
CONRV_12	0	0.33760E-03	323471.5	4681579.0	192.0	4.25	23.26	3.95	NO	
CONRV_13	0	0.33760E-03	323457.8	4681531.0	192.0	4.25	23.26	3.95	NO	
CONRV_14	0	0.33760E-03	323444.1	4681483.0	192.0	4.25	23.26	3.95	NO	
CONRV_15	0	0.33760E-03	323430.4	4681435.0	192.0	4.25	23.26	3.95	NO	
CONRV_16	0	0.33760E-03	323416.7	4681387.0	192.0	4.25	23.26	3.95	NO	
CONRV_17	0	0.33760E-03	323403.0	4681339.0	192.0	4.25	23.26	3.95	NO	
CONRV_18	0	0.33760E-03	323389.3	4681291.0	192.0	4.25	23.26	3.95	NO	
CONRV_19	0	0.33760E-03	323375.6	4681243.0	192.0	4.25	23.26	3.95	NO	
CONRV_20	0	0.33760E-03	323361.9	4681195.0	192.0	4.25	23.26	3.95	NO	
CONRV_21	0	0.33760E-03	323348.2	4681147.0	192.0	4.25	23.26	3.95	NO	
CONRV_22	0	0.33760E-03	323334.5	4681098.0	192.0	4.25	23.26	3.95	NO	
CONRV_23	0	0.33760E-03	323320.8	4681050.0	192.0	4.25	23.26	3.95	NO	
CONRV_24	0	0.33760E-03	323307.0	4681002.0	192.0	4.25	23.26	3.95	NO	
CONRV_25	0	0.33760E-03	323293.3	4680954.0	192.0	4.25	23.26	3.95	NO	
CONRV_26	0	0.33760E-03	323279.6	4680906.0	192.0	4.25	23.26	3.95	NO	
DELRAY_1	0	0.62690E-03	325953.7	4683583.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
DELRAY_2	0	0.62690E-03	325931.9	4683538.0	192.0	4.25	23.26	3.95	NO	
DELRAY_3	0	0.62690E-03	325910.2	4683493.0	192.0	4.25	23.26	3.95	NO	
DELRAY_4	0	0.62690E-03	325888.4	4683448.0	192.0	4.25	23.26	3.95	NO	
DELRAY_5	0	0.62690E-03	325866.6	4683403.0	192.0	4.25	23.26	3.95	NO	
DELRAY_6	0	0.62690E-03	325844.8	4683358.0	192.0	4.25	23.26	3.95	NO	
DELRAY_7	0	0.62690E-03	325823.1	4683313.0	192.0	4.25	23.26	3.95	NO	
USSTL_01	0	0.23420E-02	323661.1	4679390.0	192.0	4.25	23.26	3.95	NO	
USSTL_02	0	0.23420E-02	323690.8	4679430.0	192.0	4.25	23.26	3.95	NO	
USSTL_03	0	0.23420E-02	323720.5	4679471.0	192.0	4.25	23.26	3.95	NO	
USSTL_04	0	0.23420E-02	323750.3	4679511.0	192.0	4.25	23.26	3.95	NO	
USSTL_05	0	0.23420E-02	323780.0	4679551.0	192.0	4.25	23.26	3.95	NO	
USSTL_06	0	0.23420E-02	323809.7	4679591.0	192.0	4.25	23.26	3.95	NO	
USSTL_07	0	0.23420E-02	323839.4	4679631.0	192.0	4.25	23.26	3.95	NO	
USSTL_08	0	0.23420E-02	323869.2	4679672.0	192.0	4.25	23.26	3.95	NO	
USSTL_09	0	0.23420E-02	325180.8	4681844.0	192.0	4.25	23.26	3.95	NO	
USSTL_10	0	0.23420E-02	325230.7	4681841.0	192.0	4.25	23.26	3.95	NO	
USSTL_11	0	0.23420E-02	325280.7	4681838.0	192.0	4.25	23.26	3.95	NO	
USSTL_12	0	0.23420E-02	325330.6	4681836.0	192.0	4.25	23.26	3.95	NO	
USSTL_13	0	0.23420E-02	325380.5	4681833.0	192.0	4.25	23.26	3.95	NO	
USSTL_14	0	0.23420E-02	325430.4	4681830.0	192.0	4.25	23.26	3.95	NO	

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  USSTL_15      0   0.23420E-02  325480.3 4681827.0   192.0     4.25    23.26     3.95     NO


GROUP ID                                                SOURCE IDs


 ALL       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  , SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06,
SEVER_07, SEVER_08,

           SEVER_09, SEVER_10, SEVER_11, SEVER_12, SEVER_13, SEVER_14, SEVER_15, CONLV_01, CONLV_02, CONLV_03,
CONLV_04, CONLV_05,

           CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10, CONLV_11, CONLV_12, CONLV_13, CONLV_14, CONLV_15,
CONLV_16, CONLV_17,

           CONLV_18, NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09,
NORFK_10, NORFK_11,

           NORFK_12, NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21,
NORFK_22, NORFK_23,

           NORFK_24, NORFK_25, NORFK_26, NORFK_27, NORFK_28, NORFK_29, NORFK_30, NORFK_31, NORFK_32, NORFK_33,
NORFK_34, NORFK_35,

           NORFK_36, NORFK_37, NORFK_38, NORFK_39, NORFK_40, NORFK_41, NORFK_42, NORFK_43, NORFK_44, CONRV_01,
CONRV_02, CONRV_03,

           CONRV_04, CONRV_05, CONRV_06, CONRV_07, CONRV_08, CONRV_09, CONRV_10, CONRV_11, CONRV_12, CONRV_13,
CONRV_14, CONRV_15,

           CONRV_16, CONRV_17, CONRV_18, CONRV_19, CONRV_20, CONRV_21, CONRV_22, CONRV_23, CONRV_24, CONRV_25,
CONRV_26, DELRAY_1,

           DELRAY_2, DELRAY_3, DELRAY_4, DELRAY_5, DELRAY_6, DELRAY_7, USSTL_01, USSTL_02, USSTL_03, USSTL_04,
USSTL_05, USSTL_06,

           USSTL_07, USSTL_08, USSTL_09, USSTL_10, USSTL_11, USSTL_12, USSTL_13, USSTL_14, USSTL_15,


 CSX       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  ,


 SEVERSTA  SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06, SEVER_07, SEVER_08, SEVER_09, SEVER_10,
SEVER_11, SEVER_12,

           SEVER_13, SEVER_14, SEVER_15,


 CONLIVER  CONLV_01, CONLV_02, CONLV_03, CONLV_04, CONLV_05, CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10,
CONLV_11, CONLV_12,

           CONLV_13, CONLV_14, CONLV_15, CONLV_16, CONLV_17, CONLV_18,


 NORFOLK   NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09, NORFK_10,
NORFK_11, NORFK_12,

           NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21, NORFK_22,
NORFK_23, NORFK_24,


SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.92564 AT (  322805.00,  4685985.00

 CSX      1ST HIGHEST VALUE IS       0.90488 AT (  322805.00,  4685985.00

 SEVERSTA 1ST HIGHEST VALUE IS       0.00449 AT (  322805.00,  4685985.00

 CONLIVER 1ST HIGHEST VALUE IS       0.00381 AT (  322805.00,  4685985.00

 NORFOLK  1ST HIGHEST VALUE IS       0.00598 AT (  322805.00,  4685985.00

 CONRIVER 1ST HIGHEST VALUE IS       0.00227 AT (  322805.00,  4685985.00

 DELRAY   1ST HIGHEST VALUE IS       0.00055 AT (  322805.00,  4685985.00

 USSTEEL  1ST HIGHEST VALUE IS       0.00486 AT (  322805.00,  4685985.00
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2005 AERMOD SUMMARY – SWHS MONITOR LOCATION RAILYARD REDUCTIONS

*** AERMOD - VERSION 07026 *** *** DEARBORN MONITOR IMPACTS ***
04/29/08

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CSX_01	0	0.36060E-02	322524.0	4686057.0	192.0	4.25	23.26	3.95	NO	
CSX_02	0	0.36060E-02	322545.0	4686012.0	192.0	4.25	23.26	3.95	NO	
CSX_03	0	0.36060E-02	322566.0	4685966.0	192.0	4.25	23.26	3.95	NO	
CSX_04	0	0.36060E-02	322587.0	4685921.0	192.0	4.25	23.26	3.95	NO	
CSX_05	0	0.36060E-02	322607.9	4685876.0	192.0	4.25	23.26	3.95	NO	
CSX_06	0	0.36060E-02	322628.9	4685830.0	192.0	4.25	23.26	3.95	NO	
CSX_07	0	0.36060E-02	322649.9	4685785.0	192.0	4.25	23.26	3.95	NO	
CSX_08	0	0.36060E-02	322670.9	4685740.0	192.0	4.25	23.26	3.95	NO	
CSX_09	0	0.36060E-02	322691.9	4685694.0	192.0	4.25	23.26	3.95	NO	
CSX_10	0	0.36060E-02	322712.9	4685649.0	192.0	4.25	23.26	3.95	NO	
CSX_11	0	0.36060E-02	322733.9	4685603.0	192.0	4.25	23.26	3.95	NO	
CSX_12	0	0.36060E-02	322754.8	4685558.0	192.0	4.25	23.26	3.95	NO	
CSX_13	0	0.36060E-02	322775.8	4685513.0	192.0	4.25	23.26	3.95	NO	
CSX_14	0	0.36060E-02	322796.8	4685467.0	192.0	4.25	23.26	3.95	NO	
CSX_15	0	0.36060E-02	322817.8	4685422.0	192.0	4.25	23.26	3.95	NO	
CSX_16	0	0.36060E-02	322838.8	4685377.0	192.0	4.25	23.26	3.95	NO	
SEVER_01	0	0.29250E-03	321271.3	4686627.0	192.0	4.25	23.26	3.95	NO	
SEVER_02	0	0.29250E-03	321240.7	4686588.0	192.0	4.25	23.26	3.95	NO	
SEVER_03	0	0.29250E-03	321210.1	4686548.0	192.0	4.25	23.26	3.95	NO	
SEVER_04	0	0.29250E-03	321179.5	4686509.0	192.0	4.25	23.26	3.95	NO	
SEVER_05	0	0.29250E-03	321148.9	4686469.0	192.0	4.25	23.26	3.95	NO	
SEVER_06	0	0.29250E-03	321118.3	4686430.0	192.0	4.25	23.26	3.95	NO	
SEVER_07	0	0.29250E-03	321087.7	4686390.0	192.0	4.25	23.26	3.95	NO	
SEVER_08	0	0.29250E-03	321057.1	4686350.0	192.0	4.25	23.26	3.95	NO	
SEVER_09	0	0.29250E-03	321026.5	4686311.0	192.0	4.25	23.26	3.95	NO	
SEVER_10	0	0.29250E-03	320995.8	4686271.0	192.0	4.25	23.26	3.95	NO	
SEVER_11	0	0.29250E-03	320965.3	4686232.0	192.0	4.25	23.26	3.95	NO	
SEVER_12	0	0.29250E-03	320934.7	4686192.0	192.0	4.25	23.26	3.95	NO	
SEVER_13	0	0.29250E-03	320904.0	4686153.0	192.0	4.25	23.26	3.95	NO	
SEVER_14	0	0.29250E-03	320873.4	4686113.0	192.0	4.25	23.26	3.95	NO	
SEVER_15	0	0.29250E-03	320842.8	4686074.0	192.0	4.25	23.26	3.95	NO	
CONLV_01	0	0.73150E-03	324682.3	4687492.0	192.0	4.25	23.26	3.95	NO	
CONLV_02	0	0.73150E-03	324731.7	4687500.0	192.0	4.25	23.26	3.95	NO	
CONLV_03	0	0.73150E-03	324781.0	4687508.0	192.0	4.25	23.26	3.95	NO	
CONLV_04	0	0.73150E-03	324830.4	4687516.0	192.0	4.25	23.26	3.95	NO	
CONLV_05	0	0.73150E-03	324879.8	4687524.0	192.0	4.25	23.26	3.95	NO	
CONLV_06	0	0.73150E-03	324929.1	4687532.0	192.0	4.25	23.26	3.95	NO	
CONLV_07	0	0.73150E-03	324978.4	4687540.0	192.0	4.25	23.26	3.95	NO	
CONLV_08	0	0.73150E-03	325027.8	4687548.0	192.0	4.25	23.26	3.95	NO	
CONLV_09	0	0.73150E-03	325077.2	4687556.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CONLV_10	0	0.73150E-03	325126.5	4687564.0	192.0	4.25	23.26	3.95	NO	
CONLV_11	0	0.73150E-03	325175.9	4687572.0	192.0	4.25	23.26	3.95	NO	
CONLV_12	0	0.73150E-03	325225.2	4687580.0	192.0	4.25	23.26	3.95	NO	
CONLV_13	0	0.73150E-03	325274.6	4687588.0	192.0	4.25	23.26	3.95	NO	
CONLV_14	0	0.73150E-03	325323.9	4687596.0	192.0	4.25	23.26	3.95	NO	
CONLV_15	0	0.73150E-03	325373.3	4687604.0	192.0	4.25	23.26	3.95	NO	
CONLV_16	0	0.73150E-03	325422.7	4687612.0	192.0	4.25	23.26	3.95	NO	
CONLV_17	0	0.73150E-03	325472.0	4687620.0	192.0	4.25	23.26	3.95	NO	
CONLV_18	0	0.73150E-03	325521.4	4687628.0	192.0	4.25	23.26	3.95	NO	
NORFK_01	0	0.59770E-03	319338.3	4682375.0	192.0	4.25	23.26	3.95	NO	
NORFK_02	0	0.59770E-03	319386.9	4682387.0	192.0	4.25	23.26	3.95	NO	
NORFK_03	0	0.59770E-03	319435.4	4682399.0	192.0	4.25	23.26	3.95	NO	
NORFK_04	0	0.59770E-03	319484.0	4682411.0	192.0	4.25	23.26	3.95	NO	
NORFK_05	0	0.59770E-03	319532.5	4682423.0	192.0	4.25	23.26	3.95	NO	
NORFK_06	0	0.59770E-03	319581.1	4682435.0	192.0	4.25	23.26	3.95	NO	
NORFK_07	0	0.59770E-03	319629.6	4682447.0	192.0	4.25	23.26	3.95	NO	
NORFK_08	0	0.59770E-03	319678.2	4682459.0	192.0	4.25	23.26	3.95	NO	
NORFK_09	0	0.59770E-03	319726.8	4682471.0	192.0	4.25	23.26	3.95	NO	
NORFK_10	0	0.59770E-03	319775.3	4682483.0	192.0	4.25	23.26	3.95	NO	
NORFK_11	0	0.59770E-03	319823.8	4682495.0	192.0	4.25	23.26	3.95	NO	
NORFK_12	0	0.59770E-03	319872.4	4682507.0	192.0	4.25	23.26	3.95	NO	
NORFK_13	0	0.59770E-03	319921.0	4682518.0	192.0	4.25	23.26	3.95	NO	
NORFK_14	0	0.59770E-03	319969.5	4682530.0	192.0	4.25	23.26	3.95	NO	
NORFK_15	0	0.59770E-03	320018.1	4682542.0	192.0	4.25	23.26	3.95	NO	
NORFK_16	0	0.59770E-03	320066.6	4682554.0	192.0	4.25	23.26	3.95	NO	

NORFK_17	0	0.59770E-03	320115.2	4682566.0	192.0	4.25	23.26	3.95	NO
NORFK_18	0	0.59770E-03	320163.8	4682578.0	192.0	4.25	23.26	3.95	NO
NORFK_19	0	0.59770E-03	320212.3	4682590.0	192.0	4.25	23.26	3.95	NO
NORFK_20	0	0.59770E-03	320260.8	4682602.0	192.0	4.25	23.26	3.95	NO
NORFK_21	0	0.59770E-03	320309.4	4682614.0	192.0	4.25	23.26	3.95	NO
NORFK_22	0	0.59770E-03	320358.0	4682626.0	192.0	4.25	23.26	3.95	NO
NORFK_23	0	0.59770E-03	320406.5	4682638.0	192.0	4.25	23.26	3.95	NO
NORFK_24	0	0.59770E-03	320455.1	4682650.0	192.0	4.25	23.26	3.95	NO
NORFK_25	0	0.59770E-03	320503.6	4682662.0	192.0	4.25	23.26	3.95	NO
NORFK_26	0	0.59770E-03	320552.2	4682674.0	192.0	4.25	23.26	3.95	NO
NORFK_27	0	0.59770E-03	320600.7	4682686.0	192.0	4.25	23.26	3.95	NO
NORFK_28	0	0.59770E-03	320649.3	4682698.0	192.0	4.25	23.26	3.95	NO
NORFK_29	0	0.59770E-03	320697.8	4682709.0	192.0	4.25	23.26	3.95	NO
NORFK_30	0	0.59770E-03	320746.4	4682721.0	192.0	4.25	23.26	3.95	NO
NORFK_31	0	0.59770E-03	320794.9	4682733.0	192.0	4.25	23.26	3.95	NO

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
NORFK_32	0	0.59770E-03	320843.5	4682745.0	192.0	4.25	23.26	3.95	NO	
NORFK_33	0	0.59770E-03	320892.1	4682757.0	192.0	4.25	23.26	3.95	NO	
NORFK_34	0	0.59770E-03	320940.6	4682769.0	192.0	4.25	23.26	3.95	NO	
NORFK_35	0	0.59770E-03	320989.2	4682781.0	192.0	4.25	23.26	3.95	NO	
NORFK_36	0	0.59770E-03	321037.7	4682793.0	192.0	4.25	23.26	3.95	NO	
NORFK_37	0	0.59770E-03	321086.3	4682805.0	192.0	4.25	23.26	3.95	NO	
NORFK_38	0	0.59770E-03	321134.8	4682817.0	192.0	4.25	23.26	3.95	NO	
NORFK_39	0	0.59770E-03	321183.4	4682829.0	192.0	4.25	23.26	3.95	NO	
NORFK_40	0	0.59770E-03	321231.9	4682841.0	192.0	4.25	23.26	3.95	NO	
NORFK_41	0	0.59770E-03	321280.5	4682853.0	192.0	4.25	23.26	3.95	NO	
NORFK_42	0	0.59770E-03	321329.1	4682865.0	192.0	4.25	23.26	3.95	NO	
NORFK_43	0	0.59770E-03	321377.6	4682877.0	192.0	4.25	23.26	3.95	NO	
NORFK_44	0	0.59770E-03	321426.2	4682888.0	192.0	4.25	23.26	3.95	NO	
CONRV_01	0	0.33760E-03	323622.3	4682108.0	192.0	4.25	23.26	3.95	NO	
CONRV_02	0	0.33760E-03	323608.6	4682060.0	192.0	4.25	23.26	3.95	NO	
CONRV_03	0	0.33760E-03	323594.9	4682012.0	192.0	4.25	23.26	3.95	NO	
CONRV_04	0	0.33760E-03	323581.2	4681964.0	192.0	4.25	23.26	3.95	NO	
CONRV_05	0	0.33760E-03	323567.5	4681916.0	192.0	4.25	23.26	3.95	NO	
CONRV_06	0	0.33760E-03	323553.8	4681868.0	192.0	4.25	23.26	3.95	NO	
CONRV_07	0	0.33760E-03	323540.1	4681820.0	192.0	4.25	23.26	3.95	NO	
CONRV_08	0	0.33760E-03	323526.4	4681772.0	192.0	4.25	23.26	3.95	NO	
CONRV_09	0	0.33760E-03	323512.7	4681724.0	192.0	4.25	23.26	3.95	NO	
CONRV_10	0	0.33760E-03	323498.9	4681675.0	192.0	4.25	23.26	3.95	NO	
CONRV_11	0	0.33760E-03	323485.3	4681627.0	192.0	4.25	23.26	3.95	NO	
CONRV_12	0	0.33760E-03	323471.5	4681579.0	192.0	4.25	23.26	3.95	NO	
CONRV_13	0	0.33760E-03	323457.8	4681531.0	192.0	4.25	23.26	3.95	NO	
CONRV_14	0	0.33760E-03	323444.1	4681483.0	192.0	4.25	23.26	3.95	NO	
CONRV_15	0	0.33760E-03	323430.4	4681435.0	192.0	4.25	23.26	3.95	NO	
CONRV_16	0	0.33760E-03	323416.7	4681387.0	192.0	4.25	23.26	3.95	NO	
CONRV_17	0	0.33760E-03	323403.0	4681339.0	192.0	4.25	23.26	3.95	NO	
CONRV_18	0	0.33760E-03	323389.3	4681291.0	192.0	4.25	23.26	3.95	NO	
CONRV_19	0	0.33760E-03	323375.6	4681243.0	192.0	4.25	23.26	3.95	NO	
CONRV_20	0	0.33760E-03	323361.9	4681195.0	192.0	4.25	23.26	3.95	NO	
CONRV_21	0	0.33760E-03	323348.2	4681147.0	192.0	4.25	23.26	3.95	NO	
CONRV_22	0	0.33760E-03	323334.5	4681098.0	192.0	4.25	23.26	3.95	NO	
CONRV_23	0	0.33760E-03	323320.8	4681050.0	192.0	4.25	23.26	3.95	NO	
CONRV_24	0	0.33760E-03	323307.0	4681002.0	192.0	4.25	23.26	3.95	NO	
CONRV_25	0	0.33760E-03	323293.3	4680954.0	192.0	4.25	23.26	3.95	NO	
CONRV_26	0	0.33760E-03	323279.6	4680906.0	192.0	4.25	23.26	3.95	NO	
DELRAY_1	0	0.62690E-03	325953.7	4683583.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
DELRAY_2	0	0.62690E-03	325931.9	4683538.0	192.0	4.25	23.26	3.95	NO	
DELRAY_3	0	0.62690E-03	325910.2	4683493.0	192.0	4.25	23.26	3.95	NO	
DELRAY_4	0	0.62690E-03	325888.4	4683448.0	192.0	4.25	23.26	3.95	NO	
DELRAY_5	0	0.62690E-03	325866.6	4683403.0	192.0	4.25	23.26	3.95	NO	
DELRAY_6	0	0.62690E-03	325844.8	4683358.0	192.0	4.25	23.26	3.95	NO	
DELRAY_7	0	0.62690E-03	325823.1	4683313.0	192.0	4.25	23.26	3.95	NO	
USSTL_01	0	0.23420E-02	323661.1	4679390.0	192.0	4.25	23.26	3.95	NO	
USSTL_02	0	0.23420E-02	323690.8	4679430.0	192.0	4.25	23.26	3.95	NO	
USSTL_03	0	0.23420E-02	323720.5	4679471.0	192.0	4.25	23.26	3.95	NO	
USSTL_04	0	0.23420E-02	323750.3	4679511.0	192.0	4.25	23.26	3.95	NO	
USSTL_05	0	0.23420E-02	323780.0	4679551.0	192.0	4.25	23.26	3.95	NO	
USSTL_06	0	0.23420E-02	323809.7	4679591.0	192.0	4.25	23.26	3.95	NO	
USSTL_07	0	0.23420E-02	323839.4	4679631.0	192.0	4.25	23.26	3.95	NO	
USSTL_08	0	0.23420E-02	323869.2	4679672.0	192.0	4.25	23.26	3.95	NO	
USSTL_09	0	0.23420E-02	325180.8	4681844.0	192.0	4.25	23.26	3.95	NO	
USSTL_10	0	0.23420E-02	325230.7	4681841.0	192.0	4.25	23.26	3.95	NO	
USSTL_11	0	0.23420E-02	325280.7	4681838.0	192.0	4.25	23.26	3.95	NO	
USSTL_12	0	0.23420E-02	325330.6	4681836.0	192.0	4.25	23.26	3.95	NO	
USSTL_13	0	0.23420E-02	325380.5	4681833.0	192.0	4.25	23.26	3.95	NO	
USSTL_14	0	0.23420E-02	325430.4	4681830.0	192.0	4.25	23.26	3.95	NO	

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  USSTL_15      0   0.23420E-02  325480.3 4681827.0   192.0     4.25    23.26     3.95     NO


GROUP ID                                                SOURCE IDs


 ALL       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  , SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06,
SEVER_07, SEVER_08,

           SEVER_09, SEVER_10, SEVER_11, SEVER_12, SEVER_13, SEVER_14, SEVER_15, CONLV_01, CONLV_02, CONLV_03,
CONLV_04, CONLV_05,

           CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10, CONLV_11, CONLV_12, CONLV_13, CONLV_14, CONLV_15,
CONLV_16, CONLV_17,

           CONLV_18, NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09,
NORFK_10, NORFK_11,

           NORFK_12, NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21,
NORFK_22, NORFK_23,

           NORFK_24, NORFK_25, NORFK_26, NORFK_27, NORFK_28, NORFK_29, NORFK_30, NORFK_31, NORFK_32, NORFK_33,
NORFK_34, NORFK_35,

           NORFK_36, NORFK_37, NORFK_38, NORFK_39, NORFK_40, NORFK_41, NORFK_42, NORFK_43, NORFK_44, CONRV_01,
CONRV_02, CONRV_03,

           CONRV_04, CONRV_05, CONRV_06, CONRV_07, CONRV_08, CONRV_09, CONRV_10, CONRV_11, CONRV_12, CONRV_13,
CONRV_14, CONRV_15,

           CONRV_16, CONRV_17, CONRV_18, CONRV_19, CONRV_20, CONRV_21, CONRV_22, CONRV_23, CONRV_24, CONRV_25,
CONRV_26, DELRAY_1,

           DELRAY_2, DELRAY_3, DELRAY_4, DELRAY_5, DELRAY_6, DELRAY_7, USSTL_01, USSTL_02, USSTL_03, USSTL_04,
USSTL_05, USSTL_06,

           USSTL_07, USSTL_08, USSTL_09, USSTL_10, USSTL_11, USSTL_12, USSTL_13, USSTL_14, USSTL_15,


 CSX       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  ,


 SEVERSTA  SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06, SEVER_07, SEVER_08, SEVER_09, SEVER_10,
SEVER_11, SEVER_12,

           SEVER_13, SEVER_14, SEVER_15,


 CONLIVER  CONLV_01, CONLV_02, CONLV_03, CONLV_04, CONLV_05, CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10,
CONLV_11, CONLV_12,

           CONLV_13, CONLV_14, CONLV_15, CONLV_16, CONLV_17, CONLV_18,


 NORFOLK   NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09, NORFK_10,
NORFK_11, NORFK_12,

           NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21, NORFK_22,
NORFK_23, NORFK_24,


SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.04822 AT (  326344.00,  4685318.00

 CSX      1ST HIGHEST VALUE IS       0.01734 AT (  326344.00,  4685318.00

 SEVERSTA 1ST HIGHEST VALUE IS       0.00076 AT (  326344.00,  4685318.00

 CONLIVER 1ST HIGHEST VALUE IS       0.00598 AT (  326344.00,  4685318.00

 NORFOLK  1ST HIGHEST VALUE IS       0.00248 AT (  326344.00,  4685318.00

 CONRIVER 1ST HIGHEST VALUE IS       0.00117 AT (  326344.00,  4685318.00

 DELRAY   1ST HIGHEST VALUE IS       0.00730 AT (  326344.00,  4685318.00

 USSTEEL  1ST HIGHEST VALUE IS       0.01331 AT (  326344.00,  4685318.00
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2005 AERMOD SUMMARY – WYANDOTTE MONITOR LOCATION
RAILYARD REDUCTIONS

*** AERMOD - VERSION 07026 *** *** DEARBORN MONITOR IMPACTS ***
04/29/08

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CSX_01	0	0.36060E-02	322524.0	4686057.0	192.0	4.25	23.26	3.95	NO	
CSX_02	0	0.36060E-02	322545.0	4686012.0	192.0	4.25	23.26	3.95	NO	
CSX_03	0	0.36060E-02	322566.0	4685966.0	192.0	4.25	23.26	3.95	NO	
CSX_04	0	0.36060E-02	322587.0	4685921.0	192.0	4.25	23.26	3.95	NO	
CSX_05	0	0.36060E-02	322607.9	4685876.0	192.0	4.25	23.26	3.95	NO	
CSX_06	0	0.36060E-02	322628.9	4685830.0	192.0	4.25	23.26	3.95	NO	
CSX_07	0	0.36060E-02	322649.9	4685785.0	192.0	4.25	23.26	3.95	NO	
CSX_08	0	0.36060E-02	322670.9	4685740.0	192.0	4.25	23.26	3.95	NO	
CSX_09	0	0.36060E-02	322691.9	4685694.0	192.0	4.25	23.26	3.95	NO	
CSX_10	0	0.36060E-02	322712.9	4685649.0	192.0	4.25	23.26	3.95	NO	
CSX_11	0	0.36060E-02	322733.9	4685603.0	192.0	4.25	23.26	3.95	NO	
CSX_12	0	0.36060E-02	322754.8	4685558.0	192.0	4.25	23.26	3.95	NO	
CSX_13	0	0.36060E-02	322775.8	4685513.0	192.0	4.25	23.26	3.95	NO	
CSX_14	0	0.36060E-02	322796.8	4685467.0	192.0	4.25	23.26	3.95	NO	
CSX_15	0	0.36060E-02	322817.8	4685422.0	192.0	4.25	23.26	3.95	NO	
CSX_16	0	0.36060E-02	322838.8	4685377.0	192.0	4.25	23.26	3.95	NO	
SEVER_01	0	0.29250E-03	321271.3	4686627.0	192.0	4.25	23.26	3.95	NO	
SEVER_02	0	0.29250E-03	321240.7	4686588.0	192.0	4.25	23.26	3.95	NO	
SEVER_03	0	0.29250E-03	321210.1	4686548.0	192.0	4.25	23.26	3.95	NO	
SEVER_04	0	0.29250E-03	321179.5	4686509.0	192.0	4.25	23.26	3.95	NO	
SEVER_05	0	0.29250E-03	321148.9	4686469.0	192.0	4.25	23.26	3.95	NO	
SEVER_06	0	0.29250E-03	321118.3	4686430.0	192.0	4.25	23.26	3.95	NO	
SEVER_07	0	0.29250E-03	321087.7	4686390.0	192.0	4.25	23.26	3.95	NO	
SEVER_08	0	0.29250E-03	321057.1	4686350.0	192.0	4.25	23.26	3.95	NO	
SEVER_09	0	0.29250E-03	321026.5	4686311.0	192.0	4.25	23.26	3.95	NO	
SEVER_10	0	0.29250E-03	320995.8	4686271.0	192.0	4.25	23.26	3.95	NO	
SEVER_11	0	0.29250E-03	320965.3	4686232.0	192.0	4.25	23.26	3.95	NO	
SEVER_12	0	0.29250E-03	320934.7	4686192.0	192.0	4.25	23.26	3.95	NO	
SEVER_13	0	0.29250E-03	320904.0	4686153.0	192.0	4.25	23.26	3.95	NO	
SEVER_14	0	0.29250E-03	320873.4	4686113.0	192.0	4.25	23.26	3.95	NO	
SEVER_15	0	0.29250E-03	320842.8	4686074.0	192.0	4.25	23.26	3.95	NO	
CONLV_01	0	0.73150E-03	324682.3	4687492.0	192.0	4.25	23.26	3.95	NO	
CONLV_02	0	0.73150E-03	324731.7	4687500.0	192.0	4.25	23.26	3.95	NO	
CONLV_03	0	0.73150E-03	324781.0	4687508.0	192.0	4.25	23.26	3.95	NO	
CONLV_04	0	0.73150E-03	324830.4	4687516.0	192.0	4.25	23.26	3.95	NO	
CONLV_05	0	0.73150E-03	324879.8	4687524.0	192.0	4.25	23.26	3.95	NO	
CONLV_06	0	0.73150E-03	324929.1	4687532.0	192.0	4.25	23.26	3.95	NO	
CONLV_07	0	0.73150E-03	324978.4	4687540.0	192.0	4.25	23.26	3.95	NO	
CONLV_08	0	0.73150E-03	325027.8	4687548.0	192.0	4.25	23.26	3.95	NO	
CONLV_09	0	0.73150E-03	325077.2	4687556.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
CONLV_10	0	0.73150E-03	325126.5	4687564.0	192.0	4.25	23.26	3.95	NO	
CONLV_11	0	0.73150E-03	325175.9	4687572.0	192.0	4.25	23.26	3.95	NO	
CONLV_12	0	0.73150E-03	325225.2	4687580.0	192.0	4.25	23.26	3.95	NO	
CONLV_13	0	0.73150E-03	325274.6	4687588.0	192.0	4.25	23.26	3.95	NO	
CONLV_14	0	0.73150E-03	325323.9	4687596.0	192.0	4.25	23.26	3.95	NO	
CONLV_15	0	0.73150E-03	325373.3	4687604.0	192.0	4.25	23.26	3.95	NO	
CONLV_16	0	0.73150E-03	325422.7	4687612.0	192.0	4.25	23.26	3.95	NO	
CONLV_17	0	0.73150E-03	325472.0	4687620.0	192.0	4.25	23.26	3.95	NO	
CONLV_18	0	0.73150E-03	325521.4	4687628.0	192.0	4.25	23.26	3.95	NO	
NORFK_01	0	0.59770E-03	319338.3	4682375.0	192.0	4.25	23.26	3.95	NO	
NORFK_02	0	0.59770E-03	319386.9	4682387.0	192.0	4.25	23.26	3.95	NO	
NORFK_03	0	0.59770E-03	319435.4	4682399.0	192.0	4.25	23.26	3.95	NO	
NORFK_04	0	0.59770E-03	319484.0	4682411.0	192.0	4.25	23.26	3.95	NO	
NORFK_05	0	0.59770E-03	319532.5	4682423.0	192.0	4.25	23.26	3.95	NO	
NORFK_06	0	0.59770E-03	319581.1	4682435.0	192.0	4.25	23.26	3.95	NO	
NORFK_07	0	0.59770E-03	319629.6	4682447.0	192.0	4.25	23.26	3.95	NO	
NORFK_08	0	0.59770E-03	319678.2	4682459.0	192.0	4.25	23.26	3.95	NO	
NORFK_09	0	0.59770E-03	319726.8	4682471.0	192.0	4.25	23.26	3.95	NO	
NORFK_10	0	0.59770E-03	319775.3	4682483.0	192.0	4.25	23.26	3.95	NO	
NORFK_11	0	0.59770E-03	319823.8	4682495.0	192.0	4.25	23.26	3.95	NO	
NORFK_12	0	0.59770E-03	319872.4	4682507.0	192.0	4.25	23.26	3.95	NO	
NORFK_13	0	0.59770E-03	319921.0	4682518.0	192.0	4.25	23.26	3.95	NO	
NORFK_14	0	0.59770E-03	319969.5	4682530.0	192.0	4.25	23.26	3.95	NO	

NORFK_15	0	0.59770E-03	320018.1	4682542.0	192.0	4.25	23.26	3.95	NO
NORFK_16	0	0.59770E-03	320066.6	4682554.0	192.0	4.25	23.26	3.95	NO
NORFK_17	0	0.59770E-03	320115.2	4682566.0	192.0	4.25	23.26	3.95	NO
NORFK_18	0	0.59770E-03	320163.8	4682578.0	192.0	4.25	23.26	3.95	NO
NORFK_19	0	0.59770E-03	320212.3	4682590.0	192.0	4.25	23.26	3.95	NO
NORFK_20	0	0.59770E-03	320260.8	4682602.0	192.0	4.25	23.26	3.95	NO
NORFK_21	0	0.59770E-03	320309.4	4682614.0	192.0	4.25	23.26	3.95	NO
NORFK_22	0	0.59770E-03	320358.0	4682626.0	192.0	4.25	23.26	3.95	NO
NORFK_23	0	0.59770E-03	320406.5	4682638.0	192.0	4.25	23.26	3.95	NO
NORFK_24	0	0.59770E-03	320455.1	4682650.0	192.0	4.25	23.26	3.95	NO
NORFK_25	0	0.59770E-03	320503.6	4682662.0	192.0	4.25	23.26	3.95	NO
NORFK_26	0	0.59770E-03	320552.2	4682674.0	192.0	4.25	23.26	3.95	NO
NORFK_27	0	0.59770E-03	320600.7	4682686.0	192.0	4.25	23.26	3.95	NO
NORFK_28	0	0.59770E-03	320649.3	4682698.0	192.0	4.25	23.26	3.95	NO
NORFK_29	0	0.59770E-03	320697.8	4682709.0	192.0	4.25	23.26	3.95	NO
NORFK_30	0	0.59770E-03	320746.4	4682721.0	192.0	4.25	23.26	3.95	NO
NORFK_31	0	0.59770E-03	320794.9	4682733.0	192.0	4.25	23.26	3.95	NO

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
NORFK_32	0	0.59770E-03	320843.5	4682745.0	192.0	4.25	23.26	3.95	NO	
NORFK_33	0	0.59770E-03	320892.1	4682757.0	192.0	4.25	23.26	3.95	NO	
NORFK_34	0	0.59770E-03	320940.6	4682769.0	192.0	4.25	23.26	3.95	NO	
NORFK_35	0	0.59770E-03	320989.2	4682781.0	192.0	4.25	23.26	3.95	NO	
NORFK_36	0	0.59770E-03	321037.7	4682793.0	192.0	4.25	23.26	3.95	NO	
NORFK_37	0	0.59770E-03	321086.3	4682805.0	192.0	4.25	23.26	3.95	NO	
NORFK_38	0	0.59770E-03	321134.8	4682817.0	192.0	4.25	23.26	3.95	NO	
NORFK_39	0	0.59770E-03	321183.4	4682829.0	192.0	4.25	23.26	3.95	NO	
NORFK_40	0	0.59770E-03	321231.9	4682841.0	192.0	4.25	23.26	3.95	NO	
NORFK_41	0	0.59770E-03	321280.5	4682853.0	192.0	4.25	23.26	3.95	NO	
NORFK_42	0	0.59770E-03	321329.1	4682865.0	192.0	4.25	23.26	3.95	NO	
NORFK_43	0	0.59770E-03	321377.6	4682877.0	192.0	4.25	23.26	3.95	NO	
NORFK_44	0	0.59770E-03	321426.2	4682888.0	192.0	4.25	23.26	3.95	NO	
CONRV_01	0	0.33760E-03	323622.3	4682108.0	192.0	4.25	23.26	3.95	NO	
CONRV_02	0	0.33760E-03	323608.6	4682060.0	192.0	4.25	23.26	3.95	NO	
CONRV_03	0	0.33760E-03	323594.9	4682012.0	192.0	4.25	23.26	3.95	NO	
CONRV_04	0	0.33760E-03	323581.2	4681964.0	192.0	4.25	23.26	3.95	NO	
CONRV_05	0	0.33760E-03	323567.5	4681916.0	192.0	4.25	23.26	3.95	NO	
CONRV_06	0	0.33760E-03	323553.8	4681868.0	192.0	4.25	23.26	3.95	NO	
CONRV_07	0	0.33760E-03	323540.1	4681820.0	192.0	4.25	23.26	3.95	NO	
CONRV_08	0	0.33760E-03	323526.4	4681772.0	192.0	4.25	23.26	3.95	NO	
CONRV_09	0	0.33760E-03	323512.7	4681724.0	192.0	4.25	23.26	3.95	NO	
CONRV_10	0	0.33760E-03	323498.9	4681675.0	192.0	4.25	23.26	3.95	NO	
CONRV_11	0	0.33760E-03	323485.3	4681627.0	192.0	4.25	23.26	3.95	NO	
CONRV_12	0	0.33760E-03	323471.5	4681579.0	192.0	4.25	23.26	3.95	NO	
CONRV_13	0	0.33760E-03	323457.8	4681531.0	192.0	4.25	23.26	3.95	NO	
CONRV_14	0	0.33760E-03	323444.1	4681483.0	192.0	4.25	23.26	3.95	NO	
CONRV_15	0	0.33760E-03	323430.4	4681435.0	192.0	4.25	23.26	3.95	NO	
CONRV_16	0	0.33760E-03	323416.7	4681387.0	192.0	4.25	23.26	3.95	NO	
CONRV_17	0	0.33760E-03	323403.0	4681339.0	192.0	4.25	23.26	3.95	NO	
CONRV_18	0	0.33760E-03	323389.3	4681291.0	192.0	4.25	23.26	3.95	NO	
CONRV_19	0	0.33760E-03	323375.6	4681243.0	192.0	4.25	23.26	3.95	NO	
CONRV_20	0	0.33760E-03	323361.9	4681195.0	192.0	4.25	23.26	3.95	NO	
CONRV_21	0	0.33760E-03	323348.2	4681147.0	192.0	4.25	23.26	3.95	NO	
CONRV_22	0	0.33760E-03	323334.5	4681098.0	192.0	4.25	23.26	3.95	NO	
CONRV_23	0	0.33760E-03	323320.8	4681050.0	192.0	4.25	23.26	3.95	NO	
CONRV_24	0	0.33760E-03	323307.0	4681002.0	192.0	4.25	23.26	3.95	NO	
CONRV_25	0	0.33760E-03	323293.3	4680954.0	192.0	4.25	23.26	3.95	NO	
CONRV_26	0	0.33760E-03	323279.6	4680906.0	192.0	4.25	23.26	3.95	NO	
DELRAY_1	0	0.62690E-03	325953.7	4683583.0	192.0	4.25	23.26	3.95	NO	

*** VOLUME SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	INIT. SY (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
DELRAY_2	0	0.62690E-03	325931.9	4683538.0	192.0	4.25	23.26	3.95	NO	
DELRAY_3	0	0.62690E-03	325910.2	4683493.0	192.0	4.25	23.26	3.95	NO	
DELRAY_4	0	0.62690E-03	325888.4	4683448.0	192.0	4.25	23.26	3.95	NO	
DELRAY_5	0	0.62690E-03	325866.6	4683403.0	192.0	4.25	23.26	3.95	NO	
DELRAY_6	0	0.62690E-03	325844.8	4683358.0	192.0	4.25	23.26	3.95	NO	
DELRAY_7	0	0.62690E-03	325823.1	4683313.0	192.0	4.25	23.26	3.95	NO	
USSTL_01	0	0.23420E-02	323661.1	4679390.0	192.0	4.25	23.26	3.95	NO	
USSTL_02	0	0.23420E-02	323690.8	4679430.0	192.0	4.25	23.26	3.95	NO	
USSTL_03	0	0.23420E-02	323720.5	4679471.0	192.0	4.25	23.26	3.95	NO	
USSTL_04	0	0.23420E-02	323750.3	4679511.0	192.0	4.25	23.26	3.95	NO	
USSTL_05	0	0.23420E-02	323780.0	4679551.0	192.0	4.25	23.26	3.95	NO	
USSTL_06	0	0.23420E-02	323809.7	4679591.0	192.0	4.25	23.26	3.95	NO	
USSTL_07	0	0.23420E-02	323839.4	4679631.0	192.0	4.25	23.26	3.95	NO	
USSTL_08	0	0.23420E-02	323869.2	4679672.0	192.0	4.25	23.26	3.95	NO	
USSTL_09	0	0.23420E-02	325180.8	4681844.0	192.0	4.25	23.26	3.95	NO	
USSTL_10	0	0.23420E-02	325230.7	4681841.0	192.0	4.25	23.26	3.95	NO	
USSTL_11	0	0.23420E-02	325280.7	4681838.0	192.0	4.25	23.26	3.95	NO	
USSTL_12	0	0.23420E-02	325330.6	4681836.0	192.0	4.25	23.26	3.95	NO	

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  USSTL_13      0   0.23420E-02  325380.5 4681833.0   192.0     4.25    23.26     3.95     NO
  USSTL_14      0   0.23420E-02  325430.4 4681830.0   192.0     4.25    23.26     3.95     NO
  USSTL_15      0   0.23420E-02  325480.3 4681827.0   192.0     4.25    23.26     3.95     NO


GROUP ID                                                SOURCE IDs


 ALL       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  , SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06,
SEVER_07, SEVER_08,

           SEVER_09, SEVER_10, SEVER_11, SEVER_12, SEVER_13, SEVER_14, SEVER_15, CONLV_01, CONLV_02, CONLV_03,
CONLV_04, CONLV_05,

           CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10, CONLV_11, CONLV_12, CONLV_13, CONLV_14, CONLV_15,
CONLV_16, CONLV_17,

           CONLV_18, NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09,
NORFK_10, NORFK_11,

           NORFK_12, NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21,
NORFK_22, NORFK_23,

           NORFK_24, NORFK_25, NORFK_26, NORFK_27, NORFK_28, NORFK_29, NORFK_30, NORFK_31, NORFK_32, NORFK_33,
NORFK_34, NORFK_35,

           NORFK_36, NORFK_37, NORFK_38, NORFK_39, NORFK_40, NORFK_41, NORFK_42, NORFK_43, NORFK_44, CONRV_01,
CONRV_02, CONRV_03,

           CONRV_04, CONRV_05, CONRV_06, CONRV_07, CONRV_08, CONRV_09, CONRV_10, CONRV_11, CONRV_12, CONRV_13,
CONRV_14, CONRV_15,

           CONRV_16, CONRV_17, CONRV_18, CONRV_19, CONRV_20, CONRV_21, CONRV_22, CONRV_23, CONRV_24, CONRV_25,
CONRV_26, DELRAY_1,

           DELRAY_2, DELRAY_3, DELRAY_4, DELRAY_5, DELRAY_6, DELRAY_7, USSTL_01, USSTL_02, USSTL_03, USSTL_04,
USSTL_05, USSTL_06,

           USSTL_07, USSTL_08, USSTL_09, USSTL_10, USSTL_11, USSTL_12, USSTL_13, USSTL_14, USSTL_15,


 CSX       CSX_01  , CSX_02  , CSX_03  , CSX_04  , CSX_05  , CSX_06  , CSX_07  , CSX_08  , CSX_09  , CSX_10  , CSX_11
, CSX_12  ,

           CSX_13  , CSX_14  , CSX_15  , CSX_16  ,


 SEVERSTA  SEVER_01, SEVER_02, SEVER_03, SEVER_04, SEVER_05, SEVER_06, SEVER_07, SEVER_08, SEVER_09, SEVER_10,
SEVER_11, SEVER_12,

           SEVER_13, SEVER_14, SEVER_15,


 CONLIVER  CONLV_01, CONLV_02, CONLV_03, CONLV_04, CONLV_05, CONLV_06, CONLV_07, CONLV_08, CONLV_09, CONLV_10,
CONLV_11, CONLV_12,

           CONLV_13, CONLV_14, CONLV_15, CONLV_16, CONLV_17, CONLV_18,


 NORFOLK   NORFK_01, NORFK_02, NORFK_03, NORFK_04, NORFK_05, NORFK_06, NORFK_07, NORFK_08, NORFK_09, NORFK_10,
NORFK_11, NORFK_12,

           NORFK_13, NORFK_14, NORFK_15, NORFK_16, NORFK_17, NORFK_18, NORFK_19, NORFK_20, NORFK_21, NORFK_22,
NORFK_23, NORFK_24,


SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***

 ALL      1ST HIGHEST VALUE IS       0.04822 AT (  326344.00,  4685318.00

 CSX      1ST HIGHEST VALUE IS       0.01734 AT (  326344.00,  4685318.00

 SEVERSTA 1ST HIGHEST VALUE IS       0.00076 AT (  326344.00,  4685318.00

 CONLIVER 1ST HIGHEST VALUE IS       0.00598 AT (  326344.00,  4685318.00

 NORFOLK  1ST HIGHEST VALUE IS       0.00248 AT (  326344.00,  4685318.00

 CONRIVER 1ST HIGHEST VALUE IS       0.00117 AT (  326344.00,  4685318.00

 DELRAY   1ST HIGHEST VALUE IS       0.00730 AT (  326344.00,  4685318.00

 USSTEEL  1ST HIGHEST VALUE IS       0.01331 AT (  326344.00,  4685318.00
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Appendix I

A CONCEPTUAL MODEL FOR AMBIENT FINE PARTICULATE MATTER OVER SOUTHEAST MICHIGAN HIGH CONCENTRATION DAYS

SUPPORT DOCUMENTATION FOR THE FINE PARTICULATE SIP

May 2008

A CONCEPTUAL MODEL FOR AMBIENT FINE PARTICULATE MATTER OVER SOUTHEAST MICHIGAN: HIGH CONCENTRATION DAYS

Revision 0.2 (Draft Final Report)
April 23, 2008

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A CONCEPTUAL MODEL FOR AMBIENT FINE PARTICULATE MATTER OVER SOUTHEAST MICHIGAN: HIGH CONCENTRATION DAYS

Revision 0.2 (Draft Final Report); April 23, 2008

Prepared by Jay R. Turner*, Washington University in St. Louis
Prepared for Southeast Michigan Council of Governments (SEMCOG)

EXECUTIVE SUMMARY

In 2006, the USEPA promulgated revisions to the National Ambient Air Quality Standard (NAAQS) for particulate matter (PM) which tightened the 24-hour (daily) $PM_{2.5}$ standard from 65 μg/m^3 to 35 μg/m^3. This revision profoundly increased the frequency of exceedance days observed in Southeast Michigan with fourteen of the fifteen compliance monitors violating the standard for the period 2004-2006. An understanding of the drivers for high $PM_{2.5}$ days is needed to support the development of effective controls strategies; this study seeks to provide insights into such drivers.

At most sites in Southeast Michigan, exceedances occur predominantly – and in some cases exclusively – on days when the entire network is exhibiting high PM. For thirteen of the fifteen monitors, at least 85% of exceedances from 1999 to 2006 occurred on days when the entire network was exhibiting high PM. Drivers for network-wide high PM are regional transport, poor atmospheric ventilation across the network, or both of these conditions. Two monitors in particular – Dearborn and Wyandotte – frequently had exceedances on days when the entire network was not exhibiting high PM with 38% of the Dearborn exceedances and 27% of the Wyandotte exceedances occurring on such days. On these days, these sites are significantly influenced by nearby emission sources. Dearborn continues to be influenced by nearby emission sources which drive exceedances (or near exceedances) on days when the network-wide base concentration is as much as 15 μg/m^3 below the standard, although the frequency of such days appears to be decreasing. In contrast, at Wyandotte all of the days for which nearby emission sources were disproportionately contributing to exceedances (or near exceedances) of the standard were prior to 2004. At those sites not significantly impacted by plumes from nearby emission sources, high PM days are most often observed when the area is experiencing a multiday high PM episode.

Seasonal variations in surface winds can explain the seasonal differences in frequency of site-specific high PM days between sites in the greater Wayne County area. Sites such as Allen Park, which are relatively free of impacts from nearby sources, exhibit similar seasonal behavior with high PM days most frequent in the summer followed by the winter. The monthly distribution of high PM days is distorted for sites with significant nearby emission sources since there is a strong seasonality to the surface winds distributions. For example, Dearborn has as many high PM days in the winter as in the summer, with the winter season having a stronger contribution from nearby sources located to the southwest of the site.

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Network-wide high PM days have disproportionately high contributions from the major ions (sulfate, nitrate, and ammonium) compared to other days. Summertime events are dominated by sulfate and wintertime events are dominated by ammonium nitrate. However these so-called high nitrate days typically have ammonium sulfate concentrations that are at least 50% of the ammonium nitrate concentration. The role of sulfate on such days should not be overlooked when considering the impact of SO_2-based regional control strategies. In general, network-wide PM base concentrations above ~20 $\mu g/m^3$ tend to be disproportionately influenced by major ion contributions and are indicative of a disproportionately high influence from regional sources. On network-wide high PM days the sulfate and nitrate concentrations are typically several times higher than the corresponding monthly median concentrations. In contrast, EC is on average only 1.3 times higher. This pattern suggests that network-wide high PM days are primarily influenced by regional transport and are to a lesser extent influenced by increased levels of urban-scale emissions arising from poor atmospheric ventilation. As previously stated, emission sources near the monitoring sites can still exert significant plume impacts regardless of the network-wide PM behavior driven by regional and urban-scale contributions.

Many network-wide high PM days coincide with high nitrate, and in some cases there is substantial variability in PM mass concentration across the network on these days. It is important to determine whether the variability is real or a measurement artifact, because these days can influence the site-specific design values and in general can explain many of the exceedingly high PM levels observed at certain sites that otherwise do not appear to be disproportionately impacted by nearby local emission source plumes on high PM days.

A conceptual model for fine PM over central Southeast Michigan includes four elements. The largest contributor to annual average PM is regionally transported material that is temporally varying but spatially homogeneous over the domain (indeed, this defines the spatial extent of the domain for the conceptual model which in this case excludes the distant sites such as Luna Pier and Port Huron). On some days, regionally transported PM contributions can be sufficiently high to cause exceedances of the daily standard when coupled with average contributions from urban- and finer-scale emission sources and, in relatively rare cases, the regionally transported PM alone can cause exceedances of the daily standard. Urban-scale emission sources (mobile, area, and point sources) create a spatial PM gradient across central Southeast Michigan. For winds from a fixed direction, these contributions create an “urban plume” with decreasing impacts with increasing distance from the zone of highest emissions activity. The spatial gradients can be clearly discerned when binning data from days with common wind patterns and become smeared, to some extent, when averaging over periods with varying wind patterns. At many sites (e.g., Linwood, East 7 Mile) a PM plume emanating from the Detroit commercial / industrial zone, which is nominally Dearborn and areas to its southeast towards the Detroit River, including Zug Island, can be distinguished from the aforementioned urban plume. At sites further downwind, such as New Haven, these two plumes have essentially merged into a single urban plume. Average impacts from these plumes depend on the monitoring site location relative to the Detroit population and commercial/industrial core zones and the frequency that winds from these zones transport the plumes to the monitoring site. Finally, certain monitors in the Detroit commercial/industrial zone are significantly impacted by emissions from nearby sources that ultimately contribute to the distant PM plume emanating from this zone. At

Dearborn and Wyandotte these sources are located southwest of the monitoring sites and historically have contributed to exceedances (or nears exceedances) of the daily standard. These sources also disproportionately influence the annual standard because they are oriented upwind of the sites for prevailing winds from the southwest.

The analyses presented in this report exploited the relatively high spatial and temporal $PM_{2.5}$ FRM measurement density across Southeast Michigan. Each site provided added value to the analysis. Future reductions in either spatial or temporal measurement density would likely affect the ability to update this analysis towards tracking the accountability of emission control programs.

In summary, emission controls that reduce regionally transported PM are needed to reduce the frequency of violations of the 24-hour $PM_{2.5}$ standard. Emission reductions from a few specific point sources, especially near Dearborn, are also needed. While regional and point source controls will decrease annual average $PM_{2.5}$ concentrations for standardized synoptic weather patterns, relatively small but significant decreases could also be realized by controls on other urban emission sources such as mobile, area, and other point sources.

1. MOTIVATION

In 2006, the USEPA promulgated revisions to the National Ambient Air Quality Standard (NAAQS) for particulate matter (PM) which tightened the 24-hour (daily) $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. This revision profoundly increased the frequency of exceedance days observed in Southeast Michigan. For fifteen monitors over the time period 1999-2006[1], there were 7 and 179 exceedance days (days with one-or-monitors in the area with concentration greater than or equal to 35 $\mu g/m^3$) under the old and new standards, respectively. While none of the monitors violated the old standard, for the period 2004-2006 fourteen of the fifteen monitors violated the new standard. Only one of the eleven sites elsewhere in the state – Grand Rapids – violated the standard for the 2004-2006. This behavior motivates the need for a refined understanding of the drivers for high concentration days in Southeast Michigan. In particular, a detailed description is needed of the emissions, meteorology and atmospheric processes that modulate PM concentrations. This "conceptual model", with explicit emphasis on understanding $PM_{2.5}$ high mass concentration days over the Southeast Michigan, could be utilized towards developing effective control strategies.

The conceptual model presented in this document is focused on the information needed to support the development and implementation of control strategies to meet the 24-hour $PM_{2.5}$ NAAQS. It intentionally excludes a detailed treatment of annual average concentration patterns and instead focuses on the subset of days exhibiting high concentrations. **Figure 1-1** shows the elements that go into the development of a conceptual model which is necessarily dynamic and must be refined as new knowledge becomes available. Content and presentation of the conceptual model for $PM_{2.5}$ over Southeast Michigan loosely follows the framework used by Vickery (2004) for nine North American geographic regions and as revisited by Allen and Turner (2008). A conceptual model for $PM_{2.5}$ over St. Louis was recently developed which included the following elements: annual and seasonal levels of $PM_{2.5}$ in relation to the mass-based standards; compositional analysis of $PM_{2.5}$; meteorological influences; atmospheric processes contributing to $PM_{2.5}$; sources and source regions contributing to the principle chemicals of concern; and implications to policy makers (Turner and Garlock, 2007). For this study, the framework has been modified to accommodate the emphasis on those days with high PM concentrations.

An assessment of the drivers for high concentration days, compared to annual average behavior, is complicated by several factors. First, high concentration days are relatively infrequent and thus there is limited data to probe. Second, while the standard defines a bright line for exceedance days, the use of threshold concentration values to censor data can mask some of the key features. The sensitivity of key findings to the operational definition of a high concentration day is important and care has been taken in this study to ensure the results are resistant to the selection of the threshold concentration.

[1] Some of these monitors did not operate for the entire eight year period, and the monitors collect samples with frequency from every day to every sixth day.

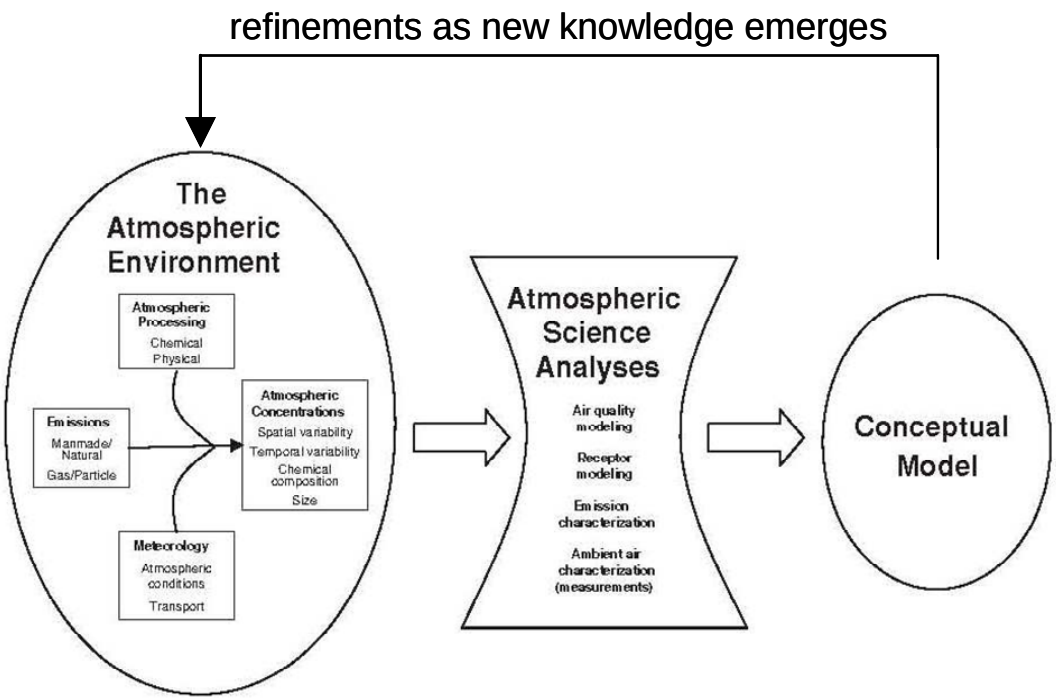


Figure 1-1. Development of a conceptual model (adapted from Vickery, 2004).

This conceptual model is grounded in an analysis of eight years of $PM_{2.5}$ FRM mass concentration data and allied data for particle speciation and meteorology. Nonetheless, it should be treated as a living document, to be periodically updated as additional data becomes available (in particular to capture temporal trends) and revised as more-detailed analysis is performed on the existing data.

2. APPROACH

Extensive monitoring and data analysis has been performed for Southeast Michigan. From a regulatory context, most of the data analysis effort has focused on the annual-average NAAQS. This work focuses on the drivers for exceedances of the daily (24-hour) NAAQS. This metric presents certain challenges to the characterization effort. In contrast to the annual average NAAQS, which requires an understanding of the average contribution of sources to observed burdens, consideration of the daily standard must necessarily focus on a much smaller number of days and with interest in the drivers of the concentrations specifically on those days. Many of the data analysis tools, such as receptor modeling by positive matrix factorization (PMF), are most powerful when considering the average behavior; estimates for high concentration days are less reliable and indeed in many analyses extreme values are down-weighted to improve the stability of the solution. Air quality surveillance is relatively sparse with sustained daily FRM measurements at only one site (Allen Park); this provides a challenge to placing an observed exceedance day in a temporal context. However, the Southeast Michigan FRM network is relatively dense, and this greatly facilitated the ability to the analyses presented in this report. Semicontinuous PM mass and composition measurements certainly provide considerable insight and in the future their deployment should be very beneficial in refining our knowledge of high concentration events.

A significant body of work has been assembled to characterize PM in Southeast Michigan with most-recent emphasis on the annual average $PM_{2.5}$ NAAQS. Indeed, efforts currently underway to address the annual average standard are expected to improve the area's status with regard to the daily standard. However, additional measures might be needed to eliminate violations and bring the area into attainment with the daily standard. Thus, the key findings from this analysis are compared and contrasted with the Weight-of-Evidence (WOE) developed for the annual standard to more fully understand the synergies between the drivers and control strategies.

Many questions can be raised towards characterizing an observed exceedance of the daily standard. Was it driven by local emissions, regional transport, or both? Did it arise from an exceptional event, such as a structural fire or unusual industrial emission, or was it the conventional mix of emission sources with their contributions amplified by poor atmospheric ventilation conditions such as a persistent stagnation? Exceptional events will be experienced that cannot be explained with the typical types and levels of surveillance. For example, documented exceptional events at the St. Louis – Midwest Supersite in East St. Louis, IL, included nearby structural fires that in some cases were captured by the images from an on-site camera and in other cases were visually observed by site operators. The ability to identify exceptional events in the East St. Louis time series decreased as the site operations became routine and staff spent less time at the site. It is possible the observed high concentrations are more susceptible to measurement error (indeed, in some cases even result solely from measurement error) and uncontrollable measurement bias. We will examine this issue in the context of spatial variability in FRM values on high nitrate days. The Regional Haze Rule construct of isolating the 20% worst days – whether visibility or mass concentration – is closer in spirit to the information needed for examining drivers for high concentration days. However, in its most-commonly applied form it is inadequate because the average behavior on the 20% worst days might not represent the condition on an actual day if there are a variety of drivers for high

concentration days. The separation of contributions emanating from different spatial scales (e.g., regional-, urban-, and even finer local-scales) is particularly challenging and the data analysis approaches adopted for this study have been customized to elucidate the contributions from these scales to the extent practicable. In consideration of the above issues, it is apparent that analyses to capture the drivers for high concentration days must focus on distributions of behavior rather than average (central tendency) behavior. The data analysis methods reflect this consideration.

There are many possible drivers for intraurban variability in $PM_{2.5}$ mass, including the following six factors: local sources of primary PM emissions; transient emission events; topographic barriers that isolate subregions of the urban area; meteorological phenomena that vary on spatial scales within the urban area; differences in behavior of semi-volatile components; and measurement error (Pinto *et al.* 2004; Turner and Allen, 2008). While this analysis does not definitively identify which of these factors are responsible for observed differences across the network, it does reflect upon these factors to explain the observed differences.

Figure 2-1 shows a conceptualization of intraurban variability arising from PM emission sources acting on various spatial scales. The air mass is transecting the domain with persistent surface winds from the left. Panel (a) shows the emission sources where the regional-scale contributions are assumed to be homogeneous across the domain (this assumption neglects interactions between regionally transported material and urban area emissions, such as urban plume processing of regionally-transported PM precursor gases). Urban-scale emissions from mobile sources, area sources, and point sources distributed across the metro core contribute to an increase in PM mass concentration (dashed line) which is skewed towards the downwind end of the domain. Neighborhood- and finer-scale emissions create local hot spots which disperse downwind and become part of the urban-scale contributions. The red line in panel (b) shows the concentration profile that would be observed along the transect. Monitor locations will dictate which features of the profile are captured. For example, panel (c) shows the location of five monitors (the "network-wide baseline" will be discussed later in this report). Monitor **A** is located upwind of the urban area and measures the regional contributions. However, a wind reversal would render it downwind of the urban area and in this case it might be impacted by the urban plume (such as monitor **D).** Monitor **B** is impacted by both a local plume and upwind urban contributions. The plume would miss the site with a wind reversal. Monitor **C** is located near the core of the urban area (from an urban-scale emissions perspective). For this scenario it is not impacted by local plumes but measures the cumulative contributions from upwind sources, including point sources in the urban area. A wind reversal, however, might render monitor **C** impacted by a local plume. Monitor **D** is outside the urban area emissions zone but nonetheless is impacted by the "urban plume" as it is advected downwind, while monitor **E** is far enough downwind that the urban plume has dispersed to the extent that the urban PM mass contributions cannot be distinguished from the underlying regional contributions. A wind reversal would render monitors **D** and **E** upwind of the urban area. This spatial concentration field represents a snapshot in time which becomes smeared for a 24-hour sample as winds shift during the day, and becomes further smeared when averaging results over many days. It is also a 1-D representation of a 2-D surface which adds complexity. That said, it does motivate the use of surface winds as a discriminator for studying site-specific PM mass trends to place each monitor in an emissions field context.

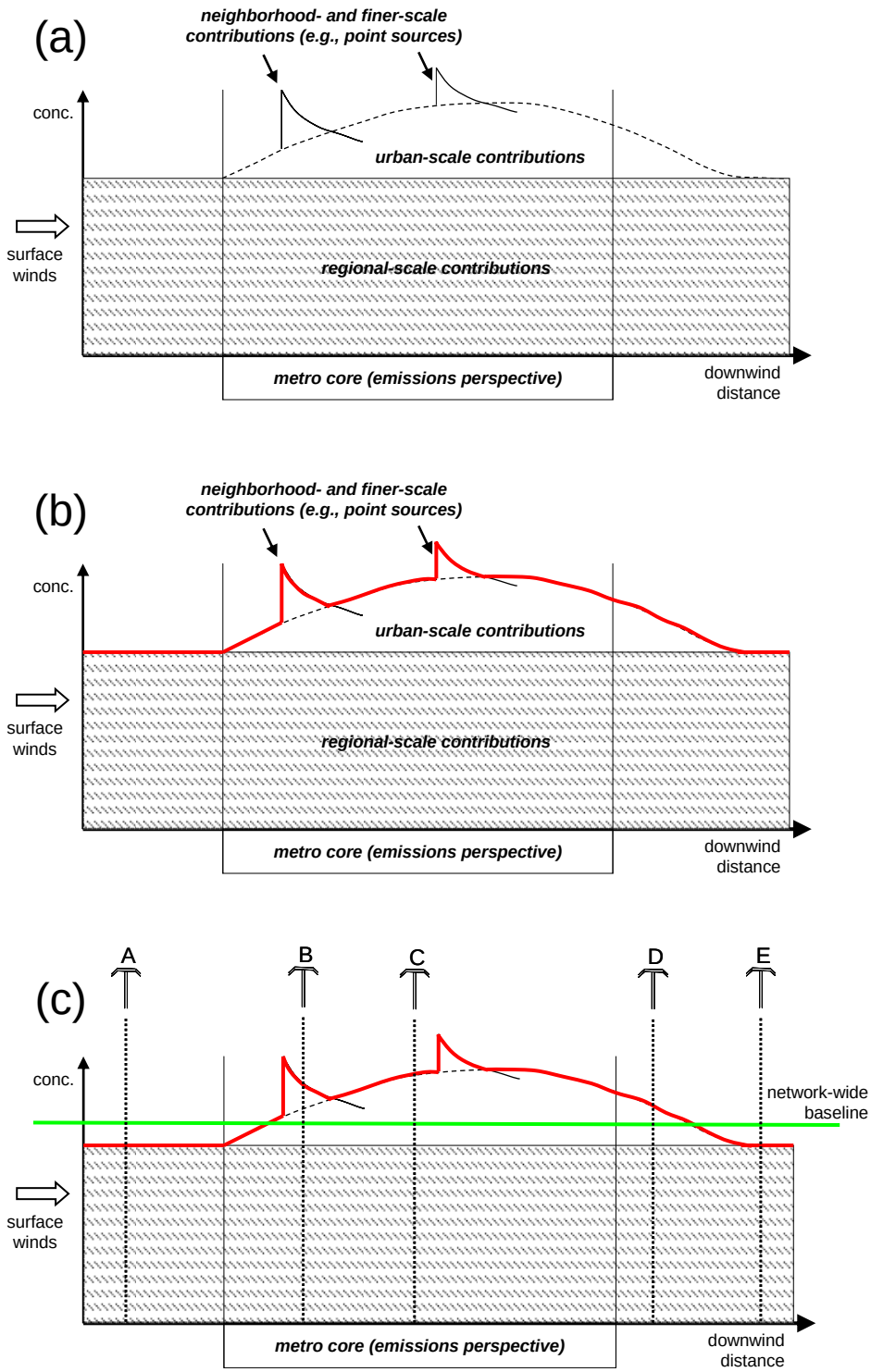


Figure 2-1. The influence of emissions acting on various spatial scales to observed concentrations at monitoring sites.

The report is structured as follows. Section 3 presents an overview of the monitoring network and key descriptive statistics and trends, including but not limited to the regulatory metrics. Section 4 examines the drivers for high concentration days by taking advantage of the relatively dense compliance monitoring network and particle speciation data. Section 5 refines the understanding of local emission source contributions by exploiting spatial and temporal variability within the network. Key findings, policy-relevant implications and recommendations for future work are summarized in Section 6.

3. SOUTHEAST MICHIGAN $PM_{2.5}$ FRM NETWORK AND CONCENTRATION TRENDS

The $PM_{2.5}$ FRM monitoring network used in this analysis is summarized in **Figures 3-1** and **3-2** and **Table 3-1**. For the $PM_{2.5}$ compliance monitoring period of 1999-2006, there were fifteen $PM_{2.5}$ FRM monitoring sites in Southeast Michigan; three sites had collocated $PM_{2.5}$ FRM samplers. All FRM monitoring sites in the Detroit-Warren-Flint CSA are included except Flint. For the purpose of this report, the spatial zone of Wayne County with highest population density (>10 persons/acre) shall be called the Detroit population core and the spatial zone which includes the Detroit central business district and industrialized zones to the south through west (e.g., Dearborn, Zug Island) shall be called the Detroit commercial/industrial core. This latter zone roughly includes the area covered by the five tightly clustered monitors in Figures 3-1 and 3-2 (Dearborn, Southwest High School, FIA/Lafayette, Newberry, and Linwood). Greater Wayne County sites shall refer to the monitoring sites located in Wayne County plus the Oak Park monitor site which is just across the county line in Oakland County.

Daily measurements have been maintained at Allen Park through the eight year period; most other sites operated on a 1-in-3 day schedule although some were cut back to 1-in-6 day in recent years due to budget constraints. There were 2,782 days with valid data reported for one-or-more sites (95.2% of days), with this high temporal data density driven by the daily sampling at Allen Park. There were 14,044 sampling events (neglecting collocated measurements). The historical compliance status of each site with respect to the 24-hour $PM_{2.5}$ NAAQS is presented in **Table 3-2**. Exceedances of the 24-hour standard were observed on 179 days which is 6.1% of the days with one-or-more monitors reporting valid data. There were 546 total exceedances which correspond to 3.9% of all sampling events.

This report reflects on the conditions and drivers for high $PM_{2.5}$ mass concentration days (hereafter called "high PM days"). We are interested in both the frequency and intensity (magnitude) of high concentration days since both factors are important in establishing the design value. **Figure 3-3** shows the site-specific frequencies of high concentration days using thresholds of 25, 30, and 35 $\mu g/m^3$. Exceedances were observed on 2-8% of sample days with 5-14%, and 8-24% of sample days having concentrations above 30 $\mu g/m^3$ and 25 $\mu g/m^3$, respectively. Dearborn exhibits the highest frequency of high concentration days, followed by SW High School and Wyandotte. The remaining monitors in Greater Wayne County exhibit similar behavior. The frequencies for FIA/Lafayette and Newberry sites might be impacted by the relatively short sampling histories at these sites and caution should be used in comparing and contrasting these sites to the rest of the network. Ann Arbor and New Haven exhibit the lowest frequencies of high concentration days; they are 50-60 km from the Detroit commercial / industrial core to the west and northeast, respectively. However, these two sites do not represent the spatial extents of the SE Michigan network with Luna Pier ~70 km to the southwest and Port Huron ~80 km to the northeast.

Figure 3-4 shows the frequency of $PM_{2.5}$ high concentration days by month for Allen Park, Dearborn, Southwest High School and New Haven (frequency plots for all sites are presented in **Figure A-1, Appendix A**). The pattern for Allen Park is generally representative of those Greater Wayne county sites with relatively modest impacts from nearby sources, as will be

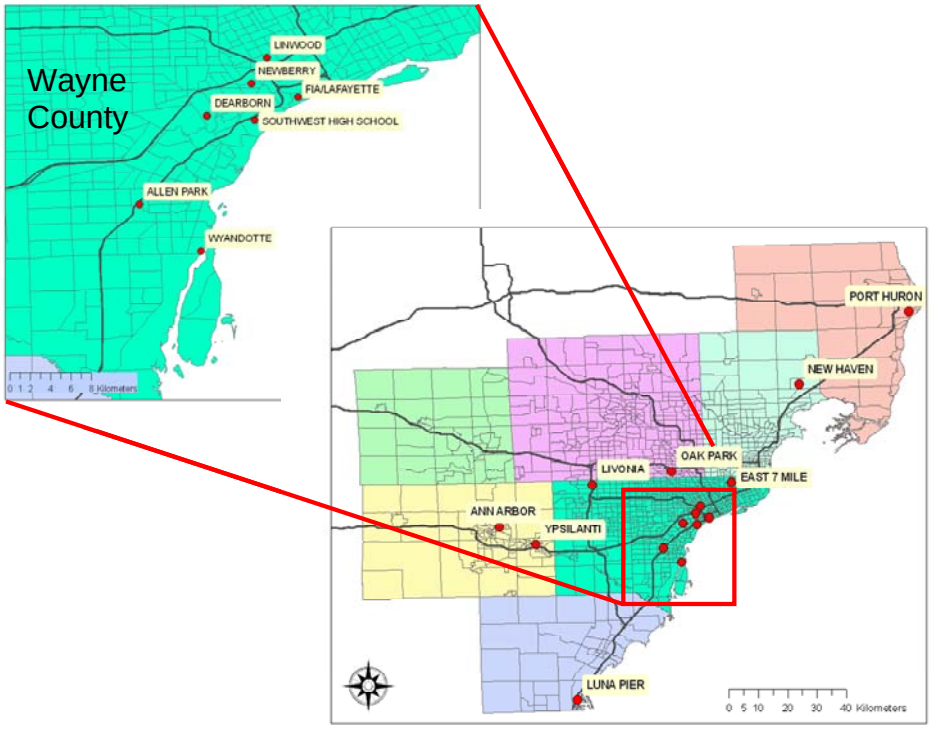


Figure 3-1. Southeast Michigan $PM_{2.5}$ FRM monitoring sites superposed on county boundaries and 2000 census tracts. The red rectangle includes a portion of Wayne County.

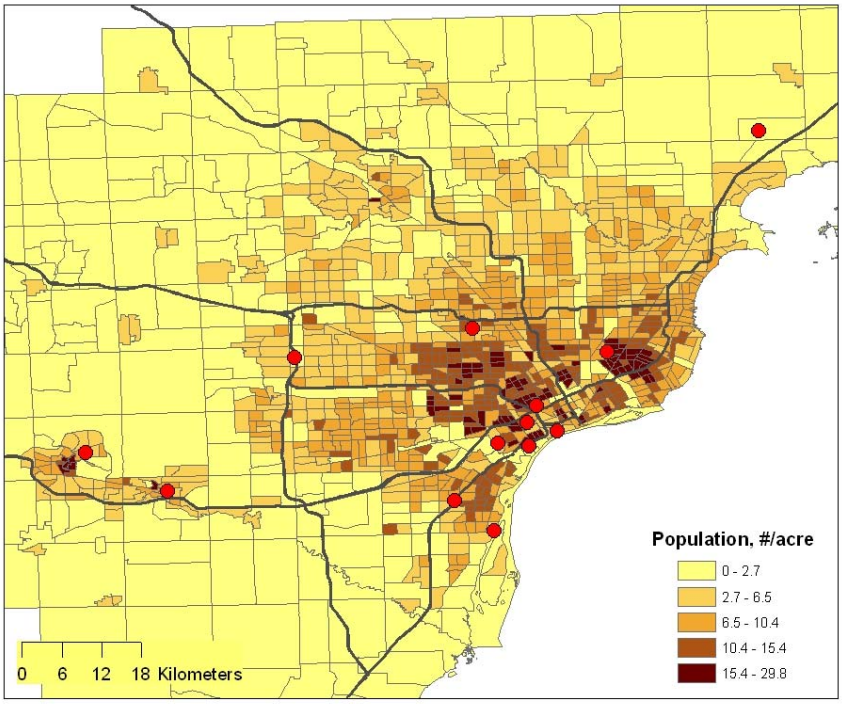


Figure 3-2. Southeast Michigan $PM_{2.5}$ FRM monitoring sites (excluding Luna Pier and Port Huron) superposed on 2000 census tract level population density data.

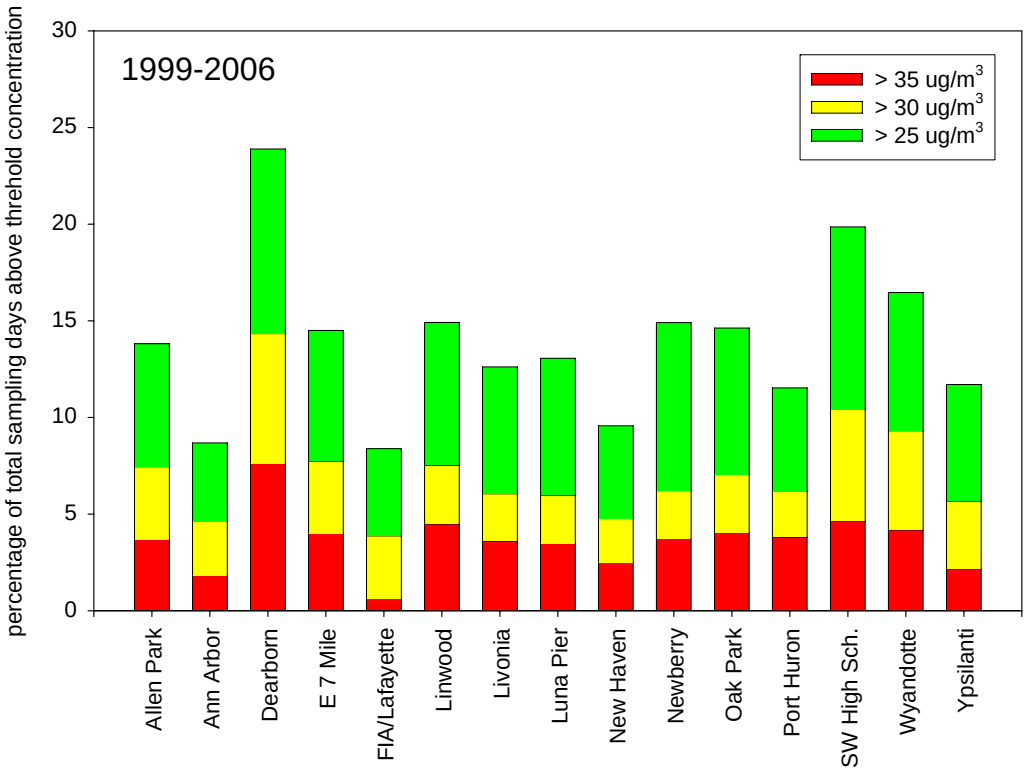
Table 3-1. Southeast Michigan $PM_{2.5}$ monitoring network as of December 2006, including exceedances days for the NAAQS daily $PM_{2.5}$ standard of 35 μg/m^3.

(A) Site Name	(B) AIRS ID	(C) Sampling Dates	(D) Maximum Sampling Frequency	(E) Number of Sampling Days	(F) Number of Exceedance Days	(G) Speciation Site (Dates)?
Allen Park	261630001	05/99--	daily	2497	92	12/00-
Ann Arbor	261610005	06/99-12/05	1-in-3 day	714	13	no
Dearborn	261630033	02/99--	1-in-3 day	879	67	05/02--
E 7 Mile	261630019	04/00--	1-in-3 day	724	29	12/00-04/02
FIA/Lafayette	261630039	08/05--	1-in-3 day	155	1	no
Linwood	261630016	05/99--	daily	2273	102	no
Livonia	261630025	08/99--	1-in-3 day	777	28	no
Luna Pier	261150005	12/99--	1-in-3 day	804	28	05/02--
New Haven	260990009	01/99--	1-in-3 day	878	22	no
Newberry	261630038	12/04--	1-in-3 day	161	6	no
Oak Park	261250001	01/99--	1-in-3 day	793	32	no
Port Huron	261470005	01/99--	1-in-3 day	841	32	no
SW High Sch.	261630015	02/99--	1-in-3 day	881	41	no
Wyandotte	261630036	02/99--	1-in-3 day	838	35	no
Ypsilanti	261610008	08/99--	1-in-3 day	829	18	06/03--

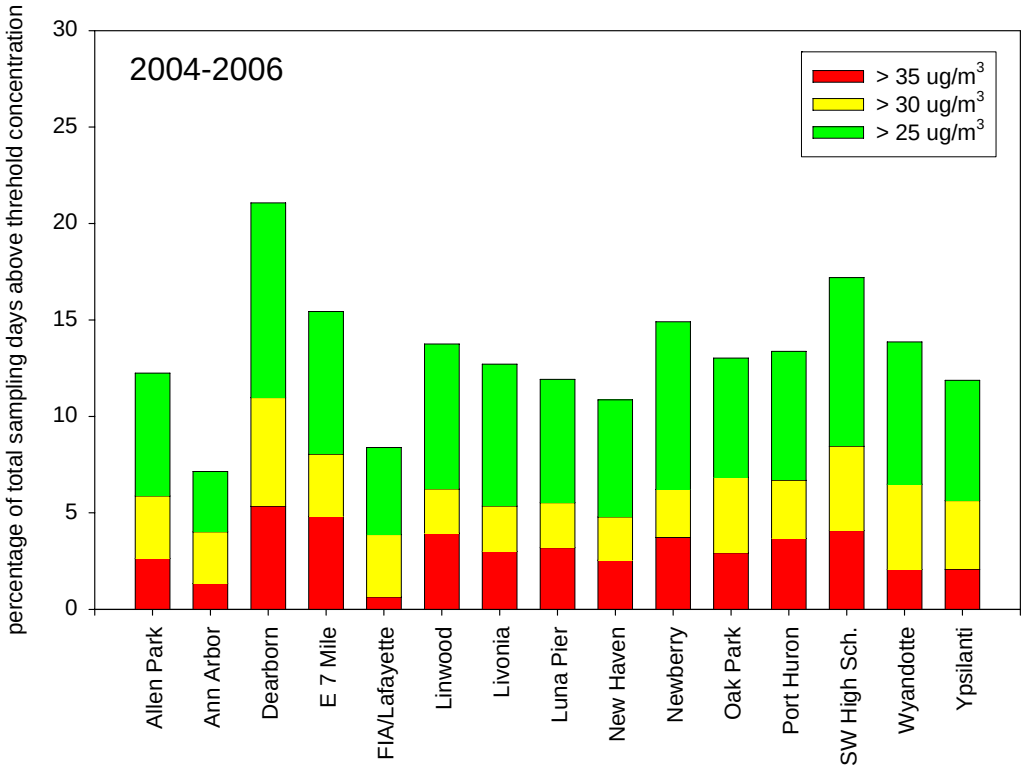
discussed later in this report. High concentration days are most frequent in the summer months followed by the winter months, while high concentration days are relatively infrequent in the spring. Dearborn exhibits higher frequencies of high concentration days for all months with the winter frequencies comparable to the summer frequencies. Southwest High School monthly frequencies fall between Allen Park and Dearborn, while New Haven has relatively few high concentration days but with the same overall pattern as Allen Park – highest frequencies in the summer followed by the winter.

Table 3-2. Southeast Michigan $PM_{2.5}$ monitoring network compliance status for the daily $PM_{2.5}$ NAAQS (POC = 1 samplers only).

		Annual 98th Percentiles								Three-Year Averages of 98th Percentiles					
Site	AIRS ID	1999	2000	2001	2002	2003	2004	2005	2006	99-01	00-02	01-03	02-04	03-05	04-06
Allen Park	261630001	43.7	38.6	44.2	39.6	40.5	36.9	43.0	34.1	42	41	41	39	40	38
Ann Arbor	261610005	38.2	33.1	38.5	31.3	33.3	28.4	39.1		37	34	34	31	34	34
Dearborn	261630033	45.1	45.1	43.2	45.7	42.8	39.4	50.2	43.1	44	45	44	43	44	44
E 7 Mile	261630019	---	42.0	42.0	34.4	37.1	35.0	52.3	36.2	42	39	38	36	41	41
FIA/Lafayette	261630039	---	---	---	---	---	---	43.9	32.4	---	---	---	---	---	38
Linwood	261630016	44.5	40.3	40.9	42.7	46.2	38.3	51.8	36.9	42	41	43	42	45	42
Livonia	261630025	38.4	35.9	44.7	32.7	38.1	32.2	40.2	30.4	40	38	39	34	37	34
Luna Pier	261150005	18.1	37.2	39.2	42.7	34.7	35.0	49.3	32.6	32	40	39	37	40	39
New Haven	260990009	31.9	33.2	42.0	35.6	31.8	31.9	41.5	34.4	36	37	36	33	35	36
Newberry	261630038	---	---	---	---	---	36.8	57.5	28.6	---	---	---	---	---	41
Oak Park	261250001	42.8	40.7	39.4	38.4	36.6	32.5	52.2	33.0	41	40	38	36	40	39
Port Huron	261470005	44.5	33.1	40.5	35.3	37.2	32.2	47.6	37.9	39	36	38	35	39	39
SW High Sch.	261630015	50.2	44.5	42.9	38.2	33.6	36.0	49.7	36.2	46	42	38	36	40	41
Wyandotte	261630036	45.0	42.7	46.6	34.1	34.8	32.3	46.7	33.2	45	41	39	34	38	37
Ypsilanti	261610008	40.6	30.3	39.7	30.9	38.8	31.5	52.1	31.3	37	34	36	34	41	38



(a)



(b)

Figure 3-3. Site-specific frequency of total sampling days above the designated concentration for periods: 1999-2006 (a); and 2004-2006 (b),

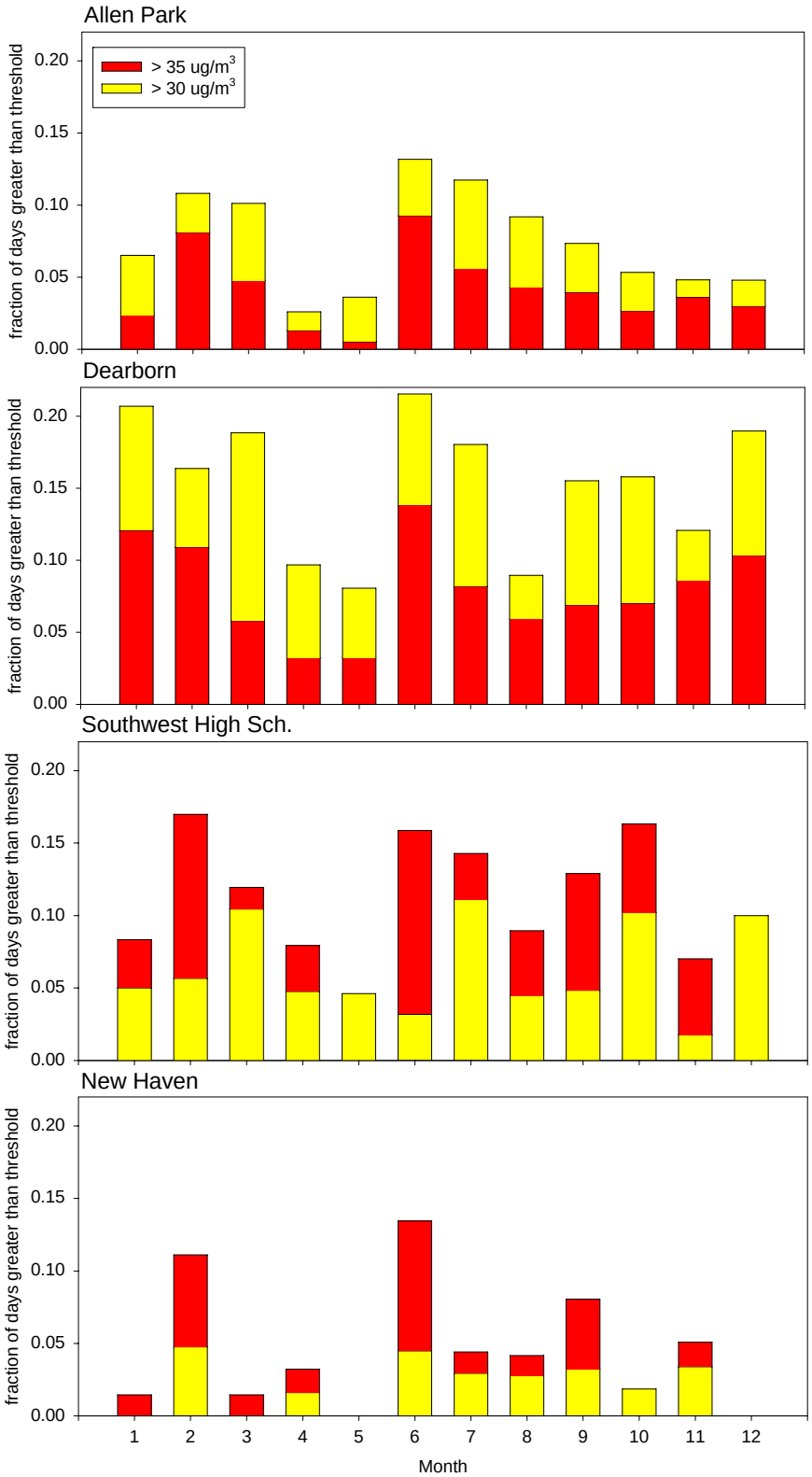


Figure 3-4. Distribution of $PM_{2.5}$ high concentration days by month for Allen Park (top) and Dearborn (second from top), Southwest High School (second from bottom), and New Haven (bottom), 1999-2006.

Surface winds dictate the coupling between local emission sources and the monitoring sites. The wind rose for hourly values from Detroit Metropolitan Wayne County Airport is shown in **Figure 3-5** for the period 1999-2006. Prevailing surface winds are from the southwest with frequent winds also from the west. Winds from the east are relatively infrequent. Hourly surface winds distributions exhibit a distinct seasonality (**Figure 3-6**) albeit with some degree of year-to-year variation (**Figure B-1**, **Appendix B**). Fall and winter months are more advective with a pronounced southwesterly component while spring and summer months have lighter winds and less distinct prevailing features. *Seasonal variations in surface winds can explain the seasonal differences in frequency of high PM days between the Greater Wayne County sites*. For example, Dearborn has a disproportionately higher frequency of high PM days in the winter compared to Allen Park. This is consistent with the increased frequency of surface winds from the southwest during the winter and the location of nearby emission sources in this direction (and indeed located between Dearborn and Allen Park).

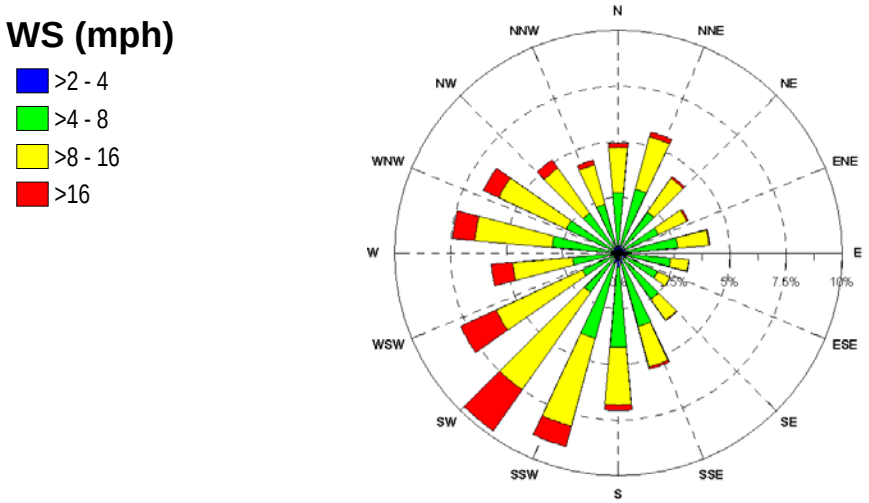


Figure 3-5. Wind rose for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW), 1999-2006. Calms (wind speeds less than 2 mph) were 11% of total hours.

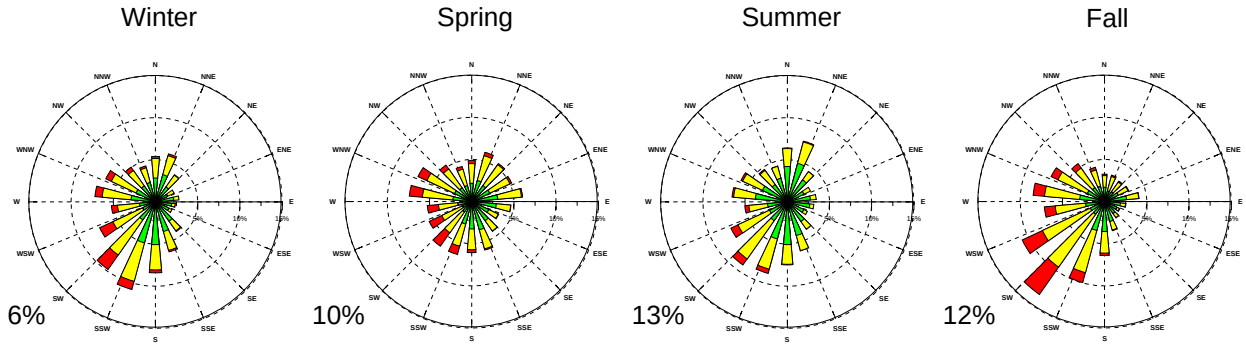


Figure 3-6. Seasonal wind roses for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW), 1999-2006. Calms (wind speeds less than 2 mph) are listed to the lower-left of each wind rose. The wind speed scales are shown in the legend for Figure 3-5.

4. CLIMATOLOGY OF NETWORK-WIDE HIGH PM DAYS

As previously described, a high fine PM mass concentration day at a given site can arise from regional contributions, local contributions, or a combination of these factors. The climatology of network-wide high PM days was examined to understand the drivers for such days. Regionally transported materials might be higher or atmospheric ventilation might be poorer. The extent to which these drivers act synergistically is not clear. For example, a summertime high pressure system advecting regionally transported PM might stall out over the area. However, the lower winds speeds might be partially offset by a large mixing layer depth on such days. While we cannot make definitive statements about such coupling, this section provides a perspective on these issues.

Descriptive analyses, including but not limited to those summarized in the previous section, demonstrate a high coherence in high PM days across the network. Thus, an exploratory analysis was performed to determine the frequency and nature of network-wide high PM days. A subset of sampling days with network-wide high PM mass concentrations was identified by first identifying those days with at least ten of the twelve Southeast Michigan FRM monitor sites reporting a valid $PM_{2.5}$ FRM mass concentration value[2]; these days are called <u>valid network days</u>. Subsequently, the valid network days were screened to include only those days with at least 2/3 of the reporting monitors having a PM concentration greater than a threshold value (e.g., 30 $\mu g/m^3$); these days are called <u>network-wide high PM days</u>. **Table 4-1** summarizes the characteristics of the valid network days and network-wide high PM days data sets. For the period 1999-2006 there were 727 sampling days with ten-or-more FRM monitor sites reporting valid $PM_{2.5}$ concentrations (valid network days). 41 of these days (5.6%) had at least 2/3 of the monitors above 30 $\mu g/m^3$ (network-wide high PM days) and all of these days had one-or-more monitor exceedance. Exceedances were also observed at one-or-more monitors on 35 days (5.1%) that were below the network-wide high PM threshold; these days likely have stronger influences from nearby emission sources impacting one or at most two sites. **Figure 4-1** shows the distribution of network-wide high PM days by month. The days are concentrated in the summer followed by the winter, with few days in the seasonal transition months of April, May, and November. This pattern is insensitive to the concentration threshold used to define network-wide high PM days.

Table 4-1. Valid network days and network-wide high PM days by year.

Year	Valid Network Days	Network-Wide High PM Days	
1999	014	01	7%
2000	084	04	5%
2001	104	10	10%
2002	101	04	4%
2003	113	05	4%
2004	117	05	4%
2005	121	09	7%
2006	073	03	4%
total	727	41	6%

[2] Ann Arbor, FIA/Lafayette and Newberry were excluded form this analysis due to their limited period of operation.

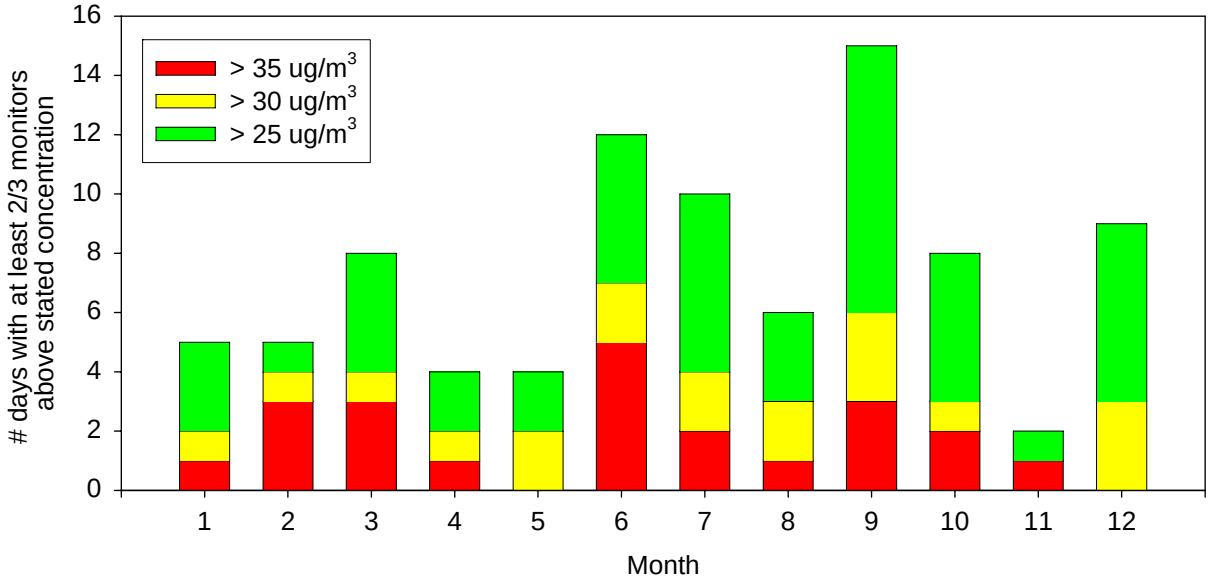


Figure 4-1. Frequency of network-wide high PM days by month using three different thresholds for defining a high PM day: ≥25; ≥30; and ≥35 μg/m^3.

The relevance of this analysis to understanding drivers for exceedances of the 24-hour standard is demonstrated in **Table 4-2**. Valid network days, as defined above, capture 27-92% of all sampling days (column D). The capture is relatively low at sites with daily sampling (Allen Park, Linwood) because ten-or-more monitors must report valid data for the day to be designated a valid network day. However, the percentage of total exceedances that fall on a valid network day (column E) is nearly identical to the percentage capture of all sampling days by valid network days (column D) and we conclude that *the subset of sampling days captured by valid network days is representative of all sampling days*. Having established the representativeness of valid network days, we observed that *at most sites exceedances occur predominantly – and in some cases exclusively – on days when the entire network is exhibiting high PM* (column F). For example, 96% of the exceedances at Allen Park on valid network days occurred on days when the entire network was exhibiting high PM. Assuming the valid network days are representative of all sampling days at Allen Park, we would assign 88 of the 92 total observed exceedances to days with network-wide high PM. Similarly, 100% of the exceedances at Ypsilanti on valid network days occurred on days when the entire network was exhibiting high PM. Assuming the valid network days are representative of all sampling days at Ypsilanti, we would assign all of the 18 total observed exceedances to days with network-wide high PM.[3] Dearborn represents the other extreme of behavior with only 62% of exceedances occurring on network-wide high PM days. In summary: (1) For nine of the fifteen monitors, more than 90% of the exceedances occurred on days when the entire network was exhibiting high PM; (2) Four monitors in the core region had a high frequency of exceedances on days when the entire network was not exhibiting high PM (Dearborn – 38%, Wyandotte – 27%, East 7 Mile – 15%, Linwood – 13%); and (3) At Luna Pier and Port Huron, which are located at the geographic extents of the Southeast Michigan

[3] In contrast to Allen Park where only 25 of the 92 exceedances were captured by valid network days (27%), at Ypsilanti 16 of the 18 exceedances where captured by valid network days (89%) and the assertion that the valid network days are representative of all sampling days is not even necessary.

Table 4-2. Site-specific exceedance trends on valid network days.

(A)	(B)	(C)	(D)	(E)	(F)
Site Name	Number of Sampling Days	Number of Exceedance Days	% Sampling Days on Valid Network Days	% Exceedances on Valid Network Days	% Network Day Exceedances on Network-Wide High PM Days
Allen Park	2497	92	27.2%	27.2%	96.0%
Ann Arbor	714	13	82.9%	92.3%	100.0%
Dearborn	879	67	77.1%	77.6%	61.5%
E 7 Mile	724	29	92.1%	89.7%	84.6%
FIA/Lafayette	155	1	68.4%	100.0%	100.0%
Linwood	2273	102	29.5%	29.4%	86.7%
Livonia	777	28	87.1%	89.3%	92.0%
Luna Pier	804	28	82.8%	85.7%	87.5%
New Haven	878	22	80.4%	86.4%	100.0%
Newberry	161	6	71.4%	100.0%	100.0%
Oak Park	793	32	82.0%	75.0%	91.7%
Port Huron	841	32	81.8%	81.3%	88.5%
SW High Sch.	881	41	78.4%	73.2%	93.3%
Wyandotte	838	35	80.2%	85.7%	73.3%
Ypsilanti	829	18	82.8%	88.9%	100.0%

region, 12-13% of the exceedances were on days when the entire network was not exhibiting high PM. It is possible the construct of network-wide high PM days is less robust for these sites since they might not always be bathed in the same regional air mass as the core region.

The threshold concentration used to define a network-wide high PM day does not itself capture the network-wide baseline PM level on that day (it is merely the bright line used to identify the days). Thus, for the purposes of this report a <u>base concentration for each valid network day</u> was defined as the 5th lowest concentration value across the network. Since at least ten monitors must have valid data for the day to be designated a valid network day, the 5th lowest concentration is no higher than the median concentration and ensures the base concentration is not significantly influenced by the monitors at the geographic extents (Luna Pier and Port Huron) which might be bathed in different air masses on certain days, and removes the influence of one-or-two anomalously low concentration values. The base concentration includes regionally transported PM and some portion of the urban-scale contributions. Excess mass at a given site, relative to the base concentration, can be negative for cases such as monitors **A** and **E** in Figure 2-1c.

Figure 4-2 shows the network-wide maximum and second maximum concentrations as a function of the base concentration for valid network days. The maximum concentration is often much greater than the base concentration and on these days there is a large local excess at the maximum concentration site. However, the second maximum concentration is typically within 5 $\mu g/m^3$ of the base concentration and thus on a given day there is typically at most one site with a large local excess, regardless of the base concentration. This behavior holds at both high and

[7] Typically synoptic winds would be analyzed to identify days conducive to regional transport but sulfate and nitrate will be used as a surrogate for regional transport in this work since the sulfate at Allen Park is overwhelmingly from regional transport and the nitrate is dominated by regional transport.

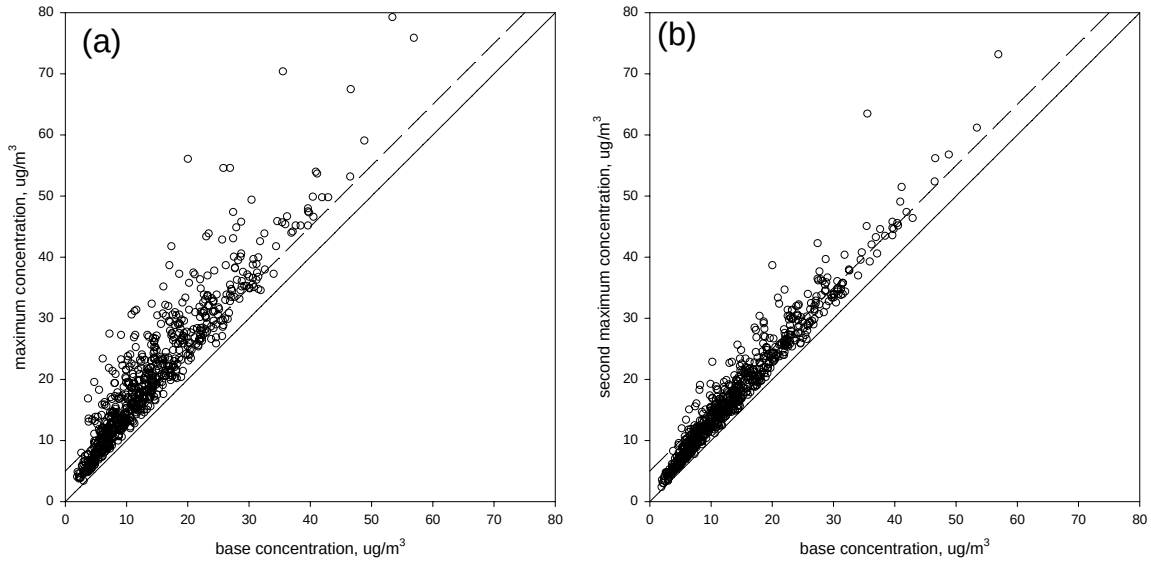


Figure 4-2. Network-wide maximum concentration (a) and second maximum concentration (b) for each valid network day compared to the respective network-wide base concentration. The analysis excludes three sites – Ann Arbor, Lafayette/FIA, and Newberry. The solid line is the base concentration (1:1 line) and the dashed line is 5 μg/m^3 above the base concentration.

low base concentrations; the extreme maximum values possibly arise from nitrate hot spots or measurement artifacts as will be described later in this report.

Day- and site-specific concentrations are compared to the base concentrations in **Figure 4-3** for valid network days. Most sites had a few exceedances days with concentrations in large excess of the base concentration. Assuming poor atmospheric ventilation affects the sites similarly and thus contributes to the base concentration, the extreme excursions above the base concentrations likely arose from nearby emission source plumes, exceptional events (including but not limited to releases from the local emission sources) or measurement error including but not limited to a possible nitrate artifact. With the exception of Dearborn and Wyandotte, most exceedances were clustered about the base concentration. Dearborn and Wyandotte had exceedances on days with base concentrations as low as 20 μg/m^3 demonstrating significant excess above the base concentration.

The analysis so far has primarily focused on the relative frequency of network-wide high PM days and their associations with exceedances. **Figure 4-4** captures the influence of the extreme values observed at each site (Figure 4-3), showing the 5th highest maximum excess and the median excess compared to the base concentration for exceedance days falling on valid network days. Several sites have low excess for the 5th highest maximum (yellow bars), although this metric is sensitive to sampling frequency. Most sites have median excess below 5 μg/m^3. Excluding Dearborn and Wyandotte, and pooling the site-specific highest three excess concentrations across the remaining ten sites, 23 of the 30 values occurred on only three days – 3/1/2003, 2/3/2005 and 2/6/2005. On all three days the network exhibited high and variable concentrations, and the latter two days were the highest nitrate at Allen Park over all valid network days (no speciation data for 3/1/2003). Further inspection of network-wide behavior on

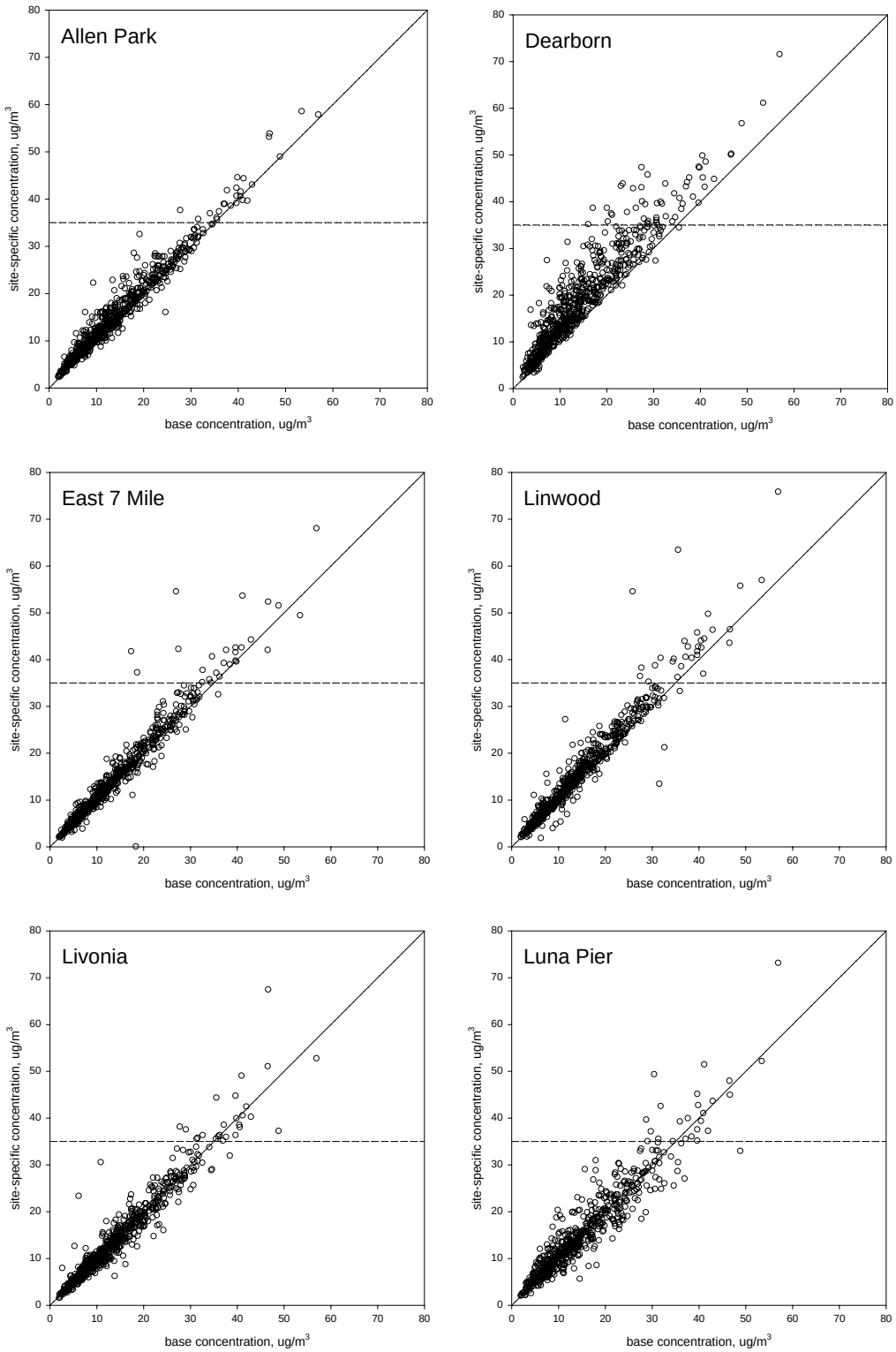


Figure 4-3. Site-specific concentrations versus base concentrations for valid network days. Solid line is the base concentration (1:1 line) and dashed line is 35 μg/m^3.

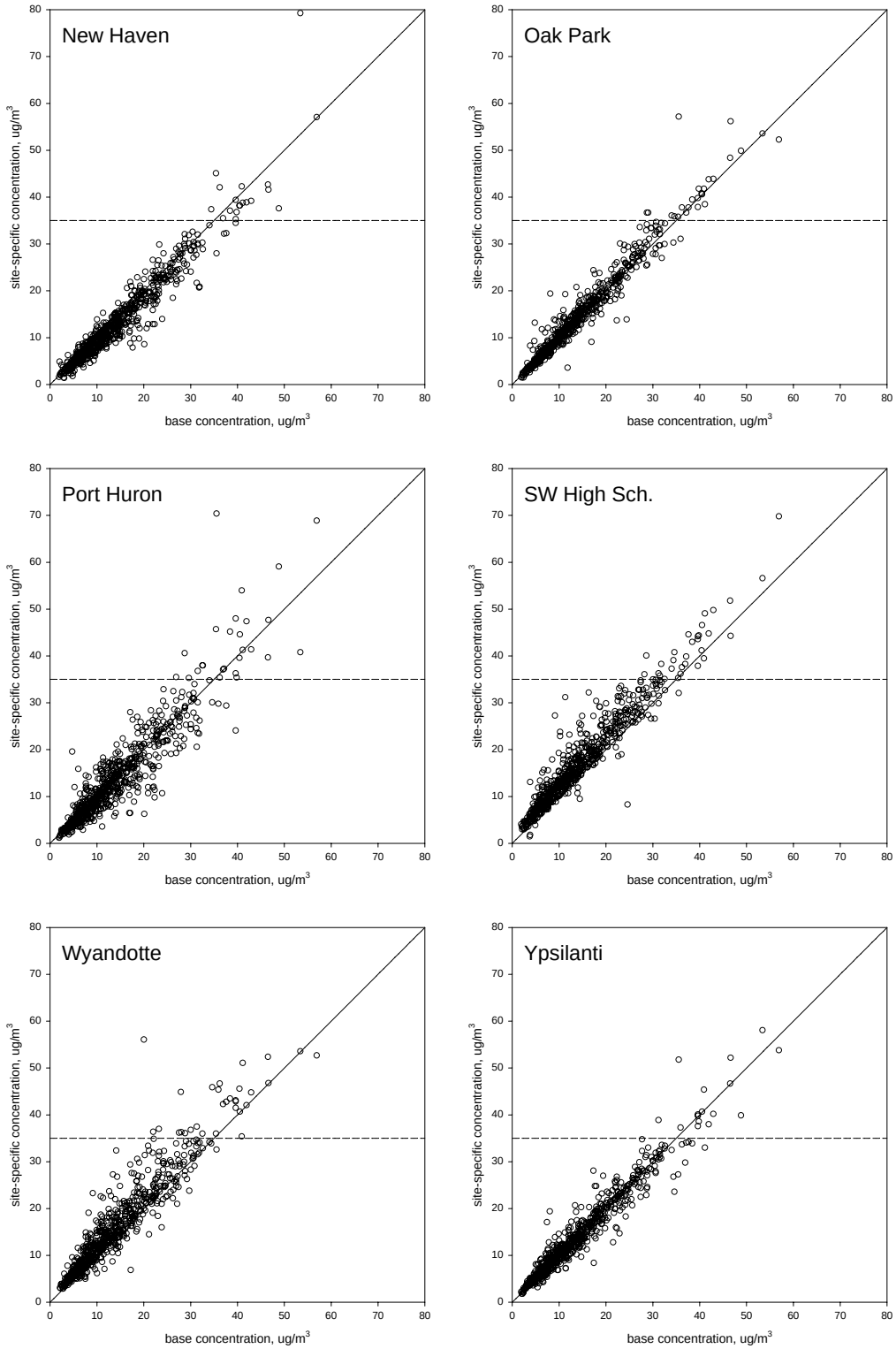


Figure 4-3 (continued). Site-specific concentrations versus base concentrations for valid network days. Solid line is the base concentration (1:1 line) and dashed line is 35 μg/m^3.

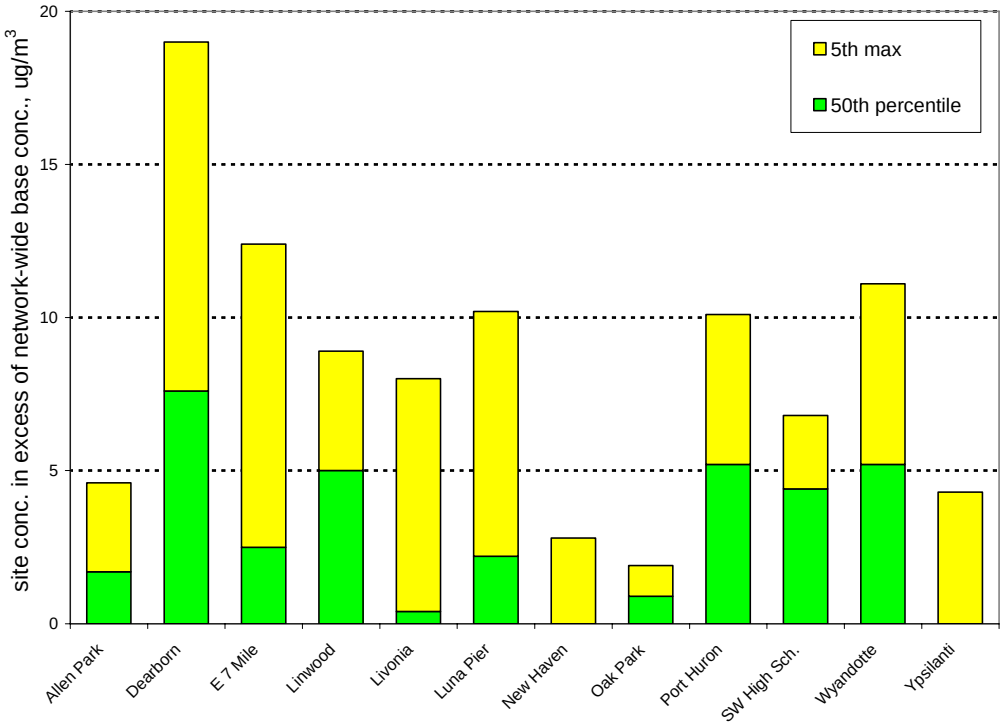


Figure 4-4. Site-specific exceedance days: 5th-highest excess concentration compared to base concentration (yellow); and 50th-precentile excess concentration compared to base concentration (green).

high nitrate days shows the spatial variability can range from nearly homogeneous to quite heterogeneous (such as the above noted days). It is likely that nitrate is driving the variability on such days and is responsible for many of the outlier mass concentrations at high base concentrations in Figure 4-3. There are at least two possible explanations for this behavior. First, there might be nitrate hot spots on high nitrate days. These hot spots are most likely to occur on days with a liquid aerosol due to high humidity. A qualitative inspection of surface weather on high nitrate days suggests they often coincide with fog events. The aerosol state (liquid versus dry), and degree of water content if wet, might vary across the network due to micrometeorology and this could influence nitrate uptake. Spatial variations in crustal material could also influence the pH of the liquid aerosol which in turn influences nitrate uptake. Second, there might be varying nitrate measurement artifact on certain high nitrate days. Even if the ambient nitrate concentration is spatially homogeneous, perhaps the Teflon filters are retaining nitrate to varying degrees and this artificially induces a spatial variability in both nitrate in FRM mass. A better understanding of the drivers for high spatial variability in FRM mass on high nitrate days is needed since only a few such events can dramatically affect the site-specific design values for the 24-hour standard. When such patterns are observed, perhaps the Teflon filters could be analyzed for nitrate by IC to determine the extent of nitrate retention; this would be particularly insightful for days coinciding with speciation sampler operation.

Figure 4-5 shows the same data as Figure 4-3 for Dearborn and Wyandotte but stratified to isolate the period 2004-2006 (the most-recent three-year period for the data set used in this study). Focusing on those days with base concentration below 35 $\mu g/m^3$ (to the left of the vertical solid line) but with site-specific concentrations approaching or greater than 35 $\mu g/m^3$

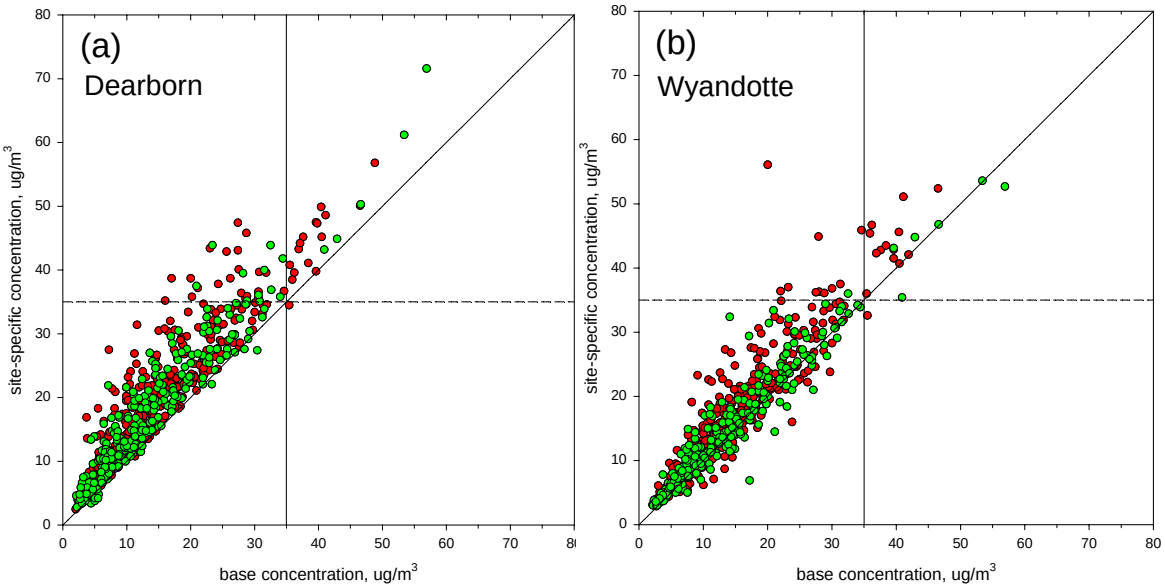


Figure 4-5. Site-specific concentrations versus base concentrations for valid network days at Dearborn (a) and Wyandotte (b) stratified by year: 1999-2003 (red markers); and 2004-2006 (green markers). Solid diagonal line is the base concentration (1:1 line), and the solid vertical line and dashed horizontal line are 35 μg/m^3.

(above the dashed horizontal line), these days correspond to cases where nearby local emission sources are likely significant contributors to an exceedance (or near exceedance) that otherwise would not occur. For Dearborn (Figure 4-4a), there has been a decrease in frequency of such local plume days but they are certainly still present for the 2004-2006 period. For Wyandotte (Figure 4-4b), however, virtually all of the days with local source plumes driving an exceedance (or near exceedance) of the standard were prior to 2004. *For the most recent data (2004-2006), Wyandotte does not appear to be disproportionately influenced by local plumes on exceedance (or near exceedance) days*. Again, these figures do not represent all sample days but rather the subset of days with ten-or-more reporting monitors such that network-wide behavior could be characterized; however, as previously demonstrated, this subset of days does appear to be representative of the overall data set.

The analysis presented to this point clearly demonstrates that exceedances at most sites correspond to days when the entire network is exhibiting high PM concentrations and the rare extreme values are likely due to exceptional events or possibly a nitrate hot spot or measurement artifact. Some sites, especially Dearborn and Wyandotte, have a significant excess superposed on the base concentration leading to exceedances when the base concentration is as low as 20 μg/m^3. It would be helpful to determine whether the day-to-day variability in the base concentration is driven by regional transport, poor atmospheric ventilation of urban-scale emissions, or a combination of these factors. There is no direct methodology to partition these influences but insights can be obtained by examining the PM speciation data and surface winds

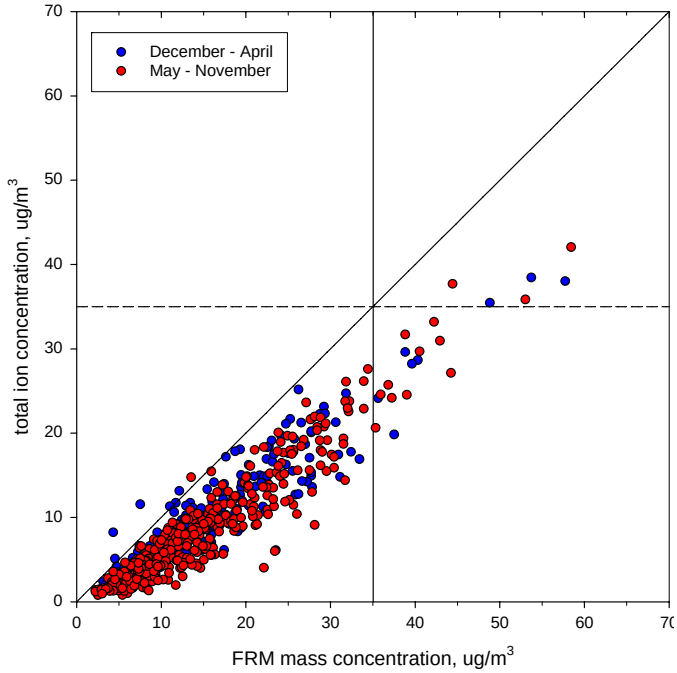


Figure 4-6. Total major ion concentration (sulfate, nitrate and ammonium) versus FRM mass at Allen Park, stratified by season.

distributions.[7] **Figure 4-6** shows the contribution of major ions (sulfate, nitrate, and ammonium) to FRM mass at Allen Park for the period December 2002 through December 2006. There were valid FRM and speciation data for 21 of the 71 exceedances observed at Allen Park during this time period. Six (29%) of these 21 exceedances days exhibited major ion concentrations greater than 35 μg/m^3 and thus the major ions alone were sufficient to cause the exceedance.[8] Over all 21 exceedance days the major ion contribution was 56-112% of the standard (median 84%) and 53-85% of the FRM $PM_{2.5}$ mass concentration (median 71%). At Allen Park the major ions are more than half of the PM on all exceedance days and, since Allen Park is representative of the network-wide base concentration (Figure 4-3), the major ions are deemed the dominant PM component at all sites with small local plume impacts.

Aerosol composition at Allen Park was examined in more detail for the network-wide high PM days. Speciation data was available for 31 of the 41 days. **Figure 4-7** is a scattergram for sulfate and nitrate on these days with all sulfate assumed to be ammonium sulfate and all nitrate assumed to be ammonium nitrate. Summertime events typically exhibit high sulfate and relatively low nitrate. Wintertime events exhibit high nitrate but sulfate is typically ~50% or more of the nitrate concentration. Thus, *while the wintertime events are often called high nitrate days, it should be noted that sulfate is also quite significant on these days*. Overall, 55% of these

[8] This assumes nitrate does not appreciably volatile from the FRM Teflon filter; in practice, the major ion concentration will be lower due to nitrate volatilization.

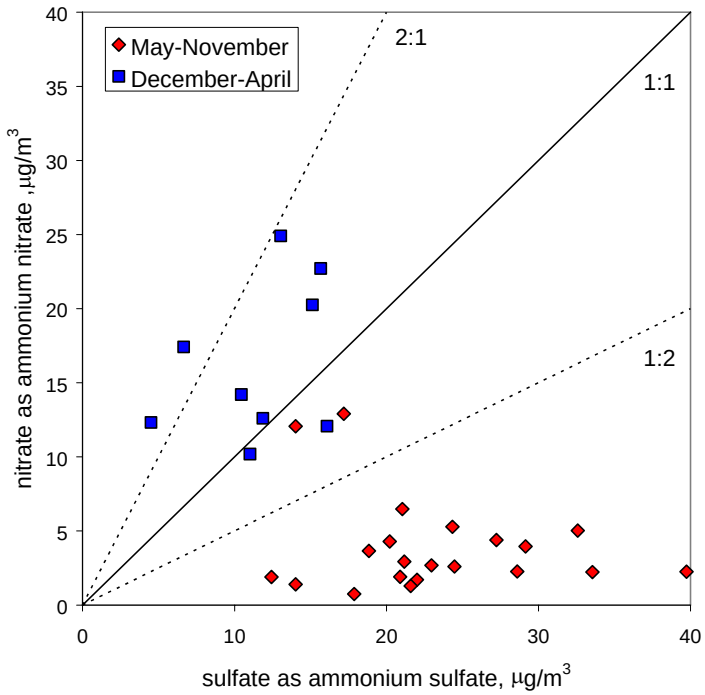


Figure 4-7. Ammonium nitrate and ammonium sulfate concentrations at Allen Park on network-wide high PM days.

31 days have a combined ammonium sulfate plus ammonium nitrate concentration exceeding 25 µg/m^3 although, as previously mentioned, the contribution of these ions will be less on certain days after correcting for ammonium nitrate loss from the FRM Teflon filters.

Previous work has demonstrated that sulfate at Allen Park is overwhelmingly from regional transport; nitrate is likely dominated by regional transport but the precise split between regional and local sources remains unknown. Assuming the sulfate and nitrate are regionally transported, the total contribution from regional sources would likely be larger than the sum of the major ions (after correction for nitrate loss), but cannot be further quantified because organic matter likely has significant regional and local contributions and at this time the organic matter concentrations in Southeast Michigan cannot be apportioned to regional and local contributions on an average basis, no less a day-to-day basis. A multivariable linear regression was performed to explain the observed organic carbon (OC) in terms of observed sulfate and elemental carbon (EC). The unconstrained regression yielded ($R^2 = 0.50$, all units in µg/m^3);

$$OC = (1.53 \pm 0.22) + (0.176 \pm 0.029)SO_4 + (2.49 \pm 0.26)EC$$

where the 95% confidence interval for each regression parameter is reported. There are many caveats to this very simple approach to apportioning the OC. For example OC associated with sulfate would likely vary by season due to differences in secondary formation rates. The approach is merely intended as a crude way to assign OC to a component that associates with

local, primary emissions (OC associating with EC) and a component that scales with sulfate. The results should not be over-interpreted. Assuming an OM/OC ratio of 1.8, the scaling factor for organic matter associated with sulfate would be $0.32 \times SO_4$. **Figure 4-8** shows the contribution of major ions measured at Allen Park to the base concentration on valid network days (Figure 4-8a) and the contribution of the major ions plus this crude estimate of the OM associated with sulfate (Figure 4-8b). The inclusion of associated OM substantially closes the mass balance on the base concentration. High base concentrations can largely be explained by regionally transported material alone and any concomitant increase in urban- and finer-scale contributions (for example, due to poorer atmospheric ventilation) might be relatively modest. From Figure 4-8a it can also be discerned that *the major ion contribution deviates positively from the median contribution at base concentrations above ~ 20 $\mu g/m^3$; it is above this value that major ions – and thus presumably regional transport – disproportionately influences the observed $PM_{2.5}$ mass concentrations*.

Concentration enhancements in surrogates for regional transport (sulfate and nitrate as surrogates) and urban-scale local emissions (EC as surrogate) were examined for the network-wide high PM days. For each valid network day with speciation data at Allen Park, concentrations for the major aerosol components were compared to the monthly median values obtained by pooling over all valid network days and over all years. Sulfate was on average 4.5 times higher and nitrate was on average 2.8 times higher on network-wide high concentration days compared to the corresponding monthly median value. In contrast, EC was on average only 1.3 times higher on network-wide high concentration days compared to the corresponding monthly median EC concentration.[9] Using the EC enhancement as an indicator for the atmospheric ventilation of urban-sale emissions, this analysis suggests *reduced atmospheric ventilation on network-wide high PM days does indeed increase the urban- and-finer scale contributions but, in the absence of direct plume hits from near-field sources, the enhancement is much smaller than observed for the major ions which are associated with regional transport.* OC was on average 1.6 times higher on network-wide high PM days compared respective monthly median concentration (1.8 times higher if the OC data is blank-corrected). This enhancement is between the values ascribed to regionally transported material and urban-scale emissions, consistent with OC contributions from a combination of local (urban or finer-scale) primary sources and secondary formation (whether local or regional in origin).

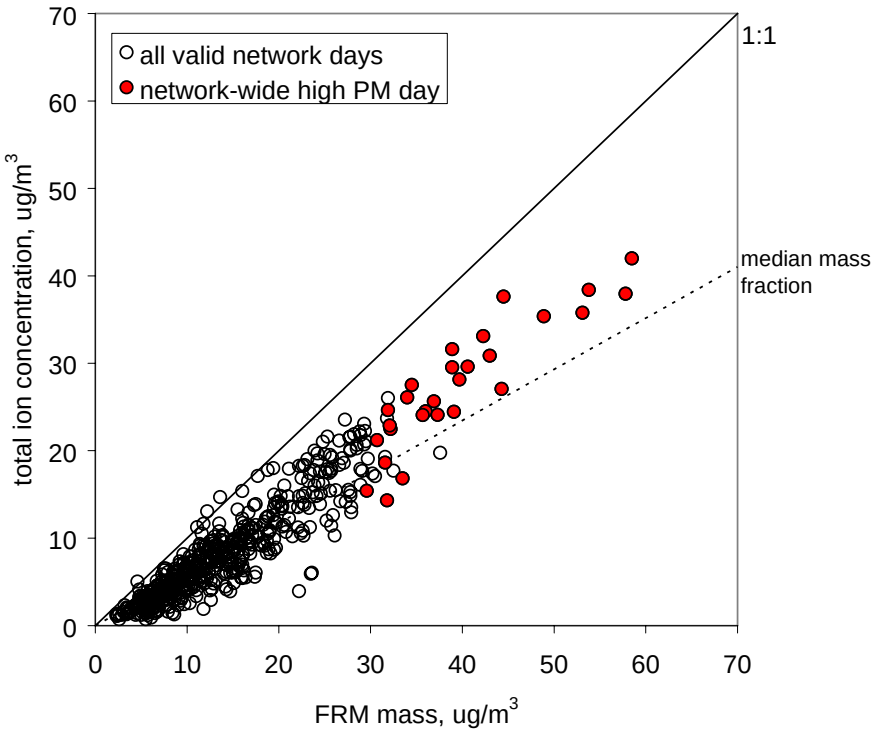
Lastly, the daily FRM sampling at Allen Park is exploited to determine whether high PM days at each site correspond to a spatially- and temporally- isolated excursion (high PM not observed at Allen Park which, as shown in Figure 4-3, largely captures the network-wide PM base concentration), a temporally-isolated excursion (high PM also observed at Allen Park on that day but not the preceding or following day), or a multiday PM episode (high PM observed at Allen Park on adjacent days). Multiday PM episodes are stratified into two groups – two successive high PM days at Allen Park, and three-or-more successive high PM days at Allen Park. Two successive high PM days could arise from a brief event that straddles midnight, while three-or-more more successive high PM days clearly indicate an episode with temporal persistence, whether caused by regional transport or sustained areawide air mass stagnations.

[9] EC has a day-of-week trend at Allen Park (higher on weekdays) so the analysis was repeated by first stratifying days as weekends and weekdays and then calculating the day-specific enhancement compared to the respective weekend or weekday monthly median value. The same average enhancement – a factor of 1.3 – was obtained.

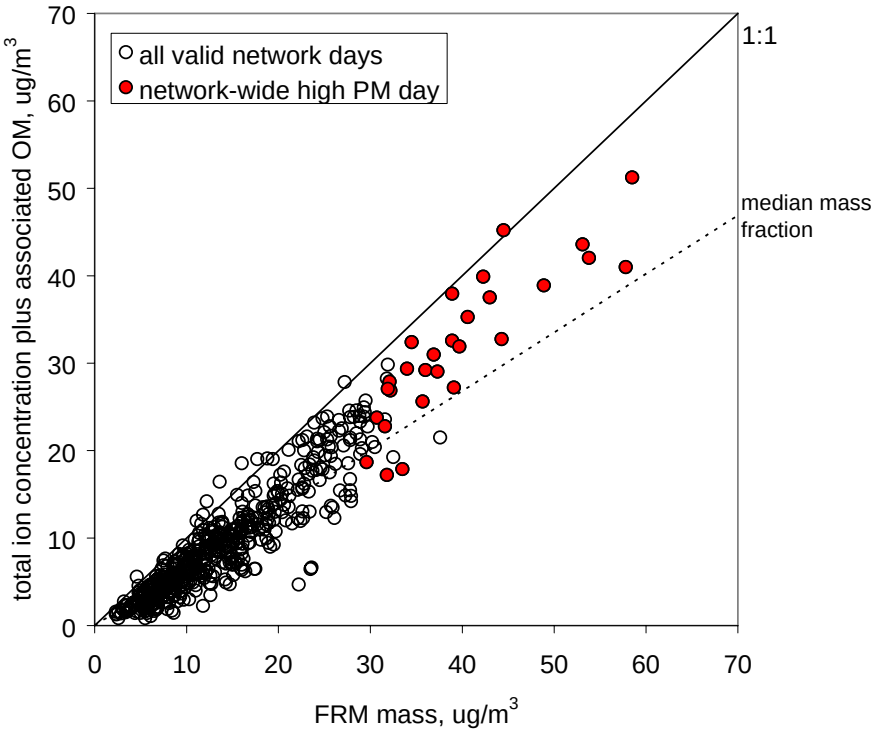
High PM conditions were defined as >30 μg/m^3 for the interrogated site and >25 μg/m^3 for the reference site (Allen Park). **Figure 4-9** shows the site-specific distributions. Dearborn has the highest frequency of spatially- and temporally-isolated high PM days (red bars; dates for all sites listed in **Appendix C**). As previously described, nearby emission sources are most important at this site and can drive high PM days even when the network-wide base concentration is as low as 20 μg/m^3. *Relatively high frequencies of spatially- and temporally-isolated high PM days were also observed at Wyandotte, Southwest High School, and East 7 Mile. At all sites except Dearborn, high PM days most frequently correspond to multiday PM episodes* (blue plus green bars) and most frequently to longer-persistence episodes (three- or-more days with high PM at Allen Park).

In summary –

- Network-wide high PM days are observed primarily in the summertime but are also observed in the wintertime.
- Network-wide high PM days in the summer typically have high sulfate and relatively low ambient nitrate. The nitrate contributions to FRM mass will be even lower after accounting from ammonium nitrate volatilization from the Teflon filter.
- Network-wide high PM days in the winter typically have high nitrate but ammonium sulfate is typically at least 50% of the ammonium nitrate mass so these events are actually high nitrate <u>and</u> high sulfate.
- Network-wide high PM days are primarily driven by regional transport with intensification of urban-scale emissions due to low atmospheric ventilation being relatively less important. Plume impacts from nearby emission sources are superposed on the network-wide baseline.
- Site-specific high PM days are most often observed when the area is experiencing a multiday high PM episode.



(a)



(b)

Figure 4-8. Allen Park species contributions to the base concentration on valid network days: major ions only (a); and major ions plus associated organic matter (b).

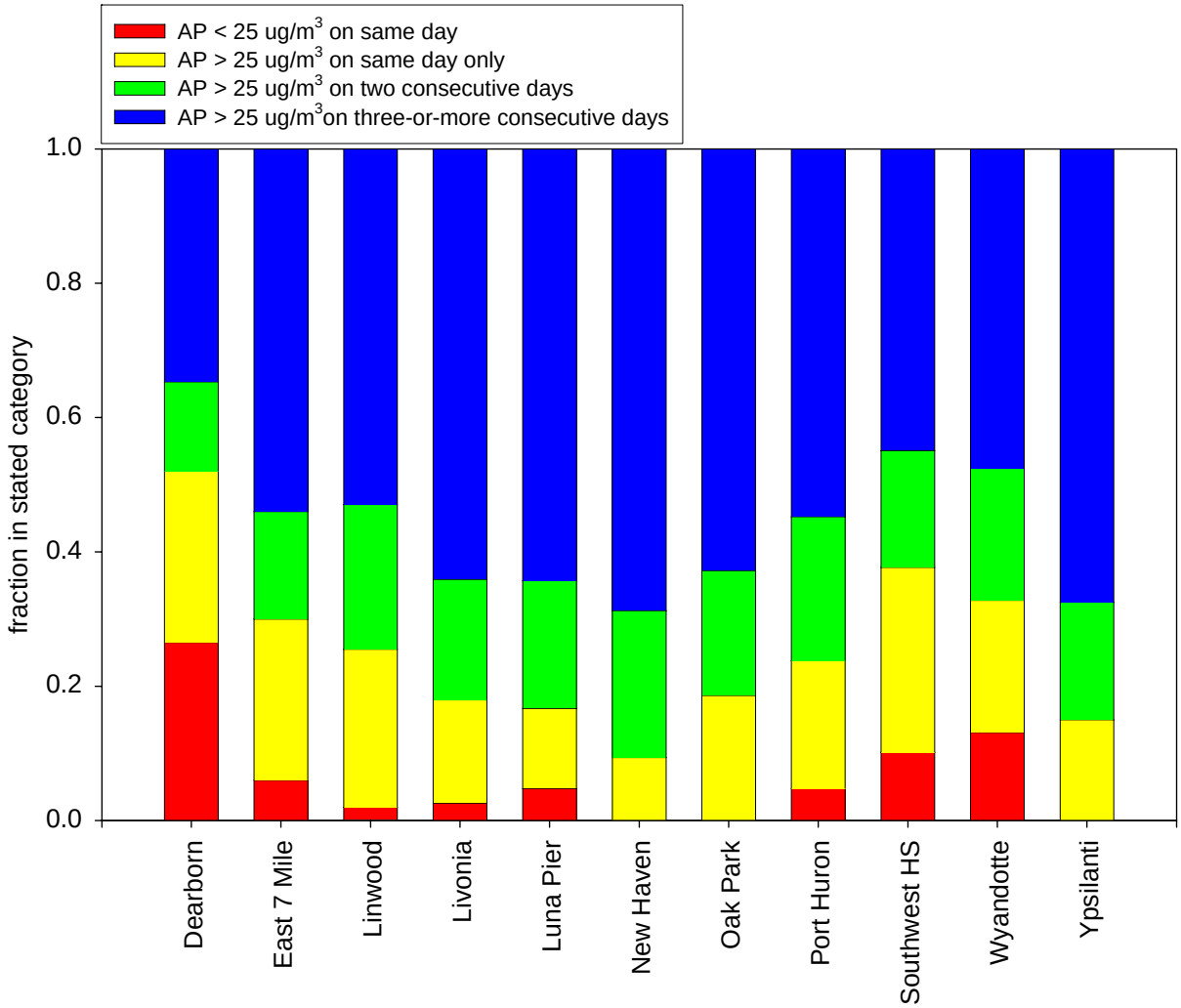


Figure 4-9. Classification of high PM days ($PM_{2.5}$ > 30 μg/m^3) at each site in Southeast Michigan by the time series behavior of daily $PM_{2.5}$ at Allen Park.

5. RELATIONSHIPS BETWEEN SITE-SPECIFIC EXCESS MASS AND SURFACE WINDS

The previous section demonstrates that exceedances of the 24-hour $PM_{2.5}$ NAAQS at most sites in Southeast Michigan are primarily driven by an enhancement of regionally transported material which elevates the concentration baseline upon which local contributions are superposed. There is typically a modest enhancement in the urban-scale contributions on high PM days, presumably due to coincident air mass stagnations. This does not imply that urban-scale contributions are small, but rather they are not significantly modulated on high PM days. At a few sites, plumes from nearby emission sources can substantially contribute to exceedances and near exceedances.

This section presents relationships between the excess mass (relative a reference concentration that should capture regional- and larger-scale influences, and to some extent urban-scale influences) and surface winds for each site. This analysis does not focus on excess mass observed on high PM days exclusively, but rather excess mass over the entire concentration distribution. While in principle there might be different local sources contributing on high PM days compared to all other days, the previous analyses do not provide any evidence for such preferential behavior and there is much statistical power to be gained from using the entire data set. Allen Park was initially chosen as a reference site for generating the times series of excess mass. Figure 4-3 demonstrates that Allen Park is indeed highly correlated with the network-wide base concentration on most days, although it is modestly influenced by nearby emissions for winds from the northeast (Dearborn) (Wade *et al.* 2008). Thus, the calculated excess mass concentrations at other sites might be biased low for winds from the northeast and sources in this direction might be damped or even missed. This limitation does not significantly affect the results for other bearings. Certain analyses were repeated using the network-wide base concentration as the reference for calculating excess mass. This reduces the number of sample days used in the analyses but removes any issues with directional bias introduced by using a single site as the reference. Finally, this methodology also relies on having representative surface winds at the site. It is not clear that hourly winds from Detroit Metropolitan Wayne County Airport will be representative for sites such as Luna Pier and Port Huron; however, the excess mass construct using Allen Park or the entire Southeast Michigan network to define a base concentration is perhaps an equally limiting factor when examining these distant sites.

Relationships between excess mass and surface winds were probed using Conditional Probability Function (CPF) and 1-D Nonparametric Wind Regression (NWR) plots. A brief summary of the methods and their utility is presented in **Appendix D**. The stability of CPF and NWR results was examined in various ways. Many analyses were run with the entire data set (1999-2006) and the most recent three years (2004-2006) since greatest interest is in current conditions. The former includes substantially more data and is less susceptible to spurious results. The threshold for high excess mass in the CPF analysis was chosen as the top quartile and each analysis was repeated using the top decile. Finally, sensitivity to days with high excess mass at the reference site (Allen Park) was examined by running most of the analyses on the full data set and then repeating the analyses with the data censored to exclude days where the excess mass was less than -2 $\mu g/m^3$. This threshold is based on two times the propagated collocated precision for the concentration difference using a collocated precision of 0.7 $\mu g/m^3$for a single measurement. Since the excess mass concentration is a 24-hour integrated parameter but the surface winds data

are hourly, care must be taken in handling calm hours. Calms days (operationally defined as six-or-more calm hours in the day) were retained but calm hours (wind speeds less than 2 mph) were removed.[11]

Figure 5-1 shows the CPF analysis results for each site using the top decile of the excess mass distribution as the threshold for a high concentration and for the period 1999-2006. Plots for Luna Pier, New Haven and Oak Park are excluded because they were either sensitive to the methodology or indistinguishable from the CPF plot for the absolute mass concentration at the site. The plots were nearly identical when using 1999-2006 data and 2004-2006 data only, which means the bearings of sources driving the excess mass have not changed over time. Dearborn, Newberry, and Wyandotte CPF plots all implicate sources to the southwest. These are likely nearby sources and, recalling that the prevailing wintertime surface winds are from the southwest (Figures 3-4 and 3-5) it is not surprising that the analyses in Section 4 implicated local sources as significant contributors to the excess mass at these sites given the favorable wind directions for advecting emissions from the sources to these sites. East 7 Mile, Linwood, and Southwest High School CPF plots exhibit higher frequency of excess mass with winds from the south/southwest, albeit weaker signatures than observed for Dearborn / Newberry / Wyandotte. Ann Arbor and Ypsilanti have a higher frequency of high excess mass when the winds are from the east and Livonia has a higher frequency of high excess mass when the winds are from the southeast. All three of these cases correspond to bearings in the direction of the Detroit population and/or commercial/industrial cores. However, surface winds from the east are not common and thus these sites are rarely downwind of the urban core zones. The CPF plot for Port Huron implicates sources at bearings east through south of the site which is consistent with the industrial zones along the U.S./Canada border including but not limited to petroleum refineries. In summary, the CPF plots are consistent with the local source impacts identified in Section 4 and consistent with known emission source regions. It appears this analysis can pick up the urban plume advected from Detroit to sites that are outside the urban emissions zone.

NWR plots show the expected excess concentration as a function of wind direction. Several analyses were performed using Allen Park data for the reference concentrations (see footnote #11). Subsequently, NWR plots were constructed using the network-wide base concentration estimates for the reference concentrations and those results, which were generally consistent with the results that were obtained using Allen Park as a reference, are presented here. Yearly box plots were generated for the excess $PM_{2.5}$ mass at each site compared to the network-wide base concentration. FRM data for 2007 was also included in these time series plots but have not been examined in sufficient detail for incorporation into wind regression analyses. Given the seasonal and year-to-year variability in surface winds, the representativeness of valid network days was assessed by comparing to the annual surface winds for all days. **Figure B-2** shows annual wind roses for all days and valid network days.

[11] The following analyses were performed with results available upon request: CPF for top quartile of absolute concentration distribution (no subtraction of Allen Park concentration values), 1999-2006; CPF for top decile of entire excess mass distribution, 1999-2006; CPF for top quartile of entire excess mass distribution, 1999-2006; CPF for top quartile of censored excess mass distribution, 1999-2006; CPF for top decile of entire excess mass distribution, 2004-2006; CPF for top quartile of entire excess mass distribution, 2004-2006; NWR for entire excess mass distribution, 1999-2006; NWR for entire excess mass distribution, 2004-2006; and NWR for censored excess mass distribution, 1999-2006.

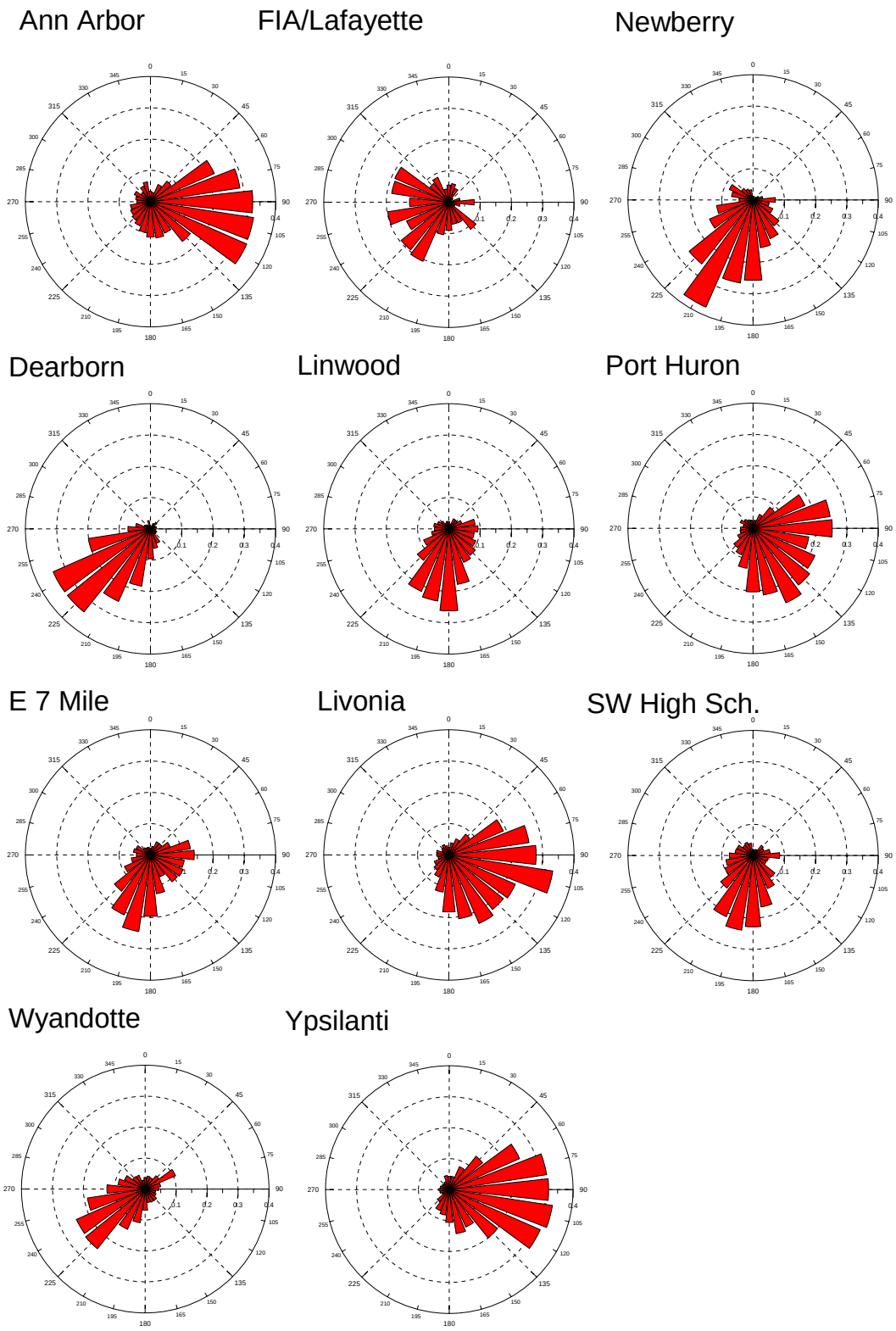


Figure 5-1. Conditional probability function plots for excess mass at each site relative to Allen Park, 1999-2006. Probabilities are for the top decile of the excess mass distribution.

Data for 1999 were excluded from the concentration time series because the network was being phased in during that year; there were only 14 valid network days and the valid network days winds distribution was markedly different from the 1999 annual surface winds distribution. For the remaining years the annual wind roses for valid network days showed good agreement with the annual wind roses for all days (Figure B-2), including 2006 which had a relatively low number of valid network days (also seasonally biased towards the first quarter) due to a reduction in sampling frequency at certain sites. These favorable comparisons demonstrate the representativeness in using valid network days to capture annual average behavior for the site-specific excess mass.

Figure 5-2 shows annual distributions of the network-wide base concentration. Similar distributions were observed for the first four years (2000-2003) with substantial year-to-year variability for the subsequent four years (2004-2007). The lowest median value was in 2004, followed by a relatively high mean value in 2005.

Excess mass annual time series and NWR plots were generated for each site with selected results presented in this report. NWR was performed after stratifying the data into two time periods: 2000-2003 and 2004-2006. Hourly surface winds distributions, **Figure 5-3**, exhibit a lower frequency of winds from the southwest for the 2004-2006 period compared to the 2000-2003 period. However, the NWR results are presented as the expected concentration value for each wind direction and thus are not influenced by the frequency distribution of wind direction. An apportionment of the average excess mass to wind sectors (and thus emission sources in that sector) would require a weighting of the sector-specific expected concentration by the sector-specific frequency of wind direction. This step is discussed in Section 6 as a recommendation for future work. For the purpose of identifying whether emission source strengths have changed over time, the expected concentration as presented in this section is appropriate since it is not influenced by year-to-year differences in the distribution of surface wind directions.

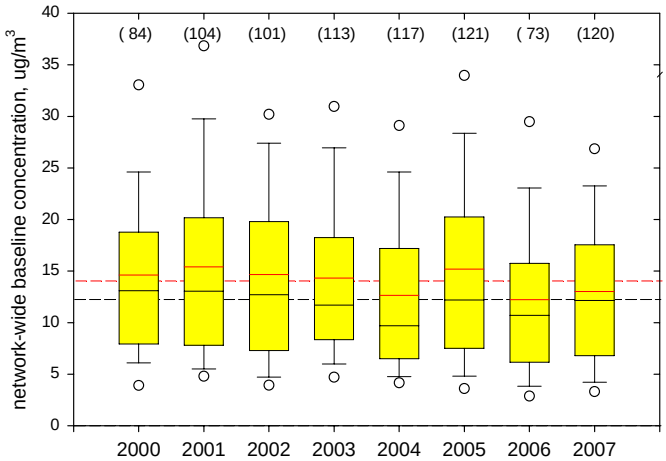
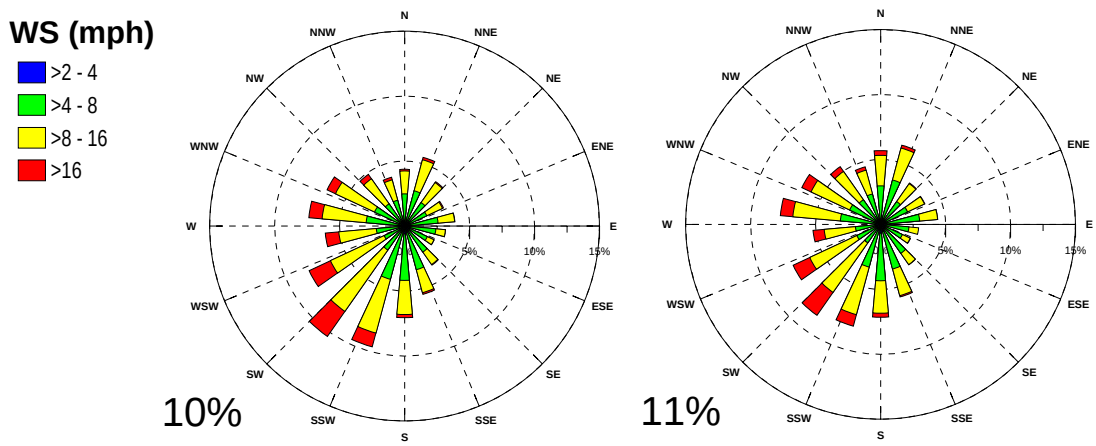


Figure 5-2. Annual distributions of the network-wide base concentration. Open circles are 5th and 95th percentile values; the red and black lines are mean and median values (solid within box for yearly, dashed for entire data set); and the number of samples is in parenthesis at the top of each plot.



(a) 2000-2003 (b) 2004-2006

Figure 5-3. Wind rose for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW): (a) 2000-2003; and (b) 2004-2006. Calms (wind speeds less than 2 mph) are listed to the lower-left of each wind rose.

Ann Arbor, FIA/Lafayette, Newberry were excluded because sampling was not sustained over the 2000-2006 time period. Luna Pier and Port Huron were excluded because they are at the spatial extents of the geographic domain and both the base concentration estimates and surface winds might not be representative. **Figures 5-4** through **5-7** show the time series and NWR plots for Dearborn, Wyandotte, Southwest High School and Linwood, respectively. NWR results as polar plots are presented with the radial concentration units in $\mu g/m^3$; the red line is the average contribution and the pink lines are the 95% confidence intervals. NWR results were also generated after first censoring the data to remove extreme values and thereby stabilize the expected concentration estimates.[12] The bottom plot in each panel of Figure 5-4 shows the NWR results for censored data, and includes the difference in expected concentration values between the two time periods (blue line). **Figure E-1** (**Appendix E**) presents NWR results for all sites as Cartesian plots for all data and censored data.

Dearborn (Figure 5-4) exhibits the average highest average excess mass. Both the mean and median excess mass decreased beginning in 2005 despite an increase that year in the mean base concentration (Figure 5-2). The time series for the annual base concentration and excess mass concentration are decoupled which adds confidence that the decreases in excess mass are real. Expected mass concentrations of at least 2 $\mu g/m^3$ were observed for all wind directions (center and bottom plots in Figure 5-4) with elevated excess mass for bearings 120-300°N and a maximum in the expected concentration at ~225°N of with concentrations 9 and 7 $\mu g/m^3$ for 2000-2003 and 2004-2006, respectively. The excess mass floor of ~2 $\mu g/m^3$ might be real since the Detroit population core, perhaps a surrogate for mobile source and area emissions, is to the

[12] Extreme values were defined as those values exceeding the upper outer fences (UOF) and lower outer fences (LOF) of the nonparametric distribution of excess mass: $C_{UOF} = C_{75} + 3\times C_{IQR}$; and $C_{LOF} = C_{25} - 3\times C_{IQR}$ where C_i is concentration *i*, subscripts 25 and 75 denote 25th and 75th percentiles, and IQR is the interquartile range ($C_{75} - C_{25}$).

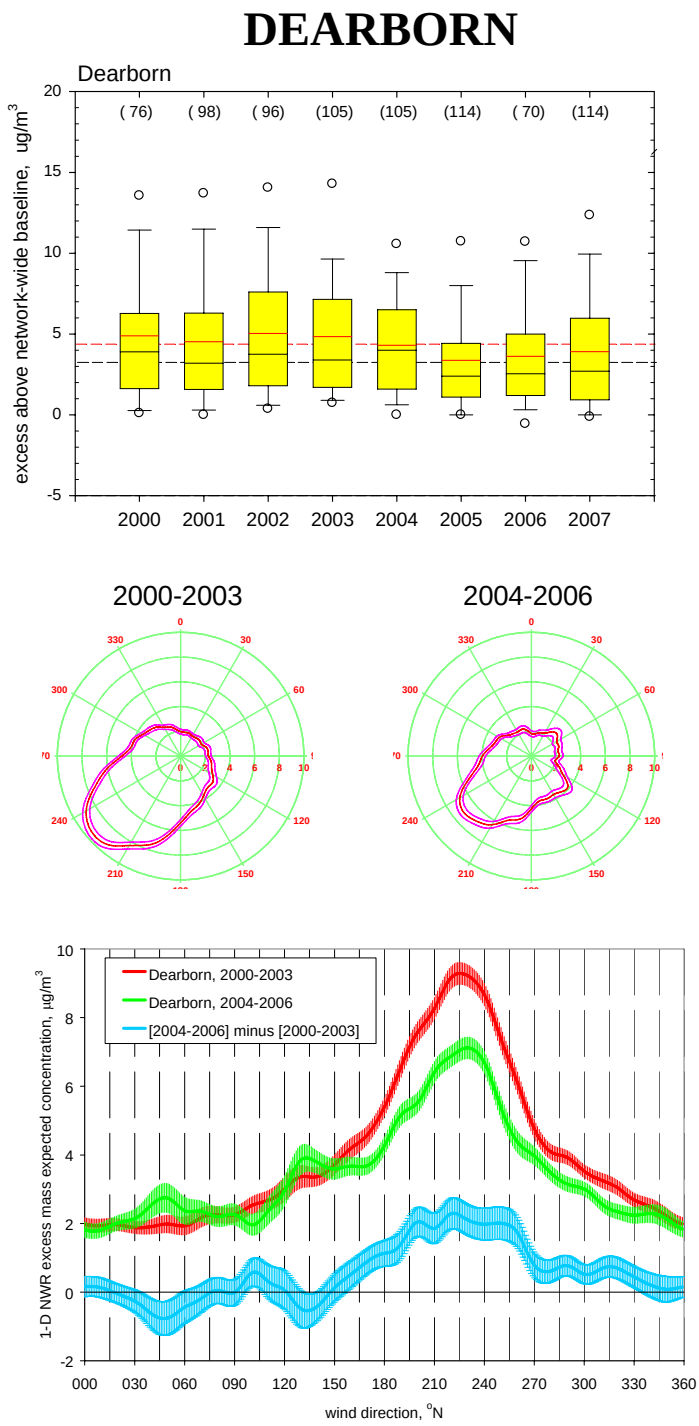


Figure 5-4. Excess $PM_{2.5}$ mass compared to the network-wide base concentration. **Top:** box plots of annual excess mass concentration distributions. Open circles are 5th and 95th percentile values; the red and black lines are mean and median values (solid within box for yearly, dashed for entire data set); and the number of samples is in parenthesis. **Center:** 1-D NWR for excess mass at each site relative to the network-wide baseline concentration for 2000-2003 (left) and 2004-2006 (right). Average concentrations and 95% confidence intervals are red and pink lines, respectively, and radial units are $\mu g/m^3$. **Bottom:** 1-D NWR expected excess mass concentrations after censoring the data to remove extreme values.

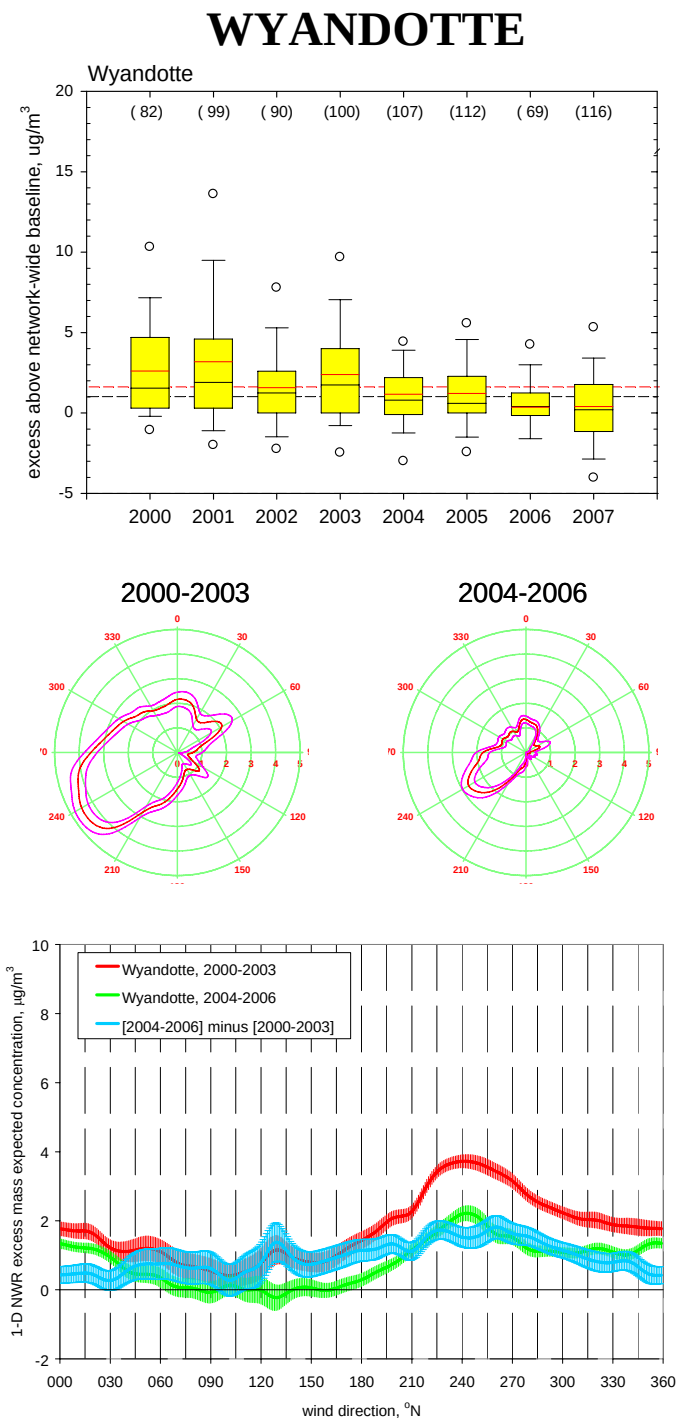


Figure 5-5. Excess $PM_{2.5}$ mass compared to the network-wide base concentration. **Top:** box plots of annual excess mass concentration distributions. Open circles are 5th and 95th percentile values; the red and black lines are mean and median values (solid within box for yearly, dashed for entire data set); and the number of samples is in parenthesis. **Center:** 1-D NWR for excess mass at each site relative to the network-wide baseline concentration for 2000-2003 (left) and 2004-2006 (right). Average concentrations and 95% confidence intervals are red and pink lines, respectively, and radial units are $\mu g/m^3$. **Bottom:** 1-D NWR expected excess mass concentrations after censoring the data to remove extreme values.

SOUTHWEST HIGH SCHOOL

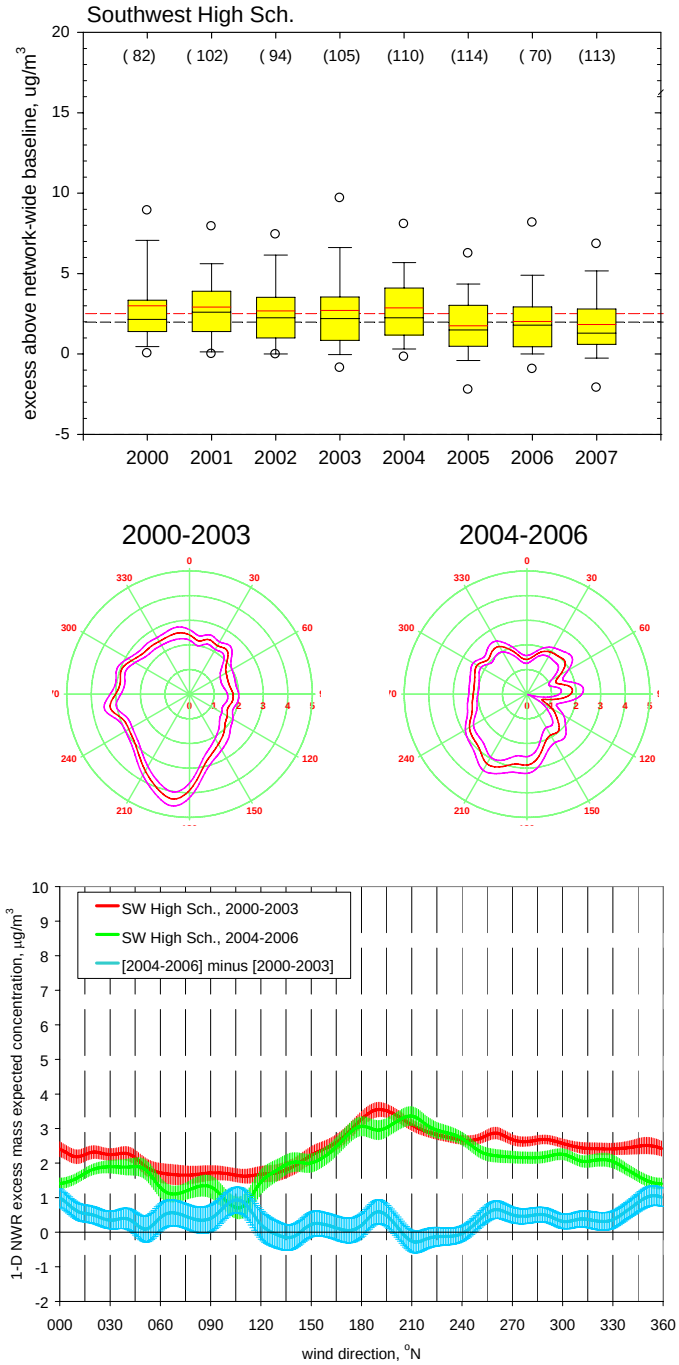


Figure 5-6. Excess $PM_{2.5}$ mass compared to the network-wide base concentration. **Top:** box plots of annual excess mass concentration distributions. Open circles are 5th and 95th percentile values; the red and black lines are mean and median values (solid within box for yearly, dashed for entire data set); and the number of samples is in parenthesis. **Center:** 1-D NWR for excess mass at each site relative to the network-wide baseline concentration for 2000-2003 (left) and 2004-2006 (right). Average concentrations and 95% confidence intervals are red and pink lines, respectively, and radial units are µg/m^3. **Bottom:** 1-D NWR expected excess mass concentrations after censoring the data to remove extreme values.

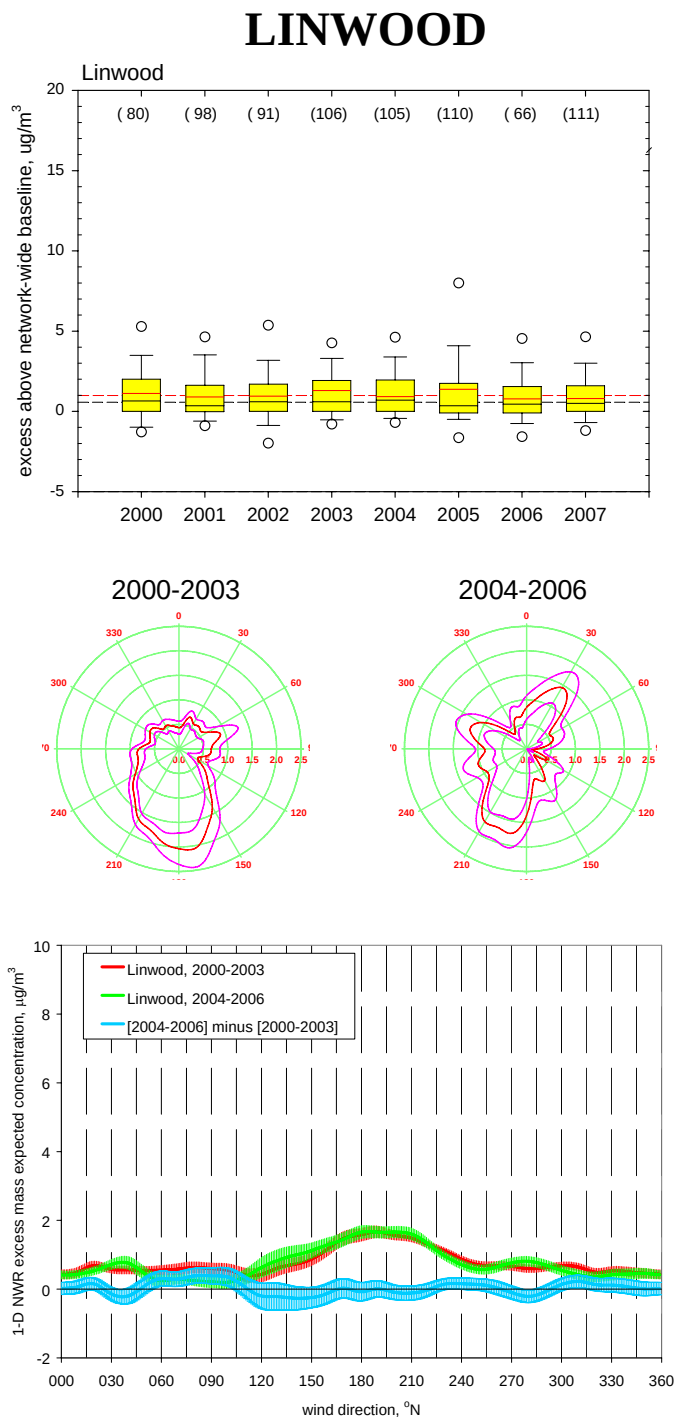


Figure 5-7 Excess $PM_{2.5}$ mass compared to the network-wide base concentration. **Top:** box plots of annual excess mass concentration distributions. Open circles are 5th and 95th percentile values; the red and black lines are mean and median values (solid within box for yearly, dashed for entire data set); and the number of samples is in parenthesis. **Center:** 1-D NWR for excess mass at each site relative to the network-wide baseline concentration for 2000-2003 (left) and 2004-2006 (right). Average concentrations and 95% confidence intervals are red and pink lines, respectively, and radial units are $\mu g/m^3$. **Bottom:** 1-D NWR expected excess mass concentrations after censoring the data to remove extreme values.

north and east and the site is located in the Detroit commercial/industrial core. It is possible, however, that the excess mass floor reflects contamination in the NWR analysis from using daily-integrated FRM mass together with hourly winds which might vary over the course of the day and thus smear short duration, high intensity contributions from the local emission sources across other wind directions. The period 2004-2006 does indeed exhibit lower excess mass concentrations compared to 2000-2003, consistent with Figure 4-5, with maximum reductions of ~2 $\mu g/m^3$ from ~195-255°N. The Dearborn NWR results were insensitive to the censoring of data to remove extreme values (Figure E-1). In summary, Dearborn is significantly influenced by local emission sources to the southwest of the site. This is also the direction of the prevailing wind and thus emission controls on these sources would have a dramatic impact on observed concentrations at the Dearborn site. There is also a significant urban scale contribution regardless of wind direction with expected concentration greater than 2 $\mu g/m^3$ (the excess mass floor is 2 $\mu g/m^3$ plus there are urban-scale contributions to the base concentration) although the relative contributions of mobile, area, and dispersed point source emissions is not clear.

Wyandotte and Southwest High School have similar mean and median excess mass, second after Dearborn. Let us first consider Wyandotte. The top plot in Figure 5-5 shows a dramatic and steady reduction in mean and median excess mass starting in 2004. Expected mass concentrations were lowest for wind directions from the east/southeast (indeed, ~0 $\mu g/m^3$ for 2004-2006) which is consistent with the orientation of the site relative to local sources and the Detroit population and commercial / industrial cores. There are two sectors with high expected excess mass concentrations. One sector is broadly to the north/northwest with expected excess mass concentrations ~2 $\mu g/m^3$ for 2000-2003 and with ~50% decrease for 2004-2006. This bearing is consistent with the location of the Detroit population and commercial / industrial cores which are north of Wyandotte. The other sector is to the southwest with a maximum excess mass concentration of nearly 4 $\mu g/m^3$ for 2000-2003 and with ~50% decrease for 2004-2006. Given both the alignment of this sector with the prevailing wind direction and the magnitude of the expected concentrations, the emission reductions achieved from this sector are most responsible for the observed decrease in the excess mass concentration over time. Local emission sources in this sector include a large quarry. Like Dearborn, the NWR results are relatively insensitive to the censoring of extreme values (Figure E-1). In summary, the wind direction dependence of expected excess mass concentration at Wyandotte is consistent with known emission sources / source regions. Expected concentrations have decreased over the past few years for two wind distinct bearings – north and southwest of the site – which suggest that emission reductions have taken place in both sectors. The reductions from the southwest are more significant to both annual average concentrations and high PM days.

Annual mean and median excess mass concentrations at Southwest High School also decreased starting in 2005 (Figure 5-6). NWR polar plots suggest the excess mass decrease was driven by emission reductions to the south/southwest. However, NWR results for all data and censored data (Figure E-1) demonstrate that a few extreme events were driving the higher expected mass from the south/southwest for 2000-2003 compared to 2004-2006. Indeed, the NWR plot for censored data (Figure 5-6, bottom) shows essentially no difference in expected excess mass at the location of the maximum (~190°N). Emission reductions might be driving small differences in expected excess concentration between 2000-2003 and 2004-2006 at bearings of ~105, 250-300, and 355°N. The expected excess mass concentration floor was ~2 $\mu g/m^3$ for

2000-2003 and was modestly lower for 2004-2006. This floor is similar to the excess mass concentration floor observed at Dearborn which is consistent with their close proximity. In summary, in contrast to Dearborn and Wyandotte, individual local sources contributing to excess mass at Southwest High School appear to have smaller average impact and are potentially more numerous. Highest expected concentrations are from bearing of ~190°N and with extreme events realized primarily in the period 2000-2003. Based on Figure 4-3 these events typically occurred on relatively clean days (base concentrations 10-20 μg/m^3) and were not sufficiently high to cause exceedances. Like Dearborn, there is a relatively high floor for the excess mass over all wind directions but the relative contributions of mobile, area, and dispersed point source emissions is not known.

Linwood is located near the northeast corner of the Detroit industrial core. There are no discernible changes in the excess mass distribution over time (Figure 5-7). NWR polar plots show different features for the 2000-2003 and 2004-2006 time periods; the differences are driven by extreme values and NWR on the censored data yields very consistent concentrations profiles for the two time periods (Figure 5-7, bottom plot). The excess mass concentration floor is ~0.5 μg/m^3 with perhaps modestly lower values for bearings to the east/northeast (60-105°N). Increased excess mass is observed over the range 120-240°N with a broad maximum at 150-210°N. This behavior suggests that Linwood is at the fringe of the high emissions zone in the Detroit commercial/industrial core. Excess mass concentrations when the winds are from the southwest approach 1.5-2 μg/m^3, consistent with the floors at Dearborn and Southwest High School. For other wind directions, the expected concentrations are lower.

The above detailed analysis of four sites – Dearborn ,Wyandotte, Southwest High School, and Linwood – contributes to our understanding of local and urban-scale emissions contributions to observed PM mass. Local point source impacts are historically large at both Dearborn and Wyandotte but have been decreasing. In both cases, the largest contributors are located southwest of the sites, which is consistent with the prevailing winds. Dearborn and Southwest High School have expected excess mass concentrations of a least 1.5-2 μg/m^3 from all wind directions, while the minimum expected mass concentrations are lower at Wyandotte and Linwood. Thus, Dearborn and Southwest High School appear to be within the high emissions zone with contributions from multiple point sources and possibly significant contributions from area and mobile sources. The plume from this high emissions zone is advected downwind, consistent with the higher expected excess mass concentrations at Wyandotte and Linwood for winds from the north and south/southwest, respectively. Thus plume is superposed on the broader urban-scale emissions contributions from mobile, area, and possibly other point sources, which presumably also disperse as advected downwind.

This conceptual model is tested by examining excess mass patterns at sites outside the commercial/industrial core. **Figure 5-8** shows the Allen Park, Dearborn, Linwood, East 7 Mile, and New Haven NWR results for 2004-2006 censored data (note the concentration scale range is different than Figures 5-4 to 5-7). These five sites fall roughly along a transect oriented ~225°N and thus can be examined using the framework of Figure 2-1. The right figure shows that Allen Park (black line) and Linwood (red line) concentration profiles are nearly mirror images spanning the range 0.25-2 μg/m^3 with a Linwood maximum and Allen Park minimum at 180-220°N. These sites are on opposite ends, and nearly equidistant, from Dearborn (clearly a

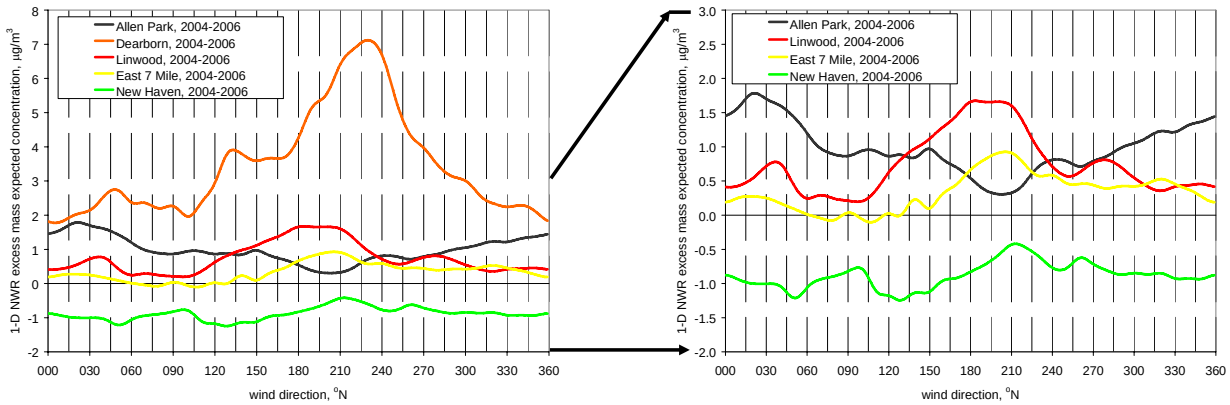


Figure 5-8. NWR expected concentrations for excess $PM_{2.5}$ mass compared to the network-wide base concentration, 2004-2006 data censored to remove extreme values as described in footnote #12.

hot spot, left figure) and the industrialized zone to its southeast. This suggests there is an emissions plume emanating from Dearborn and industrial areas to its southeast, extending to the Detroit River, which impact Allen Park and Linwood similarly in terms of expected concentrations. Average mass contributions to these sites will differ with the frequency distribution of wind directions. The expected concentration from this plume decreases at more distant sites. It is still evident at East 7 Mile and is barely discernible from the baseline at New Haven. In addition to this plume from the Detroit commercial/industrial core, there appears to be a broader urban scale emissions profile as evidenced by the decreasing excess mass concentration floors with increasing distance from the Detroit population core. Expected excess mass concentrations for bearings outside the commercial / industrial core plume are ~ 0.5 $\mu g/m^3$ at Allen Park and Linwood, ~0 $\mu g/m^3$ at East 7 Mile, and about -1 $\mu g/m^3$ at New Haven. Recall that the base concentration includes regional and some urban-scale contributions and the negative excess concentrations at New Haven suggest a maximum of at least 1.5$\mu g/m^3$ (based on -1 $\mu g/m^3$ at New Haven and +0.5 $\mu g/m^3$ at Allen Park/Linwood) for the urban-scale contributions within the metro area.

Six sites – Allen Park, East 7 Mile, Livonia, New Haven, Oak Park, and Ypsilanti – are considered from a complementary perspective. Figure 4-3 demonstrates that large excess mass excursions above the network-wide base concentration are relatively rare at these sites. There are occasional extreme excess values which are both positive and negative with respect to the base concentration, so the excess mass distributions were stabilized by censoring to remove extreme values.[12] NWR results for all these sites using both all data and censored data are presented in Figure E-1. For each site, all expected concentrations were scaled so the lowest expected concentration as a function of wind direction was zero (concentrations are negative when the expected concentration is below the base concentration) and the normalized to a maximum expected concentration of unity. **Figure 5-9** shows the scaled NWR concentration plots are superposed on 2000 census tract level population density data. The plots are ordered clockwise about Detroit area starting with Ypsilanti and ending with Allen Park. The following features are observed.

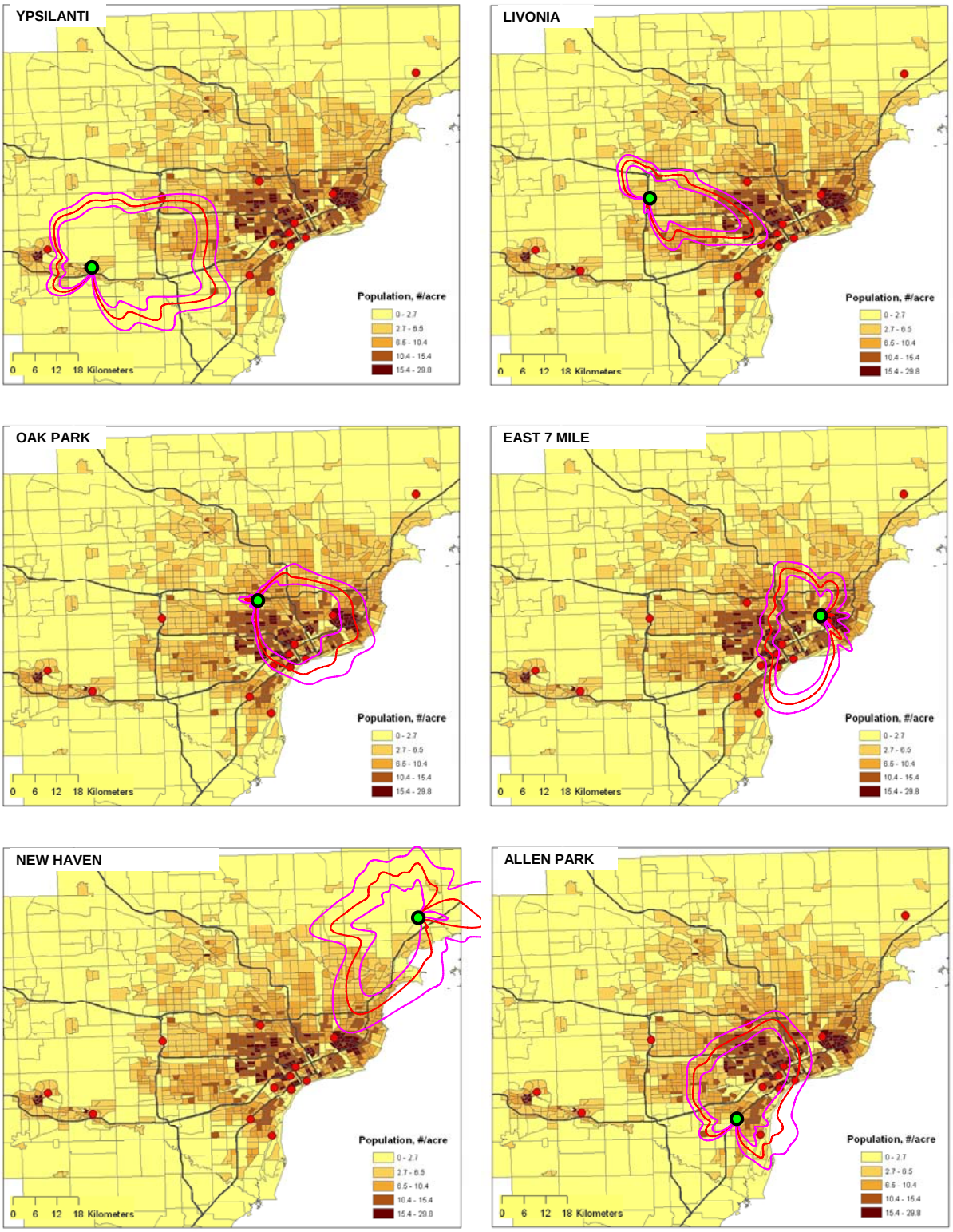


Figure 5-5. 1-D NWR for excess mass at each site (green circle) relative to the network-wide baseline concentration for 2004-2006, censored to remove extreme values according to footnote #12. NWR results are superposed on 2000 census tract population density data.

- *Ypsilanti.* The expected excess mass concentration ranged from -1 to +1 μg/m^3. Bearings of highest excess mass concentration correspond to an urban plume emanating from the east, consistent with the Detroit population and commercial/industrial cores.
- *Livonia.* The expected excess mass concentration ranged from -1 to +1 μg/m^3. Bearings of highest excess mass concentration correspond to an urban plume emanating from the Detroit population and commercial/industrial cores with potentially larger impacts from the latter core.
- *Oak Park.* The expected excess mass concentration ranged from -0.5 to +1 μg/m^3. The higher floor is consistent with this site being closer to the Detroit population and commercial/industrial cores than Ypsilanti and Livonia. Bearings of highest excess mass concentration range from due east to due south, consistent with the Detroit population and commercial/industrial cores.
- *East 7 Mile.* The expected excess mass concentration ranged from 0 to +1 μg/m^3. Highest concentration bearings are to southwest with elevated expected concentrations also to the west, consistent with the Detroit commercial/industrial and population cores, respectively.
- *New Haven.* The expected excess mass concentration is nearly constant at -1 μg/m^3. A bearing of modestly elevated expected excess mass concentrations is to the southwest, aligned with the Detroit commercial/industrial and population core.
- *Allen Park.* The expected excess mass concentration ranged from 0.5 to +2 μg/m^3. High concentration bearings are to the north through east of the site, consistent with the Detroit population and commercial/industrial cores.

These six sites completely surround the Detroit population and commercial / industrial cores and in each case demonstrate highest expected excess mass for winds from the core zones. This analysis clearly demonstrates the ability to decouple excess mass concentrations from the network-wide base and to draw a consistent interpretation from the results across all sites. Ypsilanti, Livonia and New Haven all have expected excess mass concentrations of about -1 μg/m^3 when the sites are upwind of the Detroit population and commercial/industrial cores. Thus a reasonable estimate for the average urban-scale contribution to the average network-wide base is about 1 μg/m^3. The 2004-2006 average base concentration of 13.5 μg/m^3 could be apportioned as 12.5 μg/m^3 from regional sources and a 1 μg/m^3 portion of the urban-scale contributions. Urban-scale emissions contribute, on average, up to 3 μg/m^3 depending on location within the Greater Wayne County area and the specified wind pattern. They appear to be greatest in the Detroit commercial/industrial core and might include significant contributions from point sources that are either far enough from the monitor and/or low enough in emissions to not be distinguished from the urban-scale contributions. Large local emission sources can exert significant influence on near-field monitors as demonstrated for Dearborn and Wyandotte.

In summary, analyses of $PM_{2.5}$ mass concentrations – separated into network-wide base and site-specific excess mass components – together with surface winds provide the following model for $PM_{2.5}$ mass concentrations over Southeast Michigan (excluding the distant sites of Ann Arbor, Luna Pier, and Port Huron):

- At most sites, high PM days coincide with network-wide high PM levels and typically occur when the area is experiencing a multiday high PM episode (Section 4).
- Hot spots of high PM concentration arise near large emission sources and, in the cases of Dearborn and Wyandotte, can drive exceedances (or near exceedances) of the daily standard. In both cases, the high emissions zones are located to the southwest of the monitoring sites. This is consistent with the prevailing winds from the southwest exacerbating the frequency of high impact days. Expected concentration contributions from these zones have decreased in recent years, presumably due to emission reductions.
- An idealized conceptual model for PM behavior, that explains, both daily and annual PM mass trends, consists of four layers: (1) regionally transported PM with average concentration of about 12.5 $\mu g/m^3$ over the 2004-2006 period; (2) urban-scale emissions from mobile, area, and point sources that contribute up to 3 $\mu g/m^3$ for specific surface winds patterns, depending on location, with less impact when averaged over the distribution of wind directions impacting a given site; (3) a PM plume from the Detroit commercial/industrial core that remains distinct from the other urban-scale contributions for sites as distant as East 7 Mile and possible New Haven; and (4) localized hot spots for cases when certain monitoring sites are directly impacted by emission plumes from nearby sources with high potentially impacts on a given day and less impact when averaged of the distribution of wind directions impacting such sites.

6. SUMMARY, POLICY-RELEVANT IMPLICATIONS, AND RECOMMENDATIONS

Summary

At most sites in Southeast Michigan, exceedances occur predominantly – and in some cases exclusively – on days when the entire network is exhibiting high PM. For thirteen of the fifteen monitors, at least 85% of exceedances occurred on days when the entire network was exhibiting high PM. Drivers for network-wide high PM are regional transport, poor atmospheric ventilation across the network, or both of these conditions. Two monitors in particular – Dearborn and Wyandotte – frequently had exceedances on days when the entire network was not exhibiting high PM with 38% of the Dearborn exceedances and 27% of the Wyandotte exceedances occurring on such days. On these days, these sites are significantly influenced by nearby emission sources. Dearborn continues to be influenced by nearby emission sources which drive exceedances (or near exceedances) on days when the network-wide base concentration is as much as 15 $\mu g/m^3$ below the standard, although the frequency of such days appears to be decreasing. In contrast, at Wyandotte all of the days for which nearby emission sources were disproportionately contributing to exceedances (or near exceedances) of the standard were prior to 2004. At those sites not significantly impacted by plumes from nearby emission sources, high PM days are most often observed when the area is experiencing a multiday high PM episode.

Seasonal variations in surface winds can explain the seasonal differences in frequency of high PM days between sites in the Greater Wayne County area. Sites such as Allen Park, which are relatively free of impacts from nearby sources, exhibit similar seasonal behavior with high PM days most frequent in the summer followed by the winter. The monthly distribution of high PM days is distorted for sites with significant nearby emission sources since there is a strong seasonality to the surface winds distributions. For example, Dearborn has as many high PM days in the winter as in the summer, with the winter season having a stronger contribution from nearby sources located to the southwest of the site.

Network-wide high PM days have disproportionately high contributions from the major ions (sulfate, nitrate, and ammonium) compared to other days. Summertime events are dominated by sulfate and wintertime events are dominated by ammonium nitrate. However these so-called high nitrate days typically have ammonium sulfate concentrations that are at least 50% of the ammonium nitrate concentration. The role of sulfate on such days should not be overlooked when considering the impact of SO_2-based regional control strategies. In general, network-wide PM base concentrations above ~20 $\mu g/m^3$ tend to be disproportionately influenced by major ion contributions and are indicative of a disproportionately high influence from regional sources. On network-wide high PM days the sulfate and nitrate concentrations are typically several times higher than the corresponding monthly median concentrations. In contrast, EC is on average only 1.3 times higher. This pattern suggests that network-wide high PM days are primarily influenced by regional transport and are to a much lesser extent influenced by a increased levels of urban-scale emissions arising from poor atmospheric ventilation. As previously stated, emission sources near the monitoring sites can still exert significant plume impacts regardless of the network-wide PM behavior driven by regional and urban-scale contributions.

Many network-wide high PM days coincide with high nitrate, and in some cases there is substantial variability in PM mass concentration across the network on these days. It is important to determine whether the variability is real or a measurement artifact, because these days can influence into the site-specific design values and in general can explain many of the exceedingly high PM levels observed at certain sites that otherwise do not appear to be disproportionately impacted by nearby local emission source plumes on high PM days.

A conceptual model for fine PM over central Southeast Michigan includes four elements. The largest contributor to annual average PM is regionally transported material that is temporally varying but spatially homogeneous over the domain (indeed, this defines the spatial extent of the domain for the conceptual model which in this case excludes the distant sites such as Luna Pier and Port Huron). On some days, regionally transported PM contributions can be sufficiently high to cause exceedances of the daily standard when coupled with average contributions from urban- and finer-scale emission sources and, in relatively rare cases, the regionally transported PM alone can cause exceedances of the daily standard. Urban-scale emission sources (mobile, area, and point sources) create a spatial PM gradient across central Southeast Michigan. For winds from a fixed direction, these contributions create an "urban plume" with decreasing impacts with increasing distance from the zone of highest emissions activity. The spatial gradients can be clearly discerned when binning data from days with common wind patterns and become smeared, to some extent, when averaging over periods with varying wind patterns. At many sites (e.g., Linwood, East 7 Mile) a PM plume emanating from the Detroit commercial / industrial zone, which is nominally Dearborn and areas to its southeast towards the Detroit River, including Zug Island, can be distinguished from the aforementioned urban plume. At sites further downwind, such as New Haven, these two plumes have essentially merged into a single urban plume. Average impacts from these plumes depend on the monitoring site location relative to the Detroit population and commercial/industrial core zones and the frequency that winds from these zones transport the plumes to the monitoring site. Finally, certain monitors in the Detroit commercial/industrial zone are significantly impacted by emissions from nearby sources that ultimately contribute to the distant PM plume emanating from this zone. At Dearborn and Wyandotte these sources are located southwest of the monitoring sites and historically have contributed to exceedances (or nears exceedances) of the daily standard. These sources also disproportionately influence the annual standard because they are oriented upwind of the sites for prevailing winds from the southwest.

In summary, emission controls that reduce regionally transported PM are needed to reduce the frequency of violations of the 24-hour $PM_{2.5}$ standard. Emission reductions from a few specific point sources, especially near Dearborn, are also needed. While regional and point source controls will decrease annual average $PM_{2.5}$ concentrations for standardized synoptic weather patterns, relatively small but significant decreases could also be realized by controls on other urban emission sources such as mobile, area, and other point sources.

Policy-Relevant Implications

The policy-relevant implications are framed using the Weight-of-Evidence (WOE)[13] prepared in support of the control strategy package for the attaining the $PM_{2.5}$ annual average standard. The WOE elements are in regular typeface with comments, based on this work, added in italics.

I. Inventory

- I(c)… National stationary source controls, including CAIR and the NO_x SIP call, are expected to reduce point source NO_x emissions by 40% and SO_2 emissions by 15% between 2002 and 2009. *These reductions are very important to the daily standard control strategy because exceedances of the daily standard tend to occur on days with network-wide high PM from regional transport of species including but likely not limited to ammonium sulfate and ammonium nitrate.*
- I(c)… [There] is compelling evidence that areas in Southeast Michigan that are currently attaining the [annual] standard will remain in compliance. *For the period 2004-2006, only one monitor in Southeast Michigan was in compliance with the 24-hour standard. While reductions in local emissions should prevent backsliding, daily exceedances are coupled to the frequency and severity of regional transport episodes which can vary from year to year. For example, 2005 was severe in terms of regional transport and this is reflected in the elevated 98th percentile concentrations across all sites in Southeast Michigan.*
- I(d)… While these [programmed] reductions are already having a significant, positive impact in Southeast Michigan and will continue to do so in future, we cannot assume that they will result in attainment at Dearborn and Southwestern High School (SWHS), the two monitoring sites that are still exceeding the annual standard. *Additional reductions in the vicinity of these sites are needed. Dearborn is currently the design value site for the daily standard. This study has demonstrated that contributions from certain local emission source have decreased in recent years. In contrast, the magnitude of the urban plume, which includes a broader range of emission sources, has not significantly decreased in recent years as evidenced by expected concentration patterns observed at sites such as East 7 Mile and Linwood.*
- I(e)… The area surrounding the two non-attaining monitors in Southeast Michigan contains a complex array of emission sources. Some of these sources may be significant contributors because their emissions occur closer to ground level and/or because of their proximity to a monitor. However, many of these are area sources that are exempt from MDEQ's emissions inventory reporting requirements so their exact contribution is unknown. In addition, many of these smaller sources have little or no emission controls while larger sources already have controls in place. *At these sites and a few other sites, the analysis in Section 5 point towards the bearings where efforts should be focused to refine emission estimates – in particular, zones southwest of the monitoring sites due to prevailing wintertime surface winds lead to lead to higher PM than the rest of the Southeast Michigan network.*
- I(f)… A number of industrial facilities in the area surrounding the Dearborn, Southwestern High School, and Wyandotte monitors have either closed or scaled back their operations since 2002. These changes are likely contributing to the more rapid decrease in $PM_{2.5}$ levels observed at industrial monitoring sites. *While we have indeed identified decreased local emission source contributions at some sites.*
- I(g)… In addition to changes that have already taken place, significant local $PM_{2.5}$ reductions will be achieved from controls that are currently being phased in at the Severstal and U.S Steel facilities as well as the Marathon oil refinery. All three of these facilities are less than three miles from the

[13] "Weight of Evidence for the Southeast Michigan PM2.5 Attainment Strategy", 8/28/2007 draft, prepared by SEMCOG and MDEQ.

monitors measuring the highest $PM_{2.5}$ concentrations in the region - Dearborn and Southwestern High School. Based on a recent EPA study as well as permit application data, MDEQ estimates these controls will provide a combined $PM_{2.5}$ emission reduction of 330 tons per year. *These reductions should reduce the frequency of high PM days that occur at these sites when the network-wide baseline concentration is relatively low, thereby reducing the frequency of spatially isolate exceedances and near exceedances. Conditions on network-wide high PM days will also be improved. Note that in these cases the sources are located at bearings where prevailing winds can favor plume impacts at the monitoring sites, especially in the wintertime. Impacts can be tracked by periodically updating the NWR plots and the evaluating shifts in the distribution of site-specific high PM days by month. For example, if local source impacts at Dearborn are indeed reduced, we would expect the distribution of high PM days by month for Dearborn to shift to more-closely resembling Allen Park. Intersite differences between Allen Park and Dearborn should also decrease for the relevant species in the CSN data.*

- I(h)… There are a significant number of storage piles, unpaved lots, and parcels of barren land in the vicinity of the Dearborn and SWHS monitors. While most emissions from these sources are larger than 2.5 microns, their collective impact is cause for concern. As part of a previous particulate SIP, a number of facilities in the area do have fugitive dust plans. However, many others do not. *The contribution of fugitive dust to high PM days was not explicitly examined.*

II. Monitoring:

- II(a)…$PM_{2.5}$ in Southeast Michigan is comprised largely of sulfates, nitrates, and organic carbon. At the Dearborn monitoring site, there is also a significant "crustal" component, which is largely iron. *The excess iron at Dearborn is largely related to steelmaking operations and efforts to reduce these emissions will reduce the local source impacts on exceedance and near exceedance days at Dearborn.*
- II(b)… Southeast Michigan's current nonattainment designation pertains to the annual standard, not the daily standard. Developing a control strategy to address an annual standard is complicated because sources may be significant contributors on certain days or during certain times of the year but not during others. However, recent source apportionment studies show that the source contributions to $PM_{2.5}$ on an annual average basis are similar to those on high $PM_{2.5}$ concentration days. This suggests that a strategy designed to reduce annual average $PM_{2.5}$ concentrations will also be effective in reducing high daily $PM_{2.5}$ concentrations. *Strategies targeting regional sulfate and nitrates will be important towards meeting both standards; in the absence of significant sulfate reduction it might be very challenging to meet the daily standard, even with aggressive local source controls. SO_2 reductions might not be fully realized as PM reductions if ammonium nitrate formation is ammonia limited.*
- II(c)… The entire Southeast Michigan area has been designated nonattainment. However, the only monitors measuring violations of the standard are located in a small portion of eastern Wayne County. *For 2004-2006 all Southeast Michigan sites except Ann Arbor violated the daily standard. However, based on 2005-2007 data several sites were in compliance. This demonstrates the year-to-year variations that can be induced by synoptic weather patterns which in turn include the frequency and severity of regional transport events.*
- II(f)… Since 2000, $PM_{2.5}$ concentrations at all sites in the region have steadily declined. The 3-year average concentration dropped 1.6 $\mu g/m^3$ between 2002 and 2006.. The largest decreases have occurred at the sites with the highest concentrations: Dearborn (2.69 $\mu g/m^3$), SWHS (2.16 $\mu g/m^3$), and Wyandotte (3.04 $\mu g/m^3$). *Dramatic year-to-year swings in the 98th percentile concentration are observed throughout the Southeast Michigan network due to varying impacts from regional transport. In this sense the daily stand is more "volatile" and it is harder to discern long term trends.*
- II(g)… $PM_{2.5}$ concentrations at monitoring sites in the industrial core of Southeast Michigan's nonattainment area (Dearborn, SWHS & Wyandotte) have been decreasing faster than other sites. This is likely due to changes in emissions in the industrial area. *Reduced impacts from local emission*

sources at Dearborn and especially Wyandotte have indeed been demonstrated in this study; average reductions are smaller at SWHS and are coupled to a lower frequency of extreme events which might have been caused by upsets at industrial facilities. Of course, any future industrial activity expansions that increase emissions could at least partially reverse these trends.

- II(k)… At the time Southeast Michigan was designated nonattainment, monitoring data showed the Luna Pier monitor in Monroe County was violating the annual standard. This monitor is located in the southeastern corner of the county, one mile north of the Ohio border. In its February 2004 PM2.5 nonattainment designation recommendation to EPA, MDEQ argued strongly that Monroe and Wayne counties should be designated as separate nonattainment areas because $PM_{2.5}$ levels at the Luna Pier monitor tracked far more closely with those in Toledo. *Many regional events operate on a large enough spatial scale to similarly impact Luna Pier and the Wayne County area. Indeed, the behavior at these two areas appears coupled on high PM days. That said, Figure 4-3 demonstrates that Luna Pier and Port Huron have the greatest dispersion about the network-wide base concentration – including many days that are lower than the base concentration – and thus they are not fully coupled.*
- II(l)… MDEQ and SEMCOG also showed that levels at the site had been decreasing in recent years and trend data indicated the monitor would likely measure attainment by the end of 2004. This was an accurate prediction. Levels at the site have continued to track those in Toledo and monitors in both areas have measured attainment of the standard since 2004. In 2005, EPA redesignated the Toledo area as attainment. *Luna Pier continues to violate the daily standard (2004-2006 data).*
- II(m)… In addition, as of 2006, monitors at Allen Park, Linwood and Wyandotte are now measuring attainment [of the annual average NAAQS]. *Allen Park, Linwood and Wyandotte continue to violate the daily standard (2004-2006 data).*
- II(n)… The area where the two remaining violating monitors (Dearborn and SWHS) are located is one with a history of particulate matter problems, associated with local industrial sources. […] the areas are nearly identical. The primary source of the former PM_{10} problem was determined to be a few local industrial sources. Emissions from these sources were reduced and the region came into compliance in 1996. The overlap of the Total Suspended Particulate (TSP) and PM_{10} nonattainment areas with the PM2.5 nonattainment area, and the successful attainment of those standards after the application of local controls, suggests that the most effective attainment strategy is to focus on local emission reductions from sources in this area. *Reductions in local emissions near Dearborn have decreased the frequency of high PM days resulting from local emission sources (Figure 4-5) and the programmed emission reductions should further help to lower the local emission source influences. Local emissions near SWHS frequently lead to near exceedances when the network-wide PM levels are otherwise low but, unlike Dearborn and Wyandotte, the local source contributions appear to be just low enough to avoid exceedances on otherwise relatively clean days.*
- II(o)… Various analyses of both local and regional monitoring data all indicate that Southeast Michigan's nonattainment problem is caused by a combination of regional transport and local emissions from sources in the vicinity of the violating monitors. *This has also been demonstrated for the daily standard in this study with local source impacts driving the frequency of exceedances at a few sites and regional transport contributing to exceedances at all sites.*
- II(o)(3)… Lake Michigan Air Directors Consortium (LADCO) analysis of rural background concentrations versus urban excess in the Midwest shows that the vast majority of $PM_{2.5}$ measured in our region is coming from outside Southeast Michigan. *This pattern is certainly the case on network-wide high PM days that coincide with the most frequent exceedances of the daily standard.*
- II(o)(6)… A wind rose for the iron component of $PM_{2.5}$ at Dearborn points directly to the southwest. Conversely, the iron wind rose for Allen Park, while measuring much lower levels, points to the northeast. The Allen Park monitor is approximately five miles southwest of Dearborn. Additional wind direction analysis shows that, when winds are from the southwest average crustal concentrations at Dearborn are over 2.5 $\mu g/m^3$ higher than those at Allen Park and are sometimes as much as 6 $\mu g/m^3$ higher. This clearly indicates a significant local iron source directly between these

two sites (which are approximately five miles apart) and closer to the Dearborn monitor. The importance of local emission sources to the southwest of Dearborn has been demonstrated in this study. *These sources likely lead to the high frequency of wintertime high PM days at Dearborn compared to the Allen Park and the rest of the network since the prevailing surface winds are from the southwest during the winter.*

- II(p)… The localized nature of Southeast Michigan's nonattainment problem makes broad-based application of control measures throughout the official seven-county nonattainment area an ineffective and unproductive strategy for bringing the region into compliance. All available data show that targeted local organic carbon emission reductions, coupled with the iron reductions resulting from planned steel mill controls, will be the most cost-effective way to bring the region into attainment. *Similarly, while the relative roles of regional- and urban-scale contributions have not been quantified in this study, it has been shown that regionally transported species concentrations are enhanced much more than urban-scale tracer species on high PM days.*
- II(y)… The difference in $PM_{2.5}$ is highest from the southwest and west wind directions when nearby monitors are subtracted out of the Dearborn concentration. This would indicate that there is a large local source [or sources] between the Dearborn and "background" monitors (Allen Park, Luna Pier & Ypsilanti). *This was clearly demonstrated in Section 5 of this study.*

Recommendations for Future Work

Projects currently funded by LADCO will likely provide considerable refinements to this analysis. For example, sampling for organics speciation and the planned data analysis – including source apportionment – should inform the assignment of organic carbon to local and regional sources. . MDEQ is deploying semicontinuous monitors for particle speciation and high time resolution data can be particularly powerful for identifying source contributions. Results from the summer 2007 USEPA/ORD measurement intensive should be particularly insightful since PM elements were measured at high time resolution. Outdoor measurement data from USEPA's DEARS project could also be exploited.

A background monitoring site would be helpful, but care is needed to ensure it is sufficiently coupled to the Detroit area in terms of air mass behavior. The site needs to be far enough away to not be influenced by the urban area, but close enough to still be similarly impacted by regional transport. This is even more critical if measurements will be conducted for 24-hour periods once every few days as the "snapshots" at each monitor must be synchronized across the domain. For example, the background site effectively used for St. Louis is about 100 km to the south which places it upwind of the city for the prevailing surface winds. Perhaps more importantly, however, the line connecting this site to the urban area is nearly perpendicular the direction of summertime synoptic air mass flows which lead to high PM in St. Louis (St. Louis is often on the backside of a high pressure system located over the Great Lakes, which lead to regional transport from the east/southeast). This orientation might actually be preferred as an upwind site – from the surface winds perspective – because the sites will be impacted at the same time for regional air masses with spatial extents greater than the site separation.

A better understanding of the drivers for high spatial variability in FRM mass on high nitrate days is needed since only a few such events can dramatically affect the site-specific design values for the 24-hour standard. When such patterns are observed, perhaps the Teflon filters could be analyzed for nitrate by IC to determine the extent of nitrate retention; this would be

particularly insightful for days coinciding with speciation sampler operation to place the Teflon filter nitrate levels in context of the ambient concentrations.

It might be possible to better characterize the spatial pattern of urban-scale emission source contributions by performing reflectrometry measurements on archived $PM_{2.5}$ FRM samples. The parameter from these measurements is typically highly correlated with thermo-optical EC. Thus, it provides an inexpensive approach to characterizing EC spatial profiles which might be a reasonable surrogate for urban-scale emission sources.

FIA/Lafayette and Newberry sites were excluded from this analysis because they commenced operation relatively recently. The analysis used concentration percentiles across the network to define network-wide behavior and thus it was necessary to use a temporally consistent subset of the network. The base concentrations generated from this work could be applied to the FIA/Lafayette and Newberry data to split observed concentrations into base and excess mass components, and then nonparametric wind regression (NWR) could be used to determine expected excess mass concentrations as a function of wind direction. This work, which is relatively modest in level of effort, could significantly contribute to our understanding of PM behavior in the Detroit commercial/industrial core.

Relatively little attention has been given to the behavior at Luna Pier and Port Huron on high concentration days. The analysis approach taken in this report has limitations when applied to sites at such large distances from the Greater Wayne County area. Locally-collected surface winds should be used to examine behavior at these sites. Luna Pier and Port Huron must also be considered within the context of emissions from Toledo and Sarnia, respectively.

NWR results are presented in Section 5 in terms of the expected concentration of excess mass observed at a site when the winds are from a given direction. This has proven to be insightful because the results do not depend on the frequency distribution of wind directions which can vary from year-to-year and confound the identification of temporal changes in emissions. From this analysis we can state that emissions from a certain wind sector have been modulated by a certain amount over time. However, we are also interested in an apportionment of the contributions of such emission sources to the PM burden at the monitoring site. This would require weighting the expected concentrations by the frequency of winds from each direction sector. We have developed a conceptual model based on the network behavior for various surface wind patterns. The next step is to incorporate the observed distribution of wind patterns to quantify how the observed PM levels are being modulated. We have shown that a PM plume from the Detroit commercial/industrial core impacts Linwood. By incorporating the observed distribution of surface wind directions we could quantify the annual-average PM mass from this plume impacting the site. This analysis would extend the focus of this report on high PM days to more robustly characterize annual average behavior and could be instrumental in providing a framework for assessing the effectiveness of emission control programs.

7. REFERENCES

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APPENDIX A: $PM_{2.5}$ HIGH CONCENTRATION DAYS BY MONTH

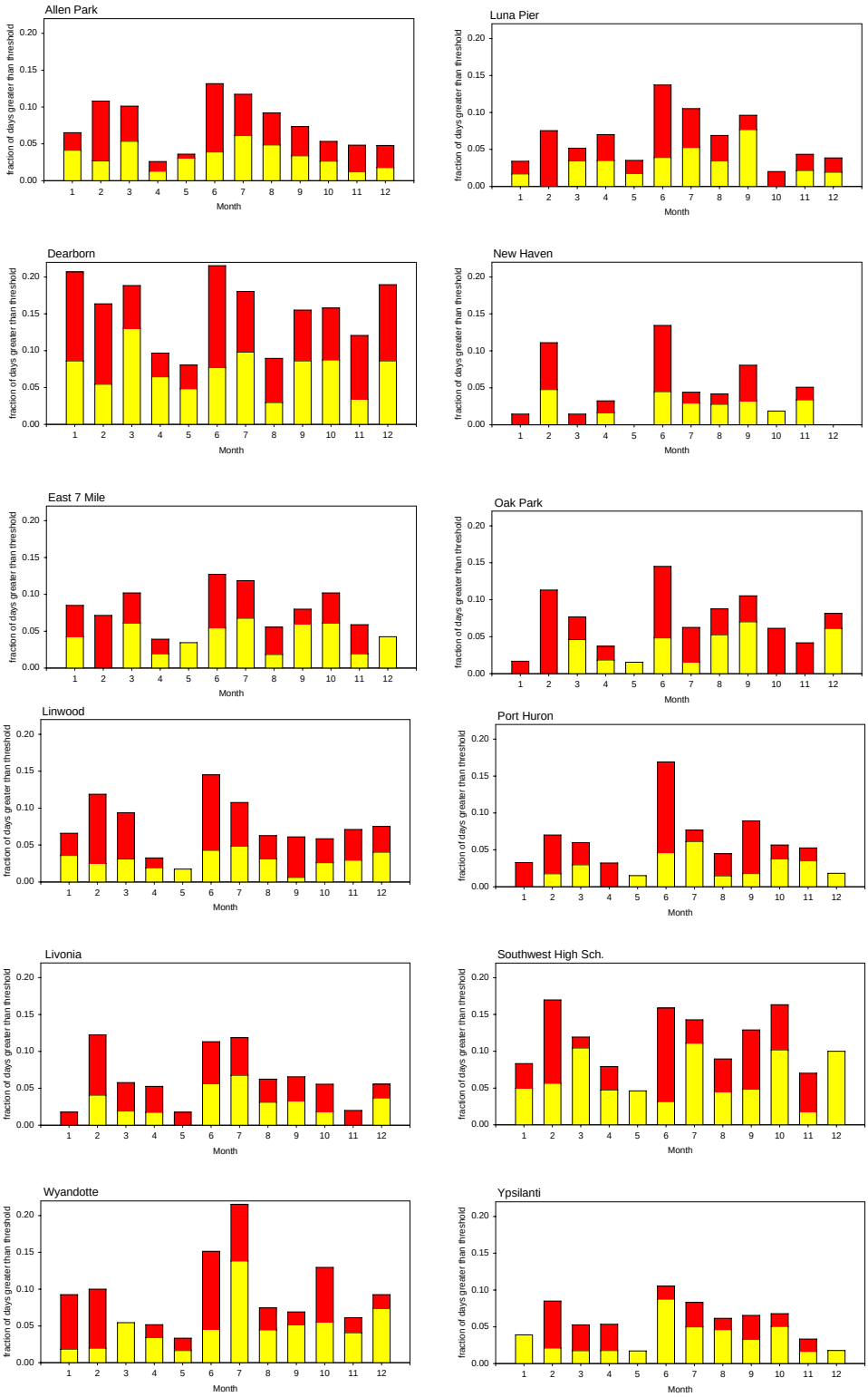

Figure A-1. Distribution of $PM_{2.5}$ high concentration days by month, 1999-2006. Ann Arbor, FIA/Lafayette, and Newberry are excluded because FRM data was not collected at these sites over the entire time period.

APPENDIX B: HOURLY WIND ROSES

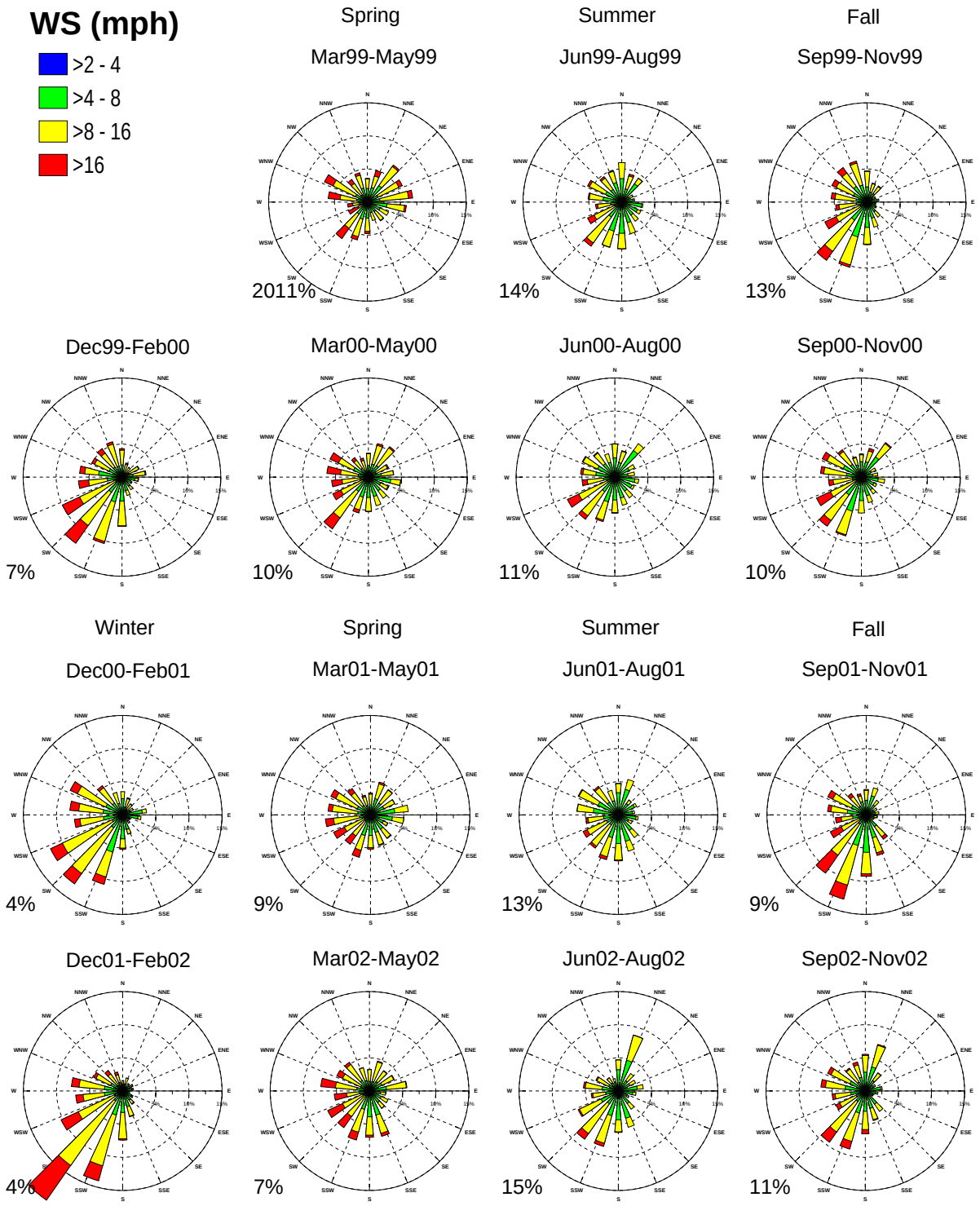

Figure B-1. Seasonal wind roses for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW). Calms (wind speeds less than 2 mph) are listed to the lower-left of each wind rose.

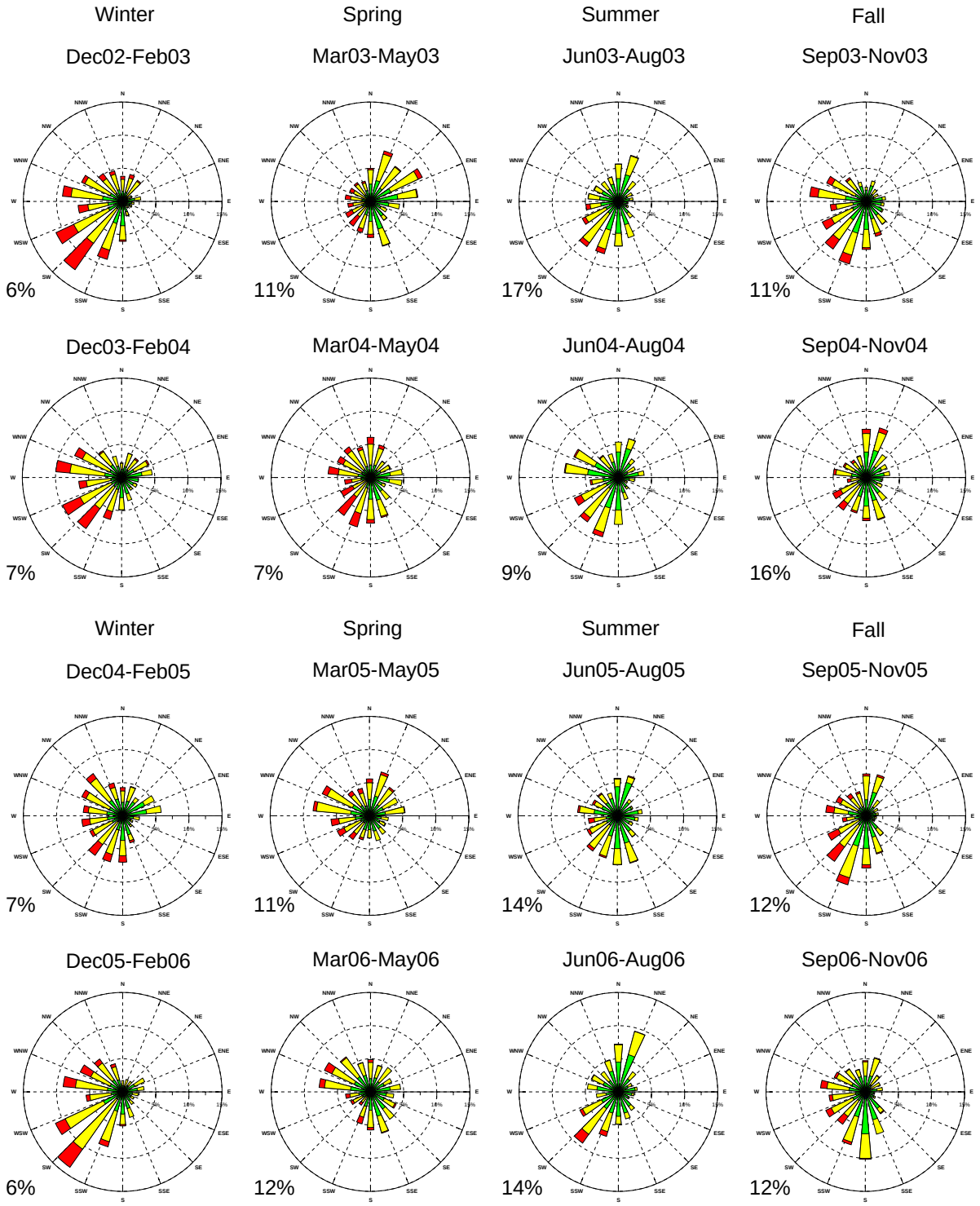

Figure B-1 (continued). Seasonal wind roses for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW). Calms (wind speeds less than 2 mph) are listed to the lower-left of each wind rose.

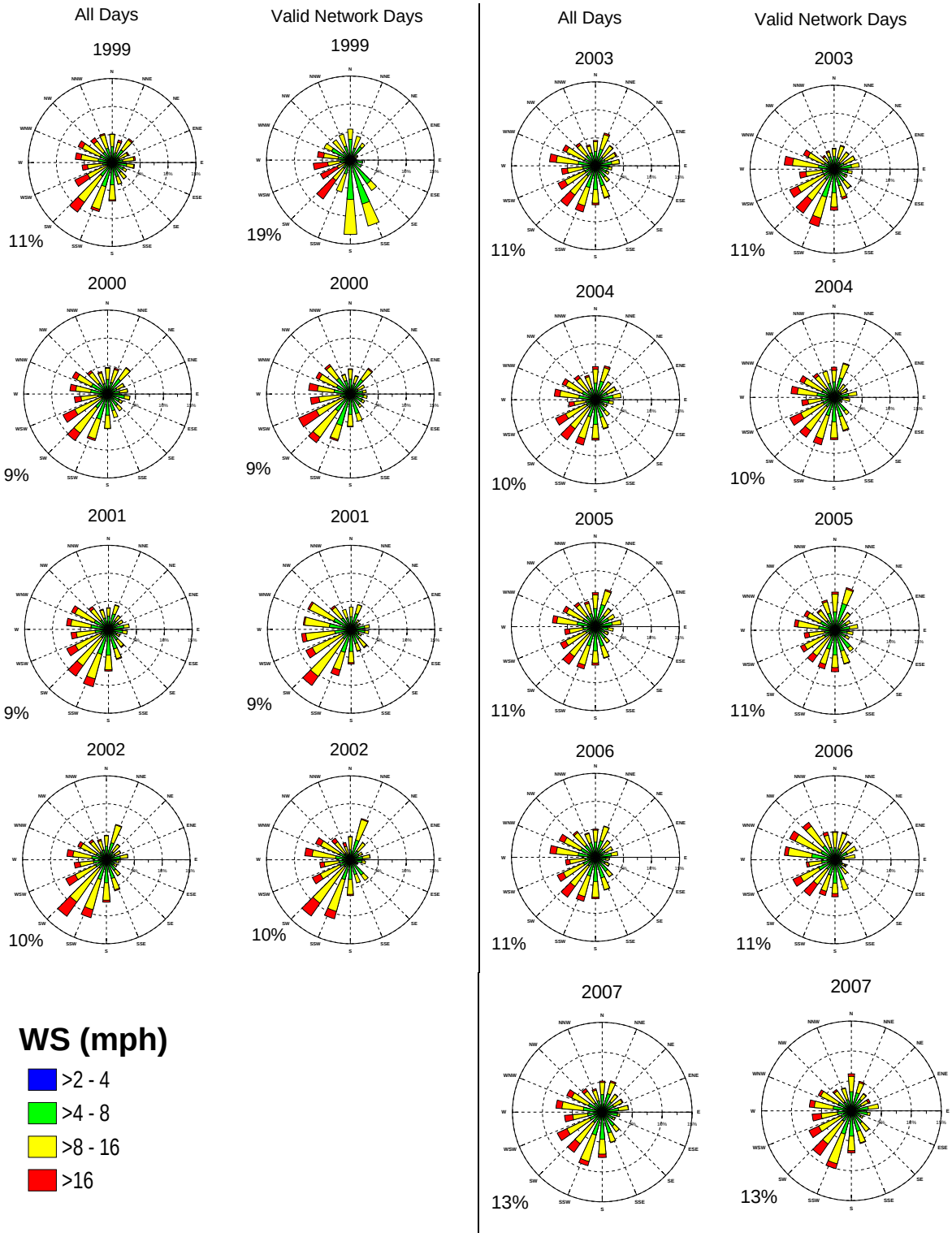

Figure B-2. Annual wind roses for non-calm hours, observations at Detroit Metropolitan Wayne County Airport (DTW) for all days and valid network days. Calms (wind speeds less than 2 mph) are listed to the lower-left of each wind rose.

APPENDIX C: SITE-SPECIFIC HIGH PM DAYS NOT OBSERVED THROUGHOUT THE NETWORK, 1999-2006

Dearborn		E 7 Mile		Linwood		Livonia		Luna Pier		Oak Park		Port Huron		SWHS		Wyandotte	
07/05/1999	(2)	05/12/2000	(1)	11/18/1999	(2)	12/17/2000	(1,2)	05/10/2001	(1,2)	11/25/2006	(1)	05/07/2005	(1,2)	09/27/1999	(2)	07/05/1999	(2)
01/01/2000	(2)	04/18/2004	(1,2)	12/08/1999	(2)			03/12/2002	(2)			07/18/2005	(1,2)	07/17/2000	(1,2)	05/06/2000	(1)
01/31/2000	(2)	01/28/2005	(1,2)	01/02/2000	(2)			04/02/2002	(1,2)					02/09/2001	(1,2)	05/12/2000	(1)
02/24/2000	(1,2)	05/07/2005	(1,2)	02/24/2000	(1,2)			11/02/2003	(1)					05/10/2001	(1,2)	12/26/2000	(1,2)
03/07/2000	(1,2)													08/23/2001	(1)	01/10/2001	(1,2)
05/06/2000	(1,2)													02/14/2003	(1)	01/28/2001	(1)
05/12/2000	(1)													08/25/2003	(1)	07/09/2001	(1)
06/08/2000	(1,2)													11/02/2003	(1)	08/23/2001	(1)
09/09/2000	(1)													12/29/2003	(1,2)	11/28/2002	(1,2)
12/23/2000	(1,2)													03/25/2004	(1,2)	03/19/2003	(1,2)
01/10/2001	(1,2)													04/30/2004	(1)	08/25/2003	(1)
01/28/2001	(1)													02/16/2006	(1)	02/06/2004	(1)
03/02/2001	(1,2)													12/13/2006	(1)	07/18/2005	(1)
08/23/2001	(1)															12/06/2005	(1,2)
12/27/2001	(1,2)															12/21/2005	(1,2)
01/05/2002	(2)															02/10/2006	(1)
01/08/2002	(1,2)																
02/07/2002	(1,2)																
03/06/2002	(1)																
11/13/2002	(1,2)																
11/28/2002	(1,2)																
01/18/2003	(1,2)																
02/08/2003	(1,2)																
02/14/2003	(1)																
02/20/2003	(1,2)																
04/15/2003	(1,2)																
11/11/2003	(1,2)																
03/25/2004	(1,2)																
04/30/2004	(1)																
10/15/2004	(1)																
12/02/2004	(1,2)																
03/29/2005	(1,2)																
04/19/2005	(1,2)																
07/18/2005	(1,2)																
10/31/2005	(1,2)																
12/06/2005	(1,2)																
02/16/2006	(1)																
09/08/2006	(1,2)																
12/13/2006	(1,2)																

* Ann Arbor, FIA/Lafayette and Newberry excluded from the analysis.
* No high PM days meeting these criteria for New Haven and Ypsilanti.
(1) denotes site concentration >30 $\mu g/m^3$ while Allen Park <25 $\mu g/m^3$.
(2) denotes site concentration >30 $\mu g/m^3$ while network-wide base <25 $\mu g/m^3$ (limited to those days which are valid network days) (red bars in Figure 4-9).

APPENDIX D: CPF AND NWR PLOTS[14]

$PM_{2.5}$ mass concentrations (both absolute and excess with respect to a reference site) were examined using Conditional Probability Function (CPF) plots and 1-D Nonparametric Wind Regression (NWR) plots. Kim and Hopke (2004) compared and contrasted the CPF and NWR methodologies and demonstrated that they provide complementary and largely consistent information. CPF plots provide insights into the bearing of emission sources impacting the monitoring site from a perspective that is not biased by the prevailing wind patterns. The plots address the question: "for the ensemble of hourly winds from a given direction, what fraction of these hours corresponds to high concentration days?". The threshold for defining a "high concentration day" is typically chosen as the top 25th percentile of the concentration distribution (either absolute concentrations or mass fractions). For example, **Figure D-1(a)** shows the CPF plot for the PMF-resolved copper factor at the Springfield site in Chicago. Nearly 70% of the hours with winds from 180°N coincided with a daily contribution in the top quartile of the concentration distribution for the copper factor contributions. This pattern suggests a copper source south of the monitoring site but it does not address the magnitude of the impacts which depend on source strength, dispersion characteristics and the frequency of winds from this direction.

One dimensional nonparametric wind regression estimates the expected value of concentration as a function of wind direction (Kim and Hopke, 2004). It is similar to a pollution rose but with more robust mathematical support. NWR results can be multiplied by the wind direction frequency distribution to determine the contribution of each wind direction to average PM mass. Figure D-1(b) shows the NWR plot for the PMF-resolved copper factor at the Springfield site in Chicago. Factor contributions (red line) for winds from 180°N are three times greater than the study-average factor contribution (pink circle). In aggregate the CPF and NWR plots provide insights into both the location of emission sources and their impacts.

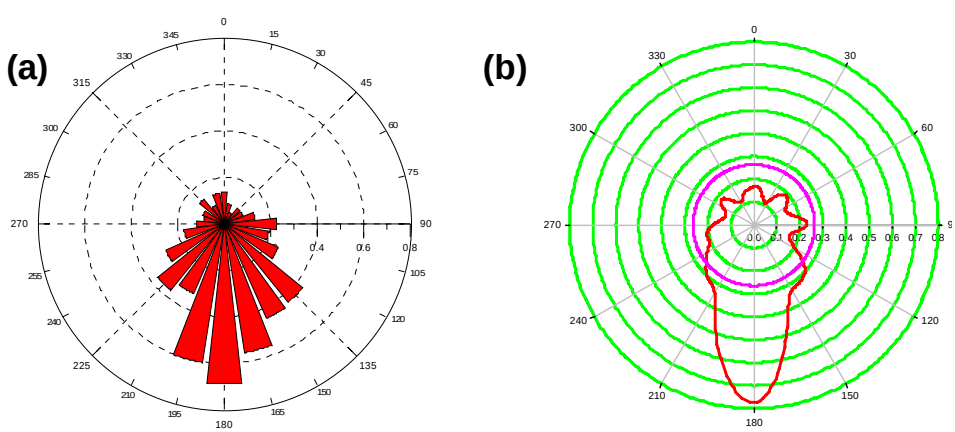

Figure D-1. Surface wind analyses for the PMF-resolved copper factor at the Springfield site in Chicago: (a) conditional probability function plot for the top quartile of absolute contributions; and (b) 1-D nonparametric wind regression plot (radial units in μg/m^3) where the red line denotes the observed contributions from each bearing and the pink circle denotes the study-average contribution.

[14] Adapted from Wade *et al.* (2008).

APPENDIX E: 1-D NWR ON $PM_{2.5}$ EXCESS MASS

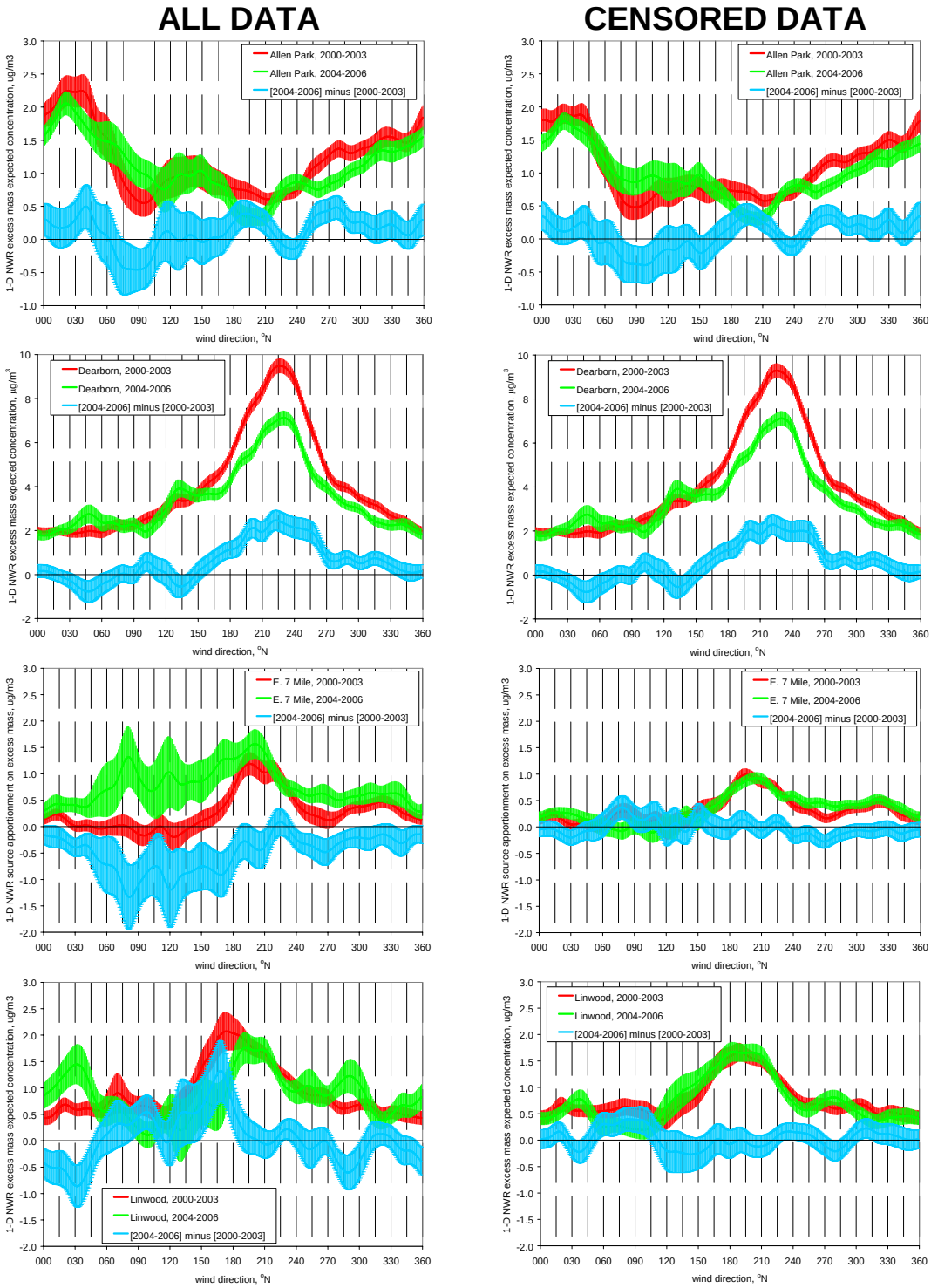

Figure E-1 (continued). 1-D NWR results for $PM_{2.5}$ excess mass relative to the network-wide base for all network days (left column) and censored to remove extreme values as defined in footnote #12 (right column). The blue line is the change between 2004-2006 and 2000-2003 and the error bands are 95% confidence intervals.

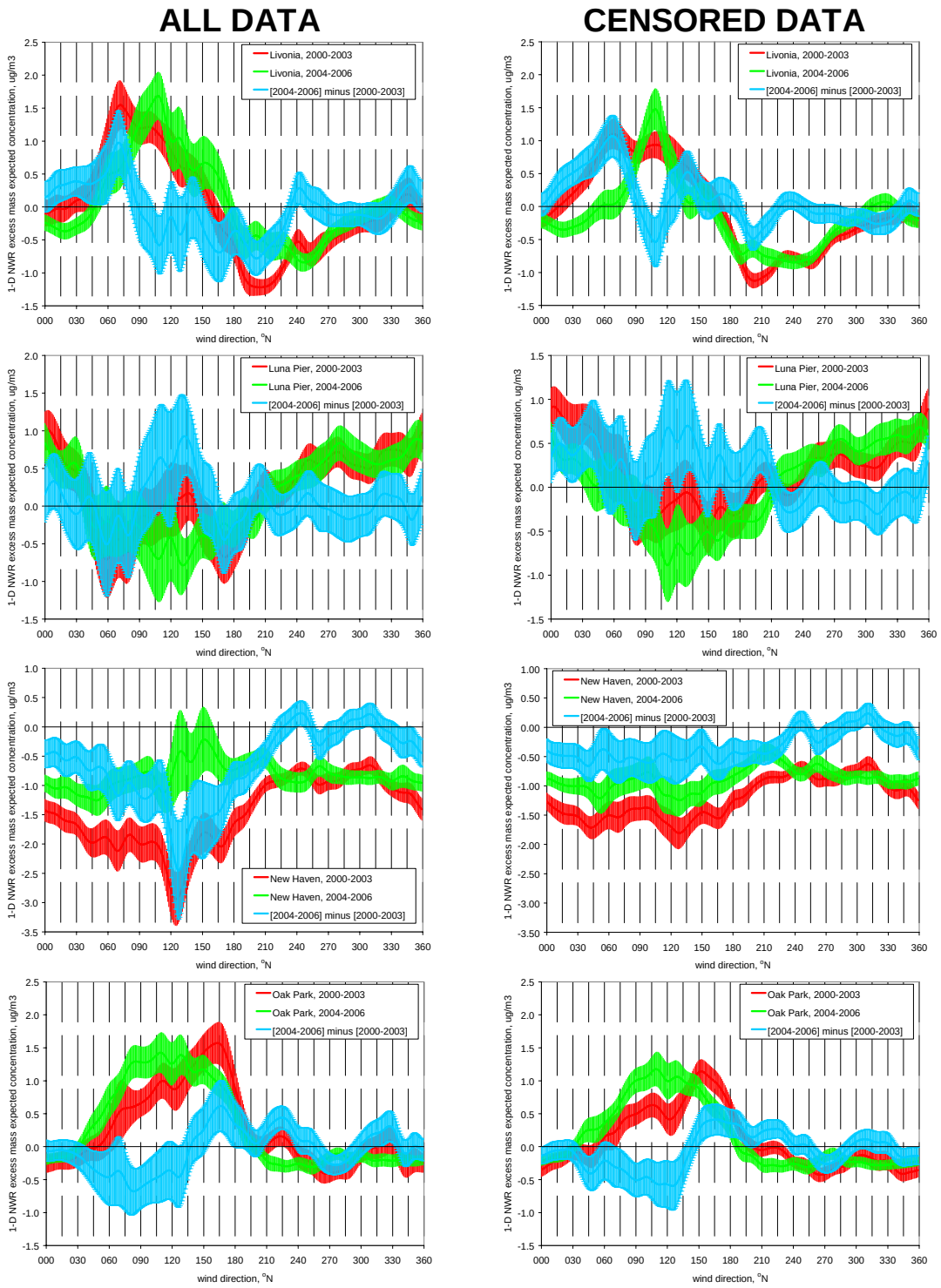

Figure E-1 (continued). 1-D NWR results for $PM_{2.5}$ excess mass relative to the network-wide base for all network days (left column) and censored to remove extreme values as defined in footnote #12 (right column). The blue line is the change between 2004-2006 and 2000-2003 and the error bands are 95% confidence intervals.

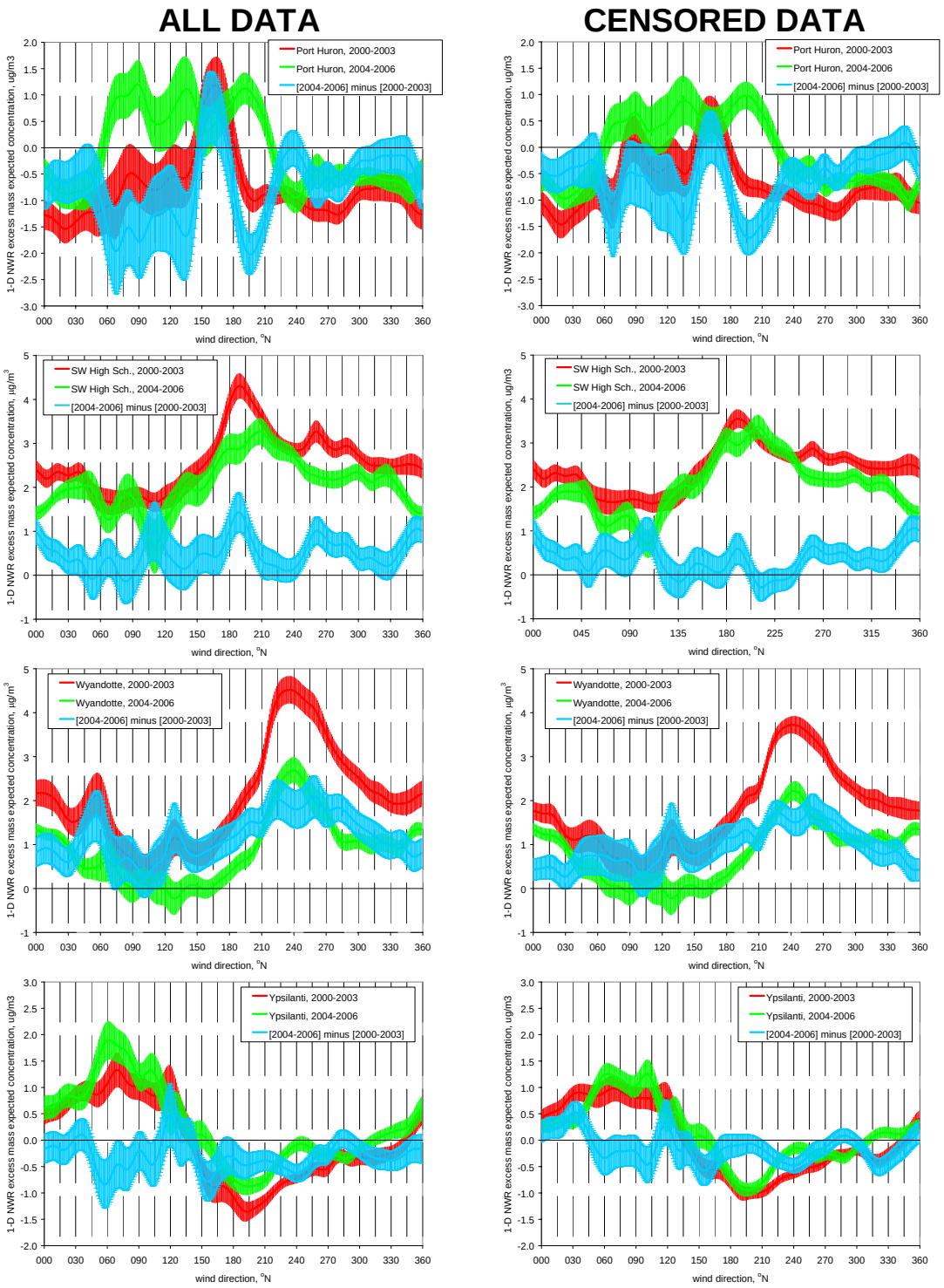

Figure E-1 (continued). 1-D NWR results for $PM_{2.5}$ excess mass relative to the network-wide base for all network days (left column) and censored to remove extreme values as defined in footnote #12 (right column). The blue line is the change between 2004-2006 and 2000-2003 and the error bands are 95% confidence intervals.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

April 19, 2007

PERMIT TO INSTALL
182-05B

ISSUED TO
SEVERSTAL NORTH AMERICA, INC

LOCATED AT
3001 Miller Road
Dearborn, Michigan

IN THE COUNTY OF
Wayne

STATE REGISTRATION NUMBER
A8640

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: **January 11, 2007**	
DATE PERMIT TO INSTALL APPROVED: **April 19, 2007**	SIGNATURE: **G. Vinson Hellwig**
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL
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Common Abbreviations / Acronyms

Common Acronyms		Pollutant/Measurement Abbreviations	
AQD	Air Quality Division	Btu	British Thermal Unit
ANSI	American National Standards Institute	°C	Degrees Celsius
BACT	Best Available Control Technology	CO	Carbon Monoxide
CAA	Clean Air Act	dscf	Dry standard cubic foot
CEM	Continuous Emission Monitoring	dscm	Dry standard cubic meter
CFR	Code of Federal Regulations	°F	Degrees Fahrenheit
COM	Continuous Opacity Monitoring	gr	Grains
EPA	Environmental Protection Agency	Hg	Mercury
EU	Emission Unit	hr	Hour
FG	Flexible Group	H_2S	Hydrogen Sulfide
GACS	Gallon of Applied Coating Solids	hp	Horsepower
GC	General Condition	lb	Pound
HAP	Hazardous Air Pollutant	m	Meter
HVLP	High Volume Low Pressure *	mg	Milligram
ID	Identification	mm	Millimeter
LAER	Lowest Achievable Emission Rate	MM	Million
MACT	Maximum Achievable Control Technology	MW	Megawatts
MAERS	Michigan Air Emissions Reporting System	NOx	Oxides of Nitrogen
MAP	Malfunction Abatement Plan	PM	Particulate Matter
MDEQ	Michigan Department of Environmental Quality	PM-10	Particulate Matter less than 10 microns diameter
MIOSHA	Michigan Occupational Safety & Health Administration	pph	Pound per hour
MSDS	Material Safety Data Sheet	ppm	Parts per million
NESHAP	National Emission Standard for Hazardous Air Pollutants	ppmv	Parts per million by volume
NSPS	New Source Performance Standards	ppmw	Parts per million by weight
NSR	New Source Review	psia	Pounds per square inch absolute
PS	Performance Specification	psig	Pounds per square inch gauge
PSD	Prevention of Significant Deterioration	scf	Standard cubic feet
PTE	Permanent Total Enclosure	sec	Seconds
PTI	Permit to Install	SO_2	Sulfur Dioxide
RACT	Reasonable Available Control Technology	THC	Total Hydrocarbons
ROP	Renewable Operating Permit	tpy	Tons per year
SC	Special Condition Number	µg	Microgram
SCR	Selective Catalytic Reduction	VOC	Volatile Organic Compounds
SRN	State Registration Number	yr	Year
TAC	Toxic Air Contaminant	Hg	Mercury
VE	Visible Emissions	Mn	Manganese
Cr	Chromium	Pb	Lead

* For High Volume Low Pressure (HVLP) applicators, the pressure measured at the HVLP gun air cap shall not exceed ten (10) pounds per square inch gauge (psig).

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **[R336.1201(1)]**

2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **[R336.1201(4)]**

3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **[R336.1201(6)(b)]**

4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **[R336.1201(8), Section 5510 of Act 451, PA 1994]**

5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to R336.1219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of R336.1219. The written request shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environmental Quality. **[R336.1219]**

6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **[R336.1901]**

7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **[R336.1912]**

8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.

9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R336.1303. **[R336.1301]**

    a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.

    b) A visible emission limit specified by an applicable federal new source performance standard.

    c) A visible emission limit specified as a condition of this permit to install.

12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R336.1370(2). **[R336.1370]**

13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R336.2001 and R336.2003, under any of the conditions listed in R336.2001. **[R336.2001]**

SPECIAL CONDITIONS

Emission Unit Identification

Unit/Group ID	Emission Unit/Process Group Description	Installation/ Modification Date	Control Device Description	Stack/ Vent ID	Requirement Table No.
EUCOALHANDLING	Raw coal silo, pulverized coal silo, rail car unloading shed, coal pulverizer, & two 25 MMBtu/hr natural gas-fired heaters		4 Baghouses	NA	E-01.01
EUBBFCASTHOUSE	B Blast furnace cast house operations	1/1/1922	Baghouse	ROOF MONITORS, SVBFCE	E-01.02 F-01.01
EUBFCESTOVE	Blast Furnace B stove	1/1/1922	Low-NOx technology	SVBFCESTOVE	E-01.03 F-01.02
EUCBFCASTHOUSE	C Blast furnace cast house operations	1/1/48	Baghouse	ROOF MONITORS, SVCFCE	E-01.04 F-01.01
EUCFCESTOVE	Blast Furnace C stove	1/1/48	Low-NOx technology	SVCFCESTOVE	E-01.05 F-01.02
EURELADLINGBOF	Reladling south and north - BOF	1/1/75	Baghouse	SVRELADLEBAG, SVBOFBH	E-01.06 F-01.03
EUDESULFURIZATION	Desulfurization operation	1/1/81	Baghouse	SVDESULF	E-01.07
EUBOF	Basic oxygen furnace (BOF), 2 vessels	1/1/64	Electrostatic precipitator, baghouse	SVBOFESP, SVBOFBH	E-01.08 F-01.03
EUDESULFWATERINGSTATION	BOF desulfurization by-product material "desulf" watering station located at the south end of the BOF building. Levy digs the desulf materials with a front-end loader, brings them to an open area for	4/17/95	NA	NA	E-01.09

Unit/Group ID	Emission Unit/Process Group Description	Installation/ Modification Date	Control Device Description	Stack/ Vent ID	Requirement Table No.
	cooling using water spray and for fugitive dust control. After thorough cooling, Levy loads the materials into trucks for processing off site.				
EULADLEREFINE1	No. 1 Ladle refining facility	1/1/90	Baghouse	SVLADLEREFINE1	E-01.10
EULADLEREFINE2	No. 2 Ladle refining facility	1/1/95	Baghouse	SVLADLEREFINE2	E-01.11
EUANNEALFURNACES	34 annealing furnaces		NA	NA	E-01.12
EUSREHEATFURNACE1	Slab reheat furnace 1	1/1/79	NA	SVHSMREHEATFCE11 SVHSMREHEATFCE21	F-01.04
EUSREHEATFURNACE2	Slab reheat furnace 2	1/1/74	NA	SVHSMREHEATFCE21 SVHSMREHEATFCE22	F-01.04
EUSREHEATFURNACE3	Slab reheat furnace 3	1/1/74	NA	SVHSMREHEATFCE31 SVHSMREHEATFCE32	F-01.04

Flexible Group Identification

Flexible Grouping ID	Emission Unit/Process Groups Included in Flexible Grouping	Requirement Table No.
FGB&CCASTHOUSES	EUBBFCASTHOUSE, EUCBFCASTHOUSE	F-01.01
FGB&CSTOVES	EUBFCESTOVE, EUCFCESTOVE	F-01.02
FGBOFSHOP	EUBOF, EURELADLINGBOF	F-01.03
FGSREHEATFURNACE123	EUSREHEATFURNACE1, EUSREHEATFURNACE2, EUSREHEATFURNACE3	F-01.04
FGFACILITY	All equipment at the stationary source including equipment covered by other permits, grandfathered equipment and exempt equipment.	F-01.05

TABLE E-01.01 COAL HANDLING EQUIPMENT
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUCOALHANDLING
Flexible Grouping ID	NA

I. DESIGN PARAMETERS

A. Pollution Control Equipment	4 Baghouses
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVTRACKHOPPER	NA	NA	NA	30,000	NA
SVRAWCOALSILO	NA	NA	NA	1,800	NA
SVFINECOALSILO	NA	NA	NA	6,200	NA
SVPULVERIZER	NA	NA	NA	16,000	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
Natural gas	1. 214.7 MMscf per 12-month rolling time period in the pulverizer hot gas generator. **(40 CFR 52.21(b)(3))** 2. 214.7 MMscf per 12-month rolling time period in the rail car shed heater. **(40 CFR 52.21(b)(3))**

B. Pollutant	Maximum Emission Limit
1. PM	1. 0.005 gr/dscf from the track hopper baghouse **(40 CFR 52.21(b)(3), R336.1331(c))** 2. 0.005 gr/dscf from the raw coal silo baghouse **(40 CFR 52.21(b)(3), R336.1331(c))** 3. 0.005 gr/dscf from the fine coal silo baghouse **(40 CFR 52.21(b)(3), R336.1331(c))** 4. 0.005 gr/dscf from the coal pulverizer baghouse **(40 CFR 52.21(b)(3), R336.1331(c))**
2. PM10	1. 0.005 gr/dscf from the track hopper baghouse **(R336.1205(1)(a) & (b))** 2. 0.005 gr/dscf from the raw coal silo baghouse **(R336.1205(1)(a) &(b))** 3. 0.005 gr/dscf from the fine coal silo baghouse **(R336.1205(1)(a) &(b))** 4. 0.005 gr/dscf from the coal pulverizer baghouse **(R336.1205(1)(a) & (b))**
3. Visible emissions	1. 10% opacity from the track hopper baghouse **(R336.1301(1)(c))** 2. 10% opacity from raw coal silo baghouse **(R336.1301(1)(c))** 3. 10% opacity from the fine coal silo baghouse **(R336.1301(1)(c))** 4. 10% opacity from the coal pulverizer baghouse **(R336.1301(1)(c))**

TABLE E-01.01 COAL HANDLING EQUIPMENT
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING	
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	NA
3. Other Monitoring and/or Recordkeeping	1. The permittee shall perform a Method 9 certified visible emission observation of each baghouse at least once a month during processing activity. The permittee shall initiate corrective action upon observation of visible emissions in excess of the applicable visible emission limitation and shall keep a written record of each required observation and corrective action taken. **(R336.1910)** 2. Permittee shall periodically inspect each baghouse to determine the operational and physical condition of the baghouse at least once per month, and immediately after observing visible emissions in excess of the applicable limitation. Each baghouse shall be inspected as necessary immediately after a malfunction or failure of the baghouse or the process equipment to determine the reason for the malfunction or failure. Written records of each inspection and corrective action taken, if any, shall be maintained. **(R336.1910)** 3. The permittee shall keep, in a satisfactory manner, monthly and previous 12-month fuel usage records for the rail car shed heater and the pulverizer hot gas generator. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3)**

B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	NA
2. Method/Analysis	NA
3. Frequency and Schedule of Testing/Recordkeeping	NA

IV. REPORTING	
Reports and Schedules	NA

V. OPERATIONAL PARAMETERS

1. The permittee shall not operate the coal pulverizer unless the baghouse is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1301, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3))**

2. The permittee shall not load coal into the raw coal silo unless the baghouse is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1301, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3))**

TABLE E-01.01 COAL HANDLING EQUIPMENT **EMISSION UNIT/PROCESS GROUP REQUIREMENTS**
3. The permittee shall not load coal into the fine coal silo unless the baghouse is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1301, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3))** 4. The permittee shall not load coal into the track hopper unless the baghouse is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1301, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3))**
VI. OTHER REQUIREMENTS
NA

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUBBFCASTHOUSE
Flexible Grouping ID	FGB&CCASTHOUSE
I. DESIGN PARAMETERS	
A. Pollution Control Equipment	Natural gas suppression system prior to installation of baghouse. Baghouse after June 30, 2008
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBBFROOFMONEAST	75.2	NA	NA	NA	**R336.1225**
SVBBFROOFMONWEST	75.2	NA	NA	NA	**R336.1225**
SVBFCE	200	111	150	250,000	**R336.1225**

C. Other Design Parameters	
NA	
II. MATERIAL USAGE/EMISSION LIMITS	
A. Material	**Maximum Usage Rate**
NA	NA
B. Pollutant	**Maximum Emission Limit**
1. PM	1. 0.003 gr/dscf from baghouse stack **(40 CFR 52.21(b)(3) R336.1331, 40 CFR 63 Subpart FFFFF)** 2. 5.59 lb/hr from baghouse stack **(40 CFR 52.21(b)(3))**
2. PM-10	1. 0.0015 gr/dscf from baghouse stack **(R336.1205(1)(a) & (b))** 2. 2.85 lb/hr from baghouse stack **(R336.1205(1)(a) & (b))**
3. Opacity from roof monitors	20% **(R336.1358 (1))**
4. Secondary emissions exiting any opening in the casthouse	20% (6-minute average) **(40 CFR 63.7790(a))**
5. Opacity from baghouse stack	10% **(R336.1361)**
III. COMPLIANCE EVALUATION **Records of all of the following shall be maintained on file for a period of 5 years.**	
A. MONITORING/RECORDKEEPING	
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	1. If applicable, the permittee shall install, maintain, and operate a Continuous Parametric Monitoring System (CPMS) for the baghouse capture system according to the requirements of 40 CFR 63.7830(a) and 40 CFR 63.7831(e). **(40 CFR 63.7830(a))**
3. Other Monitoring and/or Recordkeeping	1. Prior to installation of the B blast furnace casthouse baghouse, the permittee shall perform a Method 9 certified visible emission observation of roof monitors at least once a week during the blast furnace operation for a minimum of one entire cast. After installation of the B blast furnace casthouse baghouse, the permittee shall perform non-certified visible emission observation for the roof monitors at least once a week during blast furnace processing activity and a Method 9 certified visible emission observation of roof monitors at least once every month during blast furnace processing activity. The permittee

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS

EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	shall initiate corrective action upon observation of visible emissions in excess of the applicable visible emission limitation and shall keep a written record of each required observation and corrective action taken. **(R336.1358(1))** 2. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 3. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 4. The permittee shall maintain records associated with performance tests, and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))** 5. Except as allowed in S.C. 8 permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))** a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))** b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))** c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))** d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))** 6. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7831(f)(6))** 7. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7833(c)(2))**

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	8. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)** 9. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))** 10. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))** 11. The permittee shall confirm that the compressed air supply to the pulse-jet baghouse is operating properly on a daily basis. **(40 CFR 63.7830(b)(3))** 12. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4))** 13. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 14. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 15. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 16. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 17. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))** 18. The permittee shall prepare, and operate at all times according to, a written operation and maintenance plan for the baghouse capture system. The plan shall address each of the following: **(40 CFR 63.7800(b))**

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

a. Weekly inspections of the equipment that is important to the performance of the total capture system, including, but not limited to, observations of the physical appearance of the equipment and requirements to repair any defect or deficiency in the capture system before the next scheduled inspection; **(R336.1301, R336.1358(1), 40 CFR 63.7800(b)(1))**

b. Operating limit parameters appropriate for the capture system design that are representative and reliable indicators of the performance of the capture system including, but not limited to, operating limit parameters that indicate the level of the ventilation draft and the damper position settings for the capture system when operating to collect emissions, including revised settings for seasonal variations. Appropriate operating limit parameters for ventilation draft include, but are not limited to, volumetric flow rate through each separately ducted hood, total volumetric flow rate at the inlet to the control device to which the capture system is vented, fan motor amperage, or static pressure. **(40 CFR 63.7800(b)(3))**

19. If applicable, the permittee shall monitor the hourly average actual volumetric flow rate through each separately ducted hood and the average hourly total volumetric flow rate at the inlet to the baghouse according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7830(a))**

20. If applicable, the permittee shall develop and make available for inspection upon request by AQD a site-specific monitoring plan that addresses all of the following requirements for the baghouse capture system: **(40 CFR 63.7831(a))**
    a. Installation of the CPMS sampling probe or other interface at a measurement location relative to each hooded emission point such that the measurement is representative of capture of the exhaust emissions; **(40 CFR 63.7831(a)(1))**
    b. Performance and equipment specifications for the sample interface, the parametric signal analyzer, and the data collection and reduction system; **(40 CFR 63.7831(a)(2))**
    c. Performance evaluation procedures and acceptance criteria; **(40 CFR 63.7831(a)(3))**
    d. Ongoing operation and maintenance procedures in accordance with the general requirements of 40 CFR 63.8(c)(1), (c)(3), (c)(4)(ii), (c)(7), and (c)(8); **(40 CFR 63.7831(a)(4))**
    e. Ongoing data quality assurance procedures in accordance with the general requirements of 40 CFR 63.8(d); and **(40 CFR 63.7831(a)(5))**
    f. Ongoing recordkeeping and reporting procedures in accordance the general requirements of 40 CFR 63.10(c), (e)(1), and (e)(2)(i). **(40 CFR 63.7831(a)(6))**

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	21. If applicable, the permittee shall operate and maintain the capture system CPMS in continuous operation according to the site-specific monitoring plan. Unless otherwise specified, the CPMS shall: **(40 CFR 63.7831(b))** a. Complete a minimum of one cycle of operation for each successive 15-minute period and collect a minimum of three of the required four data points to constitute a valid hour of data; **(40 CFR 63.7831(b)(1))** b. Provide valid hourly data for at least 95 percent of every averaging period; and **(40 CFR 63.7831(b)(2))** c. Determine and record the hourly average of all recorded readings. **(40 CFR 63.7831(b)(3))** 22. The permittee shall operate the baghouse capture system at or above the lowest value or settings established for the operating limits in the operation and maintenance plan and collect, reduce, and record the monitoring data for each of the operating limit parameters. **(40 CFR 63.7833(b))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10
2. Method/Analysis	Approved Method
3. Frequency and Schedule of Testing/Recordkeeping	1. Within 180 operating days after commencement of trial operation of the B blast furnace casthouse baghouse, verification of PM and PM10 emission rates from the B-Blast Furnace baghouse stack, by testing at owner's expense, in accordance with Department requirements, will be required. No less than 60 days prior to testing, a complete test plan shall be submitted to the AQD. The final plan must be approved by the AQD prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205, R336.1331(c), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 2. The permittee shall conduct a performance test to demonstrate initial compliance with the applicable emission and opacity limitations of 40 CFR Part 63, Subpart FFFFF, contained in this table within 180 days of the startup of “B” BF casthouse baghouse. **(40 CFR 63.7820(a))** 3. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)** 4. The permittee shall demonstrate compliance with the opacity limitation in II.B.4 with a certified observer of Method 9 visible emissions using Method 9. The performance test for visible emissions shall consist of

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	30 6-minute block averages during tapping of the furnace. **(40 CFR 63.7823(c)(1) and (2))** 5. The permittee shall maintain records of visible emissions observations required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7842(c)** 6. The permittee shall sample for an integral number of furnace tapping operations to obtain at least 1 hour of sampling for each test run. **(40 CFR 63.7822(e))** 7. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 8. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))** 9. The permittee shall certify that the baghouse capture system operated during the performance test at the site-specific operating limits established in the operation and maintenance plan using the following procedures: **(40 CFR 63.7824(a))** a. Concurrent with all opacity observations, measure and record values for each of the operating limit parameters in the capture system operation and maintenance plan according to the monitoring requirements specified in §63.7830(a). **(40 CFR 63.7824(a)(1))** b. For any dampers that are manually set and remain at the same position at all times the capture system is operating, the damper position shall be visually checked and recorded at the beginning and end of each opacity observation period segment. **(40 CFR 63.7824(a)(2))** c. Review and record the monitoring data and identify and explain any times the capture system operated outside the applicable operating limits. **(40 CFR 63.7824(a)(3))** d. Certify in the performance test report that during all observation period segments, the capture system was operating at the values or settings established in the capture system operation and maintenance plan. **(40 CFR 63.7824(a)(4))** 10. The permittee may change the operating limits for the baghouse capture system if the following requirements are met: **(40 CFR 63.7824(d))** a. Submit a written notification to the Administrator requesting to conduct a new performance test to revise the operating limit. **(40 CFR 63.7824(d)(1))**

TABLE E-01.02 B BLAST FURNACE CAST HOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	b. Conduct a performance test to demonstrate compliance with the applicable operating limitation. **(40 CFR 63.7824(d)(2))** c. Establish revised operating limits according to the applicable procedures in 40 CFR 63.7824, paragraphs (a) through (c) for a capture system. **(40 CFR 63.7824(d)(3))**
IV. REPORTING	
Reports and Schedules	1. Permittee shall report the results of the initial performance test in the notification of compliance status. **(40 CFR 63.7820(a), 40 CFR 63.7825(c) and 40 CFR 63.7840(e))** 2. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 3. Any time an action taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with all requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**

V. OPERATIONAL PARAMETERS

1. After June 30, 2008, B Blast Furnace Cast House shall not be operated unless the baghouse is installed, maintained and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3), MDEQ Consent Order AQD No. 6-2006 Paragraph 10.B)**

2. Prior to installation of the baghouse, the B Blast Furnace Cast House shall not be operated unless the natural gas fired fume suppression system is installed and operating properly. **(R336.1910)**

3. Prior to installation of the baghouse, the permittee shall operate and maintain a flow indication system for natural gas to the suppression system when the B Blast Furnace Casthouse is operated. **(R336.1910)**

4. The B Blast Furnace Cast House shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**

5. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the B Blast Furnace Cast House. **(40 CFR 63.7810(c), 40 CFR 63.7835(b) and 40 CFR 63.6(e)(3))**

6. By January 31, 2008, the permittee shall provide the B blast furnace casthouse baghouse capture system design plans and a signed certification from the designer, certifying that the baghouse capture system is designed to achieve no less than 98% collection efficiency. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))**

VI. OTHER REQUIREMENTS

1. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

TABLE E-01.03 B BLAST FURNACE STOVE
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

FLEXIBLE GROUPING	FGB&CSTOVES
Emission Unit/Process Group	EUBFCESTOVE

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Low-NOx technology; scrubber and mechanical collector for blast furnace gas precleaning
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBSTOVE	190	99	750	NA	**R336.1225, 40 CFR 52.21(c) & (d)**

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. NOx	1. 36.0 lb/hr **(R336.1205(1)(a) & (b))** 2. 136.6 ton/12-month rolling period **(R336.1205(1)(a) & (b))**
2. SO2	1. 70.9 lb/hr. **(40 CFR 52.21(c) & (d), 40 CFR 52.21(j))**
3. CO	1. 661.1 lb/hr **(40 CFR 52.21(d))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	1. The permittee shall keep, in a satisfactory manner, daily fuel usage records for EUBFCESTOVE. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3), (c), & (d))** 2. Following the performance testing required in S.C. III.B.3.1 of this table, the permittee shall determine compliance with emission limits in S.C. II.B.1.2 of this table by establishing emission factors based up on the BFCE stove stack testing and applying these emission factors to the daily fuel usage recorded in S.C. III.A.2.1, as outlined in Appendix 1.7. **(R336.1205(1)(a) & (b))**

TABLE E-01.03 B BLAST FURNACE STOVE EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	3. Following the performance testing required in S.C. III.B.3.1 of Table E-01.05, the permittee shall determine compliance with the emission limit in S.C. II.B.3.1 of this table by establishing an emission factor based upon the CFCE stove stack testing and applying this emission factor to the daily fuel usage recorded in S.C. III.A.2.1, as outlined in Appendix 1.7. **(40 CFR 52.21 (d))**
3. Other Monitoring and/or Recordkeeping	NA
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. NOx 2. SO2
2. Method/Analysis	Approved method
3. Frequency and Schedule of Testing/Recordkeeping	1. Within 180 operating days after commencement of trial operation of the B blast furnace casthouse baghouse, verification of NOx and SO2 emission rates from the B-Blast Furnace stove stack, by testing at owner's expense, in accordance with Department requirements, will be required. No less than 60 days prior to testing, a complete test plan shall be submitted to the AQD. The final plan must be approved by the AQD prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.2001, R336.2003, R336.2004, 40 CFR 52.21(c) & (d), 40 CFR 52.21(j))**
IV. REPORTING	
Reports and Schedules	NA
V. OPERATIONAL PARAMETERS	
1. After completion of C-FCE modification, the permittee shall not operate EUBFCESTOVE unless the low-NOx technology is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1910)** 2. The permittee shall not fire blast furnace gas in EUBFCESTOVE unless the scrubber and mechanical collector for pre-combustion gas cleaning are installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1910, 40 CFR 52.21(b)(3))**	
VI. OTHER REQUIREMENTS	
NA	

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUCBFCASTHOUSE
Flexible Grouping ID	FGB&CBFCASTHOUSE

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Baghouse.
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVCBFROOFMONEAST	75.2	NA	NA	NA	**R336.1225**
SVCBFROOFMONWEST	75.2	NA	NA	NA	**R336.1225**
SVCFCE	200	153	150	500,000	**R336.1225**

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. PM	1. 0.003 gr/dscf from baghouse stack **(40 CFR 52.21(b)(3), R336.1331, 40 CFR 63 Subpart FFFFF)** 2. 11.17 lb/hr from baghouse stack **(40 CFR 52.21(b)(3))**
2. PM-10	1. 0.0015 gr/dscf from baghouse stack **(R336.1205(1)(a) & (b))** 2. 5.70 lb/hr from baghouse stack **(R336.1205(1)(a) & (b))**
3. Opacity from roof monitors	20% **(R336.1358 (1))**
4. Secondary emissions exiting any opening in the casthouse	20% (6-minute average) **(40 CFR 63.7790(a))**
5. Opacity from baghouse stack	10% **(R336.1361)**
6. SO2 from baghouse stack	1. 23.03 lb/hr **(40 CFR 52.21 (c) & (d), 40 CFR 52.21 (j))** 2. 91.79 ton per 12-month rolling time period **(40 CFR 52.21 (c), (d), & (j))**
7. NOx from baghouse stack	1. 2.45 lb/hr **(R336.1205(1)(a) & (b))** 2. 9.77 ton per 12-month rolling time period **(R336.1205(1)(a) & (b))**
8. VOC from baghouse stack	1. 6.77 lb/hr **(R336.1702(a))**
9. Mn	1. 0.00256 lb/hr from baghouse stack **(R336.1225)**
10. Pb	1. 0.00015 lb/hr from baghouse stack **(40 CFR 52.21(d))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	1. If applicable, the permittee shall install, maintain, and operate a Continuous Parametric Monitoring System (CPMS) for the baghouse capture system according to the requirements of 40 CFR 63.7830(a) and 40 CFR 63.7831(e). **(40 CFR 63.7830(a))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

3. Other Monitoring and/or Recordkeeping	1. Prior to installation of the C blast furnace casthouse baghouse, the permittee shall perform a Method 9 certified visible emission observation of roof monitors at least once a week during the blast furnace operation for a minimum of one entire cast. After installation of the C blast furnace casthouse baghouse, the permittee shall perform non-certified visible emission observation for the roof monitors at least once a week during blast furnace processing activity and a Method 9 certified visible emission observation of roof monitors at least once every month during blast furnace processing activity. The permittee shall initiate corrective action upon observation of visible emissions in excess of the applicable visible emission limitation and shall keep a written record of each required observation and corrective action taken. **(R336.1358(1))** 2. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 3. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 4. The permittee shall maintain records associated with performance tests, and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))** 5. Except as allowed in S.C. 8, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))** a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))** b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))** c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))** d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))** 6. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7831(f)(6))** 7. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7833(c)(2))** 8. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40 CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)** 9. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))** 10. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))** 11. The permittee shall confirm that the compressed air supply to the pulse-jet baghouse is operating properly on a daily basis. **(40 CFR 63.7830(b)(3))** 12. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4))** 13. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 14. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 15. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 16. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

17. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))**

18. The permittee shall prepare, and operate at all times according to, a written operation and maintenance plan for the baghouse capture system. The plan shall address each of the following: **(40 CFR 63.7800(b))**
    a. Weekly inspections of the equipment that is important to the performance of the total capture system, including, but not limited to, observations of the physical appearance of the equipment and requirements to repair any defect or deficiency in the capture system before the next scheduled inspection; **(R336.1301, R336.1358(1), 40 CFR 63.7800(b)(1))**

    b. Operating limit parameters appropriate for the capture system design that are representative and reliable indicators of the performance of the capture system including, but not limited to, operating limit parameters that indicate the level of the ventilation draft and the damper position settings for the capture system when operating to collect emissions, including revised settings for seasonal variations. Appropriate operating limit parameters for ventilation draft include, but are not limited to, volumetric flow rate through each separately ducted hood, total volumetric flow rate at the inlet to the control device to which the capture system is vented, fan motor amperage, or static pressure. **(40 CFR 63.7800(b)(3))**

19. If applicable, the permittee shall monitor the hourly average actual volumetric flow rate through each separately ducted hood and the average hourly total volumetric flow rate at the inlet to the baghouse according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7830(a))**

20. If applicable, the permittee shall develop and make available for inspection upon request by AQD a site-specific monitoring plan that addresses all of the following requirements for the baghouse capture system: **(40 CFR 63.7831(a))**
    a. Installation of the CPMS sampling probe or other interface at a measurement location relative to each hooded emission point such that the measurement is representative of capture of the exhaust emissions; **(40 CFR 63.7831(a)(1))**
    b. Performance and equipment specifications for the sample interface, the parametric signal analyzer, and the data collection and reduction system; **(40 CFR 63.7831(a)(2))**
    c. Performance evaluation procedures and acceptance criteria; **(40 CFR 63.7831(a)(3))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	d. Ongoing operation and maintenance procedures in accordance with the general requirements of 40 CFR 63.8(c)(1), (c)(3), (c)(4)(ii), (c)(7), and (c)(8); **(40 CFR 63.7831(a)(4))** e. Ongoing data quality assurance procedures in accordance with the general requirements of 40 CFR 63.8(d); and **(40 CFR 63.7831(a)(5))** f. Ongoing recordkeeping and reporting procedures in accordance the general requirements of 40 CFR 63.10(c), (e)(1), and (e)(2)(i). **(40 CFR 63.7831(a)(6))** 21. If applicable, the permittee shall operate and maintain the capture system CPMS in continuous operation according to the site-specific monitoring plan. Unless otherwise specified, the CPMS shall: **(40 CFR 63.7831(b))** a. Complete a minimum of one cycle of operation for each successive 15-minute period and collect a minimum of three of the required four data points to constitute a valid hour of data; **(40 CFR 63.7831(b)(1))** b. Provide valid hourly data for at least 95 percent of every averaging period; and **(40 CFR 63.7831(b)(2))** c. Determine and record the hourly average of all recorded readings. **(40 CFR 63.7831(b)(3))** 22. The permittee shall operate the baghouse capture system at or above the lowest value or settings established for the operating limits in the operation and maintenance plan and collect, reduce, and record the monitoring data for each of the operating limit parameters. **(40 CFR 63.7833(b))** 23. The permittee shall keep a daily record of the amount of iron cast from the furnace. **(R336.1205(1)(a) & (b), R336.1225)** 24. The permittee shall keep, in a satisfactory manner, monthly and previous 12-month records of SO2 and NOx emission calculations for C blast furnace casthouse baghouse, using emission factors developed during the testing required in SC III.B.3.1, using the method shown in Appendix 1.7. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(c) and (d))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. SO2

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	5. NOx 6. VOC 7. Mn 8. Pb
2. Method/Analysis	Approved Method
3. Frequency and Schedule of Testing/Recordkeeping	1. Within 180 days after commencement of trial operation, verification of PM, PM10, NOx, VOC, and SO2 emission rates from the C-Blast Furnace baghouse stack, by testing at owner's expense, in accordance with Department requirements, will be required. No less than 60 days prior to testing, a complete test plan shall be submitted to the AQD. The final plan must be approved by the AQD prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205, R336.702, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(c) & (d), 40 CFR 52.21(j))** 2. The permittee shall conduct a performance test to demonstrate initial compliance with the applicable emission and opacity limitations of 40 CFR Part 63, Subpart FFFFF contained in this table within 180 days of startup. **(40 CFR 63.7820(a))** 3. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)** 4. The permittee shall demonstrate compliance with the opacity limitation in II.B.4 with a certified observer of Method 9 visible emissions using Method 9. The performance test for visible emissions shall consist of 30 6-minute block averages during tapping of the furnace. **(40 CFR 63.7823(c)(1) and (2))** 5. The permittee shall maintain records of visible emissions observations required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7842(c)** 6. The permittee shall sample for an integral number of furnace tapping operations to obtain at least 1 hour of sampling for each test run. **(40 CFR 63.7822(e))** 7. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

8. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))**

9. The permittee shall obtain an analysis of the C Blast Furnace Casthouse baghouse dust once per calendar month during the 1st year after the modification of C blast furnace and quarterly thereafter, or less frequently if approved in writing by the Air Quality Division. The analysis shall determine the percentage of Pb and Mn in the collected PM dust from the baghouse. The permittee shall submit an acceptable protocol for baghouse dust sampling and analysis methods to the Air Quality Division, at least 60 days prior the initial performance emission test. **(R336.1225, R336.1228, 40 CFR 52.21(d))**

10. Within 60 days of achieving the maximum production rate, but not later than 180 days after commencement of trial operation, the permittee shall verify and quantify Mn and Pb emission rates and the ratio of Mn and Pb concentrations in the baghouse dust to the actual amount of Mn and Pb emitted from the C Blast Furnace Casthouse by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1225, R336.1228, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))**

11. The permittee shall certify that the baghouse capture system operated during the performance test at the site-specific operating limits established in the operation and maintenance plan using the following procedures: **(40 CFR 63.7824(a))**
    a. Concurrent with all opacity observations, measure and record values for each of the operating limit parameters in the capture system operation and maintenance plan according to the monitoring requirements specified in §63.7830(a). **(40 CFR 63.7824(a)(1))**

    b. For any dampers that are manually set and remain at the same position at all times the capture system is operating, the damper position shall be visually checked and recorded at the beginning and end of each opacity observation period segment. **(40 CFR 63.7824(a)(2))**

    c. Review and record the monitoring data and identify and explain any times the capture system operated outside the applicable operating limits. **(40 CFR 63.7824(a)(3))**

    d. Certify in the performance test report that during all observation period segments, the capture system was operating at the values or settings established in the capture system operation and maintenance plan. **(40 CFR 63.7824(a)(4))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	12. The permittee may change the operating limits for the baghouse capture system if the following requirements are met: **(40 CFR 63.7824(d))** a. Submit a written notification to the Administrator requesting to conduct a new performance test to revise the operating limit. **(40 CFR 63.7824(d)(1))** b. Conduct a performance test to demonstrate compliance with the applicable operating limitation. **(40 CFR 63.7824(d)(2))** c. Establish revised operating limits according to the applicable procedures in 40 CFR 63.7824, paragraphs (a) through (c) for a capture system. **(40 CFR 63.7824(d)(3))**
IV. REPORTING	
Reports and Schedules	1. Permittee shall report the results of the initial performance test in the notification of compliance status. **(40 CFR 63.7820(a), 40 CFR 63.7825(c) and 40 CFR 63.7840(e))** 2. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 3. Any time an action taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with all requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**

V. OPERATIONAL PARAMETERS

1. After completion of C-FCE modification, C Blast Furnace Cast House shall not be operated unless the baghouse is installed, maintained and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1331, R336.1910, 40 CFR 52.21(b)(3))**

2. The permittee shall install a baghouse dust collector for C blast furnace casthouse according to the following schedule:
   a. Complete construction and place in operation by January 31, 2008 or startup of enhanced C-FCE, whichever is sooner. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))**

3. The permittee shall keep on file a copy of the CFCE baghouse capture system design plans and a signed certification from the designer, certifying that the baghouse capture system is designed to achieve no less than 98% collection efficiency. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))**

4. The C Blast Furnace Cast House shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**

5. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the C Blast Furnace Cast House. **(40 CFR 63.7810(c), 40 CFR 63.7835(b) and 40 CFR 63.6(e)(3))**

6. The iron production from C Blast Furnace Casthouse shall not exceed a maximum of 10,000 tons per day based on a calendar week average. **(R336.1225, 40 CFR 52.21(c) & (d))**

TABLE E-01.04 C BLAST FURNACE CAST HOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS
VI. OTHER REQUIREMENTS
1. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

TABLE E-01.05 C BLAST FURNACE STOVE
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

FLEXIBLE GROUPING	FGB&CSTOVES
Emission Unit/Process Group	EUCFCESTOVE

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Low-NOx technology; venturi scrubber and mechanical collector for blast furnace gas precleaning
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVCSTOVE	210	129	750	NA	**R336.1225, 40 CFR 52.21(c) & (d)**

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. NOx	1. 106.3 lb/hr **(R336.1205(1)(a) & (b))** 2. 439.18 ton/12-month rolling period **(R336.1205(1)(a) & (b))**
2. SO2	1. 275.1 lb/hr [1]. **(40 CFR 52.21(c) & (d), 40 CFR 52.21(j))** 2. 1,096.1 ton/12-month rolling period **(40 CFR 52.21(j))**
3. CO	1. 2195.5 lb/hr **(40 CFR 52.21(d) & (j))** 2. 8760 ton/12-month rolling period. **(40 CFR 52.21(d) & (j))**
4. PM	14.16 lb/hr **(40 CFR 52.21(b)(3), R336.1331)**
5. PM-10	14.16 lb/hr **(R336.1205(1)(a) & (b))**
6. Mn	0.0154 lb/hr **(R336.1225)**
7. Hg	0.000414 lb/hr **(R336.1201(3), R336.1228, R336.1901)**
8. Pb	0.0141 lb/hr **(40 CFR 52.21(d))**

[1] This limit is based on a 24-hour average.

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	Continuous emission monitor for SO2 emissions **(R336.1205(1)(a) & (b), 40 CFR 52.21(c), (d), & (j))**
2. Process Monitoring System and Recordkeeping	1. The permittee shall install, calibrate, maintain and operate in a satisfactory manner a device to monitor and record the SO2 emissions from EUCFCESTOVE on a continuous basis. The permittee shall install and operate each CEM system to meet the timelines, requirements and reporting detailed in Appendix 1.3.1. and shall use the CEM data for determining compliance with Special Conditions II.B.2.1 and II.B.2.2 **(R336.1205, 40 CFR 52.21 (c), (d), & (j))**

TABLE E-01.05 C BLAST FURNACE STOVE
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	2. The permittee shall keep, in a satisfactory manner, daily fuel usage records for FGB&CSTOVES. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3), (c), & (d))** 3. Following the performance testing required in S.C. III.B.3.1 of this table, the permittee shall determine compliance with the emission limits in S.C. II.B.1.2 and II.B.3.2 of this table by establishing emission factors based upon the CFCE stove stack testing and applying these emission factors to the daily fuel usage recorded in S.C. III.A.2.2, as outlined in Appendix 1.7. **(R336.1205(1)(a) & (b), 40 CFR 52.21 (d))**
3. Other Monitoring and/or Recordkeeping	NA
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. NOx 2. SO2 3. CO 4. PM 5. PM-10 6. Mn 7. Hg 8. Pb
2. Method/Analysis	Approved method
3. Frequency and Schedule of Testing/Recordkeeping	1. Within 180 days after commencement of trial operation, verification of NOx, SO2, CO, PM, PM-10 Mn, Hg, and Pb emission rates from the C-Blast Furnace stove stack, by testing at owner's expense, in accordance with Department requirements, will be required. The permittee shall record the sulfur content of the coal and coke combusted in C blast furnace averaged over the duration of the test. No less than 60 days prior to testing, a complete test plan shall be submitted to the AQD. The final plan must be approved by the AQD prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.2001, R336.2003, R336.2004, 40 CFR 52.21(c) & (d), 40 CFR 52.21(j))**
IV. REPORTING	
Reports and Schedules	NA

TABLE E-01.05 C BLAST FURNACE STOVE

EMISSION UNIT/PROCESS GROUP REQUIREMENTS

V. OPERATIONAL PARAMETERS

1. After completion of C-FCE modification, the permittee shall not operate EUCFCESTOVE unless the low-NOx technology is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1910)**

2. The permittee shall not fire blast furnace gas in EUCFCESTOVE unless the venturi scrubber and mechanical collector for pre-combustion gas cleaning are installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1910, 40 CFR 52.21(b)(3))**

VI. OTHER REQUIREMENTS

1. The permittee shall maintain a complete copy of the coke analysis, including the sulfur content, as supplied by the coke vendor, for each shipment of coke. All records shall be kept on file for a period of at least five years and made available to the Department upon request. **(R336.1225, 40 CFR 52.21(c) & (d))**

2. The permittee shall maintain a complete copy of the coal analysis, including the sulfur content, as supplied by the coal vendor, for each shipment of coal. All records shall be kept on file for a period of at least five years and made available to the Department upon request. **(R336.1225, 40 CFR 52.21(c) & (d))**

TABLE E-01.06 RELADLING - BOF
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EURELADLINGBOF (includes South and North Reladling)
Flexible Grouping ID	NA

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Baghouse
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBOFBH (After C-FCE modification)	200	222	150	1,000,000	**R336.1225**
SVRELADLEBAG (until C-FCE modification)	27	69	175	130,000	**R336.1225**

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. Opacity from hot metal transfer operation stack.	20% **R336.1365(1)**
2. Opacity from fugitive emissions from hot metal transfer operation building or enclosure.	20% **R336.1365(2) and 40 CFR 63.7790(a)(Table 1, Item 12)**
3. PM	1. 0.01 grain per dry standard cubic foot from the reladling south baghouse prior to C-FCE modification **(40 CFR 63.7790(a)(Table 1, Item 10), R336.1331)** 2. 6.31 ton per 12 month rolling time period from the roof monitors **(40 CFR 52.21(b)(3))**
4. PM10	1. 3.22 ton per 12 month rolling time period from the roof monitors **(R336.1205(1)(a) & (b))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	
3. Other Monitoring and/or Recordkeeping	1. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 2. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))**

TABLE E-01.06 RELADLING - BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	3. The permittee shall maintain records associated with performance tests and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))** 4. Except as allowed in S.C. 7, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))** a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))** b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))** c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))** d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))** 5. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7831(f)(6))** 6. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7833(c)(2))** 7. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40 CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)** 8. The permittee shall monitor the pressure drop across the baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))** 9. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))**

TABLE E-01.06 RELADLING - BOF
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	10. The permittee shall perform monthly visual checks of bag tension on the shaker-type baghouse to ensure that bags are not kinked (kneed or bent) or lying on their sides. If the shaker-type baghouse uses self-tensioning (spring-loaded) devices, the visual checks are not required. **(40 CFR 63.7830(b)(6))** 11. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4)** 12. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 13. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 14. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 15. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 16. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))** 17. Using the method shown in Appendix 1.7, the permittee shall calculate and record by the end of each calendar month the following from the BOF roof monitors: a. emissions of PM b. emissions of PM-10 **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))** 18. The permittee shall keep a daily record of the amount of iron throughput to the Reladling South and North Operations. **(R336.1205(1)(a) & (b), R336.1225)**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM
2. Method/Analysis	Approved Method
3. Frequency and Schedule of Testing/Recordkeeping	1. Sampling during the performance tests will occur only when the operations being controlled are in operation. **(40 CFR 63.7822(h))**

TABLE E-01.06 RELADLING - BOF
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	2. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 3. The permittee shall demonstrate compliance with the opacity limitation in II.B.2. with a certified observer of Method 9 visible emissions using Method 9 with the following exceptions: **(40 CFR 63.7823(d)(1)(i))** a. Record observations to the nearest 5 percent at 15-second intervals for at least three steel production cycles rather than using the procedure specified in Section 2.4 of Method 9. **(40 CFR 63.7823(d)(1)(ii))** b. Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals. **(40 CFR 63.7823(d)(1)(iii))** 4. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))** 5. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 2. When actions taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with the requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**
V. OPERATIONAL PARAMETERS	

1. The Reladling South Operation and the associated baghouse shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**

2. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the Reladling South Operation and the associated emission control system and operate in accordance with the plan during periods of startup, shutdown, and malfunction.
(40 CFR 63.7810(c), 40 CFR 63.7835(b), and 40 CFR 63.6(e)(3))

3. Until the modification of C-FCE, the permittee shall not operate Reladling South Operation unless the baghouse dust collector is installed, maintained, and operated in a satisfactory manner. After modification of C-FCE, the permittee shall not operate Reladling South Operation unless the emissions are directed to the

TABLE E-01.06 RELADLING - BOF
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

BOF baghouse secondary dust collector and the BOF baghouse secondary dust collector is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1910, 40 CFR 52.21(b)(3))**

4. Upon rerouting the Reladling South Operations exhaust to the BOF baghouse secondary dust collector, Special Conditions II.B.1, II.B.3.1, III.A.3.4 through III.A.3.16, and III.B.1.2 of this table shall no longer apply. Thereafter the permittee shall comply with the identical or more stringent emission, monitoring, testing, and recordkeeping requirements of Table F-01.03 that supersede the above Special Conditions. **(40 CFR 63 Subpart FFFFF)**

5. The permittee shall not use the Reladling North Operations (i.e. the North Hole) of the Basic Oxygen Furnace Shop for emergency hot metal transfer, hot metal desulfurization, or beaching of molten iron, without installation and operation of appropriate control technology which prevents emissions in excess of the applicable Michigan SIP Rule or additional requirements that are promulgated under Section 112 of the Clean Air Act, 42 U.S.C. Section 7412, or are incorporated in a permit. **(USEPA Civil Action Nos. 0075452 and 0075454 Consent Decree, Paragraph 16)**

6. Unless necessary for emergency, health or safety reasons, including to allow for safe shutdown of operations, the permittee shall not use the North Hole of the Basic Oxygen Furnace Shop for emergency hot metal transfer, hot metal desulfurization, or beaching of molten iron, without installation and operation of appropriate control technology which prevents emissions in excess of the applicable Michigan SIP Rule or additional requirements that are promulgated under Section 112 of the Clean Air Act, 42 U.S.C. Section 7412, or are incorporated in a permit. If the North Hole is used for emergency reasons, the permittee shall report any such use in its next semiannual report. The report shall include the following information for each such prohibited use of the North Hole without the appropriate control technology:
   a. date
   b. start time
   c. stop time
   d. duration of use
   e. reason for use.
   (R336.1201(3))

7. Upon routing the Reladling North Operations exhaust to the new BOF baghouse secondary dust collector, the permittee may utilize the Reladling North Operations in compliance with the applicable requirements of Table E-01.06, and with the emission, monitoring, testing, and recordkeeping requirements of Table F-01.03 **(40 CFR 63 Subpart FFFFF)**

VI. OTHER REQUIREMENTS

1. The permittee shall comply with the emission limitations and operation and maintenance requirements from 40 CFR Part 63, Subpart FFFFF specified in Table E-01.06, except during periods of startup, shutdown and malfunction. **(40 CFR 63.7810(a))**

2. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

TABLE E-01.07 DESULFURIZATION OPERATION
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUDESULFURIZATION				
Flexible Grouping ID	NA				
I. DESIGN PARAMETERS					
A. Pollution Control Equipment	Baghouse				
B. Stack/Vent Parameters	NA				
Stack/Vent ID	**a. Minimum Height (feet)**	**b. Maximum Exhaust Dimension (inches)**	**c. Temp. (°F)**	**d. Air Flow Rate (acfm)**	**Applicable Requirement**
SVDESULF	37	66	225	94,500	**R336.1225**
C. Other Design Parameters					
NA					
II. MATERIAL USAGE/EMISSION LIMITS					
A. Material	**Maximum Usage Rate**				
B. Pollutant	**Maximum Emission Limit**				
1. Opacity from desulfurization stack.	20% **(R336.1366(1))**				
2. Opacity from fugitive emissions from desulfurization operations.	20% **(R336.1366(2))**				
3. Opacity from BOF Shop Building	20% (three minute average) **(40 CFR 63.7790(a)(Table 1, Item 12))**				
4. PM	1. 0.01 grain per dry standard cubic foot from baghouse **(40 CFR 52.21(b)(3), 40 CFR 63.7790(a)(Table 1, Item 10), R336.1331)** 2. 2.09 lb/hr from baghouse **(40 CFR 52.21(b)(3))** 3. 36.2 ton per 12-month rolling time period from roof monitors **(40 CFR 52.21(b)(3))**				
5. PM10	1. 0.0074 grain per dry standard cubic foot from baghouse **(R336.1205(1)(a) & (b))** 2. 1.55 lb/hr from baghouse **(R336.1205(1)(a) & (b))** 3. 6.88 ton per 12-month rolling time period from roof monitors **(R336.1205(1)(a) & (b))**				
6. Manganese	1. 0.00064 lb/hr from baghouse stack **(R336.1225)**				
7. Pb	1. 0.000278 lb/hr from baghouse stack **(40 CFR 52.21(d))**				
III. COMPLIANCE EVALUATION **Records of all of the following shall be maintained on file for a period of 5 years.**					
A. MONITORING/RECORDKEEPING					
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA				

TABLE E-01.07 DESULFURIZATION OPERATION EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
2. Process Monitoring System and Recordkeeping	NA
3. Other Monitoring and/or Recordkeeping	1. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 2. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 3. The permittee shall maintain records associated with performance tests and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))** 4. Except as allowed in S.C. 7, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))** a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))** b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))** c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))** d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))** 5. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7831(f)(6))** 6. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7833(c)(2))**

TABLE E-01.07 DESULFURIZATION OPERATION
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	7. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)** 8. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))** 9. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))** 10. The permittee shall perform monthly visual checks of bag tension on the shaker-type baghouse to ensure that bags are not kinked (kneed or bent) or lying on their sides. If the shaker-type baghouse uses self-tensioning (spring-loaded) devices, the visual checks are not required. **(40 CFR 63.7830(b)(6))** 11. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4))** 12. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 13. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 14. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 15. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 16. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 7832(b))**

TABLE E-01.07 DESULFURIZATION OPERATION EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	17. The permittee shall obtain an analysis of the Desulfurization baghouse dust once per calendar month during the 1st year after the modification of C blast furnace and quarterly thereafter, or less frequently if approved in writing by the Air Quality Division. The analysis shall determine the percentage of Pb and Mn in the collected PM dust from the baghouse. The permittee shall submit an acceptable protocol for baghouse dust sampling and analysis methods to the Air Quality Division, at least 60 days prior the initial performance emission test. **(R336.1225, R336.1228, 40 CFR 52.21(b)(3))** 18. Using the method shown in Appendix 1.7, the permittee shall calculate and record by the end of each calendar month the following from the BOF roof monitors: a. emissions of PM b. emissions of PM-10 **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))** 19. The permittee shall keep a daily record of the amount of iron throughput to the Desulfurization Operations. **(R336.1205(1)(a) & (b), R336.1225)**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. Mn 5. Pb
2. Method/Analysis	Approved method.
3. Frequency and Schedule of Testing/Recordkeeping	1. Sampling during the performance tests will occur only when the operations being controlled are in operation. **(40 CFR 63.7822(h))** 2. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 3. The permittee shall demonstrate compliance with the opacity limitation in II.B.3. with a certified observer of Method 9 visible emissions using Method 9 with the following exceptions: **(40 CFR 63.7823(d)(1)(i))** a. Record observations to the nearest 5 percent at 15-second intervals for at least three steel production cycles rather than using the procedure specified in Section 2.4 of Method 9. **(40 CFR 63.7823(d)(1)(ii))** b. Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals. **(40 CFR 63.7823(d)(1)(iii))**

TABLE E-01.07 DESULFURIZATION OPERATION
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	4. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))** 5. Within 60 days of achieving the maximum production rate, but not later than 180 days after commencement of trial operation, the permittee shall verify and quantify Mn and Pb emission rates from the desulfurization operation and the ratio of Mn and Pb concentrations in the baghouse dust to the actual amount of Mn and Pb emitted from the desulfurization operation, by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1225, R336.1228, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 6. Within 180 days after commencement of trial operation, the permittee shall verify PM and PM10 emission rates from the Desulfurization operation by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 7. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 2. When actions taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with the requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**
V. OPERATIONAL PARAMETERS	
1. The permittee shall operate and maintain the desulfurization control system in a manner as to control emissions from the desulfurization operation in compliance with the opacity limits. **(R336.1910)** 2. The Desulfurization Operation and the associated baghouse shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**	

TABLE E-01.07 DESULFURIZATION OPERATION
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

3. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the Desulfurization Operation and the associated emission control system and operate in accordance with the plan during periods of startup, shutdown, and malfunction. **(40 CFR 63.7810(c), 40 CFR 63.7835(b), and 40 CFR 63.6(e)(3))**

4. The permittee shall not operate the Desulfurization Operation unless the baghouse dust collector is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1910, 40 CFR 52.21(b)(3))**

VI. OTHER REQUIREMENTS

1. The permittee shall comply with the emission limitations and operation and maintenance requirements from 40 CFR Part 63, Subpart FFFFF specified in Table E-01.07, except during periods of startup, shutdown and malfunction. **(40 CFR 63.7810(a))**

2. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUBOF
Flexible Grouping ID	NA

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Electrostatic Precipitator, Baghouse
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBOFESP	213	204	300	841,000	**R336.1225**
SVBOFBH	200	222	150	1,000,000	**R336.1225**

C. Other Design Parameters

1. Permittee shall not operate the basic oxygen furnace (BOF) controlled by an electrostatic precipitator control system unless each transformer-rectifier set of the electrostatic precipitator is equipped with a saturable core reactor, silicon-controlled rectifier linear reactor, or equivalent type automatic control system approved by the AQD District Supervisor. **(R336.1330(1))**

2. Each automatic controller shall be set to provide maximum power, or optimal power if operating in a sparking mode, from its respective transformer-rectifier set. **(R336.1330(1))**

3. Each transformer-rectifier set shall be capable of operating in a spark-limited mode and shall meter and display the primary RMS voltage and amperage, the average secondary amperage, and the average spark rate. **(R336.1330(2))**

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. PM.	1. 0.0152 gr/dscf from ESP stack **(R336.1331, 40 CFR 63.7790(a), 40 CFR 52.21(b)(3))** 2. 50.94 lb/hr from ESP stack **(40 CFR 52.21(b)(3))** 3. 15.88 ton per 12-month rolling time period from roof monitors **(40 CFR 52.21(b)(3)**
2. PM-10.	1. 0.0113 gr/dscf from ESP stack **(R336.1205(1)(a) & (b))** 2. 37.70 lb/hr from ESP stack **(R336.1205(1)(a) & (b))** 3. 7.25 ton per 12-month rolling time period from roof monitors **(R336.1205(1)(a) & (b)**
3. Opacity from roof monitors	20% **(R336.1364(2))**
4. Opacity from BOF Shop Building	20% (3 minute average) **(R336.1364(2), (40 CFR 63.7790(a))**
5. Opacity from ESP stack	No greater than 10% on an hourly average basis **(40 CFR 63.7790(b)(3))**
6. NOx	1. 52.94 lb/hr from the ESP stack. **(R336.1205(1)(a) & (b))**
7. CO	1. 3,057.4 lb/hr from ESP stack **(40 CFR 52.21(d))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING	
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	1. Continuous opacity monitor on ESP stack. **(R36.1301(1)(c), 40 CFR 63.7830(d))**
2. Process Monitoring System and Recordkeeping	1. The permittee shall install, operate and maintain a continuous opacity monitor on the ESP stack and monitor the hourly average opacity of the stack continuously when the process is in operation. The COMS shall provide valid 1 hour averages for at least 95 percent of process operating hours for every quarterly reporting period. The permittee shall operate the COM system to meet the timelines, requirements and reporting detailed in Appendix 1.3.2. **(R336.1301(1)(c), 40 CFR 63.7830(d), 40 CFR 63.7831(h), and 40 CFR 63.7832(a))** 2. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. All other data collected during all other periods must be used in assessing compliance. **(40 CFR 63.7832(b))**
3. Other Monitoring and/or Recordkeeping	1. Prior to installation of the BOF secondary emissions collection baghouse, the permittee shall perform a Method 9 certified visible emission observation of roof monitors at least once a week during BOF operation for a minimum of one complete heat. After installation of the BOF secondary emissions collection baghouse, the permittee shall perform non-certified visible emission observation for the BOF roof monitors (including reladling and desulfurization operations) at least once a week during BOF operations and a Method 9 certified visible emission observation of the BOF roof monitors (including reladling and desulfurization operations) at least once every month during BOF operations. The permittee shall initiate corrective action upon observation of visible emissions in excess of the applicable visible emission limitation and shall keep a written record of each required observation and corrective action taken. **(R336.1364(2))** 2. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 3. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 4. The permittee shall maintain records associated with performance tests, performance evaluations, and opacity observations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

5. The permittee shall maintain records of the following for the continuous opacity monitor:
   a. Periods when the monitor is malfunctioning or inoperative; **(40 CFR 63.7842(b)(1) and 40 CFR 63.10(b)(2)(vi))**
   b. All required measurements necessary to demonstrate compliance with a standard (including, but not limited to, 15-minute averages of monitoring data, raw performance testing measurements, and raw performance evaluation measurements, that support data that the source is required to report); **(40 CFR 63.7842(b)(1) and 40 CFR 63.10(b)(2)(vii))**
   c. All results of performance tests, monitor performance evaluations and opacity and visible emission observations; **(40 CFR 63.7842(b)(1) and 40 CFR 63.10(b)(2)(viii))**
   d. All measurements necessary to determine the conditions of performance tests and evaluations; **(40 CFR 63.7842(b)(1), 40 CFR 63.10(b)(2)(ix))**
   e. All monitor calibration checks; **(40 CFR 63.7842(b)(1) and 40 CFR 63.10(b)(2)(x))**
   f. All adjustments and maintenance performed on the continuous monitor; **(40 CFR 63.7842(b)(1) and 40 CFR 63.10(b)(2)(xi))**
   g. Monitoring data produced during performance testing; **(40 CFR 63.7842(b)(2))**
   h. Superceded versions of the performance evaluation plan; and **(40 CFR 63.7842(b)(3) and 40 CFR 63.8(d)(3))**
   i. The date and time each deviation started and stopped and whether the deviation occurred during a period of startup, shutdown, malfunction, or during another period. **(40 CFR 63.7842(b)(4))**

6. The permittee shall perform preventative maintenance on the ESP as specified in the operation and maintenance plan for the ESP. **(40 CFR 63.7834(a)(2))**

7. The permittee shall comply with the recordkeeping requirement as specified in 40 CFR Part 63 Subpart FFFFF 63.7842(a), (b), (c) and (d). **(40 CFR 63.7842(a), (b), (c) and (d))**

8. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))**

9. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF) EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	10. The permittee shall keep 12-month rolling time period records of the amount of scrap and fragmented scrap charged to the BOF. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1201(3), R336.1225, R336.1228, R336.1901)** 11. The permittee shall obtain an analysis of the BOF ESP dust once per calendar month during the 1st year after the modification of C blast furnace and quarterly thereafter, or less frequently if approved in writing by the Air Quality Division. The analysis shall determine the percentage of Pb, Hg, and Mn in the collected PM dust from the ESP. The permittee shall submit an acceptable protocol for baghouse dust sampling and analysis methods to the Air Quality Division, at least 60 days prior the initial performance emission test. **(R336.1225, R336.1228, 40 CFR 52.21(d))** 12. Using the method shown in Appendix 1.7, the permittee shall calculate and record by the end of each calendar month the following from the BOF roof monitors: a. emissions of PM b. emissions of PM-10 **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))** 13. The permittee shall keep a daily record of the amount of steel produced in the Basic Oxygen Furnace. **(R336.1205(1)(a) & (b), R336.1225)**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. NOx 5. CO
2. Method/Analysis	Approved method.
3. Frequency and Schedule of Testing/Recordkeeping	1. The permittee shall demonstrate compliance with the opacity limitation for the BOF Shop Building in II.B.4. with a certified observer of Method 9 visible emissions using Method 9 with the following exceptions: **(40 CFR 63.7823(d)(1)(i))** a. Record observations to the nearest 5 percent at 15-second intervals for at least three steel production cycles rather than using the procedure specified in Section 2.4 of Method 9. **(40 CFR 63.7823(d)(1)(ii))** b. Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals. **(40 CFR 63.7823(d)(1)(iii))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	2. Opacity observations from the roof monitors must cover at least three steel production cycles. A production cycle begins when scrap is charged and ends three minutes after slag is emptied from the vessel into the slag pot. **(40 CFR 63.7823(d)(4))** 3. Permittee shall determine and record the starting and stopping times of the steel production cycle. **(40 CFR 63.7823(d)(5))** 4. The permittee shall maintain a copy of the current operation and maintenance plans required in this table onsite and available for inspection. **(40 CFR 63.7834(b))** 5. The permittee shall maintain records of the monitoring data from the continuous opacity monitor. **(40 CFR 63.7842(d))** 6. Within 180 days after commencement of trial operation, the permittee shall verify PM, PM10, NOx, and CO emission rates from the ESP stack by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3), 40 CFR 52.21(d))** 7. Permittee shall conduct overlapping performance tests for particulate matter emissions and opacity from the BOF roof monitor at least twice per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall report the results of the initial performance test in the notification of compliance status. **(40 CFR 63.7820(a), 40 CFR 63.7825(c) and 40 CFR 63.7840(e))** 2. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 3. Any time an action taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with all requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**
V. OPERATIONAL PARAMETERS	
1. The permittee shall not operate the Basic Oxygen Furnace unless the electrostatic precipitator (ESP) dust collector is installed and operating properly. **(R336.1301, R336.1331(c), R336.1910)** 2. After completion of C-FCE modification, the permittee shall not operate the Basic Oxygen Furnace unless the baghouse secondary emission dust collector is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1910, 40 CFR 52.21(b)(3))**	

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

3. The Basic Oxygen Furnace off-gas conditioning system which provides additional air-atomized water spray, shall be maintained as part of the off gas conditioning system. **(R336.1910)**

4. The BOF vessels and ESP shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**

5. The permittee shall operate the BOF vessels and ESP according to an operation and maintenance plan that meets the requirements of 40 CFR 63.7800(b)(1)-(5). **(40 CFR 63.7800(b) and 40 CFR 63.6(e)(3))**

6. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the BOF vessels and the associated emission control system. **(40 CFR 63.7810(c), 40 CFR 63.7835(b) and 40 CFR 63.6(e)(3))**

7. The permittee shall not produce more than 12,200 tons of steel per day based on a calendar week average nor 4,052,230 tons of steel per 12-month rolling time period from the BOF **(R336.1205(1)(a) & (b), R336.1225, 40 CFR 52.21(b)(3))**

8. The permittee shall not charge more than 21,882 tons of fragmented scrap in the BOF per 12-month rolling time period. **(R336.1201(3), R336.1228, R336.1901)**

VI. OTHER REQUIREMENTS

1. The permittee shall comply with the emission limitations and operation and maintenance requirements from 40 CFR Part 63, Subpart FFFFF specified in Table E-01.08, except during periods of startup, shutdown and malfunction. **(40 CFR 63.7810(a))**

2. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

3. If the hourly average opacity of the electrostatic precipitator exceeds the operating limit in S.C. II.B.5, the permittee shall implement the following procedures: **(40 CFR 63.7833(g))**
   a. Permittee shall initiate corrective action to determine the cause of the exceedance within 1 hour. During any period of corrective action, the permittee shall continue to monitor and record all required operating parameters for equipment that remains in operation. Within 24 hours of the exceedance, the permittee shall measure and record the hourly average operating parameter value for the emission unit on which corrective action was taken. If the hourly average parameter value meets the applicable operating limit, then the corrective action was successful and the emission unit is in compliance with the applicable operating limit. **(40 CFR 63.7833(g)(1))**
   b. If the initial corrective action required in paragraph (a) of this condition was not successful, the permittee shall complete additional corrective action within the next 24 hours (48 hours from the time of the exceedance). During any period of corrective action, the permittee shall continue to monitor and record all required operating parameters for equipment that remains in operation. After this second 24-hour period, the permittee shall again measure and record the hourly average operating parameter value for the emission unit on which corrective action was taken. If the hourly average parameter value meets the applicable operating limit, then the corrective action was successful and the emission unit is in compliance with the applicable operating limit. **(40 CFR 63.7833(g)(2))**

TABLE E-01.08 BASIC OXYGEN FURNACE (BOF)
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

c. For purposes of paragraphs (a) and (b) of this condition, in the case of an exceedance of the hourly average opacity operating limit for the electrostatic precipitator, measurements of the hourly average opacity based on visible emission observations in accordance with Method 9 (40 CFR part 60, appendix A) may be taken to evaluate the effectiveness of corrective action. **(40 CFR 63.7833(g)(3))**

d. If the second attempt at corrective action required in paragraph (b) of this condition was not successful, the permittee shall report the exceedance as a deviation in the next semiannual compliance report according to 40 CFR 63.7841(b). **(40 CFR 63.7833(g)(4))**

4. The permittee shall not increase the iron production rate of FGB&CCASTHOUSE to more than 8125 tons of liquid iron per day based on a calendar week average unless the on-site screening procedure and material management plan, or alternate plan(s) are approved in writing by the AQD District Supervisor. The plan(s) shall be implemented and maintained immediately after approval. The on-site screening procedure and material management plan will facilitate the permittee's efforts in controlling mercury and/or other toxics and VOC emissions by eliminating unacceptable scrap and eliminating or reducing scrap with mercury contaminated materials. The permittee shall require all suppliers document that mercury-containing devices and switches have been removed from the scrap. **(R336.1201(3), R336.1228, R336.1901)**

5. The permittee shall record the specific information as required in the on-site screening procedure and scrap management plan. All such records shall be kept on file for a period of at least five years and made available to the Air Quality Division upon request. **(R336.1201(3), R336.1228, R336.1901)**

TABLE E-01.09 BOF DESULFURIZATION BY-PRODUCTS "DESULF" PROCESS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	**EUDESULFWATERINGSTATION** BOF desulfurization by-product material "desulf" watering station located at the south end of the BOF building. Levy or any other winning bidder in the future for the service, digs the desulf materials with a front-end loader, brings them to an open area for cooling using water spray and for fugitive dust control. After thorough cooling, Levy or any other winning bidder in the future for the service, loads the materials into trucks for processing off site. Note: Levy currently has the contract to buy this material and, consequently, currently operates the Desulf Watering Station.
Flexible Grouping ID	NA

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Water spray system
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
NA	NA	NA	NA	NA	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. Opacity of fugitive dust emissions from sources other than roads, lots, or storage pile	20% (3 minute average) **(R324.5524(2))**
2. Opacity of fugitive dust emissions from material handling activities at a storage pile and from building openings other than roof monitors	10% (3 minute average) **(R324.5524(8), R336.1301(c))**
3. Opacity of fugitive dust emissions from roof monitors	20% **(R336.1301)**

III. COMPLIANCE EVALUATION

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	NA

TABLE E-01.09 BOF DESULFURIZATION BY-PRODUCTS "DESULF" PROCESS EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
3. Other Monitoring and/or Recordkeeping	The permittee shall perform a Method 9D certified visible emission ob servation of the desulf watering station at least once every two weeks for a minimum of 15 minutes during the dumping, watering and loading operation. The permittee shall initiate corrective action upon observation of visible emissions in excess of the applicable visible emission limitation and shall keep a written record of each required observation and corrective action taken. **(R336.1213(3), R336.1910)**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	NA
2. Method/Analysis	NA
3. Frequency and Schedule of Testing/Recordkeeping	NA
IV. REPORTING	
Reports and Schedules	NA
V. OPERATIONAL PARAMETERS	
To control fugitive dust when processing the desulf material, the permittee shall not process the desulf material outside the BOF building without cooling off the material thoroughly with the water spray system. **(R336.1910, R336.1901)**	
VI. OTHER REQUIREMENTS	
NA	

TABLE E-01.10 LADLE REFINING FACILITY No. 1
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EULADLEREFINE1				
Flexible Grouping ID	NA				
I. DESIGN PARAMETERS					
A. Pollution Control Equipment	Baghouse				
B. Stack/Vent Parameters	NA				
Stack/Vent ID	**a. Minimum Height (feet)**	**b. Maximum Exhaust Dimension (inches)**	**c. Temp. (°F)**	**d. Air Flow Rate (acfm)**	**Applicable Requirement**
SVLADLEREFINE1	148	108	150	175,000	NA
C. Other Design Parameters					
NA					
II. MATERIAL USAGE/EMISSION LIMITS					
A. Material	**Maximum Usage Rate**				
NA	NA				
B. Pollutant	**Maximum Emission Limit**				
1. Opacity from ladle refining facility roof monitors.	1. 0% **(R336.1301(c), 40 CFR 63.7790(a))**				
2. Opacity from ladle refining facility baghouse.	5%. **(R336.1301(c))**				
3. PM from ladle refining facility baghouse.	1. 0.005 grains per dry standard cubic foot **(R336.1331(c), 40 CFR 52.21(b)(3), 40 CFR 63.7790(a))** 2. 6.8 lb/hr **(R336.1331(c), 40 CFR 52.21(b)(3))**				
4. PM10	1. 0.005 grains per dry standard cubic foot **(R336.1205(1)(a) & (b))** 2. 6.8 lb/hr. **(R336.1205(1)(a) & (b))**				
5. Pb	1. 0.0224 lb/hr. **(40 CFR 52.21(d))**				
III. COMPLIANCE EVALUATION **Records of all of the following shall be maintained on file for a period of 5 years.**					
A. MONITORING/RECORDKEEPING					
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA				
2. Process Monitoring System and Recordkeeping	NA				
3. Other Monitoring and/or Recordkeeping	1. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 2. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 3. The permittee shall maintain records associated with performance tests, and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))**				

TABLE E-01.10 LADLE REFINING FACILITY No. 1
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

4. Except as allowed in S.C. 7, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))**
   a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))**
   b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))**
   c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))**
   d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))**

5. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7831(f)(6))**

6. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7833(c)(2))**

7. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40 CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)**

8. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))**

9. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))**

10. The permittee shall confirm that the compressed air supply to the pulse-jet baghouse is operating properly on a daily basis. **(40 CFR 63.7830(b)(3))**

11. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4))**

TABLE E-01.10 LADLE REFINING FACILITY No. 1
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	12. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 13. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 14. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 15. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 16. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. Pb
2. Method/Analysis	Approved method.
3. Frequency and Schedule of Testing/Recordkeeping	1. Sampling during the performance tests will occur only when the operations being controlled are in operation. **(40 CFR 63.7822(h))** 2. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 3. The permittee shall demonstrate compliance with the opacity limitation in II.B.1 with a certified observer of Method 9 visible emissions using Method 9 with the following exceptions: **(40 CFR 63.7823(d)(1)(i))** a. Record observations to the nearest 5 percent at 15-second intervals for at least three steel production cycles rather than using the procedure specified in Section 2.4 of Method 9. **(40 CFR 63.7823(d)(1)(ii))** b. Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals. **(40 CFR 63.7823(d)(1)(iii))** 4. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))**

TABLE E-01.10 LADLE REFINING FACILITY No. 1
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	5. Within 180 days after commencement of trial operation, the permittee shall verify PM, PM10, and Pb emission rates from the Ladle Refining Facility No. 1 by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 6. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 2. When actions taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with the requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**
V. OPERATIONAL PARAMETERS	
1. The Ladle Refining Facility No. 1 shall not be operated unless the main baghouse is installed and operating properly. **(R336.1331(c), R336.1910, R336.1201(3))** 2. Ladle Refining Facility No. 1 and associated baghouse shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))** 3. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the Ladle Refining Facility No. 1 and the associated emission control system and operate in accordance with the plan during periods of startup, shutdown, and malfunction. **(40 CFR 63.7810(c), 40 CFR 63.7835(b), and 40 CFR 63.6(e)(3))**	
VI. OTHER REQUIREMENTS	
1. The permittee shall comply with the emission limitations and operation and maintenance requirements from 40 CFR Part 63, Subpart FFFFF specified in Table E-01.10, except during periods of startup, shutdown and malfunction. **(40 CFR 63.7810(a))** 2. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**	

TABLE E-01.11 LADLE REFINING FACILITY No.2
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EULADLEREFINE2
Flexible Grouping ID	NA
I. DESIGN PARAMETERS	
A. Pollution Control Equipment	Baghouse
B. Stack/Vent Parameters	Exhaust gases shall be discharged unobstructed vertically upwards unless otherwise noted.

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
1. SVLADLEREFINE2	150	72	150	100,000	**R336.1225**

C. Other Design Parameters	
NA	
II. MATERIAL USAGE/EMISSION LIMITS	
A. Material	**Maximum Usage Rate**
NA	NA
B. Pollutant	**Maximum Emission Limit**
1. PM	1. 0.005 grains per dry standard cubic foot **(R336.1331(c), 40 CFR 52.21(b)(3), 40 CFR 63.7790(a))** 2. 3.87 lb/hr **(R336.1331(c), 40 CFR 52.21(b)(3))**
2. Visible emissions from baghouse stack	1. Shall not exceed a 6-minute average of 5% opacity. **(R336.1201(3))**
3. Opacity from the Ladle Refining No. 2 Building	1. 0% **(R336.1301(c), 40 CFR 63.7790(a))**
4. PM10	1. 0.005 grains per dry standard cubic foot **(R336.1205(1)(a) & (b))** 2. 3.87 lb/hr. **(R336.1205(1)(a) & (b))**
5. Pb	1. 0.0128 lb/hr. **(40 CFR 52.21(d))**
III. COMPLIANCE EVALUATION **Records of all of the following shall be maintained on file for a period of 5 years.**	
A. MONITORING/RECORDKEEPING	
1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	NA
3. Other Monitoring and/or Recordkeeping	1. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 2. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))**

TABLE E-01.11 LADLE REFINING FACILITY No.2
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

3. The permittee shall maintain records associated with performance tests and performance evaluations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))**

4. Except as allowed in S.C. 7, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control: **(40 CFR 63.7831(f))**
   a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))**
   b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))**
   c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))**
   d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))**

5. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7831(f)(6))**

6. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period. This requirement does not apply if the permittee installs a COMS as specified in S.C. 7. **(40 CFR 63.7833(c)(2))**

7. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)**

8. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual. **(40 CFR 63.7830(b)(1))**

9. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms. **(40 CFR 63.7830(b)(2))**

TABLE E-01.11 LADLE REFINING FACILITY No.2 EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	10. The permittee shall confirm that the compressed air supply to the pulse-jet baghouse is operating properly on a daily basis. **(40 CFR 63.7830(b)(3))** 11. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology. **(40 CFR 63.7830(b)(4)** 12. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means. **(40 CFR 63.7830(b)(5))** 13. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks. **(40 CFR 63.7830(b)(7))** 14. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means. **(40 CFR 63.7830(b)(8))** 15. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 16. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 7832(b))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. Pb
2. Method/Analysis	Approved method.
3. Frequency and Schedule of Testing/Recordkeeping	1. Sampling during the performance tests will occur only when the operations being controlled are in operation. **(40 CFR 63.7822(h))** 2. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 3. The permittee shall demonstrate compliance with the opacity limitation in II.B.3.1. with a certified observer of Method 9 visible emissions using Method 9 with the following exceptions: **(40 CFR 63.7823(d)(1)(i))**

TABLE E-01.11 LADLE REFINING FACILITY No.2
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	a. Record observations to the nearest 5 percent at 15-second intervals for at least three steel production cycles rather than using the procedure specified in Section 2.4 of Method 9. **(40 CFR 63.7823(d)(1)(ii))** b. Determine the 3-minute block average opacity from the average of 12 consecutive observations recorded at 15-second intervals. **(40 CFR 63.7823(d)(1)(iii))** 4. Performance tests for visible emissions shall be conducted such that the opacity observations overlap with the performance tests for particulate. **(40 CFR 63.7823(b))** 5. Within 180 days after commencement of trial operation, the permittee shall verify PM, PM10, and Pb emission rates from the Ladle Refining Facility No. 2 by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 6. Permittee shall conduct performance tests for particulate matter emissions and opacity at least once per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 2. When actions taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) are not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with the requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**

V. OPERATIONAL PARAMETERS

1. The permittee shall not operate the Ladle Refining Facility No. 2 unless the 100,000 ACFM baghouse dust collector is installed and operating properly. **(R336.1201(3), R336.1331(c), R336.1910)**

2. Ladle Refining Facility No. 2 and the associated baghouse shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR Part 63, Subpart FFFFF. **(40 CFR 63.7800(a) and 40 CFR 63.6(e)(1)(i))**

3. The permittee shall develop and implement a written startup, shutdown and malfunction plan for the Ladle Refining Facility No. 2 and the associated emission control system and operate in accordance with the plan during periods of startup, shutdown, and malfunction. **(40 CFR 63.7810(c), 40 CFR 63.7835(b), and 40 CFR 63.6(e)(3))**

TABLE E-01.11 LADLE REFINING FACILITY No.2
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

VI. OTHER REQUIREMENTS

1. The permittee shall comply with the emission limitations and operation and maintenance requirements from 40 CFR Part 63, Subpart FFFFF specified in Table E-01.11, except during periods of startup, shutdown and malfunction. **(40 CFR 63.7810(a))**

2. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**

TABLE E-01.12 ANNEALING FURNACES
FLEXIBLE GROUPING REQUIREMENTS

FLEXIBLE GROUPING	NA
Emission Unit / Process Group	EUANNEALFURNACES

I. DESIGN PARAMETERS

A. Pollution Control Equipment	NA
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
NA	NA	NA	NA	NA	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit	
Nitrogen Oxide	1. 140 lb/ MMscf natural gas fired	**(R336.1205(1)(a) & (b))**
PM	1. 10 lb/MMscf natural gas fired.	**(40 CFR 52.21(b)(3))**
PM10	1. 10 lb/MMscf natural gas fired.	**(R336.1205(1)(a) & (b))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	The permittee shall keep a record of the following for the annealing furnaces: 1. Total natural gas consumption per month. **(R336.1205(1)(a) & (b)**
3. Other Monitoring and/or Recordkeeping	NA

B. TESTING/RECORDKEEPING

1. Parameter to be Tested/ Recorded	1. NOx 2. PM 3. PM-10
2. Method/Analysis	Approved method

TABLE E-01.12 ANNEALING FURNACES FLEXIBLE GROUPING REQUIREMENTS	
3. Frequency and Schedule of Testing/Recordkeeping	Within 180 days after commencement of trial operation, the permittee shall verify NOx, PM, and PM-10 emission rates from a representative annealing furnace from EUANNEALFURNACES by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.1331, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))**
IV. REPORTING	
Reports and Schedules	NA
V. OPERATIONAL PARAMETERS	
1. Oil shall not be used as fuel in the annealing furnaces. **(R336.1205(1)(a) & (b))**	
VI. OTHER REQUIREMENTS	
NA	

TABLE F-01.01 B & C BLAST FURNACE CASTHOUSE OPERATIONS EMISSION UNIT/PROCESS GROUP REQUIREMENTS

FLEXIBLE GROUPING	FGB&CBFCASTHOUSES
Emission Unit/Process Group	EUBBFCASTHOUSE, EUCBFCASTHOUSE
I. DESIGN PARAMETERS	
A. Pollution Control Equipment	Baghouse control of fugitive emissions (one for each operating casthouse)
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBBFROOFMONEAST	75.2	NA	NA	NA	**R336.1225**
SVBBFROOFMONWEST	75.2	NA	NA	NA	**R336.1225**
SVBFCE (baghouse)	200	111	150	250,000	**R336.1225**
SVCBFROOFMONEAST	75.2	NA	NA	NA	**R336.1225**
SVCBFROOFMONWEST	75.2	NA	NA	NA	**R336.1225**
SVCFCE (baghouse)	200	153	150	500,000	**R336.1225**

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. PM	1. 19.93 tpy[1] from roof monitors **(40 CFR 52.21(b)(3))**
2. PM-10	1. 10.16 tpy[1] from roof monitors **(R336.1205(1)(a) & (b))**
3. SO2 from baghouse stacks	1. 29.94 lb/hr **(40 CFR 52.21 (c) & (d), 40 CFR 52.21 (j))** 2. 91.79 ton per 12-month rolling time period **(40 CFR 52.21 (c), (d), & (j))**
4. NOx from baghouse stacks	1. 3.19 lb/hr **(R336.1205(1)(a) & (b))** 2. 9.77 ton per 12-month rolling time period **(R336.1205(1)(a) & (b))**
5. VOC from baghouse stacks	1. 8.81 lb/hr **(R336.1702(a))**
6. Mn	1. 0.00385 lb/hr total from baghouse stacks **(R336.1225)** 2. 0.0060[2] lb/hr from roof monitors **(R336.1225)**
7. Pb	1. 0.000223 lb/hr total from baghouse stacks **(40 CFR 52.21(d))** 2. 0.000087[1] lb/hr from roof monitors **(40 CFR 52.21(d))**

[1] These limits are based on a 12-month rolling time period.
[2] This limit is based on a daily time period

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	NA

TABLE F-01.01 B & C BLAST FURNACE CASTHOUSE OPERATIONS
EMISSION UNIT/PROCESS GROUP REQUIREMENTS

3. Other Monitoring and/or Recordkeeping	1. Using the method shown in Appendix 1.7, the permittee shall calculate and record by the end of each calendar month the following from the casthouse roof monitors: a. emissions of PM b. emissions of PM-10 c. emissions of Mn d. emissions of Pb **(R336.1205(1)(a) & (b), R336.1225, 40 CFR 52.21(b)(3), 40 CFR 52.21(d))** 2. The permittee shall keep a daily record of the amount of iron cast from each furnace individually and combined. **(R336.1205(1)(a) & (b), R336.1225)** 3. Using the method shown in Appendix 1.7, the permittee shall calculate records of SO2, NOx, VOC, Mn, and Pb emissions for FGB&CBFCASTHOUSES (baghouses) using emission factors developed during the testing required in S.C. III.B.3.1 and S.C. III.B.3.10 of Table E-01.04, and other factors, as specified in Appendix 1.7. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(c) and (d))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	NA
2. Method/Analysis	NA
3. Frequency and Schedule of Testing/Recordkeeping	NA
IV. REPORTING	
Reports and Schedules	1. Permittee shall report the results of the initial performance test in the notification of compliance status. **(40 CFR 63.7820(a), 40 CFR 63.7825(c) and 40 CFR 63.7840(e))**
V. OPERATIONAL PARAMETERS	
1. The iron production from FGB&CBFCASTHOUSES shall not exceed a combined maximum of 10,000 ton/day based on a calendar week average. **(R336.1205(1)(a) & (b), R336.1225, 40 CFR 52.21(b)(3))** 2. The iron production from FGB&CBFCASTHOUSES shall not exceed a combined maximum of 3,321,500 tons per 12-month rolling period. **(R336.1205(1)(a) & (b), R336.1225, 40 CFR 52.21(b)(3))**	
VI. OTHER REQUIREMENTS	
NA	

TABLE F-01.02 B AND C BLAST FURNACE STOVES FLEXIBLE GROUPING REQUIREMENTS

FLEXIBLE GROUPING	FGB&CSTOVES
Emission Unit/Process Group	EUBFCESTOVE, EUCFCESTOVE

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Low-NOx technology, mechanical collectors and scrubbers for blast furnace gas precleaning
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
NA	NA	NA	NA	NA	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit	
1. NOx	439.18 ton/12-month rolling period	**(R336.1205(1)(a) & (b))**
2. SO2	1,096.1 ton/12-month rolling period	**(40 CFR 52.21(j))**
3. CO	8,760 ton/12-month rolling period.	**(40 CFR 52.21(d) & (j))**
4. PM	14.16 lb/hr	**(40 CFR 52.21(b)(3))**
5. PM-10	14.16 lb/hr	**(R336.1205(1)(a) & (b))**
6. Mn	0.0154 lb/hr	**(R336.1225)**
7. Total Hg	0.000414 lb/hr	**(R336.1201(3), R336.1228, R336.1901)**
8. Pb	0.0141 lb/hr	**(40 CFR 52.21(d))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	1. The permittee shall keep, in a satisfactory manner, daily fuel usage records for FGB&CSTOVES. The permittee shall keep all records on file at the facility for a period of at least five years and make them available to the Department upon request. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3), (c), & (d))** 2. Following the performance testing required in S.C. III.B.3.1 of Table E-01.03 and S.C. III.B.3.1 of Table E-01.05, the permittee shall determine compliance with emission limits in S.C. II.B.1, II.B.3, II.B.4, II.B.5, II.B.6, II.B.7, and II.B.8 of this table by establishing emission factors based up on the BFCE and CFCE stove stack testing and applying these emission factors to the daily fuel usage recorded in S.C. III.A.2.1, as outlined in Appendix 1.7. **(R336.1205(1)(a) & (b), R336.1225, R336.1228, R336.1901, 40 CFR 52.21(b)(3), (c), & (d))**

TABLE F-01.02 B AND C BLAST FURNACE STOVES FLEXIBLE GROUPING REQUIREMENTS	
	3. Utilizing the CEMS for SO2 emissions from the C Blast Furnace stoves, the permittee shall determine compliance with the emission limits in S.C. II.B.2 by determining daily emission factors and applying these emission factors to the daily fuel usage recorded in S.C. III.A.2.1, as outlined in Appendix 1.7. **(40 CFR 52.21 (c), & (d))**
3. Other Monitoring and/or Recordkeeping	NA
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	NA
2. Method/Analysis	NA
3. Frequency and Schedule of Testing/Recordkeeping	NA
IV. REPORTING	
Reports and Schedules	NA
V. OPERATIONAL PARAMETERS	
NA	
VI. OTHER REQUIREMENTS	
NA	

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

EMISSION GROUP	EUBOF, EURELADLINGBOF
Flexible Grouping ID	FGBOFSHOP

I. DESIGN PARAMETERS

A. Pollution Control Equipment	Baghouse
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
SVBOFESP	213	204	300	841,000	**R336.1225**
SVBOFBH	200	222	150	1,000,000	**R336.1225**

C. Other Design Parameters

1. NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
1. PM.	1. 0.003 gr/dscf from baghouse stack **(R336.1331(c), 40 CFR 63.7790(a), 40 CFR 52.21(b)(3))** 2. 7.45 lb/hr from baghouse stack **(40 CFR 52.21(b)(3))**
2. PM-10.	1. 0.00135 gr/dscf from baghouse stack. **(R336.1205(1)(a) & (b))** 2. 3.35 lb/hr from baghouse stack **(R336.1205(1)(a) & (b))**
3. NOx	1. 10.17 lb/hr from the baghouse stack. **(R336.1205(1)(a) & (b))**
4. Manganese	1. 0.101 lb/hr from baghouse and ESP stacks combined. **(R336.1225)** 2. 0.0709 lb/hr from the baghouse stack. **(R336.1225)**
5. Total Mercury	1. 0.0125 lb/hr from the baghouse and ESP stacks combined. **(R336.1201(3), R336.1228, R336.1901)**
6. Lead	1. 0.067 lb/hr from the baghouse and ESP stacks combined. **(40 CFR 52.21(d))**
7. Opacity from baghouse stack.	1. 20% **(R336.1364(1), R336.1365(1))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	1. If applicable, the permittee shall install, maintain, and operate a Continuous Parametric Monitoring System (CPMS) for the baghouse capture system according to the requirements of 40 CFR 63.7830(a) and 40 CFR 63.7831(e). **(40 CFR 63.7830(a))**
3. Other Monitoring and/or Recordkeeping	1. The permittee shall maintain a copy of each notification and report submitted under 40 CFR Part 63, Subpart FFFFF, including all

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	documentation supporting the initial notification or notification of compliance status submitted according to 40 CFR 63.10(b)(2)(xiv)). **(40 CFR 63.7842(a)(1))** 2. The permittee shall maintain the records required for startup, shutdown and malfunction under 63.6(e)(3)(iii) through (v). **(40 CFR 63.7842(a)(2))** 3. The permittee shall maintain records associated with performance tests, performance evaluations, and opacity observations as required by 40 CFR 63.10(b)(2)(viii). **(40 CFR 63.7842(a)(3))** 4. The permittee shall comply with the recordkeeping requirement as specified in 40 CFR Part 63 Subpart FFFFF 63.7842(a), (b), (c) and (d). **(40 CFR 63.7842(a), (b), (c) and (d))** 5. Except as allowed in S.C. 8, permittee shall install, operate, and maintain a bag leak detection system meeting the following specifications on the baghouse control, if applicable: **(40 CFR 63.7831(f))** a. Certified by the manufacturer to be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic foot (0.0044 grains per actual cubic foot). **(40 CFR 63.7831(f)(1))** b. Provides output of relative changes in particulate matter loadings. **(40 CFR 63.7831(f)(2))** c. Is equipped with an alarm, located such that it is heard by appropriate plant personnel, that sounds an alarm when an increase in relative particulate loadings is detected over a preset level. **(40 CFR 63.7831(f)(3))** d. Initially adjusted by establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device and setting the alarm set points and alarm delay time. **(40 CFR 63.7831(f)(5))** 6. Following the initial adjustment of the bag leak detection system, the permittee shall not adjust the sensitivity or range, averaging period, alarm set points or alarm delay time except as specified in the operation and maintenance plan, if applicable. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7831(f)(6))** 7. If the sensitivity of the bag leak detection system is changed beyond the limits established pursuant to 40 CFR 63.7831(f)(6), a copy of a written certification by a responsible official shall be included in the semiannual compliance report for that period, if applicable. This requirement does not apply if the permittee installs a COMS as specified in S.C. 8. **(40 CFR 63.7833(c)(2))** 8. If permittee does not install and operate a bag leak detection system, the permittee shall install, operate, and maintain a COMS according to the requirements in 40CFR Sec. 63.7831(h) and monitor the hourly average opacity of emissions exiting each control device stack according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7832)**

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	9. The permittee shall monitor the pressure drop across each baghouse compartment daily to ensure that the pressure drop is within the normal operating range identified in the manual, if applicable. **(40 CFR 63.7830(b)(1))** 10. The permittee shall confirm that dust is being removed from hoppers on a weekly basis through visual observations or other means of determining the proper functioning of the removal mechanisms, if applicable. **(40 CFR 63.7830(b)(2))** 11. The permittee shall confirm that the compressed air supply to the pulse-jet baghouse is operating properly on a daily basis, if applicable. **(40 CFR 63.7830(b)(3))** 12. The permittee shall monitor the cleaning cycles of the baghouse to ensure proper operation using appropriate technology, if applicable. **(40 CFR 63.7830(b)(4))** 13. The permittee shall check the bag cleaning mechanisms for proper functioning through monthly visual inspections or equivalent means, if applicable. **(40 CFR 63.7830(b)(5))** 14. The permittee shall inspect the baghouse to confirm the physical integrity of the baghouse through quarterly inspections of the interior of the baghouse for air leaks, if applicable. **(40 CFR 63.7830(b)(7))** 15. The permittee shall inspect fans for wear, material buildup, and corrosion on a quarterly basis using visual inspections, vibration detectors, or equivalent means, if applicable. **(40 CFR 63.7830(b)(8))** 16. The permittee shall monitor the process as required by this table, except during monitoring malfunctions, out-of-control periods, associated repairs, and required quality assurance or control activities (including calibration checks and required zero and span adjustments). **(40 CFR 63.7832(a))** 17. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used in data averages and calculations used to report emission or operating levels or to fulfill minimum data availability requirements. **(40 CFR 63.7832(b))** 18. The permittee shall obtain an analysis of the BOF baghouse dust once per calendar month during the 1st year after the modification of C blast furnace and quarterly thereafter, or less frequently if approved in writing by the Air Quality Division. The analysis shall determine the percentage of Pb, Hg, and Mn in the collected PM dust from the baghouse. The permittee shall submit an acceptable protocol for baghouse dust sampling and analysis methods to the Air Quality Division, at least 60 days prior the initial performance emission test. **(R336.1225, R336.1228, 40 CFR 52.21(d))**

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	19. The permittee shall prepare, and operate at all times according to, a written operation and maintenance plan for the baghouse capture system. The plan shall address each of the following: **(40 CFR 63.7800(b))** a. Weekly inspections of the equipment that is important to the performance of the total capture system, including, but not limited to, observations of the physical appearance of the equipment and requirements to repair any defect or deficiency in the capture system before the next scheduled inspection; **(R336.1301, R336.1364(1), 40 CFR 63.7800(b)(1))** b. Operating limit parameters appropriate for the capture system design that are representative and reliable indicators of the performance of the capture system including, but not limited to, operating limit parameters that indicate the level of the ventilation draft and the damper position settings for the capture system when operating to collect emissions, including revised settings for seasonal variations. Appropriate operating limit parameters for ventilation draft include, but are not limited to, volumetric flow rate through each separately ducted hood, total volumetric flow rate at the inlet to the control device to which the capture system is vented, fan motor amperage, or static pressure. **(40 CFR 63.7800(b)(3))** 20. If applicable, the permittee shall monitor the hourly average actual volumetric flow rate through each separately ducted hood for each steel production cycle and the average total volumetric flow rate at the inlet to the baghouse for each steel production cycle according to the requirements in 40 CFR 63.7832. **(40 CFR 63.7830(a))** 21. If applicable, the permittee shall develop and make available for inspection upon request by AQD a site-specific monitoring plan that addresses all of the following requirements for the baghouse capture system: **(40 CFR 63.7831(a))** a. Installation of the CPMS sampling probe or other interface at a measurement location relative to each hooded emission point such that the measurement is representative of capture of the exhaust emissions; **(40 CFR 63.7831(a)(1))** b. Performance and equipment specifications for the sample interface, the parametric signal analyzer, and the data collection and reduction system; **(40 CFR 63.7831(a)(2))** c. Performance evaluation procedures and acceptance criteria; **(40 CFR 63.7831(a)(3))** d. Ongoing operation and maintenance procedures in accordance with the general requirements of 40 CFR 63.8(c)(1), (c)(3), (c)(4)(ii), (c)(7), and (c)(8); **(40 CFR 63.7831(a)(4))** e. Ongoing data quality assurance procedures in accordance with the general requirements of 40 CFR 63.8(d); and **(40 CFR 63.7831(a)(5))** f. Ongoing recordkeeping and reporting procedures in accordance the general requirements of 40 CFR 63.10(c), (e)(1), and (e)(2)(i). **(40 CFR 63.7831(a)(6))**

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS	
	22. If applicable, the permittee shall operate and maintain the capture system CPMS in continuous operation according to the site-specific monitoring plan. Unless otherwise specified, the CPMS shall: **(40 CFR 63.7831(b))** a. Complete a minimum of one cycle of operation for each successive 15-minute period and collect a minimum of three of the required four data points to constitute a valid hour of data; **(40 CFR 63.7831(b)(1))** b. Provide valid hourly data for at least 95 percent of every averaging period; and **(40 CFR 63.7831(b)(2))** c. Determine and record the hourly average of all recorded readings. **(40 CFR 63.7831(b)(3))** 23. The permittee shall operate the baghouse capture system at or above the lowest value or settings established for the operating limits in the operation and maintenance plan and collect, reduce, and record the monitoring data for each of the operating limit parameters. **(40 CFR 63.7833(b))**
B. TESTING/RECORDKEEPING	
1. Parameter to be Tested/ Recorded	1. Opacity 2. PM 3. PM-10 4. NOx 5. Mn 6. Speciated Hg 7. Pb
2. Method/Analysis	Approved method.
3. Frequency and Schedule of Testing/Recordkeeping	1. The permittee shall conduct a performance test to demonstrate initial compliance with the applicable emission and opacity limitations of 40 CFR Part 63, Subpart FFFFF contained in this table within 180 days of startup of the baghouse. **(40 CFR 63.7820(a))** 2. Performance tests shall occur when the operations are at maximum routine operating conditions. **(R336.2003, 40 CFR 63.7822(g) & (h))** 3. Permittee shall determine and record the starting and stopping times of the steel production cycle. **(40 CFR 63.7823(d)(5))** 4. The permittee shall maintain a copy of the current operation and maintenance plans required in this table onsite and available for inspection. **(40 CFR 63.7834(b))**

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	5. The permittee shall maintain records of the time corrective action was initiated, the corrective action taken, and the date when corrective actions were completed in response to a bag leak detection system alarm, if applicable. **(40 CFR 63.7842(d) and 40 CFR 63.7833(c)(1))** 6. Within 60 days of achieving the maximum production rate, but not later than 180 days after commencement of trial operation, the permittee shall verify and quantify Mn, Pb, and speciated Hg emissions rates from the FGBOFSHOP (baghouse and ESP simultaneously) and the ratio of Mn, Pb, and Hg concentrations in both the ESP dust and the baghouse dust to the actual amount of Mn, Pb, and Hg emitted from the baghouse and ESP, by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1225, R336.1228, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(d))** 7. The permittee shall certify that the baghouse capture system operated during the performance test at the site-specific operating limits established in the operation and maintenance plan using the following procedures: **(40 CFR 63.7824(a))** a. Concurrent with all opacity observations, measure and record values for each of the operating limit parameters in the capture system operation and maintenance plan according to the monitoring requirements specified in 40 CFR 63.7830(a). **(40 CFR 63.7824(a)(1))** b. For any dampers that are manually set and remain at the same position at all times the capture system is operating, the damper position shall be visually checked and recorded at the beginning and end of each opacity observation period segment. **(40 CFR 63.7824(a)(2))** c. Review and record the monitoring data and identify and explain any times the capture system operated outside the applicable operating limits. **(40 CFR 63.7824(a)(3))** d. Certify in the performance test report that during all observation period segments, the capture system was operating at the values or settings established in the capture system operation and maintenance plan. **(40 CFR 63.7824(a)(4))** 8. The permittee may change the operating limits for the baghouse capture system if the following requirements are met: **(40 CFR 63.7824(d))** a. Submit a written notification to the Administrator requesting to conduct a new performance test to revise the operating limit. **(40 CFR 63.7824(d)(1))** b. Conduct a performance test to demonstrate compliance with the applicable operating limitation. **(40 CFR 63.7824(d)(2))** c. Establish revised operating limits according to the applicable procedures in 40 CFR 63.7824, paragraphs (a) through (c) for a capture system. **(40 CFR 63.7824(d)(3))**

TABLE F-01.03 BASIC OXYGEN FURNACE (BOF)/RELADLING SOUTH & NORTH BOF EMISSION UNIT/PROCESS GROUP REQUIREMENTS

	9. Within 180 days after commencement of trial operation, the permittee shall verify NOx, PM, and PM10 emission rates from the baghouse stack by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))** 10. Permittee shall conduct overlapping performance tests for particulate matter emissions from the BOF secondary baghouse and opacity from the BOF roof monitor at least once per permit term. **(40 CFR 63.7821)**
IV. REPORTING	
Reports and Schedules	1. Permittee shall report the results of the initial performance test in the notification of compliance status. **(40 CFR 63.7820(a), 40 CFR 63.7825(c) and 40 CFR 63.7840(e))** 2. Permittee shall submit a notification of intent to perform any performance testing under 40 CFR Part 63, Subpart FFFFF at least 60 calendar days before testing is to begin. **(40 CFR 63.7840(d))** 3. Any time an action taken by the permittee during a startup, shutdown, or malfunction of an affected source (including actions taken to correct a malfunction) is not consistent with the procedures in the startup, shutdown, and malfunction plan, the permittee shall comply with all requirements of 63.10(d)(5)(ii). **(40 CFR Part 63.7841(c))**
V. OPERATIONAL PARAMETERS	
1. The permittee shall install a baghouse dust collector for BOF secondary emissions according to the following schedule: a. Complete construction and place in operation by January 31, 2008, or startup of enhanced C-FCE, whichever is sooner. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))** 2. After completion of C-FCE modification, the permittee shall not operate the Basic Oxygen Furnace or the Reladling South Operation unless the baghouse secondary emission dust collector is installed, maintained, and operated in a satisfactory manner. **(R336.1205(1)(a) & (b), R336.1225, R336.1331(c), R336.1910, 40 CFR 52.21(b)(3))** 3. The permittee shall keep on file a copy of the BOF secondary baghouse capture system design plans and a signed certification from the designer, certifying that the baghouse capture system is designed to achieve no less than 98% collection efficiency for both the BOF secondary emissions and the reladling south emissions. These design plans shall include a range of BOF vessel angles to achieve optimum emission capture. **(R336.1205(1)(a) & (b), 40 CFR 52.21(b)(3))**	
VI. OTHER REQUIREMENTS	
1. Records required under 40 CFR Part 63, Subpart FFFFF and specified in this table shall be retained for five years. The records must be maintained onsite for the two most recent years of the five year period. Records from the remaining three years of the five year period may be keep offsite. **(40 CFR 63.7843(b) and (c))**	

TABLE F-01.04 SLAB REHEAT FURNACES 1, 2 & 3 AT HOT STRIP MILL BUILDING FLEXIBLE GROUPING REQUIREMENTS

FLEXIBLE GROUPING	FGSREHEATFURNACE123
Emission Unit / Process Group	EUSREHEATFURNACE1, EUSREHEATFURNACE2, EUSREHEATFURNACE3

I. DESIGN PARAMETERS

A. Pollution Control Equipment	NA
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
NA	NA	NA	NA	NA	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
Opacity	20% **(R336.1301)**
Nitrogen Oxide	1. 0.11 lb/mmBTU **(R336.1205(1)(a) & (b), R336.1801(4))**
PM	1. 10 lb/MMscf natural gas fired. **(40 CFR 52.21(b)(3), R336.1331(c))**
PM10	1. 10 lb/MMscf natural gas fired. **(R336.1205(1)(a) & (b))**

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	The permittee shall keep a record of the following for furnaces 1, 2, and 3: 1. Total natural gas consumption per month. **(R336.1205(1)(a) & (b))**
3. Other Monitoring and/or Recordkeeping	NA

B. TESTING/RECORDKEEPING

1. Parameter to be Tested/ Recorded	1. Opacity 2. NOx 3. PM 4. PM-10
2. Method/Analysis	Approved method

TABLE F-01.04 SLAB REHEAT FURNACES 1, 2 & 3 AT HOT STRIP MILL BUILDING FLEXIBLE GROUPING REQUIREMENTS	
3. Frequency and Schedule of Testing/Recordkeeping	1. Within 180 days after commencement of trial operation, the permittee shall verify NOx, PM, and PM-10 emission rates from a representative furnace from Slab reheat furnaces 1, 2, and 3 by testing at owner's expense, in accordance with Department requirements. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. **(R336.1205(1)(a) & (b), R336.1331, R336.2001, R336.2003, R336.2004, 40 CFR 52.21(b)(3))**
IV. REPORTING	
Reports and Schedules	NA
V. OPERATIONAL PARAMETERS	
1.	
VI. OTHER REQUIREMENTS	
NA	

TABLE F-01.05 FGFACILITY
FLEXIBLE GROUPING REQUIREMENTS

FLEXIBLE GROUPING	FGFACILITY
Emission Unit / Process Group	All equipment at the stationary source including equipment covered by other permits, grandfathered equipment and exempt equipment.

I. DESIGN PARAMETERS

A. Pollution Control Equipment	NA
B. Stack/Vent Parameters	NA

Stack/Vent ID	a. Minimum Height (feet)	b. Maximum Exhaust Dimension (inches)	c. Temp. (°F)	d. Air Flow Rate (acfm)	Applicable Requirement
NA	NA	NA	NA	NA	NA

C. Other Design Parameters

NA

II. MATERIAL USAGE/EMISSION LIMITS

A. Material	Maximum Usage Rate
NA	NA

B. Pollutant	Maximum Emission Limit
NA	NA

III. COMPLIANCE EVALUATION
Records of all of the following shall be maintained on file for a period of 5 years.

A. MONITORING/RECORDKEEPING

1. Continuous Emission Monitoring (CEM) System and Recordkeeping	NA
2. Process Monitoring System and Recordkeeping	NA
3. Other Monitoring and/or Recordkeeping	NA

B. TESTING/RECORDKEEPING

1. Parameter to be Tested/ Recorded	NA
2. Method/Analysis	NA
3. Frequency and Schedule of Testing/Recordkeeping	NA

IV. REPORTING

Reports and Schedules	NA

V. OPERATIONAL PARAMETERS

NA

VI. OTHER REQUIREMENTS

This Permit to Install shall become effective on May 22, 2007, unless the permittee files a timely request for review with the Administrator of the United States Environmental Protection Agency pursuant to 40 CFR 124.15 and 124.19. **(40 CFR 124.15 and 124.19)**

Appendix 1.3. Monitoring Requirements

1.3.1 SO2 Monitoring Continuous Emission Monitoring System (CEMS) Requirements

1. Within 60 calendar days of the issuance of this permit, the permittee shall submit two copies of a Monitoring Plan to the AQD, for review and approval. The Monitoring Plan shall include drawings or specifications showing proposed locations and descriptions of the required CEMS.

2. Within 150 calendar days of the issuance of this permit, the permittee shall submit two copies of a complete test plan for the CEMS to the AQD for approval.

3. Prior to restarting the blast furnace after completion of the CFCE modification, the permittee shall complete the installation of the CEMS and complete testing within 180 days of restarting the blast furnace.

4. Within 60 days of completion of testing, the permittee shall submit to the AQD two copies of the final report demonstrating the CEMS complies with the requirements of Performance Specification (PS) 2.

5. The span value shall be 2.0 times the lowest emission standard or as specified in the federal regulations.

6. The CEMS shall be installed, calibrated, maintained, and operated in accordance with the procedures set forth in 40 CFR 60.13 and PS 2 of Appendix B, 40 CFR Part 60.

7. Each calendar quarter, the permittee shall perform the Quality Assurance Procedures of the CEMS set forth in Appendix F of 40 CFR Part 60. Within 30 days following the end of each calendar quarter, the permittee shall submit the results to the AQD in the format of the data assessment report (Figure 1, Appendix F)

8. In accordance with 40 CFR 60.7(c) and (d), the permittee shall submit two copies of an excess emission report (EER) and summary report in an acceptable format to the AQD, within 30 days following the end of each calendar quarter. The Summary Report shall follow the format of Figure 1 in 40 CFR 60.7(d). The EER shall include the following information:

   a) A report of each exceedance above the limits specified in the conditions of this permit. This includes the date, time, magnitude, cause and corrective actions of all occurrences during the reporting period.

   b) A report of all periods of CEMS downtime and corrective action.

   c) A report of the total operating time of the EUCFCESTOVE during the reporting period.

   d) A report of any periods that the CEMS exceeds the instrument range.

   e) If no exceedances or CEMS downtime occurred during the reporting period, the permittee shall report that fact.

All monitoring data shall be kept on file for a period of at least five years and made available to the AQD upon request.

1.3.2 Continuous Opacity Monitoring System (COMS) Requirements

1. Within 30 calendar days of the issuance of this permit, the permittee shall submit two copies of a Monitoring Plan to the AQD, for review and approval.

2. Within 150 calendar days of the issuance of this permit, the permittee shall submit two copies of a complete test plan for the COMS to the AQD for approval.

3. Within 180 calendar days of the issuance of this permit, the permittee shall complete the testing of the COMS.

4. Within 60 days of completion of testing, the permittee shall submit to the AQD two copies of the final report demonstrating the COMS complies with the requirements of Performance Specification (PS) 1.

5. The span value shall be 2.0 times the lowest emission standard or as specified in the federal regulations.

6. The COMS shall be installed, calibrated, maintained, and operated in accordance with the procedures set forth in 40 CFR 60.13 and PS 1 of Appendix B, 40 CFR Part 60.

7. The permittee shall perform an annual audit of the COMS using the procedures set forth in USEPA Publication 450/4-92-010, "Performance Audits Procedures for Opacity Monitors", or a procedure acceptable to AQD. Within 30 days after the completion of the audit, the results of the annual audit shall be submitted to the AQD.

8. In accordance with 40 CFR 60.7(c) and (d), the permittee shall submit two copies of an excess emission report (EER) and summary report in an acceptable format to Air Quality Division, within 30 days following the end of each calendar quarter. The Summary Report shall follow the format of Figure 1 in 40 CFR 60.7(d). The EER shall include the following information:

   a) A report of each exceedance above the hourly average limits as specified in the MACT regulations, Section 63.7833(e) and (g). This includes the date, time, magnitude, cause and corrective actions of all occurrences during the reporting period.

   b) A report of all periods of COMS downtime and corrective action.

   c) A report of the total operating time of the EUBOF during the reporting period.

   d) If no exceedances or COMS downtime occurred during the reporting period, the permittee shall report that fact.

9. Within 180 days of permit issuance, Severstal shall do the following: for each day that the ESP opacity monitor indicates a one hour average opacity above 10%, Severstal shall keep records of the total power input (voltage and secondary current) of the ESP fields and verify that the water flow to the evaporation chamber is within standard operating levels. For each day that the ESP opacity monitor indicates a one hour average opacity above 10%: if the total power input of the ESP fields exceeds 90% of the established baseline value, and water flow to the evaporation chamber is within standard operational levels, no further investigation of the cause of the exceedance is required. If the total power input of the ESP fields is less than 90% of the established baseline, or if the total power input of the ESP fields exceeds 90% of the established baseline value and water flow to the evaporation chamber is below standard operational levels, Severstal will initiate an investigation as to the cause of the exceedance. This investigation may include such factors as the reason for the lower total power input, the potential for condensation in the exhaust stack causing a false opacity exceedance (by checking parameters which may include the temperature of the exhaust gas at the COMS, the rate of water to the evaporation chamber, outside ambient temperature, operating stage of EUBOF) and performing method 9 opacity observations of the ESP stack. The ESP total power input baseline and standard operational evaporation

chamber water input shall be established within 90 days of permit issuance. Upon approval by the MDEQ District Office, Severstal may change the parameter used to establish a baseline value, establish a new baseline value, and/or use a different trigger percentage of the baseline value to initiate the corrective actions described in this paragraph.

All monitoring data is shall be kept on file for a period of at least five years and made available to the AQD upon request.

Appendix 1.7. Emission Calculations

Any changes proposed to this Appendix shall be submitted to the AQD Southeast Michigan District Office and approved, in writing, before the change is implemented.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.03 (B-FCE Stoves):

NOx Monthly Stove emissions = BFG_{BM} x NOx Test Factor (pound NOx per mmcf of BFG) / 2,000 lb/ton

NOx Annual Stove emissions = BFG_{BA} x NOx Test Factor (pound NOx per mmcf of BFG) / 2,000 lb/ton

CO Hourly Stove emissions = BFG_{BD} x CO Test Factor (pound CO per mmcf of BFG) / 24 hours

Where:

NOx Test Factor is an emission factor based upon site specific stack test data for B-FCE and the CO Test Factor is an emission factor based upon available site specific stack test data for C-FCE. Permit data will also be evaluated in determining the appropriateness of these factors.

BFG_{BD} = actual total Blast Furnace Gas combustion rate on a daily basis, based on a calendar week average, in mmcf BFG for B-FCE.

BFG_{BM} = actual total Blast Furnace Gas combustion rate for the previous month in mmcf BFG for B-FCE.

BFG_{BA} = actual total Blast Furnace Gas combustion rate for the previous 12-month rolling time period in mmcf BFG for B-FCE.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.04 (C-FCE Casthouse):

SO2 Monthly emissions from baghouse = CR_{CM} x SO2 Test Factor (pound SO2 per ton of iron) / 2,000 lb/ton

SO2 Annual emissions from baghouse = CR_{CA} x SO2 Test Factor (pound SO2 per ton of iron) / 2,000 lb/ton

NOx Monthly emissions from baghouse = CR_{CM} x NOx Test Factor (pound NOx per ton of iron) / 2,000 lb/ton

NOx Annual emissions from baghouse = CR_{CA} x NOx Test Factor (pound NOx per ton of iron) / 2,000 lb/ton

Where:

SO2 and NOx Test Factors are emission factors based upon site specific stack test data for C-FCE Casthouse Baghouse. Permit data will also be evaluated in determining the appropriateness of these factors.

CR_{CM} = actual casting rate for the previous month in tons of iron for C-FCE.

CR_{CA} = actual casting rate for the previous 12-month rolling time period in tons of iron for C-FCE.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.05 (C-FCE Stoves):

NOx Monthly Stove emissions = BFG_{CM} x NOx Test Factor (pound NOx per mmcf of BFG) / 2,000 lb/ton

NOx Annual Stove emissions = BFG_{CA} x NOx Test Factor (pound NOx per mmcf of BFG) / 2,000 lb/ton

CO Monthly Stove emissions = BFG_{CM} x CO Test Factor (pound CO per mmcf of BFG) / 2,000 lb/ton

CO Annual Stove emissions = BFG_{CA} x CO Test Factor (pound CO per mmcf of BFG) / 2,000 lb/ton

Where:

NOx and CO Test Factors are emission factors based upon site specific stack test data for C-FCE. Permit data will also be evaluated in determining the appropriateness of these factors.

BFG_{CM} = actual total Blast Furnace Gas combustion rate for the previous month in mmcf BFG for C-FCE.

BFG_{CA} = actual total Blast Furnace Gas combustion rate for the previous 12-month rolling time period in mmcf BFG for C-FCE.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.06 (Reladling – BOF):

PM roof monitor Annual emissions = RLD x 0.0038 pound PM per ton of iron / 2,000 lb/ton

PM-10 roof monitor Annual emissions = RLD x 0.0019 pound PM-10 per ton of iron / 2,000 lb/ton

Where:

RLD = actual throughput for the previous 12-month rolling time period in tons of iron for reladling operations.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.07 (Desulfurization Operation):

PM roof monitor Annual emissions = DSF x 0.0218 pound PM per ton of iron / 2,000 lb/ton

PM-10 roof monitor Annual emissions = DSF x 0.0041 pound PM-10 per ton of iron / 2,000 lb/ton

Where:

DSF = actual throughput for the previous 12-month rolling time period in tons of iron for desulfurization operations.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table E-01.08 (EUBOF):

PM roof monitor Annual emissions = BOF_C x 0.006 pound PM per ton metal charged + BOF_S x 0.0026 pound PM per ton slag tapped + BOF_T x 0.0026 pound PM per ton steel tapped / 2,000 lb/ton

PM-10 roof monitor Annual emissions = BOF_C x 0.00276 pound PM-10 per ton metal charged + BOF_S x 0.0012 pound PM-10 per ton slag tapped + BOF_T x 0.0012 pound PM-10 per ton steel tapped / 2,000 lb/ton

Where:

BOF_C = actual charging rate for the previous 12-month rolling time period in tons of metal for the BOF.

BOF_S = actual tapping rate for the previous 12-month rolling time period in tons of slag for the BOF.

BOF_T = actual tapping rate for the previous 12-month rolling time period in tons of steel for the BOF.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table F-01.01 (FG B&C Furnace Casthouses):

PM Roof Monitor emissions = CR_{TA} x 0.012 pound PM per ton of iron / 2,000 lb/ton

PM-10 Roof Monitor emissions = CR_{TA} x 0.0061 pound PM-10 per ton of iron / 2,000 lb/ton

Manganese Roof Monitor emissions = CR_{TD} x 0.000011 pound manganese per ton of iron / 24 hours

Lead Roof Monitor emissions = CR_{TA} x 0.00000016 pound lead per ton of iron / 8760 hours per 12-month rolling time period

SO2 Hourly baghouse emissions = CR_{TD} x SO2 Test Factor (in pound SO2 per ton of iron) / 24 hours

SO2 Monthly baghouse emissions = CR_{TM} x SO2 Test Factor (pound SO2 per ton of iron) / 2,000 lb/ton

SO2 Annual baghouse emissions = CR_{TA} x SO2 Test Factor (pound SO2 per ton of iron) / 2,000 lb/ton

NOx Hourly baghouse emissions = CR_{TD} x NOx Test Factor (in pound NOx per ton of iron) / 24 hours

NOx Monthly baghouse emissions = CR_{TM} x NOx Test Factor (pound NOx per ton of iron) / 2,000 lb/ton

NOx Annual baghouse emissions = CR_{TA} x NOx Test Factor (pound NOx per ton of iron) / 2,000 lb/ton

VOC Hourly baghouse emissions = CR_{TD} x VOC Test Factor (in pound VOC per ton of iron) / 24 hours

Manganese baghouse emissions = CR_{TD} x Mn Test Factor (in pound manganese per ton of iron) / 24 hours

Lead baghouse emissions = CR_{TA} x Pb Test Factor (in pound lead per ton of iron) / 8760 hours per 12-month rolling time period

Where:

SO2, NOx, VOC, Mn and Pb Test Factors are the casthouse baghouse emission factors based upon available site specific stack test data for the C-FCE Casthouse Baghouse. Permit data will also be evaluated in determining the appropriateness of these factors.

CR_{TD} = actual total casting rate on a daily basis, based on a calendar week average, in tons of iron for B-FCE and C-FCE combined.

CR_{TM} = actual total casting rate for the previous month in tons of iron for B-FCE and C-FCE combined.

CR_{TA} = actual total casting rate for the previous 12-month rolling time period in tons of iron for B-FCE and C-FCE combined.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table F-01.02 (FG B&C Furnace Stoves - except SO2):

NOx Annual Stove emissions = [(BFG_{BA} x B-FCE NOx Test Factor (lb NOx per mmcf of BFG)) + (BFG_{CA} x C-FCE NOx Test Factor (lb NOx per mmcf of BFG))] / 2,000 lb/ton

CO Annual Stove emissions = BFG_{TA} x CO Test Factor (pound CO per mmcf of BFG) / 2,000 lb/ton

PM Hourly Stove emissions = BFG_{TD} x PM Test Factor (in pound PM per mmcf of BFG) / 24 hours

PM-10 Hourly Stove emissions = BFG_{TD} x PM10 Test Factor (in pound PM10 per mmcf of BFG) / 24 hours

Manganese Hourly Stove emissions = BFG_{TD} x Mn Test Factor (in pound Mn mmcf BFG) / 24 hours

Mercury Hourly Stove emissions = BFG_{TA} x Hg Test Factor (in pound mercury per mmcf BFG) / 8760 hours per 12-month rolling time period

Lead Hourly Stove emissions = BFG_{TA} x Pb Test Factor (in pound Pb per mmcf BFG) / 8760 hours per 12-month rolling time period

Where:

NOx Test Factors are individual stove emission factors based on B-FCE and C-FCE stack test results.

CO, PM, PM-10, Mn, Pb, and Hg Test Factors are emission factors based upon available site specific stack test data for C-FCE. Permit data will also be evaluated in determining the appropriateness of these factors.

BFG_{BA} = actual total Blast Furnace Gas combustion rate for the previous 12-month rolling time period in mmcf BFG for B-FCE.

BFG_{CA} = actual total Blast Furnace Gas combustion rate for the previous 12-month rolling time period in mmcf BFG for C-FCE.

BFG_{TD} = actual total Blast Furnace Gas combustion rate on a daily basis, based on a calendar week average, in mmcf BFG for B-FCE and C-FCE combined.

BFG_{TM} = actual total Blast Furnace Gas combustion rate for the previous month in mmcf BFG for B-FCE and C-FCE combined.

BFG_{TA} = actual total Blast Furnace Gas combustion rate for the previous 12-month rolling time period in mmcf BFG for B-FCE and C-FCE combined.

The permittee shall use the following calculations to determine compliance with the recordkeeping requirements referenced in Table F-01.02 (FG B&C Furnace Stoves - for SO2 emissions):

SO2 Hourly Stove emissions = BFG_{TD} x SO2 Daily Emission Factor / 24 hours

SO2 Annual Stove emissions = $\sum_{i=1}^{n=365} (BFG_{TD} \ x \ SO2 \ Daily \ Emission \ Factor)$ / 2,000 lb/ton

Where:
BFG_{TD} = actual daily total of BFG (in mmcf) combusted in B-FCE and C-FCE combined

SO2 Daily Emission Factor = SO2 Emission Factor derived on a daily basis from the SO2 CEMS data provided by the SO2 CEMS on the C-FCE stoves.

The factor will be in pound SO2 per mmcf BFG and will be calculated either directly by the CEMS or by taking the daily pounds of SO2 from C-FCE stoves (from the CEMS) and dividing this by the amount of BFG (in mmcf) combusted in C-FCE in the same day.