

## Public Comment - AZR Variance Request

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Tue 11/19/2019 2:47 PM

To: envcomments <envcomments@cityofchicago.org>

Cc: Jennifer Hesse <Jennifer.Hesse@cityofchicago.org>; Dave Graham <Dave.Graham@cityofchicago.org>; Mort Ames <Mort.Ames@cityofchicago.org>

 2 attachments (1,003 KB)

AZR PM10 Monitor Data Analysis February to September 2019.docx; AZR FRM PM10 and Manganese Data September 2019.pdf;

Please accept the attached documents as supplements to the June 28, 2019 public comments submitted by the Southeast Environmental Task Force, the Natural Resources Defense Council and the Chicago South East Side Coalition to Ban Petcoke in opposition to AZR's pending request for a variance from requirements for the storage and handling of manganese-containing materials.

At the time these NGOs submitted their original comments, there was only a brief period during which AZR's PM10 monitoring system operated. The first attachment analyzes PM10 trends based on a much longer period of time, from mid-February through September, 2019.

There is also new data derived from the first month of operation of AZR's metals monitor. The second attachment clearly evidences that manganese is present in air releases from the AZR site.

Based on this supplemental information, the NGOs again request that CDPH deny AZR's variance request.

Thank you for your consideration of this supplemental information.

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This memo analyzes the results from AZR’s PM10 monitors from mid-February to September. AZR’s PM10 monitors are located at the north, south, east and west perimeter of the facility. The wind direction in the analysis is defined in *Table 1*.

Table 1.

Direction of Wind	Degrees	Downwind Monitor Location
North Wind	315-45	South Fenceline
East Wind	45-135	West Fenceline
South Wind	135-225	North Fenceline
West Wind	225-315	East Fenceline

For purposes of this analysis, the upwind monitor is the AZR monitor that detected PM10 levels when the wind entered the AZR facility. The downwind monitor is the AZR monitor that detected PM10 levels after the wind crossed the AZR facility. This analysis suggests the most common scenario is this – the wind blows from the south, but the highest PM10 reading is not at AZR’s south monitor. Rather, the highest PM10 level is recorded at AZR’s north monitor, after crossing the AZR facility.

As shown in *Table 2.*, a total of 5236 hours were monitored from mid-February to September for the PM10 level by AZR (only the hours when a valid wind direction was recorded and at least two monitors recorded valid PM10 readings are counted in this analysis). For these hours, 60.2% of the time we see the highest PM readings were detected at a downwind fence line monitor, after crossing the AZR site.

Table 2.

Month	Hours Highest Reading at Downwind	Hours Highest Reading NOT at Downwind	Percentage of Hours Highest Reading at Downwind
February	90	62	59.2%
March	469	273	63.2%
April	447	272	62.2%
May	436	307	58.7%
June	433	284	60.4%
July	472	279	63.7%
August	394	350	53.0%
September	409	269	60.3%
Total Measured Hours	3150	2086	60.2%

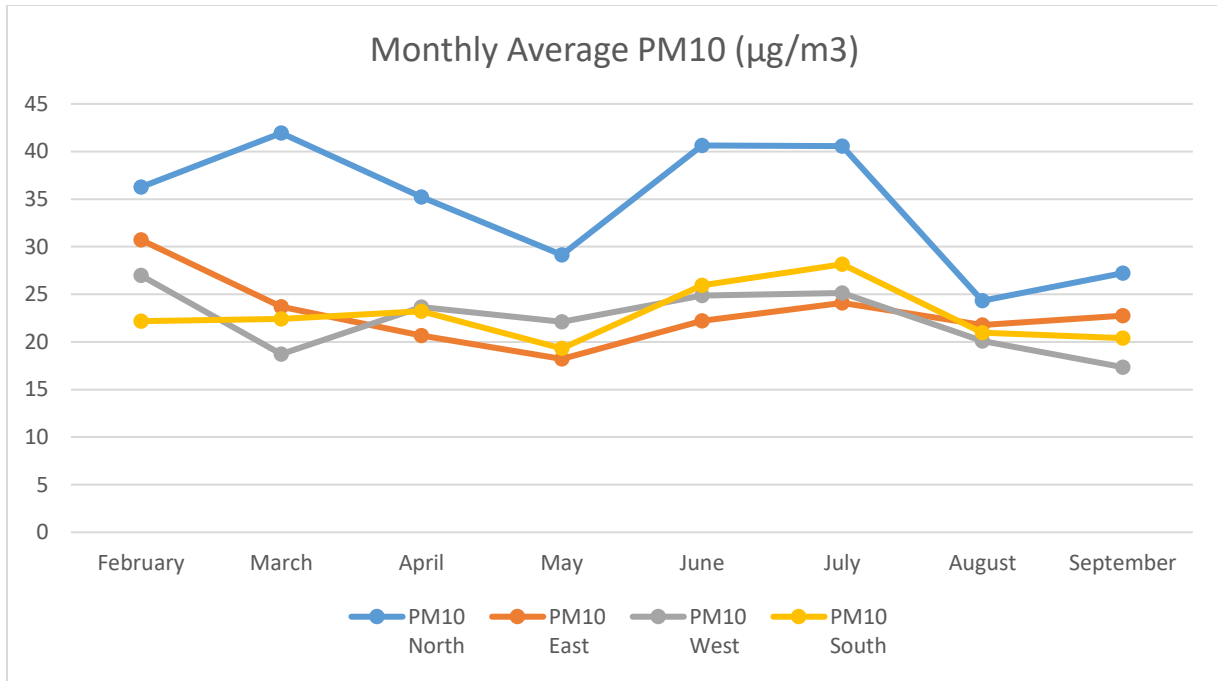
These results are the same even if a much stricter rule is applied, namely, that an hour is only counted if the “Downwind Reading Was *Significantly Higher* Than Readings at Other Directions”, meaning two conditions were met at the same time: 1.the highest reading is picked

up by the monitor at downwind direction; and, 2. this reading is 50% higher than the second highest reading. The percentage of hours which met those two conditions is still 42.1% as demonstrated by the results listed in *Table 3*. Coupled with the results described in *Table 2*, this strongly suggests that AZR contributes a significant portion of PM10 recorded in the fence-line monitors.

Table 3.

Month	Number of Hours Downwind Reading Was Significantly Higher Than Other Directions	Number of Hours Max Reading Downwind Reading Was NOT Significantly Higher Than Other Directions	Percentage of Hours Downwind Reading Was <i>Significantly Higher</i> Than Other Direction
February	60	92	39.5%
March	331	411	44.6%
April	331	388	46.0%
May	325	418	43.7%
June	326	391	45.5%
July	352	389	47.5%
August	226	518	30.4%
September	251	427	37.0%
Total	2202	3034	42.1%

AZR's contribution to PM10 levels in downwind monitors is also evidenced by PM10 events where the monitors record a PM10 level of 150  $\mu\text{g}/\text{m}^3$  for at least one hour. Using a one-hour PM10 threshold of 150  $\mu\text{g}/\text{m}^3$ , there were 34 periods that the downwind monitors recorded this PM10 level or higher for at least one hour. Although AZR claims to have adopted effective mechanisms to control the dust, so far there is no discernible decrease in the monitored PM10 level (shown in *Graph 1*. below), or a decrease in number of high level PM10 periods (see *Table 4*. below). Notably, these high PM10 level periods can be lasting. For example, on June 14-15, 10 hours exceeded 150  $\mu\text{g}/\text{m}^3$  threshold.



Graph 1.

By way of illustration, in the following Table 4, hours when the highest PM10 was picked up by the monitor located at the downwind direction are highlighted with color purple. PM10 readings higher than 150 µg/m3 or invalid results are highlighted with color pink.

Table 4.

Timestamp	Wind Speed	Wind Direction	Std. Dev. Wind Direction	Gust (3-second)	Temp	Precip	PM10 North	PM10 East	PM10 West	PM10 South
CST	mph	deg	deg	mph	°F	In.	µg/m3	µg/m3	µg/m3	µg/m3
2/23/2019 8:00	8.13	125	19.61	16.71	36.6	0	103	34	39	33
2/23/2019 9:00	6.529	138.6	22	15.52	37.3	0	118	69	65	77
2/23/2019 10:00	8.43	153.4	15.48	16.71	37.1	0	164	80	AN	103
2/23/2019 11:00	4.592	228.3	18.92	13.14	36.1	0	101	65	44	57
2/24/2019 17:00	19.72	267.1	16.28	38.16	25.5	0	46	65	17	13
2/24/2019 18:00	20.15	267.5	15.97	39.35	23.9	0	91	80	21	13
2/24/2019 19:00	19.99	269	15.48	38.75	22.2	0	103	142	22	13
2/24/2019 20:00	18.16	270.7	14.88	38.75	20.5	0	50	81	14	18
2/24/2019 21:00	18.78	268.4	15.94	33.99	18.8	0	54	61	16	14
2/24/2019 22:00	17.75	270.8	15.13	35.18	17.5	0	66	155	10	9
2/24/2019 23:00	16.57	272.8	13.58	33.39	16.3	0	61	59	11	9
2/25/2019 0:00	18.36	278.1	12.7	35.77	15.1	0	78	141	9	11
2/25/2019 1:00	17.21	277.9	13.71	31.6	13.6	0	34	78	8	7
2/27/2019 10:00	3.921	272.4	11.93	8.97	27.1	0	48	57	40	40
2/27/2019 11:00	6.823	288.6	14.55	12.54	28.6	0	55	67	50	44
2/27/2019 12:00	7.464	304.6	17.32	14.33	29.6	0	45	83	35	36
2/27/2019 13:00	7.899	318.6	21.13	15.52	29.2	0	37	52	57	46
2/27/2019 14:00	7.366	289.5	15.8	16.12	28.7	0	20	45	22	18

2/27/2019 15:00	7.797	283.5	15.13	16.71	30.2	0	14	34	22	15
2/27/2019 16:00	9.35	292.6	14.81	17.9	29.5	0	26	64	23	24
2/27/2019 17:00	9.13	298.4	15.78	16.12	28.5	0	21	212	19	19
2/27/2019 18:00	8.76	299.4	15.38	15.52	26.5	0	25	50	AN	21
2/27/2019 19:00	8.16	305.6	16.9	15.52	25.2	0	24	59	28	22

3/4/2019 10:00	10.4	268.3	17.5	17.9	3.1	0	91	99	17	34
3/4/2019 11:00	10.4	265.4	21.4	22.7	5.1	0	258	76	23	19
3/4/2019 12:00	11.6	265.5	17.4	21.5	6.7	0	137	70	19	20
3/4/2019 13:00	11.7	265.7	18.0	20.9	8.8	0	96	111	21	13
3/4/2019 14:00	11.5	268.8	13.7	22.1	10.7	0	60	79	AN	18
3/4/2019 15:00	12.0	264.4	17.8	21.5	12.0	0	138	67	18	14

3/12/2019 20:00	9.9	150.5	17.3	19.7	44.1	0	112	6	23	13
3/12/2019 21:00	10.6	152.7	17.5	23.9	44.1	0	151	8	17	19
3/12/2019 22:00	7.8	162.5	20.1	17.9	44.1	0	65	16	12	10
3/12/2019 23:00	8.3	164.2	21.2	20.3	44.3	0	48	8	14	13
3/13/2019 0:00	9.4	168.0	22.7	20.9	44.2	0	128	13	19	14
3/13/2019 1:00	7.1	168.6	22.5	17.3	44.0	0	35	8	8	9

3/13/2019 16:00	9.6	147.6	12.4	17.3	58.6	0	73	20	25	20
3/13/2019 17:00	8.6	149.3	15.8	15.5	59.3	0	67	9	20	14
3/13/2019 18:00	8.9	153.2	19.1	19.7	60.8	0	192	10	15	10
3/13/2019 19:00	8.6	148.8	17.5	15.5	60.5	0	122	12	16	15
3/13/2019 20:00	6.0	134.6	20.5	12.5	59.1	0	84	9	11	10

3/13/2019 21:00	11.5	149.0	13.5	18.5	60.5	0	124	14	14	9
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3/19/2019 15:00	6.5	218.0	30.0	14.9	48.8	0	737	63	13	33
3/19/2019 16:00	5.8	220.0	32.8	13.7	49.5	0	55	17	9	17
3/19/2019 17:00	5.8	222.0	36.2	14.9	49.3	0	61	13	14	10
3/19/2019 18:00	4.4	220.2	32.2	14.3	47.6	0	985	11	17	12
3/19/2019 19:00	3.0	199.4	16.0	7.8	45.7	0	985	20	15	13
3/19/2019 20:00	2.5	162.3	16.6	5.4	44.7	0	218	44	38	64
3/19/2019 21:00	2.8	162.4	20.3	6.0	43.3	0	365	38	27	28
3/19/2019 22:00	3.7	158.5	17.1	9.0	42.5	0	178	16	27	27
3/19/2019 23:00	4.7	168.0	20.2	10.2	42.6	0	91	12	17	16
3/20/2019 0:00	4.2	177.8	22.3	9.6	42.4	0	70	22	13	9
3/20/2019 1:00	4.9	192.0	21.4	10.8	42.4	0	40	13	17	10
3/20/2019 2:00	4.1	199.9	26.8	12.0	42.0	0	42	17	16	10
3/20/2019 3:00	5.5	202.2	21.6	13.1	42.6	0	111	6	14	11
3/20/2019 4:00	4.8	216.6	33.6	12.5	42.5	0	67	16	15	15
3/20/2019 5:00	4.0	210.3	25.2	11.4	41.7	0	36	12	16	16
3/20/2019 6:00	4.0	182.6	21.2	9.0	41.3	0	28	21	18	16
3/20/2019 7:00	5.2	189.0	20.6	13.1	40.1	0.07	181	62	17	19

3/26/2019 22:00	3.2	155.4	16.0	6.0	35.1	0	102	67	43	51
3/26/2019 23:00	4.5	164.1	14.3	9.6	34.5	0	159	43	26	27
3/27/2019 0:00	1.4	193.0	8.2	4.2	33.1	0	42	28	29	43
3/27/2019 1:00	1.7	167.8	12.5	4.8	32.7	0	69	14	39	14

3/27/2019 2:00	2.9	173.6	12.1	6.0	32.5	0	39	13	14	15
3/27/2019 3:00	2.9	172.1	12.7	5.4	32.3	0	92	11	17	15
3/27/2019 4:00	3.0	169.3	17.4	6.0	32.1	0	AN	25	19	18
3/27/2019 5:00	2.8	171.2	20.0	6.0	32.2	0	127	20	24	19
3/27/2019 6:00	2.9	177.5	19.9	7.8	32.2	0	122	78	45	65
3/27/2019 7:00	4.1	167.0	21.7	10.8	33.8	0	173	72	44	267
3/27/2019 8:00	5.8	170.4	20.9	12.5	37.9	0	268	111	34	503
3/27/2019 9:00	6.6	181.5	24.9	13.7	42.6	0	156	103	23	349
3/27/2019 10:00	7.6	202.6	27.1	18.5	46.2	0	139	146	17	198
3/27/2019 11:00	8.5	204.7	23.1	17.9	48.6	0	183	124	24	198
3/27/2019 12:00	7.8	203.2	26.2	16.1	51.1	0	393	39	17	27
3/27/2019 13:00	8.6	197.5	20.6	19.7	53.2	0	171	112	21	211
3/27/2019 14:00	8.7	189.8	22.8	18.5	55.3	0	149	102	22	197
3/27/2019 15:00	9.1	191.0	28.0	19.7	56.7	0	116	69	18	113
3/27/2019 16:00	8.8	190.7	24.8	21.5	57.1	0	155	47	14	35
3/27/2019 17:00	8.5	188.3	26.4	20.3	56.9	0	105	27	12	21
3/27/2019 18:00	8.0	183.4	21.9	19.1	55.3	0	150	20	15	18
3/27/2019 19:00	6.8	169.4	21.7	14.9	54.0	0	119	52	27	34
3/27/2019 20:00	8.0	175.8	23.7	21.5	53.7	0	101	23	19	24
3/27/2019 21:00	9.0	191.9	25.8	19.7	52.7	0	129	26	14	24
3/27/2019 22:00	5.9	224.7	29.2	20.3	51.2	0.03	211	24	26	17
3/27/2019 23:00	5.2	210.3	31.2	17.9	46.3	0.1	148	11	14	16
3/28/2019 0:00	7.8	194.6	24.1	20.3	45.9	0.01	53	8	10	8



3/28/2019 1:00	7.0	201.0	23.0	14.3	46.9	0	66	6	7	9
3/28/2019 2:00	7.3	197.1	19.6	17.9	47.4	0	84	6	11	5
3/28/2019 3:00	7.4	196.2	21.1	16.1	47.4	0	78	8	8	8
3/28/2019 4:00	7.7	201.4	22.0	16.7	48.3	0	36	13	9	7
3/28/2019 5:00	6.8	206.1	29.1	15.5	49.0	0	45	18	19	10
3/28/2019 6:00	6.3	207.9	28.8	14.9	49.1	0	40	17	17	17
3/28/2019 7:00	6.1	215.7	36.8	14.3	49.9	0	90	62	22	71
3/28/2019 8:00	7.0	216.6	35.6	17.3	51.0	0	103	67	23	55
3/28/2019 9:00	6.8	230.4	42.7	17.9	53.3	0	91	46	24	41
3/28/2019 10:00	7.5	233.5	32.5	19.7	56.3	0	124	41	25	37

4/8/2019 20:00	4.0	221.9	33.1	10.8	66.6	0	203	15	19	16
4/8/2019 21:00	4.8	223.5	33.0	14.9	65.9	0	158	17	15	11
4/8/2019 22:00	6.4	233.6	28.9	15.5	65.9	0	109	14	14	11

4/22/2019 6:00	5.4	173.6	22.3	12.0	57.6	0	179	46	39	48
4/22/2019 7:00	7.1	171.9	22.5	14.9	60.9	0	195	71	37	40
4/22/2019 8:00	7.2	160.5	21.4	16.1	62.8	0	142	68	53	46
4/22/2019 9:00	8.0	175.3	22.6	19.1	67.3	0	91	59	30	40
4/22/2019 10:00	9.1	181.0	23.8	19.1	71.5	0	143	78	32	51
4/22/2019 11:00	8.9	178.6	25.0	22.1	73.6	0	148	92	38	74
4/22/2019 12:00	9.9	194.8	23.4	23.9	75.8	0	164	66	25	48
4/22/2019 13:00	10.3	181.2	27.4	24.5	77.9	0	221	114	58	88
4/22/2019 14:00	11.9	179.1	29.4	26.8	77.8	0	206	138	57	108

4/22/2019 15:00	9.3	180.4	26.3	23.3	77.9	0	96	69	31	72
4/22/2019 16:00	10.4	181.3	26.7	26.2	78.8	0	145	66	28	47
4/22/2019 17:00	9.9	191.5	24.1	24.5	77.2	0	147	60	18	21
4/22/2019 18:00	6.6	201.6	31.4	19.7	74.6	0	275	45	27	25
4/22/2019 19:00	4.5	192.7	17.6	13.1	68.7	0.23	129	45	33	39

4/27/2019 8:00	8.0	74.7	17.1	14.9	41.0	0	25	8	159	42
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4/28/2019 13:00	5.8	71.4	27.7	11.4	45.6	0	3	2	286	42
4/28/2019 14:00	6.9	61.4	27.1	13.1	46.9	0	4	0	204	15

5/4/2019 3:00	5.4	341.4	16.0	8.4	45.2	0	-1	0	4	32
5/4/2019 4:00	4.1	339.8	21.7	7.8	44.7	0	3	1	7	64

5/8/2019 16:00	9.7	155.1	22.0	22.7	73.4	0	99	51	43	55
5/8/2019 17:00	11.7	155.7	21.0	25.7	74.0	0	159	73	34	39
5/8/2019 18:00	10.5	139.0	24.0	25.7	72.5	0	136	46	40	41
5/8/2019 19:00	9.4	141.0	27.3	20.9	70.2	0	77	38	39	39
5/8/2019 20:00	10.4	157.6	19.9	20.9	68.1	0	62	27	22	20
5/8/2019 21:00	12.0	159.4	14.7	20.9	66.9	0	100	51	15	18
5/8/2019 22:00	9.9	162.6	16.8	19.7	65.5	0	74	80	23	25
5/8/2019 23:00	7.4	168.5	22.7	20.3	63.9	0.09	118	44	17	20
5/9/2019 0:00	5.1	197.0	20.9	12.5	61.8	0.19	94	56	20	22

5/14/2019 21:00	3.7	151.7	14.4	7.8	62.4	0	175	84	39	32
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5/14/2019 22:00	3.4	164.3	11.1	6.6	60.9	0	103	44	35	26
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5/16/2019 0:00	0.6	190.4	6.2	3.0	62.0	0	61	34	40	36
5/16/2019 1:00	1.2	190.0	11.6	4.2	61.2	0	188	34	32	26
5/16/2019 2:00	0.7	209.2	10.1	4.8	60.5	0	76	29	24	26
5/16/2019 3:00	1.6	199.3	25.5	6.0	59.7	0	84	26	25	20
5/16/2019 4:00	1.9	212.9	32.9	6.0	59.3	0	124	22	26	23
5/16/2019 5:00	2.7	194.8	32.7	7.8	58.8	0	193	29	34	29
5/16/2019 6:00	3.8	199.5	31.4	9.0	60.9	0	79	38	29	39
5/16/2019 7:00	4.5	201.0	39.6	13.1	64.1	0	77	41	25	40
5/16/2019 8:00	6.1	212.9	50.6	16.7	67.5	0	141	54	41	36
5/16/2019 9:00	6.7	199.8	36.9	20.3	69.5	0	125	49	30	29
5/16/2019 10:00	6.9	194.1	37.5	17.9	70.5	0	100	58	25	38
5/16/2019 11:00	5.9	190.9	27.7	13.7	71.8	0	105	52	28	29

5/18/2019 7:00	2.6	103.4	17.7	6.0	48.8	0	26	25	29	22
5/18/2019 8:00	3.7	151.5	18.4	7.2	54.1	0	45	35	33	32
5/18/2019 9:00	4.4	168.3	28.6	9.6	64.3	0	48	27	24	28
5/18/2019 10:00	5.4	198.7	38.7	13.7	74.3	0	61	23	17	28
5/18/2019 11:00	5.7	208.9	41.7	16.7	80.9	0	105	34	24	36
5/18/2019 12:00	6.7	232.3	43.7	19.1	82.8	0	155	31	22	20
5/18/2019 13:00	6.8	204.0	46.6	18.5	83.9	0	84	25	17	17
5/18/2019 14:00	8.4	312.3	28.5	32.2	76.2	0.03	38	85	44	43
5/18/2019 15:00	6.1	278.2	17.9	18.5	65.4	0.34	4	26	8	7

5/19/2019 4:00	5.1	167.1	31.1	16.1	65.8	0	30	10	AV	6
5/19/2019 5:00	9.0	174.3	26.4	19.7	68.6	0.01	50	11	AV	13
5/19/2019 6:00	8.2	173.8	29.7	21.5	68.6	0	57	9	AV	11
5/19/2019 7:00	9.0	187.2	26.9	22.1	69.4	0	66	7	AV	10
5/19/2019 8:00	9.3	195.6	33.1	26.2	69.2	0	73	11	AV	9
5/19/2019 9:00	9.4	190.5	30.9	22.7	68.2	0	35	8	AV	5
5/19/2019 10:00	8.8	192.6	29.8	21.5	68.3	0	38	5	AV	2
5/19/2019 11:00	9.1	193.2	32.8	22.1	68.8	0	149	2	AV	4
5/19/2019 12:00	9.6	192.0	30.2	22.7	70.6	0	462	11	AV	15
5/19/2019 13:00	9.6	197.5	39.6	26.2	74.9	0	105	23	AV	22
5/19/2019 14:00	9.6	241.7	33.9	31.0	72.2	0.14	120	26	AV	17
5/19/2019 15:00	12.8	267.1	19.2	25.7	74.1	0	170	35	AV	27
5/19/2019 16:00	13.1	266.1	19.9	34.0	73.5	0	74	23	AV	10

5/22/2019 13:00	8.9	177.7	28.8	20.9	77.7	0	124	79	50	63
5/22/2019 14:00	8.7	186.0	31.8	19.7	80.4	0	213	114	80	104
5/22/2019 15:00	10.1	181.5	24.8	22.7	81.4	0	303	130	83	114
5/22/2019 16:00	9.3	183.0	31.5	23.3	82.4	0	166	124	96	114
5/22/2019 17:00	9.2	182.3	28.6	22.1	82.2	0	149	122	101	116
5/22/2019 18:00	9.1	181.4	30.8	26.2	80.9	0	116	90	71	83
5/22/2019 19:00	8.5	179.4	29.5	20.9	78.6	0	76	55	41	62

6/4/2019 12:00	4.0	154.2	27.4	9.0	68.3	0	32	23	19	25
6/4/2019 13:00	5.0	180.4	28.0	12.5	74.1	0	41	25	22	28

6/4/2019 14:00	7.0	179.3	25.3	19.1	79.1	0	60	54	26	35
6/4/2019 15:00	8.0	194.9	36.8	21.5	81.4	0	78	59	29	48
6/4/2019 16:00	7.5	195.2	49.9	20.9	80.9	0	140	63	35	45
6/4/2019 17:00	6.4	190.5	33.6	17.3	82.6	0	127	47	36	43
6/4/2019 18:00	6.0	194.4	45.8	16.1	82.0	0	166	42	30	32
6/4/2019 19:00	5.5	193.3	35.9	15.5	81.0	0	190	33	27	31
6/4/2019 20:00	3.1	198.3	39.7	10.2	78.5	0	164	30	19	29
6/4/2019 21:00	3.6	179.3	24.1	9.6	77.0	0	319	29	21	27
6/4/2019 22:00	4.2	168.5	25.3	9.6	75.4	0	68	30	18	31
6/4/2019 23:00	4.7	176.9	28.0	11.4	74.0	0	61	36	27	24
6/5/2019 0:00	3.9	174.8	24.7	8.4	73.0	0	104	28	22	26
6/5/2019 1:00	4.3	181.3	35.7	10.2	72.2	0.05	173	24	24	25
6/5/2019 2:00	8.0	269.7	20.9	21.5	70.5	0.16	122	19	25	21
6/5/2019 3:00	2.3	246.2	24.7	4.8	68.4	0.09	24	16	7	9
6/5/2019 4:00	3.2	199.6	22.0	6.6	67.5	0.03	5	12	8	9
6/5/2019 5:00	3.1	245.1	28.6	9.6	67.0	0.05	76	13	9	6
6/5/2019 6:00	3.2	210.8	34.4	9.0	66.5	0.04	47	11	6	9
6/5/2019 7:00	4.5	200.9	43.3	13.1	66.8	0	179	11	10	6
6/5/2019 8:00	5.0	256.9	26.5	12.0	69.5	0	85	16	8	3

6/12/2019 1:00	6.2	175.7	25.3	14.3	67.5	0	263	18	19	18
6/12/2019 2:00	6.9	175.5	29.1	17.3	67.0	0	97	22	15	17
6/12/2019 3:00	6.4	174.4	25.9	17.3	67.0	0	68	19	13	18
6/12/2019 4:00	5.8	178.2	23.6	14.9	67.5	0	73	14	21	12

6/12/2019 5:00	5.8	178.4	24.7	13.1	67.1	0	50	17	13	13
6/12/2019 6:00	5.5	177.1	24.9	12.5	66.8	0	72	26	18	18
6/12/2019 7:00	6.1	179.6	24.5	14.9	67.6	0	72	60	28	70
6/12/2019 8:00	6.4	186.3	27.5	16.1	70.7	0	113	75	26	69
6/12/2019 9:00	7.5	175.0	29.2	19.7	72.5	0	137	149	29	83
6/12/2019 10:00	8.1	174.0	29.7	22.1	73.1	0	181	179	38	149
6/12/2019 11:00	7.7	185.2	36.5	19.1	73.9	0	179	200	39	155
6/12/2019 12:00	6.4	263.6	22.6	14.3	69.5	0	154	101	37	92

6/13/2019 15:00	5.1	23.8	59.1	14.3	63.6	0	8	11	9	194
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6/14/2019 3:00	1.3	230.9	18.3	6.6	53.8	0	35	7	17	16
6/14/2019 4:00	1.3	209.8	33.3	4.8	52.6	0	158	18	23	19
6/14/2019 5:00	1.1	207.4	31.9	5.4	53.2	0	47	13	15	12
6/14/2019 6:00	2.4	201.8	38.1	8.4	58.0	0	57	21	18	21
6/14/2019 7:00	3.3	199.3	49.1	9.6	61.8	0	60	36	27	37
6/14/2019 8:00	5.1	208.7	56.6	17.3	65.6	0	77	60	23	33
6/14/2019 9:00	6.0	216.2	60.2	17.3	69.0	0	125	39	25	36
6/14/2019 10:00	6.4	213.9	51.0	17.9	72.0	0	125	42	27	36
6/14/2019 11:00	7.7	218.8	50.1	19.7	74.1	0	119	38	26	29
6/14/2019 12:00	8.1	220.9	49.1	21.5	75.7	0	194	44	28	33
6/14/2019 13:00	8.9	209.1	43.8	22.7	76.8	0	207	59	26	41
6/14/2019 14:00	8.9	235.0	53.0	22.7	77.6	0	195	36	31	32
6/14/2019 15:00	7.9	217.6	47.9	22.7	77.9	0	198	44	37	44

6/14/2019 16:00	7.9	197.4	39.3	22.7	78.6	0	135	26	25	27
6/14/2019 17:00	8.4	202.2	50.2	23.3	79.0	0	133	33	22	29
6/14/2019 18:00	8.9	204.5	51.6	32.2	77.1	0	180	35	27	26
6/14/2019 19:00	7.6	201.5	45.9	24.5	74.3	0	281	45	25	32
6/14/2019 20:00	6.6	208.1	55.2	23.9	72.3	0	174	32	25	19
6/14/2019 21:00	7.4	210.9	57.9	22.7	68.4	0.01	142	26	26	27
6/14/2019 22:00	5.9	224.0	52.2	25.7	63.6	0	150	28	23	24
6/14/2019 23:00	5.0	191.1	41.5	14.9	63.6	0.01	82	24	12	7
6/15/2019 0:00	6.0	178.4	30.8	16.1	64.1	0	74	11	8	8
6/15/2019 1:00	7.3	181.6	27.7	18.5	64.7	0	116	10	12	9
6/15/2019 2:00	6.7	188.7	37.8	17.9	65.1	0	202	10	7	9
6/15/2019 3:00	5.8	199.7	47.4	18.5	65.3	0	124	12	7	13
6/15/2019 4:00	4.9	204.3	53.9	15.5	65.6	0	114	10	6	11
6/15/2019 5:00	5.9	196.9	43.6	16.1	65.6	0	114	11	12	11
6/15/2019 6:00	5.9	187.9	30.8	16.7	65.6	0	186	12	10	12
6/15/2019 7:00	5.9	186.7	34.0	16.1	66.5	0	92	13	10	15
6/15/2019 8:00	6.0	192.8	40.9	14.9	67.9	0	92	18	9	26
6/15/2019 9:00	6.1	189.5	34.8	16.7	68.2	0	101	29	13	33
6/15/2019 10:00	5.5	187.1	35.8	17.3	68.1	0	117	65	12	51
6/15/2019 11:00	6.1	198.0	49.9	16.1	68.2	0	122	22	7	23
6/15/2019 12:00	5.1	191.8	31.8	14.3	65.5	0.05	132	17	12	13
6/15/2019 13:00	4.8	185.7	28.1	13.1	66.2	0	51	4	8	8

7/7/2019 13:00	5.6	9.7	49.3	14.9	72.2	0	14	13	AV	154
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7/8/2019 0:00	3.7	339.0	29.5	7.2	65.9	0	17	26	AV	60
7/8/2019 1:00	3.1	336.4	35.0	9.6	66.9	0	21	21	AV	61
7/8/2019 2:00	3.9	337.2	22.7	7.2	67.0	0	27	27	AV	97
7/8/2019 3:00	4.0	338.2	21.6	7.8	66.8	0	25	25	AV	433
7/8/2019 4:00	3.7	341.9	33.8	7.2	66.1	0	17	17	AV	164
7/8/2019 5:00	3.9	345.6	42.8	10.2	65.8	0	11	18	AV	39

7/10/2019 0:00	4.2	174.4	28.4	10.2	78.8	0	65	32	AN	26
7/10/2019 1:00	4.5	172.1	26.1	12.0	78.5	0	153	42	AN	29
7/10/2019 2:00	5.0	186.1	45.5	14.3	78.8	0	107	36	AN	24
7/10/2019 3:00	3.2	205.5	33.7	9.6	76.1	0	97	24	AN	19
7/10/2019 4:00	3.7	187.6	35.7	9.6	75.2	0	156	22	AN	20
7/10/2019 5:00	2.6	219.5	37.1	9.0	74.6	0	82	18	AN	17
7/10/2019 6:00	2.5	208.3	44.9	7.8	76.7	0	75	34	AN	30
7/10/2019 7:00	4.0	230.9	43.4	9.6	79.5	0	99	55	AN	44
7/10/2019 8:00	4.6	239.8	41.8	12.0	81.8	0	131	59	AN	57
7/10/2019 9:00	5.7	259.8	30.2	12.0	84.1	0	53	47	AN	50

7/15/2019 0:00	2.3	181.0	21.4	7.2	75.7	0	90	9	8	9
7/15/2019 1:00	2.7	183.1	24.7	7.2	74.9	0	159	9	6	7
7/15/2019 2:00	2.3	200.7	30.8	7.8	74.3	0	42	8	9	10
7/15/2019 3:00	0.8	224.6	17.3	4.2	73.4	0	24	15	11	9
7/15/2019 4:00	1.2	234.0	25.0	4.2	73.8	0	45	15	11	14
7/15/2019 5:00	2.4	231.6	46.8	7.2	74.4	0	114	17	14	12



7/15/2019 6:00	3.0	249.6	30.4	7.2	76.4	0	63	47	34	51
7/15/2019 7:00	5.6	260.4	24.3	16.1	78.1	0	41	45	22	31
7/15/2019 8:00	7.3	266.5	21.8	15.5	80.1	0	30	39	22	23
7/15/2019 9:00	7.7	274.0	23.7	17.3	82.4	0	34	117	18	27
7/15/2019 10:00	8.5	269.6	24.1	18.5	84.1	0	42	196	17	12
7/15/2019 11:00	6.5	249.6	38.3	15.5	86.1	0	63	34	21	26
7/15/2019 12:00	7.0	246.4	40.3	17.3	88.1	0	111	46	29	36
7/15/2019 13:00	6.9	235.5	43.6	18.5	89.7	0	136	59	38	49
7/15/2019 14:00	7.6	227.1	50.6	20.9	90.5	0	200	60	48	53
7/15/2019 15:00	7.6	208.2	54.8	23.3	90.8	0	145	65	45	50
7/15/2019 16:00	7.9	200.9	45.1	23.3	90.2	0	143	84	37	43
7/15/2019 17:00	7.6	219.1	50.9	23.9	87.9	0	175	47	35	30
7/15/2019 18:00	7.6	223.7	49.2	20.9	86.7	0	122	36	29	30
7/15/2019 19:00	6.2	222.3	48.0	18.5	84.5	0	78	21	22	20

7/26/2019 2:00	2.3	196.7	35.7	6.6	69.5	0	72	19	16	21
7/26/2019 3:00	2.2	185.1	28.4	7.2	68.7	0	61	17	15	15
7/26/2019 4:00	2.3	181.9	26.4	5.4	68.0	0	57	29	24	25
7/26/2019 5:00	2.5	175.0	22.7	7.8	67.4	0	94	30	21	28
7/26/2019 6:00	2.9	167.1	25.1	6.6	69.1	0	275	43	34	75
7/26/2019 7:00	4.2	182.3	33.6	9.6	71.4	0	158	59	33	39
7/26/2019 8:00	4.6	183.1	22.6	11.4	73.5	0	113	68	25	31
7/26/2019 9:00	4.4	187.5	27.9	10.2	75.1	0	108	46	35	37
7/26/2019 10:00	5.0	190.3	41.6	15.5	76.9	0	104	63	32	34

7/26/2019 11:00	5.7	184.7	31.1	12.0	78.6	0	110	57	38	34
7/26/2019 12:00	6.4	178.2	32.0	14.9	80.3	0	57	38	33	35
7/26/2019 13:00	6.1	175.0	43.7	14.9	81.7	0	75	39	25	29
7/26/2019 14:00	7.4	167.8	30.3	16.7	82.7	0	85	43	38	57
7/26/2019 15:00	6.8	169.9	30.3	15.5	83.7	0	43	40	26	40
7/26/2019 16:00	8.0	168.8	33.3	19.1	83.5	0	85	45	37	51
7/26/2019 17:00	7.2	171.8	29.6	18.5	82.7	0	85	32	30	28
7/26/2019 18:00	7.0	171.1	31.3	19.1	82.2	0	100	25	22	26
7/26/2019 19:00	6.1	164.2	29.2	13.7	80.5	0	154	25	21	27
7/26/2019 20:00	5.7	172.1	32.3	16.1	79.0	0	185	24	23	23
7/26/2019 21:00	6.4	176.5	31.3	15.5	77.6	0	75	24	19	20

7/29/2019 1:00	4.7	190.3	36.5	12.5	77.7	0	91	20	19	19
7/29/2019 2:00	4.8	187.6	40.1	13.1	77.2	0	62	15	18	20
7/29/2019 3:00	5.2	187.9	42.4	14.3	76.4	0	53	20	18	14
7/29/2019 4:00	4.3	201.4	48.4	14.9	75.2	0	75	19	19	21
7/29/2019 5:00	5.3	185.0	36.6	14.9	74.3	0	330	18	18	21
7/29/2019 6:00	5.1	210.1	41.4	13.1	74.4	0	120	33	29	25
7/29/2019 7:00	4.4	209.8	36.1	12.5	74.7	0	84	44	BA	BA

8/11/2019 4:00	3.1	154.9	17.5	7.2	68.7	0	31	21	13	17
8/11/2019 5:00	3.5	156.3	24.4	8.4	68.6	0	172	21	17	16
8/11/2019 6:00	3.1	189.1	37.0	8.4	68.9	0	61	22	14	17
8/11/2019 7:00	2.0	238.8	34.3	6.6	69.5	0	50	19	12	15

8/11/2019 8:00	3.7	197.5	36.1	12.0	71.6	0	76	17	12	14
8/11/2019 9:00	4.7	223.1	36.0	10.2	75.5	0	55	13	11	10
8/11/2019 10:00	4.2	224.8	31.7	12.0	77.6	0	37	12	12	8
8/11/2019 11:00	5.4	199.6	36.0	14.3	79.3	0	67	19	13	17
8/11/2019 12:00	6.2	197.5	39.3	16.1	81.4	0	137	23	17	21
8/11/2019 13:00	6.0	187.6	45.9	16.7	81.9	0	91	18	13	12
8/11/2019 14:00	7.1	181.4	36.1	14.3	82.7	0	82	25	17	25
8/11/2019 15:00	5.9	189.4	37.9	14.9	80.5	0	104	25	15	21
8/11/2019 16:00	6.5	178.2	29.1	15.5	80.2	0	52	18	12	16

8/21/2019 5:00	2.7	257.2	15.5	6.0	66.0	0	22	51	14	17
8/21/2019 6:00	1.9	233.2	18.4	6.6	67.1	0	9	191	11	17
8/21/2019 7:00	3.6	256.5	24.2	10.2	70.1	0	17	35	16	20

9/11/2019 5:00	0.8	191.8	33.5	4.6	74.7	0	112	31	25	27
9/11/2019 6:00	1.8	186.8	30.5	6.4	73.8	0	104	59	28	47
9/11/2019 7:00	3.1	186.4	31.3	7.8	73.6	0	187	83	25	33
9/11/2019 8:00	3.0	195.2	31.5	8.0	76.2	0	105	55	34	99
9/11/2019 9:00	3.2	192.6	32.3	11.0	79.1	0	97	62	37	62
9/11/2019 10:00	4.0	210.1	46.0	11.9	81.6	0	100	46	42	46
9/11/2019 11:00	4.5	229.0	40.5	14.2	84.1	0	67	77	36	46

9/21/2019 0:00	2.3	170.6	26.5	6.6	75.3	0	56	23	23	26
9/21/2019 1:00	3.0	176.1	26.1	8.5	74.3	0	201	32	24	23

9/30/2019 4:00	2.5	149.2	14.4	5.5	67.7	0	174	AV	AV	AV
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# American Zinc Recycling (AZR)

2701 E 114th Street, Chicago, Illinois

FRM PM <sub>10</sub> and Manganese (Mn) Data

Sampling Period: September 1, 2019 - September 30, 2019

Sampler Type: Met One E-SEQ-FRM

- Notes:
- Manganese concentrations are presented in nanograms per cubic meter (ng/m<sup>3</sup>).
  - Per City of Chicago Rules: Manganese Limit (ML) is the concentration of manganese equal to or greater than 0.30 microgram month period.
  - POL: Practical Quantitation Limit
  - MDL: Method Detection Limit
  - Method: Field: Measurement from field equipment during sample collection

IO-3.5: Measurement from analysis method  
Calculation: Resultant concentration from field and method analysis

Work Order	Client Sample ID	Lab ID	Sample Date	Date Received	Matrix	Units	Analyte	Result	Qualifier
S1910077	2958527 #47	S1910077-001	9/6/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958527 #47	S1910077-001	9/6/2019	10/3/2019	Filter	ng/filter	Manganese	2340	
S1910077	<b>2958527 #47</b>	<b>S1910077-001</b>	<b>9/6/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>97.4</b>	
S1910077	2958528 #48	S1910077-002	9/9/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958528 #48	S1910077-002	9/9/2019	10/3/2019	Filter	ng/filter	Manganese	3180	
S1910077	<b>2958528 #48</b>	<b>S1910077-002</b>	<b>9/9/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>132</b>	
S1910077	2958529 #49	S1910077-003	9/12/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958529 #49	S1910077-003	9/12/2019	10/3/2019	Filter	ng/filter	Manganese	2220	
S1910077	<b>2958529 #49</b>	<b>S1910077-003</b>	<b>9/12/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>92.5</b>	
S1910077	2958531 #90	S1910077-005	9/15/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958531 #90	S1910077-005	9/15/2019	10/3/2019	Filter	ng/filter	Manganese	5110	
S1910077	<b>2958531 #90</b>	<b>S1910077-005</b>	<b>9/15/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>213</b>	
S1910077	2958532 #93	S1910077-006	9/18/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958532 #93	S1910077-006	9/18/2019	10/3/2019	Filter	ng/filter	Manganese	3850	
S1910077	<b>2958532 #93</b>	<b>S1910077-006</b>	<b>9/18/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>160</b>	
S1910077	2958533 #95	S1910077-007	9/21/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24	
S1910077	2958533 #95	S1910077-007	9/21/2019	10/3/2019	Filter	ng/filter	Manganese	10300	

<b>S1910077</b>	<b>2958533 #95</b>	<b>S1910077-007</b>	<b>9/21/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>430</b>
S1910077	2958534 #96	S1910077-008	9/24/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24
S1910077	2958534 #96	S1910077-008	9/24/2019	10/3/2019	Filter	ng/filter	Manganese	3970
<b>S1910077</b>	<b>2958534 #96</b>	<b>S1910077-008</b>	<b>9/24/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>165</b>
S1910077	2958535 #97	S1910077-009	9/27/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24
S1910077	2958535 #97	S1910077-009	9/27/2019	10/3/2019	Filter	ng/filter	Manganese	2980
<b>S1910077</b>	<b>2958535 #97</b>	<b>S1910077-009</b>	<b>9/27/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>124</b>
S1910077	2958536 #99	S1910077-010	9/30/2019	10/3/2019	Filter	m <sup>3</sup>	Field-Actual Volume	24
S1910077	2958536 #99	S1910077-010	9/30/2019	10/3/2019	Filter	ng/filter	Manganese	2610
<b>S1910077</b>	<b>2958536 #99</b>	<b>S1910077-010</b>	<b>9/30/2019</b>	<b>10/3/2019</b>	<b>Filter</b>	<b>ng/m<sup>3</sup></b>	<b>Manganese</b>	<b>109</b>