SAT Initiative: Additional Monitoring at Jefferson Elementary School (Gary, IN)

This document describes the analysis of additional air monitoring and other data collected under EPA's initiative to assess potentially elevated air toxics levels at some of our nation's schools. The document has been prepared for technical audiences (e.g., risk assessors, meteorologists) and their management. It is intended to describe the technical analysis of data collected for this school in clear, but generally technical, terms. A summary of this analysis is presented on the page focused on this school on EPA's website (www.epa.gov/schoolair).

I. Executive Summary

- Air monitoring has been conducted at a site near Jefferson Elementary School, the Gary-4th Ave./Railcats site, as part of the EPA initiative to monitor specific air toxics in the outdoor air around priority schools.
- This site was selected for additional monitoring based on elevated ambient concentrations of manganese in air outside the school monitored during the initial phase. See the initial report for additional information (http://www.epa.gov/schoolair/pdfs/ http://www.epa.gov/schoolair/pdfs/JeffersonTechReport.pdf).
- The additional air monitoring was performed from August 5, 2010, to April 9, 2011, for manganese and other metals in particulate matter less than 10 microns (PM_{10}).
- Measured levels of manganese (PM_{10}) and the associated longer-term concentration estimate were slightly elevated in the first round of monitoring, consistent with historical data from that area. The elevated level of manganese (PM_{10}) indicated a potential for greater concern in areas closer to the source, particularly as the nearby source operations were depressed from usual operating conditions during the first round of air monitoring. It was determined that additional data, particularly at locations closer to the source, would assist in further characterizing potential exposure in the area.
- The second round of monitoring indicates that the longer-term concentration estimates for manganese (PM_{10}) are near levels of potential concern for long-term, continuous exposure.
- The Indiana Department of Environmental Management (IDEM) is aware of these monitored values, which are consistent with historical values in this area, and will continue to oversee industrial facilities in the area through air permitting and other programs.
- R5 currently has an ongoing enforcement case with the source.

II. Background on this Initiative

As part of the follow-up to the EPA initiative to implement Administrator Lisa Jackson's commitment to assess potentially elevated air toxics levels at some of our nation's schools, EPA and state and local air pollution control agencies continued to monitor specific (key) air toxics in the outdoor air around priority schools. (http://www.epa.gov/schoolair/schools.html).

- For information about the initial monitoring for Jefferson Elementary please go to http://www.epa.gov/schoolair/JeffersonEInfo.html
- The schools selected for additional monitoring were chosen based on monitored concentrations in the first round of sampling that were above levels of concern, warranting additional insight into the air quality surrounding the school and in the community. Monitors were placed at these locations for approximately 7 months and air samples were taken on at least 30 different days during that time. The samples were analyzed for specific air toxics identified for air monitoring at the school and surrounding community based on the initial round of sampling
- These monitoring results and other information collected at each school during this initiative allow us to:
  - assess specific air toxics levels occurring at these sites and associated estimates of longer-term concentrations in light of health risk-based criteria for long-term exposures,
  - better understand, in many cases, potential contributions from nearby sources to key air toxics concentrations at the schools,
  - consider what next steps might be appropriate to better understand and address air toxics at the school, and
  - improve the information and methods we will use in the future (e.g., NATA) for estimating air toxics concentrations in communities across the U.S.

Assessment of air quality under this additional monitoring initiative is specific to the elevated air toxics identified during the initial monitoring. This additional monitoring initiative is being implemented in addition to ongoing state, local, and national air quality monitoring and assessment activities, including those focused on criteria pollutants (e.g., ozone and particulate matter) or existing, more extensive, air toxics programs.

Several technical documents prepared for this project provide further details on aspects of monitoring and data interpretation and are available on the EPA website (e.g., www.epa.gov/schoolair/techinfo.html). The full titles of these documents are provided here:

- *School Air Toxics Ambient Monitoring Plan*
- *Quality Assurance Project Plan For the EPA School Air Toxics Monitoring Program*
- *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results*

Information on health effects of air toxics being monitored[1] and educational materials describing risk concepts[2] are also available from EPA's website.

III. Basis for Selecting this School and the Air Monitoring Conducted

This area was selected for additional monitoring after the initial monitoring identified elevated concentration of pollutants above levels of concern. The operational status of industry and the possible impacts on the community were also taken into consideration. The monitoring site was

[1] For example, http://www.epa.gov/schoolair/pollutants.html, http://www.epa.gov/ttn/fera/risk_atoxic.html.
[2] For example, http://www.epa.gov/ttn/atw/3_90_022.html, http://www.epa.gov/ttn/atw/3_90_024.html.

moved from the original school site to a location closer to the industrial source at Gary-4th Ave./ Railcats site (Figure 1).

Additional monitoring commenced at the Gary-4th Ave./ Railcats site on September 5, 2010, and continued through April 9, 2011. During this period, 34 valid samples of airborne particles were collected using a PM_{10} sampler[3] and analyzed for manganese (the key pollutant) and for a small standardized set of additional metals that are routinely included in the analytical methods for the key pollutant.

All sampling methodologies are described in EPA's schools air toxics monitoring plan (http://www.epa.gov/schoolair/techinfo.html).[4]

IV. Monitoring Results and Analysis

A. Background for the SAT Analysis

Please see the initial report (http://www.epa.gov/schoolair/JeffersonEInfo.html) for background information on the SAT Analysis.

B. Chemical Concentrations

Using the analysis approach described in the initial report (http://www.epa.gov/schoolair/JeffersonEInfo.html), we analyzed the chemical concentration data for the key pollutant, manganese (Table 1 and Figures 1), with regard to areas of interest identified below.

Manganese, key pollutant:

- Do the monitoring data indicate influence from a nearby source?

  → The monitoring data include several manganese (PM_{10}) concentrations that are higher than concentrations commonly observed in other locations nationally.[5]

- Do the monitoring data indicate elevated levels that pose significant long-term health concerns?

  → The longer-term concentration estimate for manganese is slightly above the long-term comparison level for continuous, long-term exposures (Table 1).[6]

[3] In general, this sampler collects airborne particles with a diameter of 10 microns or smaller.
[4] IDEM staff operated the monitors and sent the canisters and filters to the analytical laboratory under contract to EPA.
[5] For example, twenty eight of the thirty four valid sample concentrations at this site (Table 2) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix A). Because these NATTS sites are generally sited so as to not be influenced by specific nearby sources, EPA is using the 75th percentile point of concentrations at these sites as a benchmark of indicating potential influence from a source nearby to the school.
[6] The upper end of the interval is nearly 1.4 times the mean of the monitoring data and is 49% higher than the long-term noncancer-based comparison level.

- The long-term comparison level is a continuous exposure concentration (24 hours a day, all year, over a lifetime) associated with little risk of adverse effect; it is not an exposure concentration at which effects have been observed or are predicted to occur.[7]
- As manganese has not been found to be carcinogenic, it has no cancer-based comparison level.[8]

→ Additionally, we did not identify any concerns regarding short-term exposures as each individual measurement is below the individual sample screening level for manganese (which is based on consideration of exposure all day, every day over a period ranging from a couple of weeks to longer for some pollutants).[11]

Multiple Pollutants:

- Do the data collected for the air toxics monitored indicate the potential for other monitored pollutants to be present at levels that in combination with the key pollutant levels indicate an increased potential for cumulative impacts of significant concern (e.g., that might warrant further investigation)

  → The data collected for the key and other air toxics and the associated longer-term concentration estimates do not pose significant concerns for cumulative health risk from these pollutants (Appendix B and C).[9]

C. Wind and Other Meteorological Data

Please see the initial report (http://www.epa.gov/schoolair/pdfs/ http://www.epa.gov/schoolair/pdfs/JeffersonTechReport.pdf) for background on the wind and other meteorological data.

The meteorological station operated by IDEM, located 1.5 miles ENE of the monitoring site, collected wind speed and wind direction measurements beginning September 5, 2010, and ending April 9, 2011. The meteorological data collected at the IDEM site on sampling days are presented in Figure 2 and Table 2.

The nearest NWS station is at Lansing Municipal Airport in Lansing, IL. This station is approximately 11.3 miles SW of the monitoring site. Measurements taken at that station include wind, temperature, and precipitation. Measurements taken during the second round are

[7] The manganese comparison level is EPA's RfC (50 ng/m3). Manganese air concentrations at which health effects have been documented are higher than the RfC (http://www.epa.gov/ttn/atw/hlthef/manganes.html#conversion). EPA recognizes that ATSDR recently revised its chronic inhalation MRL for manganese (300 ng/m3; http://www.atsdr.cdc.gov/toxguides/toxguide-151.pdf) but maintains the hierarchy of toxicity values in which IRIS values are given first priority. The hierarchy and data analysis methods are described in the document *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results.*

[8] www.epa.gov/iris

[9] We note that this initiative is focused on investigation for a school-specific set of key pollutants indicated by previous analyses (and a small set of others for which measurements are obtained in the same analysis). The combined impact of pollutants or stressors other than those monitored in this project is a broader area of consideration in other EPA activities. General information on additional air pollutants is available at http://www.epa.gov/air/airpollutants.html

representative of meteorological data taken during 2002-2007. These are presented in Table 2 and Appendix D.

Key findings drawn from this information and the considerations discussed below include:

- Both the sampling results and the wind data indicate that some of the air samples were collected on days when the nearby key source was contributing to conditions at the monitoring location.
- The wind patterns across sampling dates are generally similar to those observed across the record of on-site meteorological data during the sampling period.
- Our ability to provide a confident characterization of the wind flow patterns over the long-term is somewhat limited; the NWS station at Lansing Municipal Airport during the sampling timeframe appears to represent the specific wind flow patterns at the monitoring location.
- The wind pattern at the NWS station during the sampling period is generally similar to the historical long-term wind flow pattern at that location. This suggests that, on a regional scale, the 7-month sampling period may be representative of year-round wind patterns.

- What is the direction of the key source of manganese emissions in relation to the monitoring location?
  - → The nearby source emitting the key pollutant into the air (described in section III above) lies approximately one mile NNE of the monitoring site.
  - → Using the property boundaries of the full facility (in lieu of information regarding the location of specific sources of emissions at the facility), we have identified an approximate range of wind directions to use in considering the potential influence of the facility on air concentrations at the monitoring site.
  - → This general range of wind directions, from approximately 281 to 79 degrees, is referred to here as the expected zone of source influence (ZOI).

- On days the air samples were collected, how often did wind come from direction of the key source?

  For manganese sampling, there were 25 out of 34 days in which the on-site wind data had a portion of the winds from the ZOI (Figure 2, Table 2).

- How do wind patterns on the air monitoring days compare to those across the complete monitoring period and what might be expected over the longer-term at the monitoring location?
  - → Wind patterns across the air monitoring days appear generally similar to those observed over the record of on-site meteorological data during the sampling period, particularly with regard to the expected ZOI.

→ Wind patterns at the nearest NWS station (at Lansing Municipal Airport) during the sampling period are generally similar to those recorded at that location over the long term (2002-2007 period; Appendix D), supporting the idea that regional meteorological patterns in the area during the monitoring period were consistent with long-term patterns. There is some uncertainty as to whether the general wind patterns at the school location for longer periods would be similar to the general wind patterns at the Lansing Municipal Airport (see below).

- How do wind patterns at the school compare to those at the Lansing Municipal Airport NWS station, particularly with regard to prevalent wind directions and the direction of the key source?
  → During the sampling period for which data are available both at the meteorological station and at the reference NWS station (approximately 7 months), prevalent winds at the meteorological station and the NWS site are predominantly from the southwest. The windroses for the two sites during the sampling period (Figure 2 and Appendix D) show some similarities in wind flow patterns.

- Are there other meteorological patterns that may influence the measured concentrations at the school monitoring site?
  → No, we did not observe other meteorological patterns that may influence the measured concentrations at the school monitoring site.

V. Key Source Information

- Was the source operating as usual during the monitoring period?
  – The nearby source of the key pollutant has an operating permit issued by IDEM that includes operating requirements.[10]
  – Information about the nearby source indicates that the facility had no significant change in production during the monitoring period.

VI. Integrated Summary and Next Steps

A. Summary of Key Findings

1. Do the data collected near this school indicate an elevated level of concern, as implied by information that led to identifying this school for monitoring?
   → Measured levels of manganese (PM_{10}) continue to be slightly elevated. This elevated level of manganese indicates a potential concern in areas closer to the source.

[10] Operating permits, which are issued to air pollution sources under the Clean Air Act, are described at: http://www.epa.gov/air/oaqps/permits.

2. Are there indications, e.g., from the meteorological or other data, that the sample set may not be indicative of longer-term air concentrations? Would we expect higher (or lower) concentrations at other times of year?
   → The data we have collected appear to reflect air concentrations during the entire monitoring period, with no indications that the sampling day conditions were inconsistent with conditions overall during this period.
   → Among the data collected for this site, we have none that would indicate generally higher (or lower) concentrations during other times of year. The wind flow patterns at the nearest NWS station during the sampling period appear to be representative of long-term wind flow at that site. The ability to provide a confident characterization of the wind flow patterns at the monitoring site over the long-term is somewhat limited. However, the NWS site at Lansing Municipal Airport does appear to represent the specific wind flow patterns at the school location.

B. **Next Steps for Key Pollutants**
1. The Indiana Department of Environmental Management (IDEM) will continue to oversee industrial facilities in the area through air permits and other programs.
2. R5 currently has an on-going enforcement case with the source.

VII. Figures and Tables

A. Tables
   1. Gary-4th Ave./Railcats Site – Key Pollutant Analysis
   2. Gary-4th Ave./Railcats Site Key Pollutant Concentrations and Meteorological Data

B. Figures
   1. Jefferson Elementary School and Gary-4th Ave./ Railcats Site Map with Meteorological Sites
   2. Gary-4th Ave./Railcats Site – Key Pollutant Analysis
   3. Gary-4th Ave./Railcats Site (Gary, IN) Concentrations and Wind Information

VIII. Appendices

A. National Air Toxics Trends Stations Measurements (2004-2008)

B. Analysis of Other (Non-Key) Air Toxics Monitored and Multiple-Pollutant Considerations.

   Table B-1. Gary-4th Ave./Railcats Site – Other Monitored Pollutant Analysis

C. Gary-4th Ave./Railcats Site Pollutant Concentrations

D. Windroses for Lansing Municipal Airport

Table 1. Gary-4th Ave./Railcats Site – Key Pollutant Analysis

Parameter	Units	Mean of Measurements	95% Confidence Interval on the Mean	Long-term Comparison Level[a]	
				Cancer-Based[b]	Noncancer-Based[c]
Manganese (PM_{10})	ng/m^3	51.64[d]	28.80 - 74.49	NA	50

ng/m^3 nanograms per cubic meter

NA not applicable

[a] Details regarding these values are in the technical report, Schools Air Toxics Monitoring Activity (2009) Uses of Health Effects Information.

[b] Air toxics for which the upper 95% confidence limit on the mean concentration is above this level will be fully discussed in the text and may be considered a priority for potential follow-up activities, if indicated in light of the full set of information available for the site. Findings of the upper 95% confidence limit below 1% of the comparison level (i.e., where the upper 95% confidence limit is below the corresponding 1-in-1-million cancer risk based concentration) are generally considered a low priority for follow-up activity. Situations where the summary statistics for a pollutant are below this comparison level but above 1% of this level are fully discussed in the text of the report.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration are near or below the noncancer-based comparison level are generally of low concern and will generally be considered a low priority for follow-up activity. Pollutants for which the 95% confidence limits extend appreciably above the noncancer-based comparison level are fully discussed in the school-specific report and may be considered a priority for follow-up activity, if indicated in light of the full set of information available for the site.

[d] The mean of measurements for manganese (PM_{10}) is the average of all sample results, which include 34 detections that ranged from 3.54 to 318 $ng/m^{3.}$

Table 2. Gary-4th Ave./ Railcats Site Key Pollutant Concentrations and Meteorological Data

Parameter	Units	9/5/2010	9/11/2010	9/17/2010	9/23/2010	9/29/2010	10/5/2010	10/11/2010	10/17/2010	10/23/2010	10/29/2010	11/4/2010	11/10/2010
Manganese (PM_{10})	ng/m^3	6.91	16.4	--	22	13.5	87.1	119	91.3	23.5	21.5	318	23.8
% Hours w/Wind Direction from Expected ZOI[a]	%	0.0	29.2	50.0	0.0	0.0	33.3	45.8	62.5	0.0	0.0	100.0	0.0
Wind Speed (avg. of hourly winds)	mph	5.6	5.2	3.9	10.0	3.7	3.7	4.2	5.4	8.6	6.5	14.9	6.7
Wind Direction (avg. of unitized vector)[b]	deg.	193.5	164.6	78.9	192.8	191.1	236.0	271.4	51.8	188.9	222.3	355.1	150.8
% of Hours with Speed below 2 knots	%	0.0	12.5	12.5	0.0	29.2	20.8	8.3	0.0	0.0	0.0	0.0	0.0
Daily Average Temperature	°F	60.8	65.5	62.2	74.3	58.9	49.5	66.3	55.1	57.7	41.1	44.9	54.8
Daily Precipitation	inches	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.19	0.00

All precipitation and temperature data were from the Lansing Municipal Airport NWS Station.

[a] Based on count of hours for which vector wind direction is from expected zone of influence.

[b] Wind direction for each day is represented by values derived by scalar averaging of hourly estimates that were produced (by wind instrumentation's logger) as unitized vectors (specified as degrees from due north).

-- No sample was conducted for this pollutant on this day or the result was invalidated.

Table 2. Gary-4th Ave./ Railcats Site Key Pollutant Concentrations and Meteorological Data

Parameter	Units	11/16/2010	11/22/2010	11/28/2010	12/4/2010	12/10/2010	12/16/2010	12/22/2010	12/28/2010	1/3/2011	1/9/2011	1/15/2011	1/21/2011
Manganese (PM_{10})	ng/m^3	79.2	5.04	3.54	93.5	37.3	--	51.2	5.76	5.78	16.7	16.3	42.3
% Hours w/Wind Direction from Expected ZOI[a]	%	45.8	0.0	0.0	54.2	0.0	8.3	62.5	0.0	0.0	8.3	54.2	8.3
Wind Speed (avg. of hourly winds)	mph	5.6	12.3	7.5	7.6	8.1	4.4	9.2	8.3	8.1	3.9	9.0	7.4
Wind Direction (avg. of unitized vector)[b]	deg.	77.1	203.4	167.3	58.4	201.1	183.3	322.4	202.4	206.4	200.3	297.9	250.2
% of Hours with Speed below 2 knots	%	16.7	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0
Daily Average Temperature	°F	40.1	61.6	30.5	30.0	30.1	22.0	29.2	19.2	26.4	18.8	25.0	8.1
Daily Precipitation	inches	0.00	0.88	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

All precipitation and temperature data were from the Lansing Municipal Airport NWS Station.

[a] Based on count of hours for which vector wind direction is from expected zone of influence.

[b] Wind direction for each day is represented by values derived by scalar averaging of hourly estimates that were produced (by wind instrumentation's logger) as unitized vectors (specified as degrees from due north).

-- No sample was conducted for this pollutant on this day or the result was invalidated.

Table 2. Gary-4th Ave./ Railcats Site Key Pollutant Concentrations and Meteorological Data

Parameter	Units	1/27/2011	2/2/2011	2/8/2011	2/14/2011	2/20/2011	2/26/2011	3/4/2011	3/10/2011	3/16/2011	3/22/2011	3/28/2011	4/3/2011	4/9/2011
Manganese (PM_{10})	ng/m^3	4.67	20.5	22.5	83.3	--	13.3	98.9	47.6	20.9	19.9	226	52.8	45.8
% Hours w/Wind Direction from Expected ZOI[a]	%	12.5	75.0	25.0	41.7	37.5	4.2	29.2	91.7	0.0	45.8	100.0	0.0	25.0
Wind Speed (avg. of hourly winds)	mph	7.7	16.0	8.8	9.4	7.7	4.6	8.2	8.7	7.3	7.7	11.1	11.5	6.1
Wind Direction (avg. of unitized vector)[b]	deg.	234.1	351.0	281.9	335.9	113.6	185.4	174.5	332.8	212.9	85.3	43.2	167.9	114.5
% of Hours with Speed below 2 knots	%	0.0	0.0	0.0	16.7	4.2	12.5	4.2	0.0	0.0	0.0	0.0	0.0	8.3
Daily Average Temperature	°F	21.9	22.6	18.9	40.8	32.4	30.8	46.6	35.9	43.8	43.1	31.2	51.8	52.6
Daily Precipitation	inches	0.00	0.02	0.01	0.00	0.44	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00

All precipitation and temperature data were from the Lansing Municipal Airport NWS Station.

[a] Based on count of hours for which vector wind direction is from expected zone of influence.

[b] Wind direction for each day is represented by values derived by scalar averaging of hourly estimates that were produced (by wind instrumentation's logger) as unitized vectors (specified as degrees from due north).

-- No sample was conducted for this pollutant on this day or the result was invalidated.

Figure 1. Jefferson Elementary School and Gary-4th Ave./ Railcats Site Map with Meteorological Sites

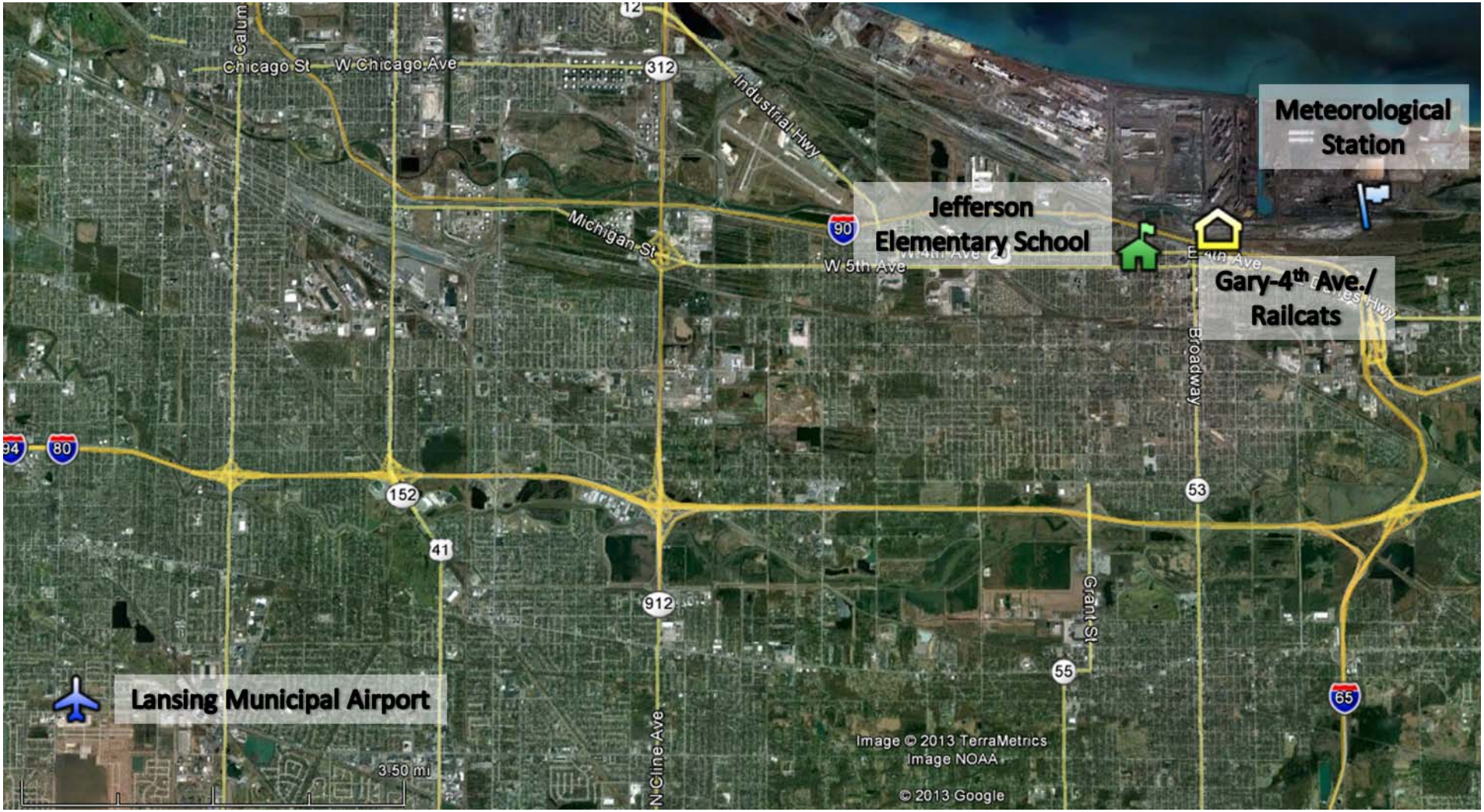
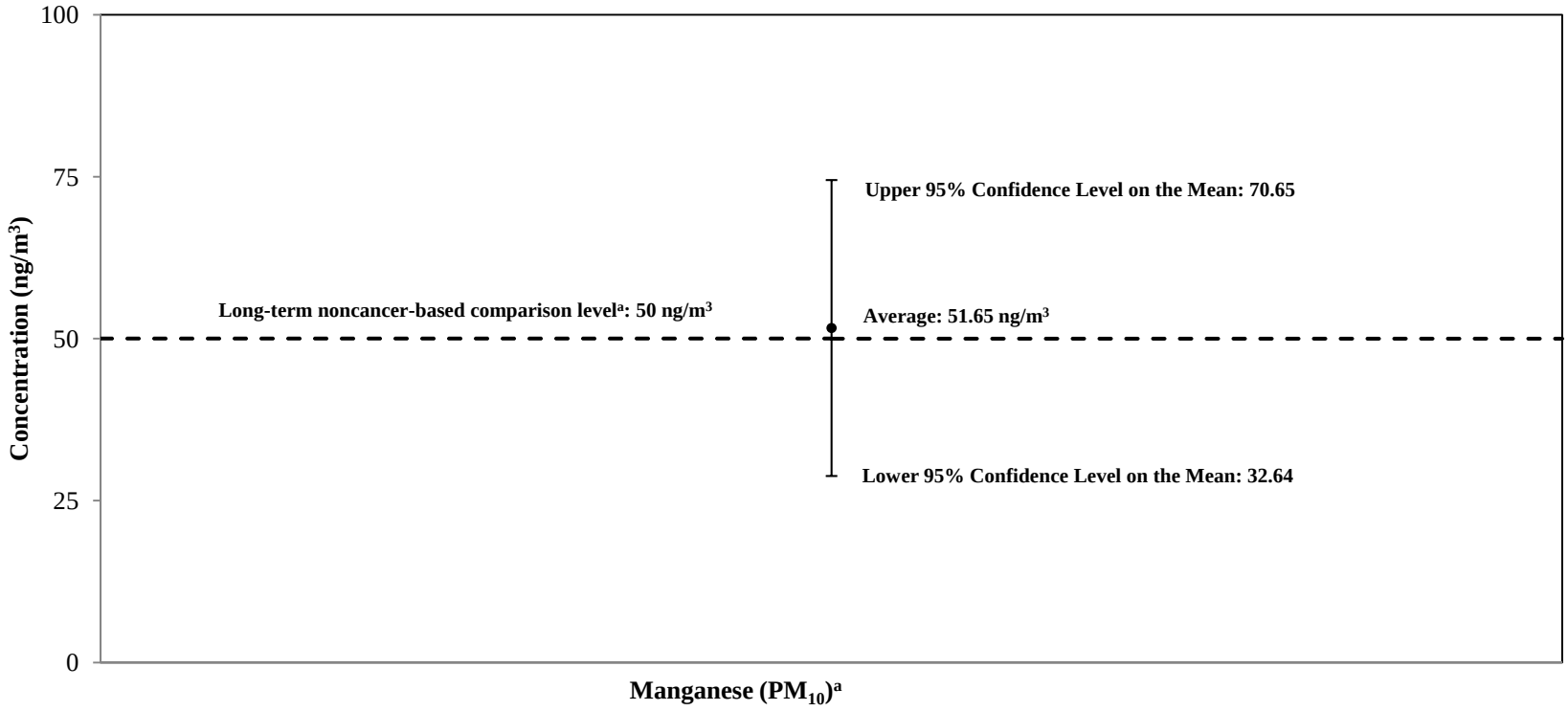
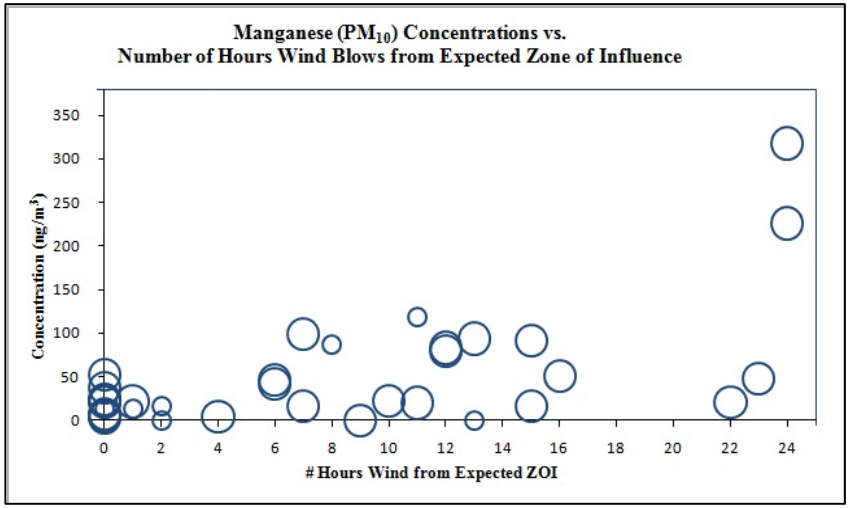


Figure 2. Gary-4th Ave./Railcats Site – Key Pollutant Analysis (Manganese (PM_{10})) Analysis



[a] Air toxics for which the upper 95% confidence limit on the mean concentration are near or below the noncancer-based comparison level are generally of low concern and will generally be considered a low priority for follow-up activity. Pollutants for which the 95% confidence limits extend appreciably above the noncancer-based comparison level are fully discussed in the school-specific report and may be considered a priority for follow-up activity, if indicated in light of the full set of information available for the site.

Figure 3. Gary-4th Ave./Railcats Site Manganese Concentration and Wind Information



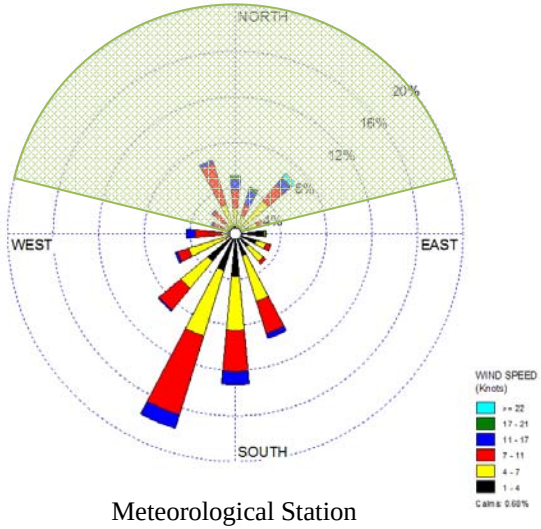
KEY

Pollutant: Manganese (PM_{10})
Timeframe: Sept. 5, 2010 – April 9, 2011

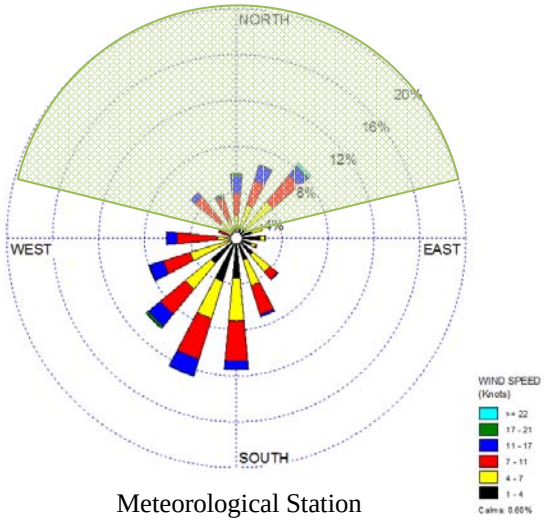
Wind Speed: 2.5 – 5.0 mph
Wind Speed: > 5.0 mph

Note

Each circle denotes a 24-hour collection of air for chemical analysis. The size of the circle indicates the magnitude of the wind speed for that day (wind data shown in Table 2). The expected zone of source influence is a rough approximation of the range of directions from which winds carrying chemicals emitted by the key source may originate.



Meteorological Station
Composite Hourly Windrose
On Sample Days
(Sept. 5, 2010 – April 9, 2011)
Zone of Influence



Meteorological Station
Composite Hourly Windrose
Across Sample Period
(Sept. 5, 2010 – April 9, 2011)
Zone of Influence

Appendix A. National Air Toxics Trends Stations Measurements (2004 – 2008)[a]

Pollutant	Units	# Samples Analyzed	% Detections	Maximum	Arithmetic Mean[b]	Geometric Mean	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Antimony (PM_{10})	ng/m^3	2,372	94%	43.30	1.71	1.21	ND	0.60	1.13	2.17	4.33
Arsenic (PM_{10})	ng/m^3	5,076	86%	47.70	0.93	0.70	ND	0.29	0.56	1.02	2.89
Beryllium (PM_{10})	ng/m^3	4,771	64%	1.97	0.05	0.02	ND	ND	<0.01	0.02	0.50
Cadmium (PM_{10})	ng/m^3	4,793	85%	15.30	0.27	0.17	ND	0.05	0.13	0.29	0.94
Chromium (PM_{10})	ng/m^3	5,094	92%	172.06	2.71	1.66	ND	0.93	1.98	2.85	7.10
Cobalt (PM_{10})	ng/m^3	2,614	91%	20.30	0.28	0.18	ND	0.08	0.15	0.27	1.00
Manganese (PM_{10})	ng/m^3	4,793	99%	734.00	10.39	5.20	<0.01	2.41	4.49	9.96	33.78
Mercury (PM_{10})	ng/m^3	1,167	81%	2.07	0.07	0.04	ND	0.01	0.02	0.06	0.32
Nickel (PM_{10})	ng/m^3	4,815	90%	110.10	2.05	1.49	ND	0.74	1.44	2.50	5.74
Selenium (PM_{10})	ng/m^3	2,382	96%	13.00	1.10	0.53	<0.01	0.24	0.53	1.07	5.50
Acetonitrile	µg/m^3	1,804	69%	542.30	3.55	0.72	ND	ND	0.27	0.76	8.60
Acrylonitrile	µg/m^3	3,673	31%	5.51	0.06	0.10	ND	ND	ND	0.03	0.33
Benzene	µg/m^3	6,313	94%	10.19	1.03	0.84	ND	0.48	0.80	1.31	2.81
Bromomethane	µg/m^3	5,376	61%	120.76	0.11	0.05	ND	ND	0.03	0.05	0.12
Butadiene, 1,3-	µg/m^3	6,427	67%	15.55	0.10	0.09	ND	ND	0.05	0.13	0.38
Carbon disulfide	µg/m^3	1,925	91%	46.71	2.32	0.25	ND	0.03	0.09	0.96	12.65
Carbon tetrachloride	µg/m^3	6,218	86%	1.76	0.52	0.58	ND	0.47	0.57	0.65	0.87
Chloro-1,3-butadiene, 2-	µg/m^3	2,341	11%	0.17	<0.01	0.03	ND	ND	ND	ND	0.02
Chlorobenzene	µg/m^3	5,763	30%	1.10	0.02	0.04	ND	ND	ND	0.01	0.11
Chloroethane	µg/m^3	4,625	37%	0.58	0.02	0.04	ND	ND	ND	0.03	0.08
Chloroform	µg/m^3	6,432	73%	48.05	0.17	0.14	ND	ND	0.10	0.17	0.61
Chloromethane	µg/m^3	5,573	95%	19.70	1.17	1.20	ND	1.03	1.18	1.36	1.68
Chlorotoluene, alpha-	µg/m^3	3,046	9%	2.49	0.01	0.05	ND	ND	ND	ND	0.05
Dibromoethane, 1,2-	µg/m^3	5,646	19%	4.15	0.01	0.05	ND	ND	ND	ND	0.05
Dichlorobenzene, p-	µg/m^3	5,409	60%	13.65	0.19	0.16	ND	ND	ND	0.18	0.90
Dichloroethane, 1,1-	µg/m^3	5,670	16%	0.36	0.01	0.02	ND	ND	ND	ND	0.02
Dichloroethylene, 1,1-	µg/m^3	5,480	19%	0.44	0.01	0.02	ND	ND	ND	ND	0.04
Dichloropropane,1,2-	µg/m^3	6,225	17%	1.80	0.01	0.03	ND	ND	ND	ND	0.04

Appendix A. National Air Toxics Trends Stations Measurements (2004 – 2008)[a]

Pollutant	Units	# Samples Analyzed	% Detections	Maximum	Arithmetic Mean[b]	Geometric Mean	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Dichloropropylene, Cis -1,3-	µg/m^3	4,705	18%	0.80	0.01	0.05	ND	ND	ND	ND	0.11
Dichloropropylene, Trans -1,3-	µg/m^3	4,678	18%	1.13	0.02	0.05	ND	ND	ND	ND	0.11
Ethyl acrylate	µg/m^3	1,917	1%	0.08	<0.01	0.04	ND	ND	ND	ND	ND
Ethylbenzene	µg/m^3	6,120	84%	8.84	0.42	0.32	ND	0.10	0.29	0.53	1.33
Ethylene dichloride	µg/m^3	6,143	38%	4.49	0.03	0.05	ND	ND	ND	0.04	0.09
Hexachloro-1,3-butadiene	µg/m^3	3,727	20%	0.97	0.03	0.10	ND	ND	ND	0.00[b]	0.18
Methyl methacrylate	µg/m^3	1,917	9%	14.05	0.13	0.49	ND	ND	ND	0.00[b]	0.53
Methyl tert-butyl ether	µg/m^3	4,370	41%	20.50	0.28	0.12	ND	ND	ND	0.04	1.53
Methyl-2-pentanone, 4-	µg/m^3	2,936	60%	2.95	0.11	0.09	ND	ND	0.02	0.12	0.49
Methylene chloride	µg/m^3	6,206	82%	214.67	0.59	0.34	ND	0.14	0.28	0.49	1.35
Styrene	µg/m^3	6,080	70%	27.22	0.16	0.11	ND	ND	0.05	0.16	0.60
Tetrachloroethane, 1,1,2,2-	µg/m^3	5,952	20%	2.47	0.02	0.04	ND	ND	ND	ND	0.07
Tetrachloroethylene	µg/m^3	6,423	71%	42.12	0.28	0.20	ND	ND	0.13	0.27	0.88
Toluene	µg/m^3	5,947	95%	482.53	2.46	1.54	0.01	0.70	1.51	3.05	7.42
Tribromomethane	µg/m^3	2,946	4%	1.18	0.01	0.16	ND	ND	ND	ND	ND
Trichlorobenzene, 1,2,4-	µg/m^3	4,301	21%	45.27	0.07	0.10	ND	ND	ND	ND	0.16
Trichloroethane, 1,1,1-	µg/m^3	5,944	73%	3.17	0.09	0.10	ND	ND	0.08	0.11	0.20
Trichloroethane,1,1,2-	µg/m^3	5,210	19%	5.89	0.01	0.04	ND	ND	ND	ND	0.05
Trichloroethylene	µg/m^3	6,410	46%	6.50	0.05	0.07	ND	ND	ND	0.05	0.22
Vinyl chloride	µg/m^3	6,284	18%	1.61	0.01	0.02	ND	ND	ND	ND	0.03
Xylene, m/p-	µg/m^3	4,260	90%	21.41	1.12	0.71	ND	0.26	0.69	1.43	3.65
Xylene, o-	µg/m^3	6,108	83%	9.21	0.41	0.30	ND	0.09	0.24	0.52	1.39
Acenaphthene (total tsp & vapor)	ng/m^3	69	93%	9.48	2.36	1.94	ND	1.24	1.99	3.03	5.10
Acenaphthylene (total tsp & vapor)	ng/m^3	69	52%	8.41	0.79	0.74	ND	ND	0.09	0.80	4.38
Anthracene (total tsp & vapor)	ng/m^3	1,102	47%	50.20	0.37	0.43	ND	ND	ND	0.39	1.48
Benzo(a)anthracene (total tsp & vapor)	ng/m^3	1,122	73%	2.56	0.10	0.07	ND	ND	0.04	0.10	0.35
Benzo(a)pyrene (total tsp & vapor)	ng/m^3	1,111	58%	2.64	0.09	0.09	ND	ND	0.03	0.10	0.34
Benzo[B]Fluoranthene	ng/m^3	1,110	86%	4.63	0.19	0.13	ND	0.04	0.10	0.21	0.67

Appendix A. National Air Toxics Trends Stations Measurements (2004 – 2008)[a]

Pollutant	Units	# Samples Analyzed	% Detections	Maximum	Arithmetic Mean[b]	Geometric Mean	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Benzo[E]Pyrene(Tsp)	ng/m^3	1,121	72%	2.29	0.11	0.09	ND	ND	0.05	0.13	0.38
Benzo[G,H,I]Perylene	ng/m^3	69	86%	0.75	0.12	0.09	ND	0.04	0.07	0.12	0.46
Benzo[K]Fluoranthene	ng/m^3	1,122	67%	1.28	0.05	0.05	ND	ND	0.02	0.06	0.20
Chrysene (total tsp & vapor)	ng/m^3	1,117	92%	3.85	0.22	0.15	ND	0.07	0.13	0.25	0.70
Dibenzo[A,H]Anthracene	ng/m^3	69	4%	0.08	<0.01	0.08	ND	ND	ND	ND	ND
Fluoranthene (total tsp & vapor)	ng/m^3	69	96%	3.04	1.46	1.16	ND	0.96	1.42	1.95	2.86
Fluorene, 9-H (total tsp & vapor)	ng/m^3	1,112	99%	117.00	4.72	3.21	<0.01	1.84	3.00	5.24	13.84
Indeno[1,2,3-Cd]Pyrene	ng/m^3	69	51%	0.55	0.06	0.08	ND	ND	0.02	0.07	0.30
Naphthalene (total tsp & vapor)	ng/m^3	1,099	100%	0.54	0.08	0.05	<0.01	0.03	0.06	0.10	0.20
Perylene (total tsp & vapor)	ng/m^3	1,128	18%	0.46	0.01	0.04	ND	ND	ND	ND	0.06
Phenanthrene (total tsp & vapor)	ng/m^3	1,116	100%	197.00	10.55	6.25	ND	3.37	6.01	12.00	33.23
Pyrene (total tsp & vapor)	ng/m^3	1,115	99%	58.80	1.37	0.84	<0.01	0.46	0.87	1.54	4.46

Key Pollutant

ND No results of this chemical were registered by the laboratory analytical equipment.

[a] The summary statistics in this table represent the range of actual daily HAP measurement values taken at NATTS sites from 2004 through 2008. These data were extracted from AQS in summer 2008 and 2009. During the time period of interest, there were 28 sites measuring VOCs, carbonyls, metals, and hexavalent chromium. We note that some sites did not sample for particular pollutant types during the initial year of the NATTS Program, which was 2004. Most of the monitoring stations in the NATTS network are located such that they are not expected to be impacted by single industrial sources. The concentrations typically measured at NATTS sites can thus provide a comparison point useful to considering whether concentrations measured at a school are likely to have been influenced by a significant nearby industrial source, or are more likely to be attributable to emissions from many small sources or to transported pollution from another area. For example, concentrations at a school above the 75th percentile may suggest that a nearby industrial source is affecting air quality at the school.

[b] In calculations involving non-detects (ND), a value of zero is used.

Appendix B. Analysis of Other (Non-Key) Air Toxics Monitored and Multiple-Pollutant Considerations.

At each school in this National SAT Initiative, monitoring has been targeted to get information on a limited set of key hazardous air pollutants (HAPs).[11] These pollutants are the primary focus of the monitoring activities at a school and a priority for us based on our emissions, modeling and other information. In analyzing air samples for these key pollutants, we have also obtained results for some other pollutants that are routinely included with the same test method. Our consideration of the data collected for these additional HAPs is described in the first section below. In addition to evaluating monitoring results for individual pollutants, we also considered the potential for cumulative impacts from multiple pollutants as described in the second section below (see Table B-1).

Other Air Toxics (HAPs)

- Do the monitoring data indicate elevated levels of any other air toxics or hazardous air pollutant (HAPs) that pose significant long-term health concerns?

  → With the exception of manganese, the longer-term concentration estimates for all other HAPs monitored are below their long-term comparison levels.

    - The longer-term concentration estimate for manganese is slightly above the long-term comparison level for manganese. This comparison level is a continuous exposure concentration (24-hours a day, all year, over a lifetime) associated with little risk of adverse effect; it is an exposure concentration appreciably below levels at which effects have been observed.

  → For pollutants with cancer-based comparison levels, longer-term concentration estimates for all but one of these (chromium) are more than tenfold lower.

  → Additionally, each individual measurement for these pollutants is below the individual sample (short-term) screening level developed for considering potential short-term exposures for that pollutant.[12]

Multiple Pollutants

As described in the main body of the report and background materials, this initiative and the associated analyses are focused on an investigation of key pollutants for each school that were identified by previous analyses. This focused design does not provide for the consideration of

[11] Section 112(b) of the Clean Air Act identifies 189 hazardous air pollutants, three of which have subsequently been removed from this list. These pollutants are the focus of regulatory actions involving stationary sources described by CAA section 112 and are distinguished from the six pollutants for which criteria and national ambient air quality standards (NAAQS) are developed as described in section 108.

[12] The individual sample screening levels and their use is summarized on the website and described in detail in *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results.*

combined impacts of pollutants or stressors other than those monitored in this project. Broader analyses and those involving other pollutants may be the focus of other EPA activities.[13]

In our consideration of the potential for impacts from key pollutants at the monitored schools, we have also considered the potential for other monitored pollutants to be present at levels that in combination with the key pollutant levels contribute to an increased potential for cumulative impacts. This was done in cases where estimates of longer-term concentrations for any non-key HAPs are within an order of magnitude of their comparison levels even if these pollutant levels fall below the comparison levels. This analysis is summarized below.

- Do the data collected for the air toxics monitored indicate the potential for other monitored pollutants to be present at levels that in combination with the key pollutant levels indicate an increased potential for cumulative impacts of significant concern (e.g., that might warrant further investigation)?

  → The data collected for the key and other air toxics and the associated longer-term concentration estimates does not pose a concern for cumulative health risk from these pollutants.

  - In addition to the key pollutant manganese, the only other HAP monitored whose longer-term concentration estimates are more than ten percent of their lowest comparison level is chromium.
  - The lowest comparison level for chromium (conservatively based on the most toxic form of chromium, hexavalent chromium)[14] is based on carcinogenic risk to the respiratory system; in addition, hexavalent chromium is commonly a small fraction of the total chromium reported. These factors (different toxic effects; likely small fraction of hexavalent chromium) reduce cumulative risk concerns for chromium and manganese.

[13] General information on additional air pollutants is available at http://www.epa.gov/air/airpollutants.html.
[14] The noncancer-based comparison level for chromium is much higher than the cancer-based level and is based on risk of other effects posed to the respiratory system by hexavalent chromium in particulate form.

Table B-1. Gary-4th Ave./Railcats Site – Other Monitored Pollutant Concentrations

Parameter	Units	Mean of Measurements[a]	95% Confidence Interval on the Mean	Long-term Comparison Level[b]	
				Cancer-Based[c]	Noncancer-Based[d]
Non-Key HAPS with mean greater than 10% of the lowest comparison level					
Chromium (PM_{10})	ng/m^3	5.74	4.95 - 6.54	8.3[e]	100[e]
Non-Key HAPS with mean lower than 10% of the lowest comparison level					
Antimony (PM_{10})	ng/m^3	1.82	1.07 - 2.56	NA	200
Arsenic (PM_{10})	ng/m^3	1.14	0.89 - 1.39	23	15
Beryllium (PM_{10})	ng/m^3	0.02	0.01 - 0.03[f]	42	20
Cadmium (PM_{10})	ng/m^3	0.46	0.25 - 0.67	56	10
Cobalt (PM_{10})	ng/m^3	0.12	0.08 - 0.16	NA	100
Mercury (PM_{10})	ng/m^3	0.05	0.02 - 0.07[g]	NA	300[h]
Nickel (PM_{10})	ng/m^3	3.00	0.0 - 6.37	420	90
Selenium (PM_{10})	ng/m^3	1.27	1.02 - 1.53	NA	20

ng/m^3 nanograms per cubic meter

NA Not applicable

ND No detection of this chemical was registered by the laboratory analytical equipment

[a] Mean of measurements is the average of all sample results which include actual measured values. If no chemical was registered, then a value of zero is used when calculating the mean

[b] Details regarding these values are in the technical report, Schools Air Toxics Monitoring Activity (2009) Uses of Health Effects Information in Evaluating Sample Results.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration is above this level will be fully discussed in the text and may be considered a priority for potential follow-up activities, if indicated in light of the full set of information available for the site. Findings of the upper 95% confidence limit below 1% of the comparison level (i.e., where the upper 95% confidence limit is below the corresponding 1-in-1-million cancer risk based concentration) are generally considered a low priority for follow-up activity. Situations where the summary statistics for a pollutant are below this comparison level but above 1% of this level are fully discussed in the text of the report.

[d] Air toxics for which the upper 95% confidence limit on the mean concentration are near or below the noncancer-based comparison level are generally of low concern and will generally be considered a low priority for follow-up activity. Pollutants for which the 95% confidence limits extend appreciably above the noncancer-based comparison level are fully discussed in the school-specific report and may be considered a priority for follow-up activity, if indicated in light of the full set of information available for the site.

[e] The comparison level is specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[f] Beryllium (PM_{10}) was detected in 33 out of 34 samples, ranging from 0.001 to 0.13 ng/m^3. The MDL is 0.03 ng/m^3.

[g] Mercury (PM_{10}) was detected in 33 out of 34 samples, ranging from 0.002 to 0.25 ng/m^3. The MDL is 0.05 ng/m^3.

[h] The comparison level is specific to elemental mercury, which is more readily and completely absorbed into the body than mercury conveyed on particles (e.g., divalent species)

Appendix C. Gary-4th Ave./Railcats Site Pollutant Concentrations

Parameter	Units	9/5/2010	9/11/2010	9/17/2010	9/23/2010	9/29/2010	10/5/2010	10/11/2010	10/17/2010	10/23/2010	10/29/2010	11/4/2010	11/10/2010	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	6.91	16.4	--	22	13.5	87.1	119	91.3	23.5	21.5	318	23.8	500
Antimony (PM_{10})	ng/m^3	1.03	1.35	--	0.73	1.93	3.22	12.3	1.4	1.77	1	2.44	2.38	2,000
Arsenic (PM_{10})	ng/m^3	3.04	0.76	--	0.58	1.26	2.08	2.25	1.79	0.97	0.78	3.46	1.61	150
Beryllium (PM_{10})	ng/m^3	0.002	0.009	--	0.009	0.009	0.04	0.04	0.03	0.01	0.009	0.13	0.02	20
Cadmium (PM_{10})	ng/m^3	0.14	0.12	--	0.11	0.19	0.4	0.44	0.85	0.19	0.18	0.89	0.38	30
Chromium (PM_{10})	ng/m^3	4.42	4.93	--	4.35	4.12	7.93	7.15	7.17	5.57	3.76	14.5	4.12	580[b]
Cobalt (PM_{10})	ng/m^3	0.03	0.05	--	0.07	0.08	0.27	0.23	0.14	0.1	0.05	0.59	0.13	100
Mercury (PM_{10})	ng/m^3	0.008	0.01	--	0.007	0.01	0.25	0.04	0.02	0.009	0.03	0.04	0.01	3,000[c]
Nickel (PM_{10})	ng/m^3	1.8	0.68	--	0.44	0.68	1.86	2.23	0.87	0.43	1.79	4.15	0.76	200
Selenium (PM_{10})	ng/m^3	0.63	1.2	--	0.99	0.49	1.13	2.74	1.41	0.8	0.52	2	2.2	20,000

Key Pollutant

ng/m^3 nanograms per cubic meter

-- No sample was conducted for this pollutant on this day or the sample was invalid.

ND No detection of this chemical was registered by the laboratory analytical equipment.

[a] The individual sample screening levels and their use is summarized on the web site and described in detail in Schools Air Toxics Monitoring Activity (2009), "Uses of Health Effects Information in Evaluating Sample Results", see http://www.epa.gov/schoolair/pdfs/UsesOfHealthEffectsInfoinEvalSampleResults.pdf. These screening levels are based on consideration of exposure all day, every day over a period ranging up to at least a couple of weeks, and longer for some pollutants.

[b] The sample screening level are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[c] The sample screening level is specific to elemental mercury, which is more readily and completely absorbed into the body than mercury conveyed on particles (e.g., divalent species).

Appendix C. Gary-4th Ave./Railcats Site Pollutant Concentrations

Parameter	Units	11/16/2010	11/22/2010	11/28/2010	12/4/2010	12/10/2010	12/16/2010	12/22/2010	12/28/2010	1/3/2011	1/9/2011	1/15/2011	1/21/2011	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	79.2	5.04	3.54	93.5	37.3	--	51.2	5.76	5.78	16.7	16.3	42.3	500
Antimony (PM_{10})	ng/m^3	2.18	0.48	1.18	6.05	2.55	--	1	1.1	0.88	3.06	0.95	0.9	2,000
Arsenic (PM_{10})	ng/m^3	1.56	0.39	0.69	1.41	0.81	--	1.26	0.44	0.51	0.97	0.71	0.53	150
Beryllium (PM_{10})	ng/m^3	0.06	0.005	0.001	0.02	0.008	--	0.005	ND	0.008	0.01	0.02	0.02	20
Cadmium (PM_{10})	ng/m^3	1.14	0.16	0.15	0.94	0.32	--	0.84	0.52	0.48	0.26	0.19	0.15	30
Chromium (PM_{10})	ng/m^3	6.48	4.53	4.24	6.15	6.51	--	5.97	5.28	3.43	4.3	4.93	5.76	580[b]
Cobalt (PM_{10})	ng/m^3	0.28	0.07	0.01	0.12	0.21	--	0.11	0.02	0.03	0.05	0.06	0.09	100
Mercury (PM_{10})	ng/m^3	0.13	ND	0.004	0.002	0.02	--	0.03	0.008	0.03	0.23	0.16	0.12	3,000[c]
Nickel (PM_{10})	ng/m^3	2.85	56.6	0.57	0.83	0.65	--	2.03	0.36	1.26	0.56	0.54	0.74	200
Selenium (PM_{10})	ng/m^3	2.47	0.85	1.04	1.41	1.03	--	1.59	0.41	0.45	1.56	0.84	0.62	20,000

Key Pollutant

ng/m^3 nanograms per cubic meter

-- No sample was conducted for this pollutant on this day or the sample was invalid.

ND No detection of this chemical was registered by the laboratory analytical equipment.

[a] The individual sample screening levels and their use is summarized on the web site and described in detail in Schools Air Toxics Monitoring Activity (2009), "Uses of Health Effects Information in Evaluating Sample Results", see http://www.epa.gov/schoolair/pdfs/UsesOfHealthEffectsInfoinEvalSampleResults.pdf. These screening levels are based on consideration of exposure all day, every day over a period ranging up to at least a couple of weeks, and longer for some pollutants.

[b] The sample screening level are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[c] The sample screening level is specific to elemental mercury, which is more readily and completely absorbed into the body than mercury conveyed on particles (e.g., divalent species).

Appendix C. Gary-4th Ave./Railcats Site Pollutant Concentrations

Parameter	Units	1/27/2011	2/2/2011	2/8/2011	2/14/2011	2/20/2011	2/26/2011	3/4/2011	3/10/2011	3/16/2011	3/22/2011	3/28/2011	4/3/2011	4/9/2011	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	4.67	20.5	22.5	83.3	--	13.3	98.9	47.6	20.9	19.9	226	52.8	45.8	500
Antimony (PM_{10})	ng/m^3	0.53	0.84	1.02	0.99	--	0.52	1.14	0.89	1.45	0.74	0.71	1.56	1.47	2,000
Arsenic (PM_{10})	ng/m^3	0.31	0.67	0.8	0.88	--	0.34	1.13	0.74	1.02	1.06	1.1	1.1	1.64	150
Beryllium (PM_{10})	ng/m^3	0.002	0.01	0.02	0.01	--	0.006	0.02	0.02	0.02	0.02	0.13	0.05	0.03	20
Cadmium (PM_{10})	ng/m^3	0.11	0.25	0.16	3.51	--	0.08	0.89	0.22	0.22	0.21	0.36	0.17	0.4	30
Chromium (PM_{10})	ng/m^3	3.25	9.33	3.74	6.55	--	4.37	6.54	5.28	4.9	4.13	11	5.36	5.23	580[b]
Cobalt (PM_{10})	ng/m^3	0.03	0.18	0.07	0.06	--	0.01	0.11	0.09	0.14	0.06	0.22	0.29	0.07	100
Mercury (PM_{10})	ng/m^3	0.04	0.08	0.07	0.01	--	0.004	0.02	0.08	0.02	0.004	0.02	0.01	0.02	3,000[c]
Nickel (PM_{10})	ng/m^3	0.33	11.3	0.66	0.88	--	0.24	0.55	1.14	0.62	0.53	0.95	0.87	1.18	200
Selenium (PM_{10})	ng/m^3	0.41	0.99	0.66	2.56	--	0.96	3.18	0.6	1.57	1.87	0.72	1.3	2.08	20,000

Key Pollutant

ng/m^3 nanograms per cubic meter

-- No sample was conducted for this pollutant on this day or the sample was invalid.

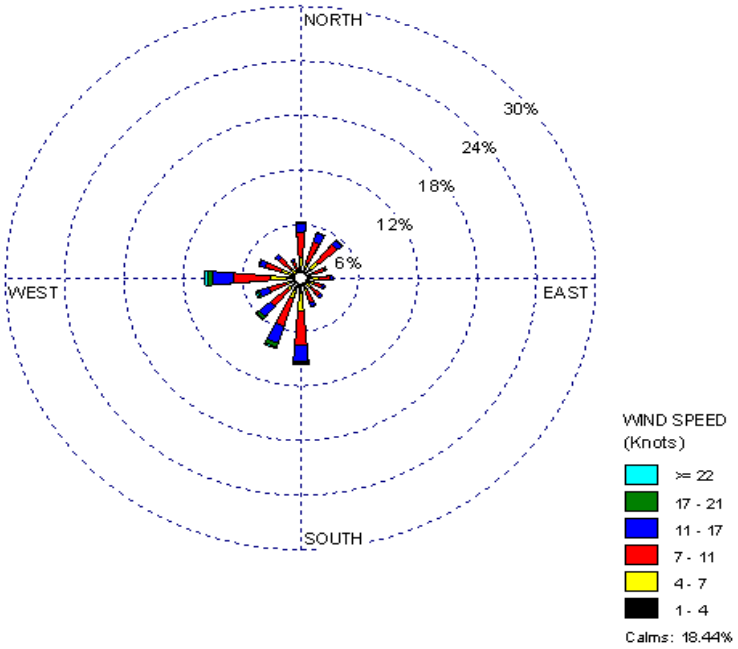
ND No detection of this chemical was registered by the laboratory analytical equipment.

[a] The individual sample screening levels and their use is summarized on the web site and described in detail in Schools Air Toxics Monitoring Activity (2009), "Uses of Health Effects Information in Evaluating Sample Results", see http://www.epa.gov/schoolair/pdfs/UsesOfHealthEffectsInfoinEvalSampleResults.pdf. These screening levels are based on consideration of exposure all day, every day over a period ranging up to at least a couple of weeks, and longer for some pollutants.

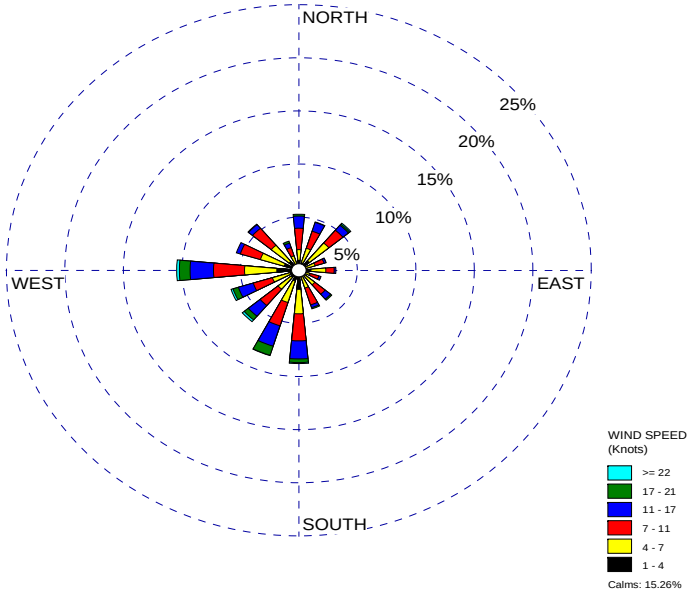
[b] The sample screening level are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[c] The sample screening level is specific to elemental mercury, which is more readily and completely absorbed into the body than mercury conveyed on particles (e.g., divalent species).

Appendix D. Windroses for Lansing Municipal Airport NWS Station



Lansing Municipal Airport NWS Station
Composite Hourly Windrose
(2002-2007)[1]



Lansing Municipal Airport NWS Station
Composite Hourly Windrose
Across Sampling Period
(Sept. 5, 2010 - Apr. 3, 2011)[1]

[1] Lansing Municipal Airport NWS Station (WBAN 04879) is 11.3 miles from the monitoring site.