SAT Initiative: Additional Monitoring at Warren Elementary School (Marietta, OH)

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 these schools in clear, but generally technical, terms. A summary of this analysis is presented on the page focused on these schools on EPA's website (www.epa.gov/schoolair).

I. Executive Summary

- Air monitoring has been conducted at Warren Elementary School (Warren) in Marietta, Ohio as part of the EPA initiative to monitor specific air toxics in the outdoor air around priority schools. Additional air monitoring was not conducted at the Ohio Valley Educational Service Center (Ohio Valley) or at Neale Elementary School (Neale) in Vienna, West Virginia.
- This school 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 at http://www.epa.gov/schoolair/pdfs/MariettaTechReport.pdf
- The additional air monitoring was performed from December 23, 2011, until February 25, 2012, for manganese and other metals in particulate matter less than 10 microns (PM_{10}). The key pollutant monitored was manganese.
- Measured levels of manganese (PM_{10}) and associated longer-term concentration estimates were 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.
- The second round of monitoring indicates that the longer-term concentration estimates for manganese (PM_{10}) indicate the potential for levels of health concern for long-term continuous exposures, particularly at locations closer to the source than the location monitored"
- EPA promulgated a Notice of Proposed Rule Making for Risk and Technology Review for Ferroalloy Production on November 23, 2011, and there is a consent decree for a Final Rule with a required signature on December 10, 2013. This rule is intended to address manganese at the source.
- The OEPA 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 permits and other programs. The Ohio Environmental Protection Agency (OEPA) continues to monitor metals in total suspended particulates (TSP) in the area.

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 are monitoring 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 Warren, Ohio Valley, and Neale please go to http://www.epa.gov/schoolair/TheOhioVal.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 this location for approximately 3 months and air samples were taken on at least 55 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 these Schools and the Air Monitoring Conducted

This school 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. (Figure 1)

Additional monitoring commenced at this school on December 23, 2011, and continued through February 26, 2012. During this period 55 samples of airborne particles were collected using a PM_{10} sampler and analyzed for manganese)[3] (the key pollutant at all three schools) and for a small standardized set of additional metals that are routinely included in the analytical methods for the key pollutants

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/TheOhioVal.html) for background information on the SAT Analysis.

B. Chemical Concentrations

Using the analysis approach described in the initial monitoring, we analyzed the chemical concentration data (Table 1 and Figure 2) with regard to areas of interest identified below.

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[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.
[3] In general this sampler collects airborne particles with a diameter of 10 microns or smaller, more of which would be considered to be in the respirable range on which the health-based comparison level for manganese is based.
[4] OEPA and WVDEP staff operated the monitors and sent the sample filters to the analytical laboratory under contract to EPA.

Key findings drawn from the information on chemical concentrations and the considerations discussed below include:

- The air sampling data collected at this school for manganese indicates influence from a nearby source, and the related longer-term concentration estimate is above the long-term comparison level for continuous, long-term exposures. This comparison level is a continuous exposure concentration associated with little risk of adverse effect; it is an exposure concentration appreciably below levels at which effects have been observed. The elevated levels at this location, however, indicate a potential concern for areas of the community near the source

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 long-term health concerns?
  → The longer-term concentration estimate for manganese is above the long-term comparison level for continuous, long-term exposures (Table 1)[6]
    - 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]
- Do the monitoring data indicate elevated levels that pose short-term health concerns?
  → We identified one out of 55 sample results at Warren which was higher than the individual sample screening level. A sample result above the screening level does not mean that there is a risk to children at the school. The individual sample screening level was a signal to EPA to evaluate and track that and subsequent results. Based on

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[5] 39 of the 55 valid samples at this school (Table 2) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix A). Because the NATTS are generally sited so as not to be influenced by specific nearby sources, EPA is using the 75th percentile point of concentrations at these sites as a benchmark for indicating potential influence from a source nearby to this school.
[6] The upper end of the interval is nearly 1.5 times the mean of the monitoring data.
[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

all the results, we did not identify concerns regarding short-term exposure for this area.

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 together 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/MariettaTechReport.pdf) for background on the wind and other meteorological data

Onsite meteorological data was not collected at the site during the follow up sample collection dates. During the initial monitoring period, wind patterns at the nearest National Weather Station (NWS) station (Mid-Ohio Valley Regional Airport in Parkersburg, OH) during the sampling period were not similar to the on-site wind patterns; additionally, the on-site wind patterns at the school were not similar to those recorded at the NWS station over the long-term (2002-2007 period). There was also 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 Mid-Ohio Valley Regional Airport in Parkersburg, OH. Wind data collected by OEPA at the each school also differed from data collected at the NWS. Therefore, we have not included a discussion of the meteorological data for this additional monitoring.

V. Key Source Information

- Was the source of manganese operating as usual during the monitoring period?
  - Eramet is subject to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) Maximum Achievable Control Technology (MACT) for the Ferroalloys Production source category and was the only source covered when the MACT standard was developed. Since then several other sources have become subject to the MACT standard. Eramet has a CAA Title V operating permit issued by OEPA that includes operating requirements.[10]

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[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). Combined impacts 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

[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/

- Information about Eramet indicates that the facility had no significant change in production during the monitoring period.

VIII. Integrated Summary and Next Steps

A. Summary of Key Findings

1. What are the key HAPs for each school?
   → Manganese is the key HAP for this school, identified based on its close proximity to Eramet, an electrometallurgical manufacturing facility that produces manganese products, including ferroalloys, used by the steel and aluminum industries. The monitoring data collected confirm elevated airborne levels of manganese (PM_{10})

2. Do the data collected at this school indicate a level of concern, as implied by information that led to identifying the schools for monitoring?
   → The measured manganese (PM_{10}) levels continue to be elevated. This elevated level of manganese continues to indicate a potential concern in the area.

B. Next Steps for Key Pollutants

1. EPA will be evaluating available emissions control technologies and reviewing the maximum achievable control technology that may be appropriate to require at the Eramet facility as part of our review of the NESHAP MACT standard for ferroalloys production. Coincident with this review of control technologies, which is now underway, EPA will also be considering the need for additional risk-based standards at this type of facility. EPA promulgated a Notice of Proposed Rule Making for Risk and Technology Review for Ferroalloy Production on November 23, 2011 and there is a consent decree for a Final Rule with a required signature on December 10, 2013. This rule is intended to address manganese at the source.
2. The OEPA will continue to oversee industrial facilities in the area through air permits and other programs. The OEPA continues to monitor metals in TSP in the area.

IX. Figures and Tables

A. Tables

1. Warren Elementary School – Key Pollutant Analysis.
2. Warren Elementary School Key Pollutant Concentrations.

B. Figures

1. Ohio Valley Education Center (Marietta, Oh), Warren Elementary School (Marietta, OH), and Neale Elementary School (Vienna, WV) Locations
2. Warren Elementary School – Key Pollutant (Manganese (PM_{10})) Analysis.

3. Warren Elementary School – Manganese (PM_{10}) Concentration.

X. Appendices

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

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

Table B-1. Warren Elementary School – Other Monitored Pollutant Analysis

C. Marietta, Ohio Area – Pollutant Concentrations.

Table 1. Warren Elementary School – Key Pollutant Analysis

Parameter	Units	Mean of Measurements	95% Confidence Interval on the Mean	Long-term Comparison Level[a]	
				Cancer-Based[b]	Noncancer-Based[b]
Manganese (PM_{10})	ng/m^3	93.89[d]	51.47 - 136.32	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 55 detections that ranged from 1.69 to 953 ng/m^3.

Table 2. Warren Elementary School Key Pollutant Concentrations and Meteorological Data

Parameter	Units	12/23/2011	12/24/2011	12/25/2011	12/26/2011	12/27/2011	12/28/2011	12/29/2011	12/30/2011	12/31/2011	1/1/2012	1/2/2012	1/3/2012	1/4/2012
Manganese (PM_{10})	ng/m^3	2.41	73.4	85.7	--	80.1	5.02	22.9	21.9	12.6	12.6	--	15.2	--
Daily Average Temperature	°F	40.7	35.5	36.4	39.5	39.5	35.1	35.1	47.5	46.0	44.3	31.1	21.9	23.4
Daily Precipitation	inches	0.30	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.20	0.04	0.00	0.00	0.00

All precipitation and temperature data were from the Mid-Ohio Valley Regional 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. Warren Elementary School Key Pollutant Concentrations and Meteorological Data

Parameter	Units	1/5/2012	1/6/2012	1/7/2012	1/8/2012	1/9/2012	1/10/2012	1/11/2012	1/12/2012	1/13/2012	1/14/2012	1/15/2012	1/16/2012	1/17/2012
Manganese (PM_{10})	ng/m^3	--	--	56.3	11.5	405	189	--	192	18.2	--	--	--	--
Daily Average Temperature	°F	35.8	47.3	51.2	35.1	36.0	38.2	34.5	45.0	23.2	22.4	21.4	31.8	50.0
Daily Precipitation	inches	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.16	0.24	0.00	0.00	0.03	0.83

All precipitation and temperature data were from Mid-Ohio Valley Regional 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. Warren Elementary School Key Pollutant Concentrations and Meteorological Data

Parameter	Units	1/18/2012	1/19/2012	1/20/2012	1/21/2012	1/22/2012	1/23/2012	1/24/2012	1/25/2012	1/26/2012	1/27/2012	1/28/2012	1/29/2012	1/30/2012
Manganese (PM_{10})	ng/m^3	4.08	96.8	4.86	2.3	1.69	11.6	145	12.4	7.82	18.3	35.6	254	33.1
Daily Average Temperature	°F	33.1	27.7	23.6	28.5	32.2	51.7	44.4	35.9	41.1	46.1	37.9	34.9	33.7
Daily Precipitation	inches	0.00	0.00	0.02	0.60	0.00	0.30	0.00	0.03	0.66	0.52	0.01	0.00	0.00

All precipitation and temperature data were from the Mid-Ohio Valley Regional 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. Warren Elementary School Key Pollutant Concentrations and Meteorological Data

Parameter	Units	1/31/2012	2/1/2012	2/2/2012	2/3/2012	2/4/2012	2/5/2012	2/6/2012	2/7/2012	2/8/2012	2/9/2012	2/10/2012	2/11/2012	2/12/2012
Manganese (PM_{10})	ng/m^3	167	379	11.6	9.56	5.64	3.16	288	953	5.12	15.8	156	31.4	6.41
Daily Average Temperature	°F	53.3	55.5	44.6	36.7	37.3	39.5	34.5	37.1	32.8	30.2	32.5	24.6	19.1
Daily Precipitation	inches	0.00	0.03	0.00	0.00	0.04	0.06	0.00	0.00	0.09	0.00	0.09	0.10	0.00

(Yellow shading) All precipitation and temperature data were from the Mid-Ohio Valley Regional 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. Warren Elementary School Key Pollutant Concentrations and Meteorological Data

Parameter	Units	2/13/2012	2/14/2012	2/15/2012	2/16/2012	2/17/2012	2/18/2012	2/19/2012	2/20/2012	2/21/2012	2/22/2012	2/23/2012	2/24/2012	2/25/2012
Manganese (PM_{10})	ng/m^3	337	66.1	11.3	59.4	9.65	223	3.39	9.73	120	222	163	73.5	3.03
Daily Average Temperature	°F	27.3	34.4	39.5	45.5	43.0	37.8	34.8	33.1	39.3	49.5	50.0	48.2	33.1
Daily Precipitation	inches	0.00	0.16	0.01	0.26	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01

All precipitation and temperature data were from the Mid-Ohio Valley Regional Airport NWS Station.

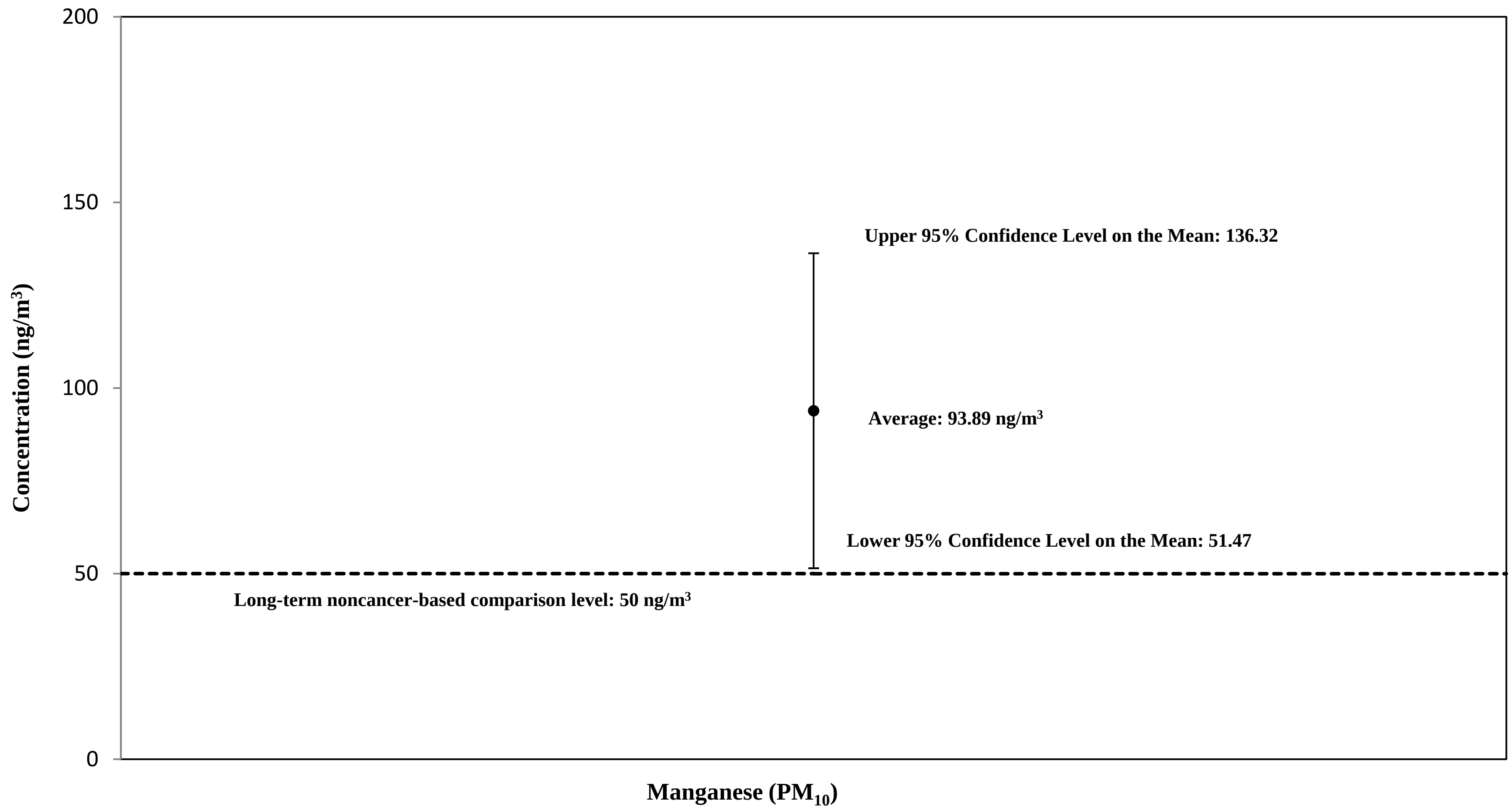
[a] Based on count of hours for which vector wind direction is from expected zone of influence.

[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. Ohio Valley Education Center (Marietta, Oh), Warren Elementary School (Marietta, OH), and Neale Elementary School (Vienna, WV) Locations

Figure 2. Warren Elementary School – 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.

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/m³	4,705	18%	0.80	0.01	0.05	ND	ND	ND	ND	0.11
Dichloropropylene, Trans -1,3-	µg/m³	4,678	18%	1.13	0.02	0.05	ND	ND	ND	ND	0.11
Ethyl acrylate	µg/m³	1,917	1%	0.08	<0.01	0.04	ND	ND	ND	ND	ND
Ethylbenzene	µg/m³	6,120	84%	8.84	0.42	0.32	ND	0.10	0.29	0.53	1.33
Ethylene dichloride	µg/m³	6,143	38%	4.49	0.03	0.05	ND	ND	ND	0.04	0.09
Hexachloro-1,3-butadiene	µg/m³	3,727	20%	0.97	0.03	0.10	ND	ND	ND	0.00[b]	0.18
Methyl methacrylate	µg/m³	1,917	9%	14.05	0.13	0.49	ND	ND	ND	0.00[b]	0.53
Methyl tert-butyl ether	µg/m³	4,370	41%	20.50	0.28	0.12	ND	ND	ND	0.04	1.53
Methyl-2-pentanone, 4-	µg/m³	2,936	60%	2.95	0.11	0.09	ND	ND	0.02	0.12	0.49
Methylene chloride	µg/m³	6,206	82%	214.67	0.59	0.34	ND	0.14	0.28	0.49	1.35
Styrene	µg/m³	6,080	70%	27.22	0.16	0.11	ND	ND	0.05	0.16	0.60
Tetrachloroethane, 1,1,2,2-	µg/m³	5,952	20%	2.47	0.02	0.04	ND	ND	ND	ND	0.07
Tetrachloroethylene	µg/m³	6,423	71%	42.12	0.28	0.20	ND	ND	0.13	0.27	0.88
Toluene	µg/m³	5,947	95%	482.53	2.46	1.54	0.01	0.70	1.51	3.05	7.42
Tribromomethane	µg/m³	2,946	4%	1.18	0.01	0.16	ND	ND	ND	ND	ND
Trichlorobenzene, 1,2,4-	µg/m³	4,301	21%	45.27	0.07	0.10	ND	ND	ND	ND	0.16
Trichloroethane, 1,1,1-	µg/m³	5,944	73%	3.17	0.09	0.10	ND	ND	0.08	0.11	0.20
Trichloroethane,1,1,2-	µg/m³	5,210	19%	5.89	0.01	0.04	ND	ND	ND	ND	0.05
Trichloroethylene	µg/m³	6,410	46%	6.50	0.05	0.07	ND	ND	ND	0.05	0.22
Vinyl chloride	µg/m³	6,284	18%	1.61	0.01	0.02	ND	ND	ND	ND	0.03
Xylene, m/p-	µg/m³	4,260	90%	21.41	1.12	0.71	ND	0.26	0.69	1.43	3.65
Xylene, o-	µg/m³	6,108	83%	9.21	0.41	0.30	ND	0.09	0.24	0.52	1.39
Acenaphthene (total tsp & vapor)	ng/m³	69	93%	9.48	2.36	1.94	ND	1.24	1.99	3.03	5.10
Acenaphthylene (total tsp & vapor)	ng/m³	69	52%	8.41	0.79	0.74	ND	ND	0.09	0.80	4.38
Anthracene (total tsp & vapor)	ng/m³	1,102	47%	50.20	0.37	0.43	ND	ND	ND	0.39	1.48
Benzo(a)anthracene (total tsp & vapor)	ng/m³	1,122	73%	2.56	0.10	0.07	ND	ND	0.04	0.10	0.35
Benzo(a)pyrene (total tsp & vapor)	ng/m³	1,111	58%	2.64	0.09	0.09	ND	ND	0.03	0.10	0.34
Benzo[B]Fluoranthene	ng/m³	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, 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 each 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 C-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 chromium, the longer-term concentration estimates for the other HAPs monitored remained below their long-term comparison levels.
  - → 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 investigation of key pollutants for each school that were identified by previous analyses. This focused design does not provide for the consideration of 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

[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 web site and described in detail in *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results*.

[13] General information on additional air pollutants is available at http://www.epa.gov/air/airpollutants.html.

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 do not together pose significant concerns for cumulative health risk from these pollutants.
    - ▪ In addition to the key pollutant manganese, the only other HAP monitored whose longer-term concentration estimates is 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.

[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. Warren Elementary School – Other Monitored Pollutant Analysis

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	12.50	11.38 - 13.63	8.3[e]	100[e]
Non-Key HAPS with mean lower than 10% of the lowest comparison level					
Antimony (PM_{10})	ng/m^3	1.09	0.84 - 1.34	NA	200
Arsenic (PM_{10})	ng/m^3	0.78	0.64 - 0.93	23	15
Beryllium (PM_{10})	ng/m^3	0.008	0.006 - 0.010[f]	42	20
Cadmium (PM_{10})	ng/m^3	0.25	0.16 - 0.33	56	10
Cobalt (PM_{10})	ng/m^3	0.18	0.14 - 0.21	NA	100
Mercury (PM_{10})	ng/m^3	0.02	0.02 - 0.02	NA	300[g]
Molybdenum (PM_{10})	ng/m^3	0.51	0.39 - 0.62	NA	NA
Nickel (PM_{10})	ng/m^3	1.08	0.67 - 1.49	420	90
Rubidium (PM_{10})	ng/m^3	0.42	0.29 - 0.54	NA	NA
Selenium (PM_{10})	ng/m^3	1.21	1.01 - 1.40	NA	20000

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 50 out of 55 samples, ranging from 0.0003 to 0.04 ng/m^3. The MDL is 0.02 ng/m^3.

[g] 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. Warren Elementary School Pollutant Concentrations

Parameter	Units	12/23/2011	12/24/2011	12/25/2011	12/26/2011	12/27/2011	12/28/2011	12/29/2011	12/30/2011	12/31/2011	1/1/2012	1/2/2012	1/3/2012	1/4/2012	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	2.41	73.4	85.7	--	80.1	5.02	22.9	21.9	12.6	12.6	--	15.2	--	500
Antimony (PM_{10})	ng/m^3	0.37	3.63	4.29	--	0.7	0.26	0.89	0.91	0.43	0.64	--	0.18	--	2,000
Arsenic (PM_{10})	ng/m^3	0.35	0.57	0.61	--	0.8	0.08	0.52	0.56	0.38	0.57	--	0.23	--	150
Beryllium (PM_{10})	ng/m^3	0.0003	0.006	0.01	--	0.003	0.003	0.006	0.004	0.0005	0.005	--	0.006	--	20
Cadmium (PM_{10})	ng/m^3	0.04	0.09	0.16	--	0.1	0.03	0.08	0.1	0.09	0.1	--	0.04	--	30
Chromium (PM_{10})	ng/m^3	10.3	10.4	11.2	--	12.4	10.5	12	12	11.8	10.6	--	9.7	--	580[b]
Cobalt (PM_{10})	ng/m^3	0.12	0.09	0.1	--	0.08	0.16	0.06	0.15	0.14	0.05	--	0.04	--	100
Mercury (PM_{10})	ng/m^3	0.02	0.02	0.02	--	0.01	0.01	0.01	0.01	0.009	0.04	--	0.02	--	3,000[c]
Nickel (PM_{10})	ng/m^3	0.22	0.28	0.32	--	0.29	0.2	0.35	0.47	0.21	0.43	--	0.33	--	200
Selenium (PM_{10})	ng/m^3	0.94	1.43	1.51	--	0.65	0.04	0.88	0.89	0.41	0.57	--	0.22	--	20,000

(yellow box) 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. Warren Elementary School Pollutant Concentrations

Parameter	Units	1/5/2012	1/6/2012	1/7/2012	1/8/2012	1/9/2012	1/10/2012	1/11/2012	1/12/2012	1/13/2012	1/14/2012	1/15/2012	1/16/2012	1/17/2012	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	--	--	56.3	11.5	405	189	--	192	18.2	--	--	--	--	500
Antimony (PM_{10})	ng/m^3	--	--	1.09	1.45	2.87	2.36	--	0.35	0.24	--	--	--	--	2,000
Arsenic (PM_{10})	ng/m^3	--	--	0.69	1.07	1.44	1.56	--	0.6	0.3	--	--	--	--	150
Beryllium (PM_{10})	ng/m^3	--	--	0.007	0.005	0.02	0.01	--	ND	0.02	--	--	--	--	20
Cadmium (PM_{10})	ng/m^3	--	--	0.16	0.12	0.29	0.32	--	0.12	0.04	--	--	--	--	30
Chromium (PM_{10})	ng/m^3	--	--	10.9	9.86	11.5	11	--	16.7	15.4	--	--	--	--	580[b]
Cobalt (PM_{10})	ng/m^3	--	--	0.2	0.06	0.47	0.19	--	0.32	0.23	--	--	--	--	100
Mercury (PM_{10})	ng/m^3	--	--	0.02	0.03	0.02	0.03	--	0.01	0.01	--	--	--	--	3,000[d]
Nickel (PM_{10})	ng/m^3	--	--	0.59	0.38	2.33	0.76	--	1.76	2.74	--	--	--	--	200
Selenium (PM_{10})	ng/m^3	--	--	1.04	0.76	1.67	2.43	--	0.88	0.75	--	--	--	--	20,000

(yellow box) 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).

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Parameter	Units	1/18/2012	1/19/2012	1/20/2012	1/21/2012	1/22/2012	1/23/2012	1/24/2012	1/25/2012	1/26/2012	1/27/2012	1/28/2012	1/29/2012	1/30/2012	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	4.08	96.8	4.86	2.3	1.69	11.6	145	12.4	7.82	18.3	35.6	254	33.1	500
Antimony (PM_{10})	ng/m^3	1.36	1.2	1.1	0.87	0.68	0.4	2.07	0.75	2.04	0.37	0.39	0.34	0.75	2,000
Arsenic (PM_{10})	ng/m^3	0.27	0.55	0.58	0.95	0.78	0.35	0.39	0.49	1.1	0.34	0.41	0.59	0.5	150
Beryllium (PM_{10})	ng/m^3	0.006	0.007	0.01	0.004	0.007	0.02	0.008	0.004	0.01	0.002	0.004	0.003	0.005	20
Cadmium (PM_{10})	ng/m^3	0.06	0.28	0.13	0.27	0.13	0.07	0.82	0.1	0.29	0.14	0.1	0.6	0.12	30
Chromium (PM_{10})	ng/m^3	10.4	9.04	10.4	10.4	11.1	12.4	11.1	12.7	11.1	10.3	8.65	10.5	10.9	580[b]
Cobalt (PM_{10})	ng/m^3	0.12	0.14	0.07	0.04	0.06	0.15	0.13	0.07	0.15	0.05	0.04	0.21	0.08	100
Mercury (PM_{10})	ng/m^3	0.01	0.02	0.02	0.02	0.01	0.008	0.01	0.007	0.008	0.003	0.006	0.01	0.04	3,000[c]
Nickel (PM_{10})	ng/m^3	0.32	0.57	0.84	0.64	0.3	0.55	0.35	0.42	0.64	0.24	0.24	0.32	0.27	200
Selenium (PM_{10})	ng/m^3	0.13	1.57	0.97	2.05	1.5	0.4	1.18	1.44	2.16	0.5	0.63	1.52	0.46	20,000

(yellow box) 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. Warren Elementary School Pollutant Concentrations

Parameter	Units	1/31/2012	2/1/2012	2/2/2012	2/3/2012	2/4/2012	2/5/2012	2/6/2012	2/7/2012	2/8/2012	2/9/2012	2/10/2012	2/11/2012	2/12/2012	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	167	379	11.6	9.56	5.64	3.16	288	953	5.12	15.8	156	31.4	6.41	500
Antimony (PM_{10})	ng/m^3	0.73	1.46	1.68	1.56	1.21	1.32	1.44	1.37	1.46	0.44	0.73	1.18	0.3	2,000
Arsenic (PM_{10})	ng/m^3	0.69	1.36	1.23	1.74	1.74	1.33	1.47	1.4	0.87	0.56	0.94	0.64	0.35	150
Beryllium (PM_{10})	ng/m^3	0.007	0.003	0.005	0.01	0.009	ND	0.003	0.006	ND	ND	0.005	ND	0.01	20
Cadmium (PM_{10})	ng/m^3	0.27	1.02	0.15	0.2	0.24	0.26	1.27	1.6	0.15	0.08	0.45	0.11	0.06	30
Chromium (PM_{10})	ng/m^3	11.5	11	12.3	14.3	12	11.9	11.7	13.2	9.63	9.51	10.6	10.9	9.95	580[b]
Cobalt (PM_{10})	ng/m^3	0.25	0.59	0.12	0.17	0.22	0.04	0.38	0.48	0.14	0.05	0.14	0.06	0.04	100
Mercury (PM_{10})	ng/m^3	0.03	0.04	0.03	0.03	0.02	0.02	0.03	0.05	0.01	0.01	0.01	0.02	0.04	3,000[c]
Nickel (PM_{10})	ng/m^3	0.67	0.74	0.72	0.81	1.32	0.38	0.74	0.8	0.6	0.35	0.56	0.99	0.23	200
Selenium (PM_{10})	ng/m^3	0.9	2.03	2.12	2.7	2.03	1.64	2.35	2.76	0.89	1.03	1.67	0.68	0.21	20,000

(yellow box) 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. Warren Elementary School Pollutant Concentrations

Parameter	Units	2/13/2012	2/14/2012	2/15/2012	2/16/2012	2/17/2012	2/18/2012	2/19/2012	2/20/2012	2/21/2012	2/22/2012	2/23/2012	2/24/2012	2/25/2012	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	337	66.1	11.3	59.4	9.65	223	3.39	9.73	120	222	163	73.5	3.03	500
Antimony (PM_{10})	ng/m^3	4.28	0.96	0.46	0.49	0.57	2	0.36	0.58	0.69	0.4	0.36	0.87	0.1	2,000
Arsenic (PM_{10})	ng/m^3	1.23	0.92	0.85	0.61	0.58	0.97	0.45	0.77	0.76	0.35	0.28	3.23	0.11	150
Beryllium (PM_{10})	ng/m^3	0.02	0.02	0.01	0.008	0.008	0.04	0.01	0.01	0.02	0.02	0.009	0.009	0.008	20
Cadmium (PM_{10})	ng/m^3	0.71	0.16	0.11	0.29	0.16	0.28	0.1	0.11	0.3	0.22	0.15	0.12	0.03	30
Chromium (PM_{10})	ng/m^3	11.1	12.4	13.6	12.3	12.6	11.2	9.33	11.3	19.6	30.3	18.9	26.9	24.5	580[b]
Cobalt (PM_{10})	ng/m^3	0.47	0.09	0.04	0.06	0.04	0.28	0.03	0.1	0.38	0.5	0.45	0.37	0.37	100
Mercury (PM_{10})	ng/m^3	0.04	0.02	0.007	0.008	0.009	0.01	0.01	0.05	0.04	0.02	0.03	0.02	0.01	3,000[c]
Nickel (PM_{10})	ng/m^3	5.53	0.51	0.38	0.3	0.33	0.47	0.49	0.97	3.79	6.6	3.09	6.82	3.9	200
Selenium (PM_{10})	ng/m^3	2.88	1.8	1.64	1.03	0.55	0.79	0.85	2.07	1.43	0.87	0.92	0.78	0.1	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).