SAT Initiative: Charles Russell Elementary School, Crabbe School, and Hatcher School in Ashland, Kentucky and Whitwell Elementary School, Ironton, Ohio

This document describes the analysis of 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 School Air Toxics webpage focused on these schools on EPA's website (www.epa.gov/schoolair).

I. Executive Summary

- Air monitoring has been conducted at Charles Russell Elementary School (Charles Russell), Crabbe School (Crabbe), and Hatcher School (Hatcher) in Ashland, Kentucky, and Whitwell Elementary School (Whitwell) in Ironton, Ohio, as part of the EPA initiative to monitor specific air toxics in the outdoor air around priority schools in 22 states and 2 tribal areas. These four schools have been combined into one report as they are located close to each other and are impacted by the same sources.
- These schools were selected for monitoring based on information indicating the potential for elevated ambient concentrations of pollutants associated with coke oven operations including benzene, arsenic, and benzo(a)pyrene in air outside the Charles Russell, Crabbe, Whitwell and Hatcher schools due to the nearby presence of a coke oven and steel manufacturing facilities located on the Ohio River. At Whitwell, manganese was also a key pollutant based on emissions from the steel manufacturing facility. The information that led to the selection of these schools included EPA's 2002 National-Scale Air Toxics Assessment (NATA).
- Air monitoring was performed from July 30, 2009, to April 2, 2010, for the following pollutants: benzene and other volatile organic compounds (VOCs); arsenic, manganese (specific to Whitwell), and other metals in particulate matter less than 10 microns (PM_{10}); and benzo(a)pyrene and other polycyclic aromatic hydrocarbons (PAH).
- Measured levels of typical coke oven pollutants, including benzene, arsenic (PM_{10}), and benzo(a)pyrene and associated longer-term concentration estimates at all four schools were below the levels of significant concern that had been suggested by the information available prior to monitoring. Specific to Whitwell, measured levels of manganese (PM_{10}) and associated longer-term concentration estimates are below levels of concern, and also are not as high as suggested by the information available prior to monitoring.
- The levels of all key pollutants, benzene, arsenic, benzo(a)pyrene, and manganese measured in the outdoor air indicate influence of nearby sources.
- The coke plant officially closed on June 23, 2011.
- Based on the analysis described here, EPA will not extend air toxics monitoring at these schools.

- EPA remains concerned about emissions from sources of air toxics and continues to work to reduce these emissions across the country, through national rules and by providing information and suggestions to assist with reductions in local areas (http://www.epa.gov/ttn/atw/eparules.html).
- The Kentucky Department for Environmental Protection (KYDEP) and the Ohio Environmental Protection Agency (OEPA) will continue to oversee industrial facilities in the area through air permits and other programs.

II. Background on this Initiative

As part of an 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 monitored specific (key) air toxics in the outdoor air around priority schools in 22 states and 2 tribal areas (http://www.epa.gov/schoolair/schools.html).

- The schools selected for monitoring included some schools near large industries that are sources of air toxics, and some schools that are in urban areas, where emissions of air toxics come from a mix of large and small industries, cars, trucks, buses and other sources.
- EPA selected schools based on information available to us about air pollution in the vicinity of each school, including results of the 2002 National-Scale Air Toxics Assessment (NATA), results from a 2008 USA Today analysis on air toxics at schools, and information from state and local air agencies. The analysis by USA Today involved use of EPA's Risk Screening Environmental Indicators tool and Toxics Release Inventory (TRI) for 2005.
  - Available information had raised some questions about air quality near these schools that EPA concluded merited investigation. In many cases, the information indicated that estimated long-term average concentrations of one or more air toxics were above the upper end of the range that EPA generally considers as acceptable (e.g., above 1-in-10,000 cancer risk for carcinogens).
- Monitors were placed at each school for approximately 60 days, and took air samples on at least 10 different days during that time. The samples were analyzed for specific air toxics identified for monitoring at the school (i.e., key pollutants).[1]
- 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

[1] In analyzing air samples for these key pollutants, samples are also being analyzed for some additional pollutants that are routinely included in the analytical methods for the key pollutants.

- 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 initiative is specific to the air toxics identified for monitoring at each school. This 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[2] and educational materials describing risk concepts[3] are also available from EPA's website.

III. Basis for Selecting these Schools and the Air Monitoring Conducted

This document describes air monitoring data collected at the Charles Russell, Crabbe, Hatcher, and Whitwell Schools. These schools were selected for monitoring in consultation with the Kentucky Department for Environmental Protection (KYDEP) and the Ohio Environmental Protection Agency (OEPA). EPA's 2002 NATA analysis also indicated the potential for levels of concern due to estimates of pollutants associated with coke oven operations including, benzene, arsenic, and benzo(a)pyrene emissions from nearby manufacturing facilities located along the Ohio River. Three of the schools (Charles Russell, Crabbe, and Hatcher) are within about 2 ½ miles of a coke oven or a steel manufacturing facility (Figure 1). Specific to Whitwell (which has since closed), manganese was included as a key pollutant of interest due to its close proximity to a steel manufacturing facility.

Monitoring commenced at these schools on July 30, 2009, and continued through April 2, 2010. During this time period, samples of airborne particles (12 samples at Charles Russell, Hatcher, and Whitwell; 11 samples at Crabbe) were collected using PM_{10} samplers,[4] and analyzed for arsenic, manganese, and a small standardized set of additional metals. Additionally, polycyclic aromatic hydrocarbons (PAHs) were collected (12 samples at Charles Russell, Hatcher and Whitwell; 11 samples for Crabbe) and analyzed for benzo(a)pyrene and a small standardized set of additional PAHs. Finally, samples of VOC from the four schools (Russell (13), Crabbe and Hatcher (12), and Whitwell (10)) were analyzed for benzene and a small standardized set of

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[2] For example, http://www.epa.gov/schoolair/pollutants.html, http://www.epa.gov/ttn/fera/risk_atoxic.html.
[3] For example, http://www.epa.gov/ttn/atw/3_90_022.html, http://www.epa.gov/ttn/atw/3_90_024.html.
[4] 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 arsenic and manganese are based.

additional VOCs. Due to an issue with VOC monitoring equipment, all VOC results were invalidated (see EPA's technical document, *Investigation and Resolution of Contamination Problems in the Collection of Volatile Organic Compounds*, at http://www.epa.gov/schoolair/pdfs/VocTechdocwithappendix1209.pdf). Additional VOC samples were collected between January 20, 2010, and April 2, 2010, to ensure that a minimum of 10 valid samples for each school were available for analysis.

All VOC results with the exception of acrolein were evaluated for health concerns. Results of a recent short-term laboratory study have raised questions about the consistency and reliability of monitoring results of acrolein. As a result, EPA will not use these acrolein data in evaluating the potential for health concerns from exposure to air toxics in outdoor air as part of the School Air Toxics Monitoring project (SAT) (http://www.epa.gov/schoolair/acrolein.html). All sampling methodologies are described in EPA's schools air toxics monitoring plan (http://www.epa.gov/schoolair/techinfo.html).[5]

IV. Monitoring Results and Analysis

A. Background for the SAT Analysis

The majority of schools being monitored in this initiative were selected based on modeling analyses that indicated the potential for annual average air concentrations of some specific (key) hazardous air pollutants (HAPs or air toxics)[6] to be of particular concern based on approaches that are commonly used in the air toxics program for considering potential for long-term risk. For example, such analyses suggested annual average concentrations of some air toxics were greater than long-term risk-based concentrations associated with an additional cancer risk greater than 10-in-10,000 or a hazard index on the order of or above 10. To make projections of air concentrations, the modeling analyses combined estimates of air toxics emissions from industrial, motor vehicle and other sources, with past measurements of winds, and other meteorological factors that can influence air concentrations, from a weather station in the general area. In some cases, the weather station was very close (within a few miles), but in other cases, it was much further away (e.g., up to 60 miles), which may contribute to quite different conditions being modeled than actually exist at the school. The modeling analyses are intended to be used to prioritize locations for further investigation.

The primary objective of this initiative is to investigate - through monitoring air concentrations of key air toxics at each school over a 2-3 month period - whether levels measured and associated longer-term concentration estimates are of a magnitude, in light of health risk-based criteria, for which follow-up activities may need to be considered. To evaluate the monitoring results consistent with this objective, we developed health risk-based air concentrations (the long-term comparison levels summarized in Appendix A) for the monitored air toxics using

[5] KYDEP and OEPA staff operated the monitors and sent the canisters and filters to the analytical laboratory under contract to EPA.

[6] The term hazardous air pollutants (commonly called HAPs or air toxics) refers to pollutants identified in section 112(b) of the Clean Air Act which 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. One of the criteria pollutants, lead, is also represented, as lead compounds, on the HAP list.

established EPA methodology and practices for health risk assessment[7] and, in the case of cancer risk, consistent with the implied level of risk considered in identifying schools for monitoring. Consistent with the long-term or chronic focus of the modeling analyses, based on which these schools were selected for monitoring, we have analyzed the full record of concentrations of air toxics measured at these schools, using routine statistical tools, to derive a 95 percent confidence interval[8] for the estimate of the longer-term average concentration of each of these pollutants. In this project, we are reporting all actual numerical values for pollutant concentrations including any values below method detection limit (MDL).[9] Additionally, a value of 0.0 is used when a measured pollutant has no value detected (ND). The projected range for the longer-term concentration estimate for each chemical (most particularly the upper end of the range) is compared to the long-term comparison levels. These long-term comparison levels conservatively presume continuous (all-day, all-year) exposure over a lifetime. The analysis of the air concentrations also includes a consideration of the potential for cumulative multiple pollutant impacts.[10] In general, where the monitoring results indicate estimates of longer-term average concentrations that are above the comparison levels - i.e., above the cancer-based comparison levels or notably above the noncancer-based comparison levels - we will consider the need for follow-up actions such as:

→ Additional monitoring of air concentrations and/or meteorology in the area,
→ Evaluation of potentially contributing sources to help us confirm their emissions and identify what options (regulatory and otherwise) may be available to us to achieve emissions reductions, and
→ Evaluation of actions being taken or planned nationally, regionally or locally that may achieve emission and/or exposure reductions. An example of this would be the actions taken to address the type of ubiquitous emissions that come from mobile sources.

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[7] While this EPA initiative will rely on EPA methodology, practices, assessments and risk policy considerations, we recognize that individual state methods, practices and policies may differ and subsequent analyses of the monitoring data by state agencies may draw additional or varying conclusions.

[8] When data are available for only a portion of the period of interest (e.g., samples not collected on every day during this period), statisticians commonly calculate the 95% confidence interval around the dataset mean (or average) in order to have a conservative idea of how high or low the "true" mean may be. More specifically, this interval is the range in which the mean for the complete period of interest is expected to fall 95% of the time (95% probability is commonly used by statisticians). The interval includes an equal amount of quantities above and below the sample dataset mean. The interval that includes these quantities is calculated using a formula that takes into account the size of the dataset (i.e., the 'n') as well as the amount by which the individual data values vary from the dataset mean (i.e., the "standard deviation"). This calculation yields larger confidence intervals for smaller datasets as well as ones with more variable data points. For example, a dataset including {1.0, 3.0, and 5.0}, results in a mean of 3.0 and a 95% confidence interval of 3.0 +/- ~5 (or -2.0 to 8.0). For comparison purposes, a dataset including {2.5, 3 and 3.5} results in a mean of 3.0 and a 95% confidence interval of 3.0 +/- ~1.2 (or 1.8 to 4.2). The smaller variation within the data in the second set of values causes the second confidence interval to be smaller.

[9] Method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the pollutant concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the pollutant.

[10] As this analysis of a 2-3 month monitoring dataset is not intended to be a full risk assessment, consideration of potential multiple pollutant impacts may differ among sites. For example, in instances where no individual pollutant appears to be present above its comparison level, we will also check for the presence of multiple pollutants at levels just below their respective comparison levels (giving a higher priority to such instances).

We have further analyzed the dataset to describe what it indicates in light of some other criteria and information commonly used in prioritizing state, local and national air toxics program activities. State, local and national programs often develop long-term monitoring datasets in order to better characterize pollutants near particular sources. The 2-3 month dataset developed under this initiative will be helpful to those programs in setting priorities for longer-term monitoring projects. The intent of this analysis is to make this 2-3 month monitoring dataset as useful as possible to state, local and national air toxics programs in their longer-term efforts to improve air quality nationally. To that end, this analysis:

→ Describes the air toxics measurements in terms of potential longer-term concentrations, and, as available, compares the measurements at these schools to monitoring data from national monitoring programs.

→ Describes the meteorological data by considering conditions on sampling days as compared to those over all the days within the 2-3 month monitoring period and what conditions might be expected over the longer-term (as indicated, for example, by information from a nearby weather station).

→ Describes available information regarding activities and emissions at the nearby sources of interest, such as that obtained from public databases such as TRI and/or consultation with the local air pollution authority.

B. Chemical Concentrations

We developed two types of long-term health risk-related comparison levels (summarized in Appendix A below) to address our primary objective. The primary objective is to investigate through the monitoring data collected for key pollutants at the schools, whether pollutant levels measured and associated longer-term concentration estimates are elevated enough in comparison with health risk-based criteria to indicate that follow-up activities be considered. These comparison levels conservatively presume continuous (all-day, all-year) exposure over a lifetime.

In developing or identifying these comparison levels, we have given priority to use of relevant and appropriate air standards and EPA risk assessment guidance and precedents.[11] These levels are based upon health effects information, exposure concentrations and risk estimates developed and assessed by EPA, the U.S. Agency for Toxic Substances and Disease Registry, and the California EPA. These agencies recognize the need to account for potential differences in sensitivity or susceptibility of different groups (e.g., asthmatics) or lifestages/ages (e.g., young children or the elderly) to a particular pollutant's effects so that the resulting comparison levels are relevant for these potentially sensitive groups as well as the broader population.

In addition to evaluating individual pollutants with regard to their corresponding comparison levels, we also considered the potential for cumulative impacts from multiple pollutants in cases where individual pollutant levels fall below the comparison levels but where multiple pollutant mean concentrations are within an order of magnitude of their comparison levels.

[11] The development of long-term comparison levels, as well as of individual sample screening levels, is described in detail in *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results.*

Using the analysis approach described above, we analyzed the chemical concentration data (Table 1 and Figures 2a-2d) with regard to areas of interest identified below.

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

- Although the air sampling data indicate influence of a nearby source of manganese emissions for Whitwell, the air sampling data and related longer-term concentration estimates for manganese (PM_{10}) are below concentrations of significant concern.

- The air sampling data and related longer-term concentration estimates for pollutants commonly associated with coke oven emissions, including benzene, arsenic (PM_{10}), and benzo(a)pyrene, were not as high as suggested by the information available prior to monitoring. Although these key pollutants were below the levels of concern that had been suggested by the modeling information, these results indicate the influence of these pollutants of concern emitted from nearby sources.

Manganese, key pollutant:

- Do the monitoring data indicate influence from a nearby source?
  - → The monitoring data collected at Whitwell include several manganese (PM_{10}) concentrations that are higher than concentrations commonly observed in other locations nationally.[12]
- Do the monitoring data indicate elevated levels that pose significant long-term health concerns?
  - → The monitoring data for manganese do not indicate levels of health concern for long-term exposures.
    - The estimate of longer-term manganese (PM_{10}) concentration (i.e., the upper bound of the 95 percent confidence interval on the mean of the dataset) is below the long-term noncancer-based comparison level (Table 1).[13] This comparison level is based on consideration of continuous exposure concentrations (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.[14]

[12] For example, six of the concentrations at this site (Table 2a) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix B). 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.

[13] The upper end of the interval is nearly 1.5 times the mean of the monitoring data and is 35% of the long-term noncancer-based comparison level.

[14] The comparison level for manganese is based on the RfC. Manganese concentrations at which health effects have been documented are higher than the RfC. For example, continuous, long-term exposure levels approximately 1,000 times higher than the comparison level are reported to cause neurological effects in workers exposed in industrial workplaces that process metallic materials. (http://www.atsdr.cdc.gov/tfacts151.html, http://www.epa.gov/ttn/atw/hlthef/manganes.html#conversion)

- As manganese has not been found to be carcinogenic, it has no cancer-based comparison level.[15]

→ Additionally, 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]

→ In summary, the combined contributions of all individual measurements in the estimate of longer-term concentration do not indicate a level of concern for long-term exposure to manganese at Whitwell.

Benzene, Arsenic, and Benzo(a)pyrene, key pollutants:

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

  → The monitoring data include several benzene,[16] arsenic (PM_{10}),[17] and benzo(a)pyrene[18] concentrations that are higher than concentrations commonly observed in other locations nationally.

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

  → Levels of pollutants associated with coke plant emissions, including benzene, arsenic (PM_{10}), and benzo(a)pyrene were not as high as suggested by the information available prior to monitoring. Although they were below the levels of concern that had been suggested by the modeling information, these results indicate the influence of these pollutants of concern emitted from nearby sources. However, since then one of the sources, the coke plant officially closed June 23, 2011.

  - The estimates of longer-term benzene concentrations (i.e., the upper bound of the 95 percent confidence interval on the mean of the dataset) are below the long-term comparison levels at all schools (Table 1).[19] These comparison levels are

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[15] www.epa.gov/iris

[16] For example, six of the concentrations at Charles Russell, five of the concentrations at Crabbe, four of the concentrations at Hatcher, and three of the concentrations at Whitwell (Table 2b) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix B). 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.

[17] For example, eight of the concentrations at Crabbe, seven of the concentrations at Hatcher, and six of the concentrations at Charles Russell and Whitwell (Table 2a) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix B). 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.

[18] For example, eight of the concentrations at Charles Russell, six of the concentrations at Crabbe and Whitwell, and seven of the concentrations at Hatcher School (Table 2a) were higher than 75 percent of samples collected at the National Air Toxics Trends Stations (NATTS) from 2004-2008 (Appendix B). 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.

[19] The upper ends of the intervals for Charles Russell, Crabbe, Hatcher, and Whitwell are 1.6, 1.8, 1.7, and 1.4 times the mean of their monitoring data, respectively. These upper ends of the intervals at Charles Russell, Crabbe, Hatcher, and Whitwell are less than 25%, 41%, 27%, and 12%, respectively, of the benzene long-term cancer-based comparison level.

based on consideration of continuous exposure concentrations (24 hours a day, all year, over a lifetime).

- The longer-term concentration estimates for the four schools are between 12-41% of the cancer-based comparison level, indicating the longer-term estimate falls between continuous (24 hours a day, 7 days a week) lifetime exposure concentrations associated with 1-in-100,000 and 1-in-10,000 additional cancer risk.

▪ The estimates of longer-term arsenic (PM_{10}) concentrations (i.e., the upper bound of the 95 percent confidence interval on the mean of the dataset) are below the long-term comparison levels (Table 1).[20] These comparison levels are based on consideration of continuous exposure concentrations (24 hours a day, all year, over a lifetime).

- Further, the longer-term concentration estimates at each school are less than or equal to 10% the cancer-based comparison level, indicating the longer-term estimates are below continuous (24 hours a day, 7 days a week) lifetime exposure concentrations associated with 1-in-100,000 additional cancer risk.

▪ The estimates of longer-term benzo(a)pyrene concentrations (i.e., the upper bound of the 95 percent confidence interval on the mean of the dataset) are below the long-term comparison level (Table 1).[21] This comparison level is based on consideration of continuous exposure concentrations (24 hours a day, all year, over a lifetime).

- Further, the longer-term concentration estimates at each school are more than tenfold lower than the cancer-based comparison level, indicating the longer-term estimates are below a continuous (24 hours a day, 7 days a week) lifetime exposure concentration associated with 1-in-100,000 additional cancer risk.

→ Additionally, we did not identify any concerns regarding short-term exposures as each individual measurement at the schools is below the individual sample screening levels for these pollutants (which are based on consideration of exposure all day, every day over a period ranging up to a couple of weeks or longer.[11]

Other Air Toxics:

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

[20] The upper ends of the intervals for Charles Russell, and Hatcher are 1.5 times the mean of the monitoring data; for Crabbe and Whitwell, 1.4 times the mean of the monitoring data. The upper ends of the intervals at Charles Russell, Crabbe, Hatcher, and Whitwell are less than 15%, 13%, 15%, and 10%, respectively of the arsenic long term noncancer-based comparison level.

[21] The upper ends of the intervals for Charles Russell is 2.6 times the mean of the monitoring data; for Crabbe, 2 times the mean of the monitoring data; for Hatcher, 2.1 times the mean of the monitoring data; and for Whitwell, 2.2 times the mean of the monitoring data. The upper ends of the intervals for all four schools are less than 3% of the long-term cancer-based comparison level.

→ The monitoring data show low levels of the other HAPs monitored, with the longer-term concentration estimates for these HAPs below their long-term comparison levels (Appendix C).

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 multiple air toxics monitored at this location were below the levels of significant concern that had been suggested by the modeling information (Appendix C).[22] In addition, levels of air toxics are expected to have decreased further since the coke plant officially closed June 23, 2011.

C. Wind and Other Meteorological Data

At each school monitored as part of this initiative, we collected meteorological data, minimally for wind speed and direction, during the sampling period. Additionally, we identified the nearest National Weather Service (NWS) station at which a longer record is available.

In reviewing these data at each school in this initiative, we are considering if these data indicate that the general pattern of winds on our sampling dates are significantly different from those occurring across the full sampling period or from those expected over the longer-term. Additionally, we are noting, particularly for school sites where the measured chemical concentrations show little indication of influence from a nearby source, whether wind conditions on some portion of the sampling dates were indicative of a potential to capture contributions from the nearby "key" source in the air sample collected.

The meteorological stations at Charles Russell, Crabbe, Hatcher, and Whitwell collected wind speed and wind direction measurements for the following time periods:

→ Charles Russell: July 21, 2009, continuing through the sampling period (July 30, 2009 – April 2, 2010), and ending on May 28, 2010;

→ Crabbe: July 28, 2009, continuing through the sampling period (July 30, 2009 – April 2, 2010), and ending on April 2, 2010;

→ Hatcher: July 21, 2009, continuing through the sampling period (July 30, 2009 – April 2, 2010), and ending on May 2, 2010; and

[22] 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.

→ Whitwell: July 29, 2009, continuing through the sampling period (July 30, 2009 – April 2, 2010), and ending on April 6, 2010.

As a result, on-site data for these meteorological parameters are available for all dates of sample collection at each school and also for a period before and after the sampling period, producing a continuous record between 8 to 10 months (Charles Russell, 10 months; Crabbe, 8 months; Hatcher, 9 months; Whitwell, 8 months) at each school. The meteorological data collected on sampling days are presented in Figures 3a-3d and Tables 2a-2b.

The nearest NWS station is at Tri-State/M.J. Ferguson Airport in Huntington, West Virginia. This station is approximately 6 miles southeast of Charles Russell, 8 miles southeast of Crabbe, 8 miles southeast of Hatcher, and 11 miles southeast of Whitwell. Measurements taken at that station include wind, temperature, and precipitation. These are presented in Tables 2a-2b, and Appendix E.

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

- Both the sampling results and the on-site wind data indicate that some of the air samples were collected on days when the nearby key sources were contributing to conditions at each school location.
- The wind patterns at all the schools are variable, probably due to the terrain and presence of the Ohio River affecting meteorological conditions.
- Our ability to provide a confident characterization of the wind flow patterns at the monitoring sites over the long-term is somewhat limited. The NWS station at Tri-State/M.J. Ferguson Airport does not appear to represent the specific wind flow patterns at any of the school locations.
- Although we lack long-term wind data at the monitoring sites, the wind pattern at the NWS station during the sampling period is similar to the historical long-term wind flow pattern at that same NWS station.

- What are the directions of the key sources of manganese, benzene, arsenic, and benzo(a)pyrene emissions in relation to the schools location?
  → The potential impact of nearby sources (A and B in Figure 1) emitting the key pollutants into the air (described in section III above) varies with distance from each school with Whitwell being closest to source A (1.26 miles north); Hatcher and Crabbe between sources A and B; and Charles Russell closest to source B (less than 1 mile southwest) (Figure 1).
  → Using the property boundaries of each facility (in lieu of information regarding the location of specific sources of manganese, benzene, arsenic, and benzo(a)pyrene emissions at each facility), we have identified an approximate range of wind directions to use in considering the potential influence of these facilities on air concentrations at each school.
  → This general range of wind directions is referred to here as the expected zone of source influence (ZOI). As there are two different sources, individual schools may be

more impacted by either source A or B, or both sources. Therefore, the ZOIs are described as ZOI A or ZOI B based on the source with most potential impact.

- For Whitwell, ZOI A is from 146 to 236 degrees.
- For Charles Russell, ZOI B is from 34 to 101 degrees.
- Crabbe is impacted by both sources with ZOI A from 304 to 326 and ZOI B from 101 to 146 degrees.
- Hatcher is also impacted by both sources with ZOI A from 304 to 349 and ZOI B from 101 to 124 degrees.

- On days the air samples were collected, how often did wind come from direction of the key sources and is there any relationship in wind patterns between the four schools?
  → Figures 4a-4d provide information regarding the number of hours the wind blows from the ZOI for each pollutant at each school as follows:
    - For Whitwell, there were eleven sampling days for manganese (PM_{10}), arsenic (PM_{10}), and benzo(a)pyrene and four sampling days for benzene in which a portion of the winds were from the expected ZOI A (Figures 4a-4d, Tables 2a-2b).
    - For Charles Russell, there were eight sampling days for arsenic (PM_{10}) and benzo(a)pyrene and seven sampling days for benzene in which a portion of the winds were from the expected ZOI B (Figures 4b-4d , Tables 2a-2b).
    - For Crabbe, there were nine sampling days for arsenic (PM_{10}) and benzo(a)pyrene, and eleven sampling days for benzene in which a portion of the winds were from the expected ZOIs (Figures 4b-4d, Tables 2a-2b).
      - Of the arsenic and benzo(a)pyrene samples, 5 of the 9 were taken on days when the winds were from the expected ZOI A, and 7 of the 9 were taken on days when the winds were from the expected ZOI B.
      - Of the benzene samples, 6 of the 9 were taken on days when the winds were from the expected ZOI A, and 7 of the 9 were taken on days when the winds were from the expected ZOI B.
    - For Hatcher, there were twelve sampling days for benzene and ten sampling days for arsenic (PM_{10}) and benzo(a)pyrene in which a portion of the winds were from the expected ZOIs (Figures 4b-4d, Tables 2a-2b).
      - Of the benzene sampling days, 9 of the 12 were taken on days when the winds were from the expected ZOI A, and 3 of the 12 were taken on days when the winds were from the expected ZOI B.
      - Of the arsenic and benzo(a) pyrene samples, 6 of the 10 were taken on days when the winds were from the expected ZOI A, and 9 of the 10 were taken on days when the winds were from the expected ZOI B.

- How do wind patterns on the air monitoring days at each school compare to those across the complete monitoring period and what might be expected over the longer-term at each school location?
  → The wind patterns at all the schools are variable, probably due to the terrain and presence of the Ohio River affecting meteorological conditions.
  → Wind patterns at the nearest NWS station (at Tri-State/M.J. Ferguson Airport) during the sampling period are similar to those recorded at the NWS station

over the long-term (2002-2007 period; Appendix E), supporting the idea that regional meteorological patterns during the sampling period were consistent with long-term patterns. There is some uncertainty as to whether the general wind patterns at each school location for longer periods would be similar to the general wind patterns at the Tri-State/M.J. Ferguson Airport (see below).

- How do wind patterns at each school compare to those at the Tri-State/M.J. Ferguson Airport NWS station, particularly with regard to prevalent wind directions and the direction of the key sources?
  - → During the sampling period for which data are available both at a school site and at the reference NWS station (approximately 8 months), the prevalent winds at the NWS station are from the south-southwest to west (Appendix E).
  - → The windroses for the four sites during the sampling period (Figures 3a-3d and Appendix E) do not show similarities in wind flow patterns.

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

V. Key Source Information

- Were the sources operating as usual during the monitoring period?
  - – The nearby sources of manganese, benzene, arsenic, and benzo(a) pyrene have operating permits issued by the KYDEP that include operating requirements.[23]
  - – The most recently available emissions data (2005 NATA, 2008 TRI) for the pollutants associated with the coke oven facility are lower than those relied upon in previous modeling analysis for this area (2002 NATA). Operations at the plant in 2009 were reduced to approximately half of recent production levels. Although production rose somewhat in 2010, the coke plant officially closed June 23, 2011.[24]
  - – Specific to Whitwell, the most recently available manganese emissions data (2008 TRI) for the steel manufacturing facility are slightly lower than those relied upon in previous modeling analysis for this area (2002 NATA). Production at the steel manufacturing facility in 2009 was reduced about 15% from the 2008 levels (72% of capacity) which were typical levels for the facility. Production rose again in 2010 (75% of capacity) which was slightly above the levels in 2008.

[23] Operating permits, which are issued to air pollution sources under the Clean Air Act, are described at: http://www.epa.gov/air/oaqps/permits.
[24] This press release is found at http://www.aksteel.com/news/press_release.aspx?doc_id=837&year=2010.

VI. Integrated Summary and Next Steps

A. Summary of Key Findings

1. What are the key HAPs for each school?
   → Benzene, arsenic, and benzo(a)pyrene are the key HAPs for all four schools; manganese is also a key pollutant for Whitwell. The key HAPs were identified based on emissions information considered in identifying these schools for monitoring. The ambient air concentrations of these pollutants on several days during the monitoring period indicate contributions from sources in the area.

2. Do the data collected at each school indicate a level of concern, as implied by information that led to identifying the schools for monitoring?
   → The levels measured at the four schools and associated longer-term concentration estimates for all key pollutants are not as high as the levels of concern for long-term exposure that had been suggested by the information available prior to monitoring.
   → EPA remains concerned about emissions from sources of air toxics and continues to work to reduce these emissions across the country, through national rules and by providing information and suggestions to assist with reductions in local areas.

3. 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 sampling 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 (at Tri-State/M.J. Ferguson Airport) during the sampling period appear to be representative of long-term wind flow at that station. The lack of long-term meteorological data at the school locations, along with our finding that the wind patterns from the nearest NWS station are not similar to those at the schools, however, limit our ability to confidently predict longer-term wind patterns at the schools (which might provide further evidence relevant to concentrations during other times).

B. Next Steps for Key Pollutants

1. Based on the analysis described here, EPA does not presently plan to continue air toxics monitoring at these schools.

2. EPA remains concerned about emissions from sources of air toxics and continues to work to reduce these emissions across the country, through national rules and by providing information and suggestions to assist with reductions in local areas (http://www.epa.gov/ttn/atw/eparules.html).

3. The KYDEP and the OEPA will continue to oversee industrial facilities in the area through air permits and other programs. The coke plant officially closed on June 23, 2011.

VII. Tables and Figures

A. Tables

1. Ashland, Kentucky and Ironton, Ohio Area Schools – Key Pollutant Analysis.

2a. Ashland, Kentucky and Ironton, Ohio Area Schools Key Pollutant Concentrations (Arsenic (PM_{10}), Benzo(a)pyrene, and Manganese (PM_{10})) and Meteorological Data.

2b. Ashland, Kentucky and Ironton, Ohio Area Schools Key Pollutant Concentrations (Benzene) and Meteorological Data.

B. Figures

1. Ashland, KY and Ironton, OH Area Schools, Sources of Interest (A, B), and the Tri-State/M.J. Ferguson Field Airport NWS Station.

2a. Whitwell Elementary School – Key Pollutant (Manganese (PM_{10})) Analysis.

2b. Ashland, Kentucky and Ironton, Ohio Area Schools – Key Pollutant (Benzene) Analysis.

2c. Ashland, Kentucky and Ironton, Ohio Area Schools – Key Pollutant (Arsenic (PM_{10})) Analysis.

2d. Ashland, Kentucky and Ironton, Ohio Area Schools – Key Pollutant (Benzo(a)pyrene) Analysis.

3a. Charles Russell Elementary School – Wind Information.

3b. Crabbe School – Wind Information.

3c. Hatcher School – Wind Information.

3d. Whitwell Elementary School – Wind Information.

4a. Whitwell Elementary School – Manganese (PM_{10}) Concentration and Wind Information.

4b. Ashland, Kentucky and Ironton, Ohio Area Schools – Benzene Concentration and Wind Information.

4c. Ashland, Kentucky and Ironton, Ohio Area Schools – Arsenic (PM_{10}) Concentration and Wind Information.

4d. Ashland, Kentucky and Ironton, Ohio Area Schools – Benzo(a)pyrene Concentration and Wind Information.

VIII. Appendices

A. Summary Description of Long-term Comparison Levels.

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

C. Analysis of Other (non-key) Air Toxics Monitored at Each School and Multiple-pollutant Considerations.

D-1. Charles Russell Elementary School Pollutant Concentrations.

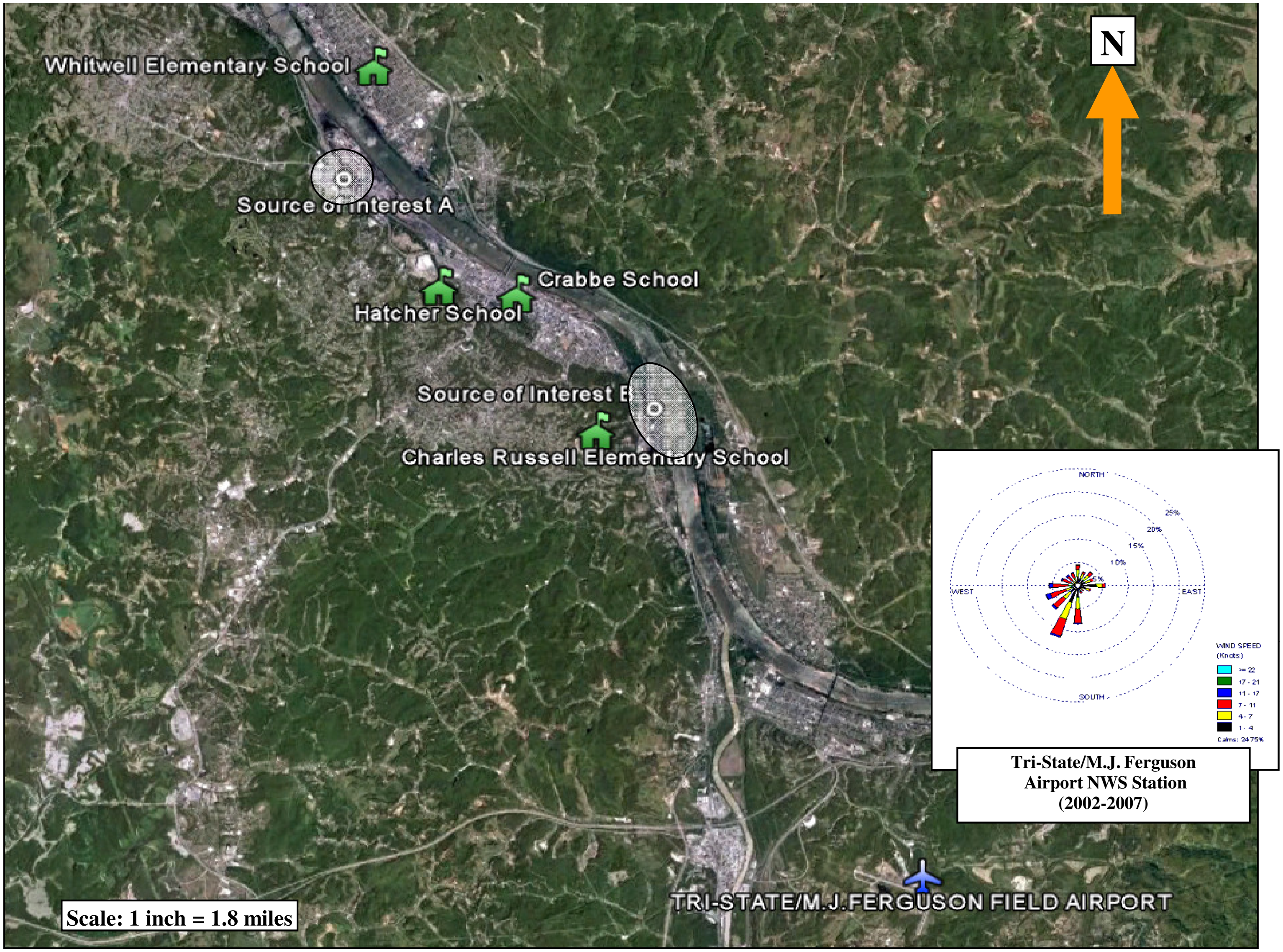
D-2. Crabbe School Pollutant Concentrations.

D-3. Hatcher School Pollutant Concentrations.

D-4. Whitwell Elementary School Pollutant Concentrations.

E. Windroses for Tri-State/M.J. Ferguson Field Airport NWS Station.

Figure 1. Ashland, KY and Ironton, OH Area Schools, Sources of Interest (A, B), and the Tri-State/M.J. Ferguson Field Airport NWS Station.



Scale: miles 0 — 1.8 — 3.6

School Name	Distance (miles)		
	Source A	Source B	NWS Station
Charles Russell Elementary	NA[1]	0.86	5.84
Crabbe School	2.61	1.6	7.76
Hatcher School	1.94	2.38	8.35
Whitwell Elementary	1.26	NA[1]	11.04

[1] NA: The source is not in the zone of source influence for this school.
Potential Sources A and B are indicated by hatched shading.

Table 1. Ashland, Kentucky and Ironton, Ohio Area Schools - Key Pollutant Analysis.

Parameter	School Name	Units	Mean of Measurements	95% Confidence Interval on the Mean	Long-term Comparison Level[a]	
					Cancer-Based[b]	Noncancer-Based[c]
Manganese (PM_{10})	Whitwell Elementary School	ng/m^3	12.1 [d]	6.69 - 17.5	NA	50
Benzene	Charles Russell Elementary School	$\mu g/m^3$	1.98 [e]	0.77 - 3.20	13	30
	Crabbe School	$\mu g/m^3$	2.92 [f]	0.53 - 5.30		
	Hatcher School	$\mu g/m^3$	2.04 [g]	0.61 - 3.47		
	Whitwell Elementary School	$\mu g/m^3$	1.11 [h]	0.63 - 1.58		
Arsenic (PM_{10})	Charles Russell Elementary School	ng/m^3	1.45 [i]	0.74 - 2.17	23	15
	Crabbe School	ng/m^3	1.39 [j]	0.89 - 1.89		
	Hatcher School	ng/m^3	1.54 [k]	0.76 - 2.32		
	Whitwell Elementary School	ng/m^3	1.09 [l]	0.70 - 1.48		
Benzo(a)pyrene	Charles Russell Elementary School	ng/m^3	0.629 [m]	0 - 1.620	57	NA
	Crabbe School	ng/m^3	0.544 [n]	0.010 - 1.070		
	Hatcher School	ng/m^3	0.297 [o]	0 - 0.640		
	Whitwell Elementary School	ng/m^3	0.244 [p]	0 - 0.530		

ng/m^3 nanograms per cubic meter

$\mu g/m^3$ micrograms 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 this 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 measurements for manganese (PM_{10}) is the average of all sample results, which include twelve detections that ranged from 1.79 to 30.5 ng/m^3.

[e] The mean of measurements for benzene is the average of all sample results, which include thirteen detections that ranged from 0.476 to 7.51 $\mu g/m^3$.

[f] The mean of measurements for benzene is the average of all sample results, which include twelve detections that ranged from 0.563 to 13.5 $\mu g/m^3$.

[g] The mean of measurements for benzene is the average of all sample results, which include twelve detections that ranged from 0.479 to 7.54 $\mu g/m^3$.

[h] The mean of measurements for benzene is the average of all sample results, which include ten detections that ranged from 0.479 to 2.46 $\mu g/m^3$.

[i] The mean of measurements for arsenic (PM_{10}) is the average of all sample results, which include twelve detections that ranged from 0.17 to 4.4 ng/m^3.

[j] The mean of measurements for arsenic (PM_{10}) is the average of all sample results, which include eleven detections that ranged from 0.22 to 2.47 ng/m^3.

[k] The mean of measurements for arsenic (PM_{10}) is the average of all sample results, which include twelve detections that ranged from 0.17 to 4.88 ng/m^3.

[l] The mean of measurements for arsenic (PM_{10}) is the average of all sample results, which include twelve detections that ranged from 0.08 to 2.5 ng/m^3.

[m] The mean of measurements for benzo(a)pyrene is the average of all sample results, which include ten detections that ranged from 0.050 to 5.59 ng/m^3. There were also two samples in which no chemical was registered by the laboratory analytical equipment. For these samples, a value of zero was used when calculating the mean.

[n] The mean of measurements for benzo(a)pyrene is the average of all sample results, which include nine detections that ranged from 0.020 to 2.24 ng/m^3. There were also two samples in which no chemical was registered by the laboratory analytical equipment. For these samples, a value of zero was used when calculating the mean.

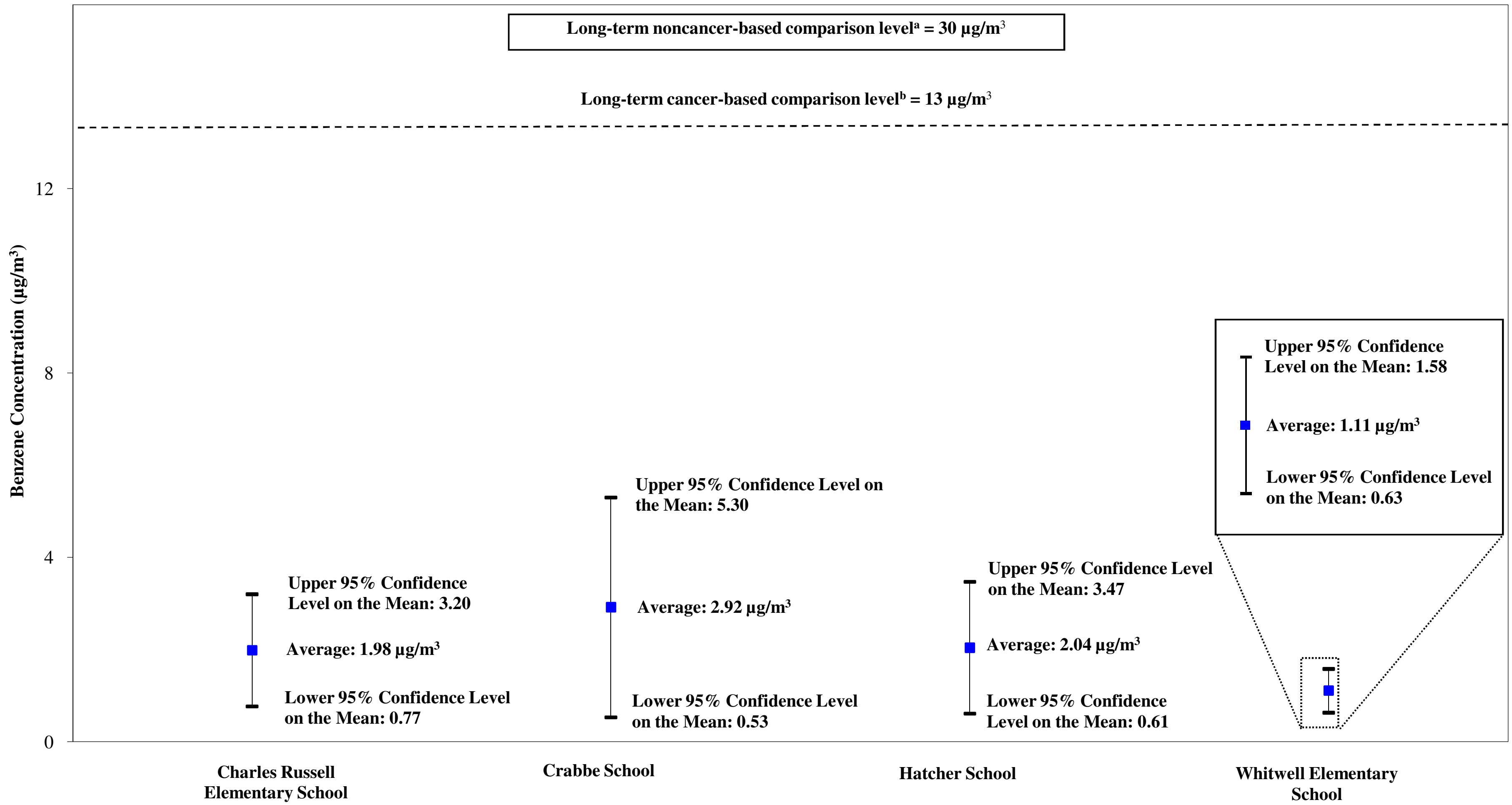
[o] The mean of measurements for benzo(a)pyrene is the average of all sample results, which include eleven detections that ranged from 0.020 to 1.96 ng/m^3. There was also one sample in which no chemical was registered by the laboratory analytical equipment. For this sample, a value of zero was used when calculating the mean.

[p] The mean of measurements for benzo(a)pyrene is the average of all sample results, which include eleven detections that ranged from 0.0400 to 1.640 ng/m^3. There was also one sample in which no chemical was registered by the laboratory analytical equipment. For this sample, a value of zero was used when calculating the mean.

Figure 2a. Whitwell Elementary School - Key Pollutant (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.

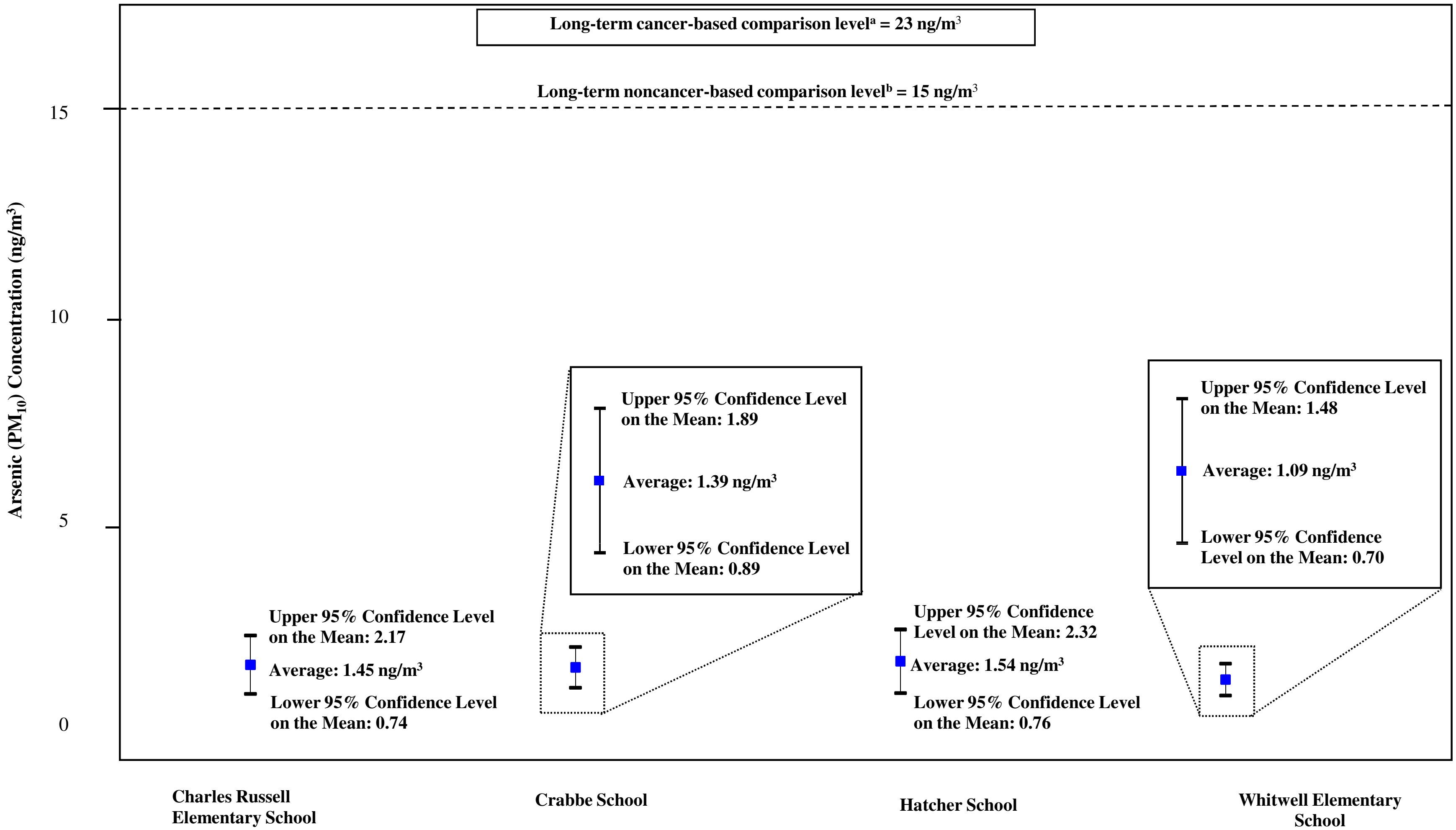
Figure 2b. Ashland, Kentucky and Ironton, Ohio Area Schools - Key Pollutant (Benzene) Analysis.



[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.

[b] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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.

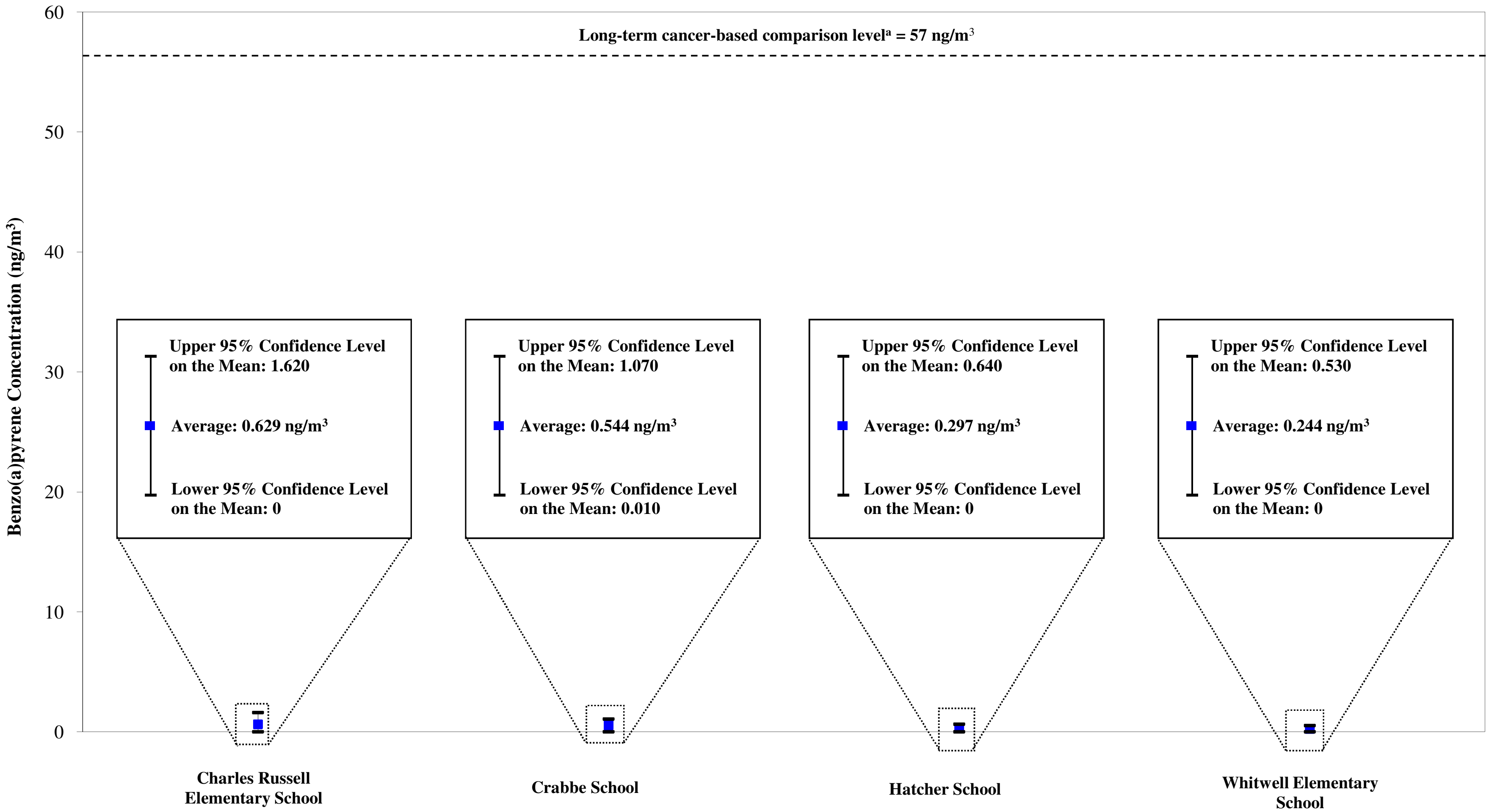
Figure 2c. Ashland, Kentucky and Ironton, Ohio Area Schools - Key Pollutant (Arsenic (PM_{10})) Analysis.



[a] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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.

[b] 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 2d. Ashland, Kentucky and Ironton, Ohio Area Schools - Key Pollutant (Benzo(a)pyrene) Analysis.



[a] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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.

Table 2a. Ashland, Kentucky and Ironton, Ohio Area Schools Key Pollutant Concentrations (Arsenic (PM_{10}), Benzo(a)pyrene, and Manganese (PM_{10})) and Meteorological Data.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009
Charles Russell Elementary School													
Arsenic (PM_{10})	ng/m^3	1.69	1.23	2.65	0.83	0.98	0.72	0.62	1.83	0.88	1.42	4.4	0.17
Benzo(a)pyrene	ng/m^3	0.18	0.12	0.05	0.15	0.16	0.15	ND	5.59	0.61	0.46	0.08	ND
% Hours w/Wind Direction from Expected ZOI B (34°-101°)[a]	%	8.3	0.0	4.2	4.2	4.2	0.0	12.5	0.0	12.5	4.2	8.3	0.0
Wind Speed (avg. of hourly speeds)	mph	2.1	1.3	2.0	2.3	2.1	1.7	2.9	1.6	2.6	2.0	2.3	6.4
Wind Direction (avg. of unitized vector)[b]	deg.	174.7	339.0	167.2	239.6	195.5	303.5	288.1	280.0	127.1	308.5	156.4	253.2
% of Hours with Speed below 2 knots	%	70.8	66.7	70.8	58.3	58.3	87.5	50.0	83.3	45.8	75.0	58.3	8.3
Crabbe School													
Arsenic (PM_{10})	ng/m^3	0.46	1.08	2.38	0.84	1.57	2.47	1.1	2.07	--	1.2	1.93	0.22
Benzo(a)pyrene	ng/m^3	ND	0.22	--	ND	1.62	0.06	0.02	0.26	2.24	0.16	1.36	0.04
% Hours w/Wind Direction from Expected ZOI A (304°-326°)[a]	%	4.2	0.0	0.0	12.5	4.2	0.0	4.2	0.0	0.0	0.0	0.0	33.3
% Hours w/Wind Direction from Expected ZOI B (101°-145°)[a]	%	8.3	0.0	54.2	16.7	29.2	0.0	0.0	33.3	50.0	0.0	62.5	4.2
Wind Speed (avg. of hourly speeds)	mph	3.9	0.6	1.5	2.7	1.5	3.5	4.6	2.2	3.2	3.8	2.1	4.4
Wind Direction (avg. of unitized vector)[b]	deg.	205.7	355.3	114.1	24.6	77.0	37.2	263.8	82.7	90.7	64.8	112.3	353.7
% of Hours with Speed below 2 knots	%	29.2	83.3	95.8	50.0	87.5	16.7	12.5	58.3	41.7	29.2	66.7	25.0
Hatcher School													
Arsenic (PM_{10})	ng/m^3	1.96	0.59	2.25	0.88	1.52	0.82	2.28	4.88	0.82	1.18	1.18	0.17
Benzo(a)pyrene	ng/m^3	ND	0.13	0.44	0.05	1.96	0.13	0.04	0.11	0.49	0.07	0.14	0.02
% Hours w/Wind Direction from Expected ZOI A (304°-349°)[a]	%	4.2	0.0	0.0	4.2	0.0	0.0	12.5	20.8	0.0	29.2	0.0	25.0
% Hours w/Wind Direction from Expected ZOI B (101°-124°)[a]	%	25.0	0.0	0.0	20.8	25.0	33.3	29.2	16.7	25.0	4.2	12.5	0.0
Wind Speed (avg. of hourly speeds)	mph	2.5	0.6	2.7	2.3	2.5	1.9	2.1	1.8	2.5	1.9	2.6	3.8
Wind Direction (avg. of unitized vector)[b]	deg.	121.6	355.3	214.0	137.0	141.9	57.0	68.6	88.3	143.1	40.2	147.6	236.1
% of Hours with Speed below 2 knots	%	54.2	83.3	41.7	58.3	62.5	83.3	79.2	100.0	58.3	79.2	45.8	29.2
Whitwell Elementary School													
Manganese (PM_{10})	ng/m^3	8.28	3.60	18.5	6.15	30.5	1.79	9.93	21.1	3.75	10.3	12.2	19.3
Arsenic (PM_{10})	ng/m^3	2.5	1.02	1.21	0.39	1.3	0.85	0.84	1.76	1.11	1.14	0.87	0.08
Benzo(a)pyrene	ng/m^3	0.10	0.38	0.15	0.05	0.19	0.04	0.06	0.14	0.04	0.14	1.64	ND
% Hours w/Wind Direction from Expected ZOI A (146°-236°)[a]	%	50.0	25.0	75.0	45.8	79.2	0.0	8.3	8.3	25.0	4.2	62.5	16.7
Wind Speed (avg. of hourly speeds)	mph	2.1	1.3	2.0	2.3	2.1	1.7	2.9	1.6	2.6	2.0	2.3	6.4
Wind Direction (avg. of unitized vector)[b]	deg.	96.4	38.7	148.7	251.0	170.0	240.1	149.1	249.1	173.4	343.6	271.7	323.4
% of Hours with Speed below 2 knots	%	70.8	66.7	70.8	58.3	58.3	87.5	50.0	83.3	45.8	75.0	58.3	8.3
Daily Average Temperature	° F	72.0	67.0	72.7	75.4	75.0	66.5	71.7	68.2	67.7	70.2	74.7	62.9
Daily Precipitation	inches	0.65	0.17	0.01	0.00	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.02

All precipitation and temperature data were from the Tri-State/M.J. Ferguson Airport NWS Station.

Table 2a. Ashland, Kentucky and Ironton, Ohio Area Schools Key Pollutant Concentrations (Arsenic (PM_{10}), Benzo(a)pyrene, and Manganese (PM_{10})) and Meteorological Data.

[gray shaded box] Due to instrument error, meteorological measurements were not collected at the school on August 5th and August 8th. Additionally, the first 12 hours of August 11th were not collected. As such, hourly wind information was extracted from theTri-State/M.J. Ferguson Airport NWS Station for these hours and used as a surrogate.

[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 collected for this pollutant on this day or the sample was invalidated.

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

Table 2b. Ashland, Kentucky and Ironton, Ohio Area Schools Key Pollutant Concentrations (Benzene) and Meteorological Data.

Parameter	Units	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010
Charles Russell Elementary School														
Benzene	$\mu g/m^3$	2.59	0.607	2.652	0.831	0.575	0.563	0.579	0.476	2.96	0.671	4	1.78	7.51
% Hours w/Wind Direction from Expected ZOI B (34° -101°)[a]	%	66.7	0.0	8.3	4.2	0.0	0.0	0.0	0.0	16.7	0.0	25.0	4.2	16.7
Wind Speed (avg. of hourly speeds)	mph	2.4	7.8	1.9	2.5	5.5	3.6	6.3	3.5	2.1	3.9	2.9	3.4	2.4
Wind Direction (avg. of unitized vector)[b]	deg.	127.1	308.5	156.4	253.2	44.9	268.5	154.8	353.2	277.2	264.9	285.6	318.3	167.7
% of Hours with Speed below 2 knots	%	54.2	0.0	66.7	50.0	4.2	25.0	8.3	0.0	54.2	4.2	41.7	41.7	62.5
Crabbe School														
Benzene	$\mu g/m^3$	0.799	0.575	4.73	--	1.21	0.889	0.563	0.665	5.72	0.742	3.93	1.69	13.5
% Hours w/Wind Direction from Expected ZOI A (304°-326°)[a]	%	0.0	25.0	0.0	4.2	33.3	25.0	66.7	25.0	0.0	0.0	0.0	8.3	0.0
% Hours w/Wind Direction from Expected ZOI B (101°-145°)[a]	%	8.3	0.0	12.5	0.0	0.0	4.2	0.0	0.0	12.5	0.0	33.3	20.8	20.8
Wind Speed (avg. of hourly speeds)	mph	4.1	6.1	2.2	3.2	4.0	3.5	6.3	6.0	2.3	5.6	2.9	3.4	2.2
Wind Direction (avg. of unitized vector)[b]	deg.	90.7	64.8	112.3	353.7	80.7	292.4	227.7	26.2	305.9	324.7	307.4	337.2	187.2
% of Hours with Speed below 2 knots	%	4.2	0.0	75.0	16.7	8.3	33.3	0.0	0.0	54.2	0.0	45.8	29.2	70.8
Hatcher School														
Benzene	$\mu g/m^3$	1.09	0.479	3.52	--	2.81	5.02	0.483	0.566	7.54	0.601	0.565	1.13	0.658
% Hours w/Wind Direction from Expected ZOI A (304°-349°)[a]	%	50.0	54.2	4.2	87.5	4.2	8.3	58.3	100	4.2	100	0.0	0.0	0.0
% Hours w/Wind Direction from Expected ZOI B (101°-124°)[a]	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.2	4.2
Wind Speed (avg. of hourly speeds)	mph	2.8	4.4	1.8	2.7	3.0	3.0	4.2	5.0	2.0	6.1	3.1	3.7	2.3
Wind Direction (avg. of unitized vector)[b]	deg.	347.9	297.1	191.2	318.7	244.8	215.1	301.2	329.8	183.7	336.8	185.0	146.6	197.5
% of Hours with Speed below 2 knots	%	41.7	0.0	79.2	37.5	29.2	16.7	16.7	0.0	62.5	0.0	54.2	41.7	58.3
Whitwell Elementary School														
Benzene	$\mu g/m^3$	1.15	--	2.46	0.607	0.735	0.777	0.479	0.748	2.12	0.636	--	1.34	--
% Hours w/Wind Direction from Expected ZOI A (146° -236°)[a]	%	0.0	0.0	33.3	0.0	0.0	4.2	0.0	0.0	33.3	0.0	20.8	25.0	37.5
Wind Speed (avg. of hourly speeds)	mph	2.4	7.8	1.9	2.5	5.5	3.6	6.3	3.5	2.1	3.9	2.9	3.4	2.4
Wind Direction (avg. of unitized vector)[b]	deg.	170.0	240.1	149.1	249.1	173.4	343.6	271.7	323.4	96.4	38.7	148.7	251.0	251.0
% of Hours with Speed below 2 knots	%	54.2	0.0	66.7	50.0	4.2	25.0	8.3	0.0	54.2	4.2	41.7	41.7	62.5
Daily Average Temperature	° F	35.1	31.3	26.7	22.4	25.0	33.7	25.4	32.4	54.4	43.5	57.5	48.0	70.9
Daily Precipitation	inches	0.07	0.06	0.00	0.00	0.04	0.00	0.07	0.06	0.01	0.00	0.03	0.00	0.00

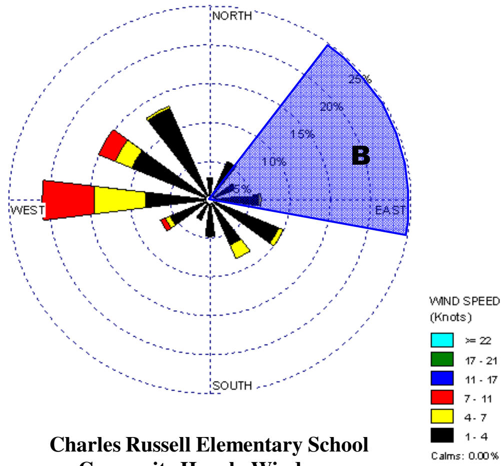
(Yellow box) All precipitation and temperature data were from the Tri-State/M.J. Ferguson Airport NWS Station.

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

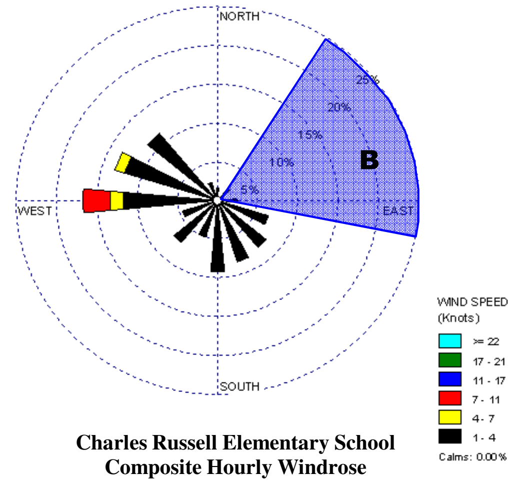
[b] Wind direction for each day is represented by values derived by scalar averaging of hourly estimates that were produced (by wind instrumentation's logger) as unitized vectors (specified as degrees from due north).

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

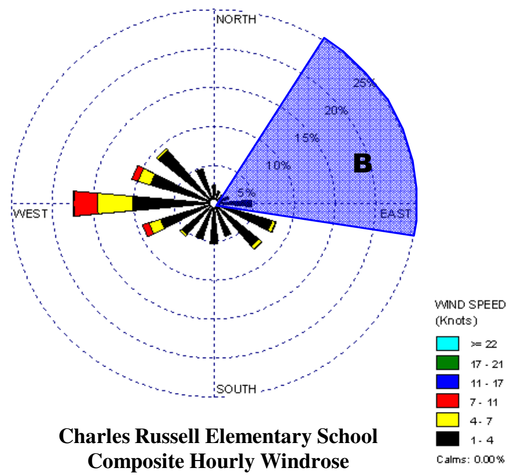
Figure 3a. Charles Russell Elementary School - Wind Information.



Charles Russell Elementary School
Composite Hourly Windrose
on Benzene Sample Days
(Jan. 20, 2010-Apr. 2, 2010)



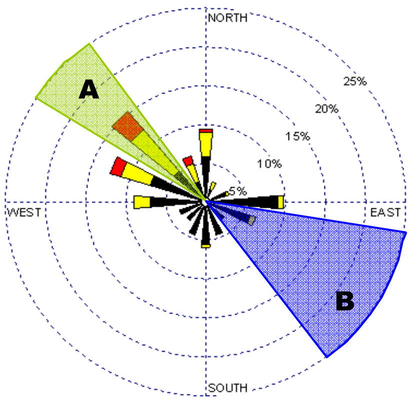
Charles Russell Elementary School
Composite Hourly Windrose
on Arsenic (PM_{10}) and Benzo(a)pyrene
Sample Days
(Jul. 30, 2009-Sep. 28, 2009)



Charles Russell Elementary School
Composite Hourly Windrose
Across Sampling Period
(Jul. 30, 2009-Apr. 2, 2010)

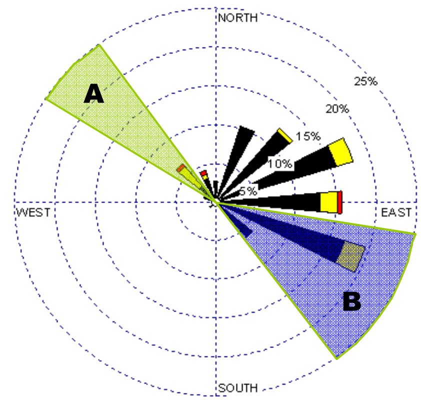
Expected Zone of Source Influence B

Figure 3b. Crabbe School - Wind Information.



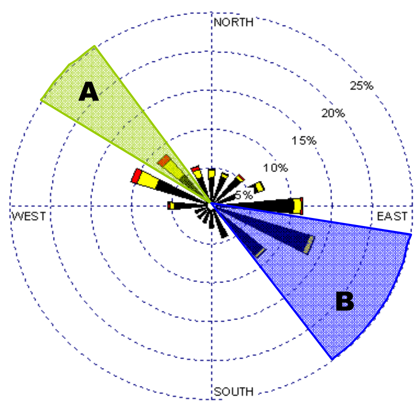
WIND SPEED (Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.35%

Crabbe School
Composite Hourly Windrose
on Benzene Sample Days
(Jan. 20, 2010-Apr. 2, 2010)



WIND SPEED (Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.00%

Crabbe School
Composite Hourly Windrose
on Arsenic (PM_{10}) and Benzo(a)pyrene Sample Days
(Jul. 30, 2009-Sep. 28, 2009)

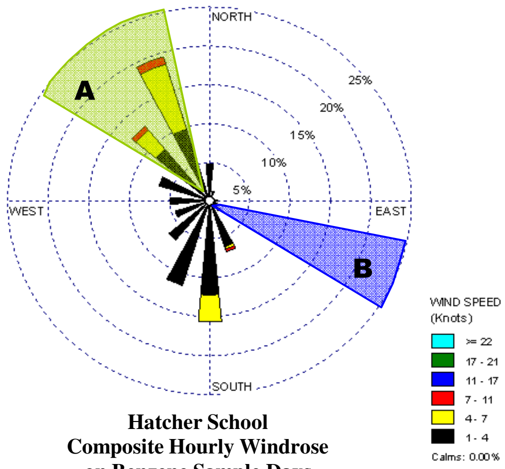


WIND SPEED (Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.00%

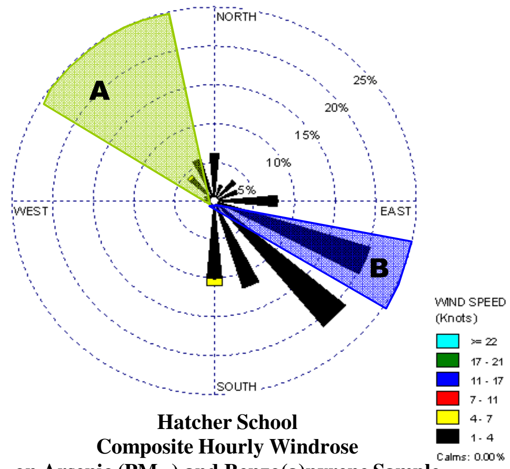
Crabbe School
Composite Hourly Windrose
Across Sampling Period
(Jul. 30, 2009-Apr. 2, 2010)

Expected Zone of Source Influence A
Expected Zone of Source Influence B

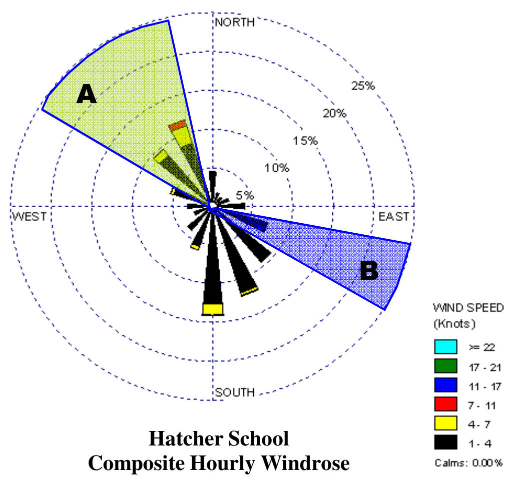
Figure 3c. Hatcher School - Wind Information.



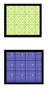
Hatcher School
Composite Hourly Windrose
on Benzene Sample Days
(Jan. 20, 2010-Apr. 2, 2010)



Hatcher School
Composite Hourly Windrose
on Arsenic (PM_{10}) and Benzo(a)pyrene Sample Days
(Jul. 30, 2009-Sep. 28, 2009)



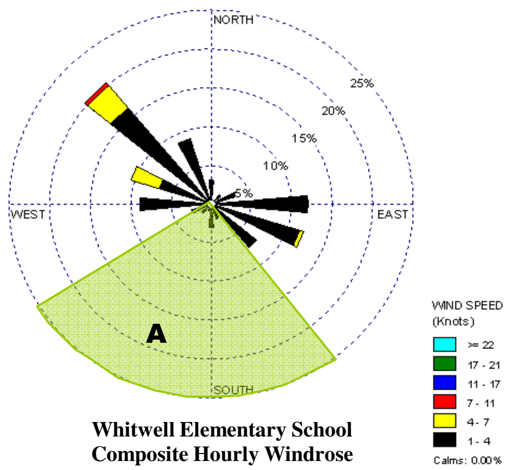
Hatcher School
Composite Hourly Windrose
Across Sampling Period
(Jul. 30, 2009-Apr. 2, 2010)



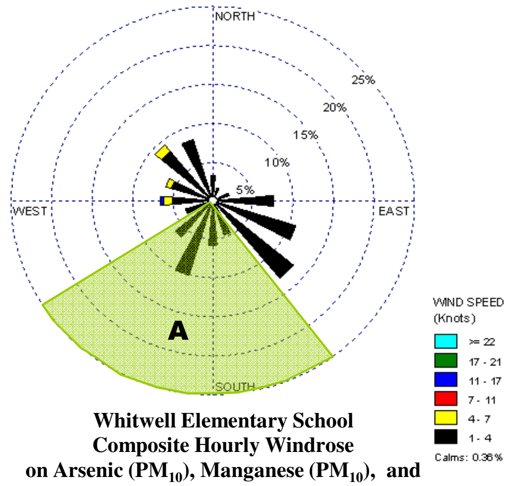
Expected Zone of Source Influence A

Expected Zone of Source Influence B

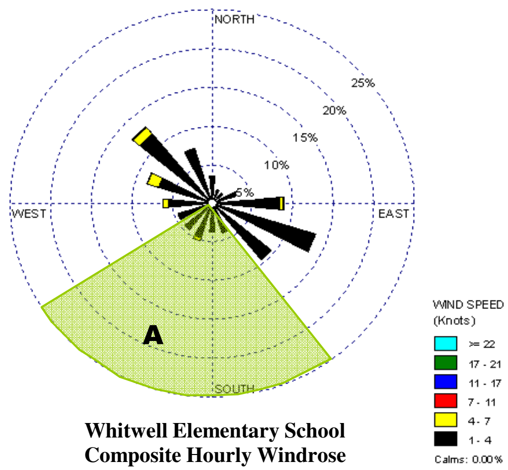
Figure 3d. Whitwell Elementary School - Wind Information.



**Whitwell Elementary School
Composite Hourly Windrose
on Benzene Sample Days
(Jan. 20, 2010-Mar. 27, 2010)**



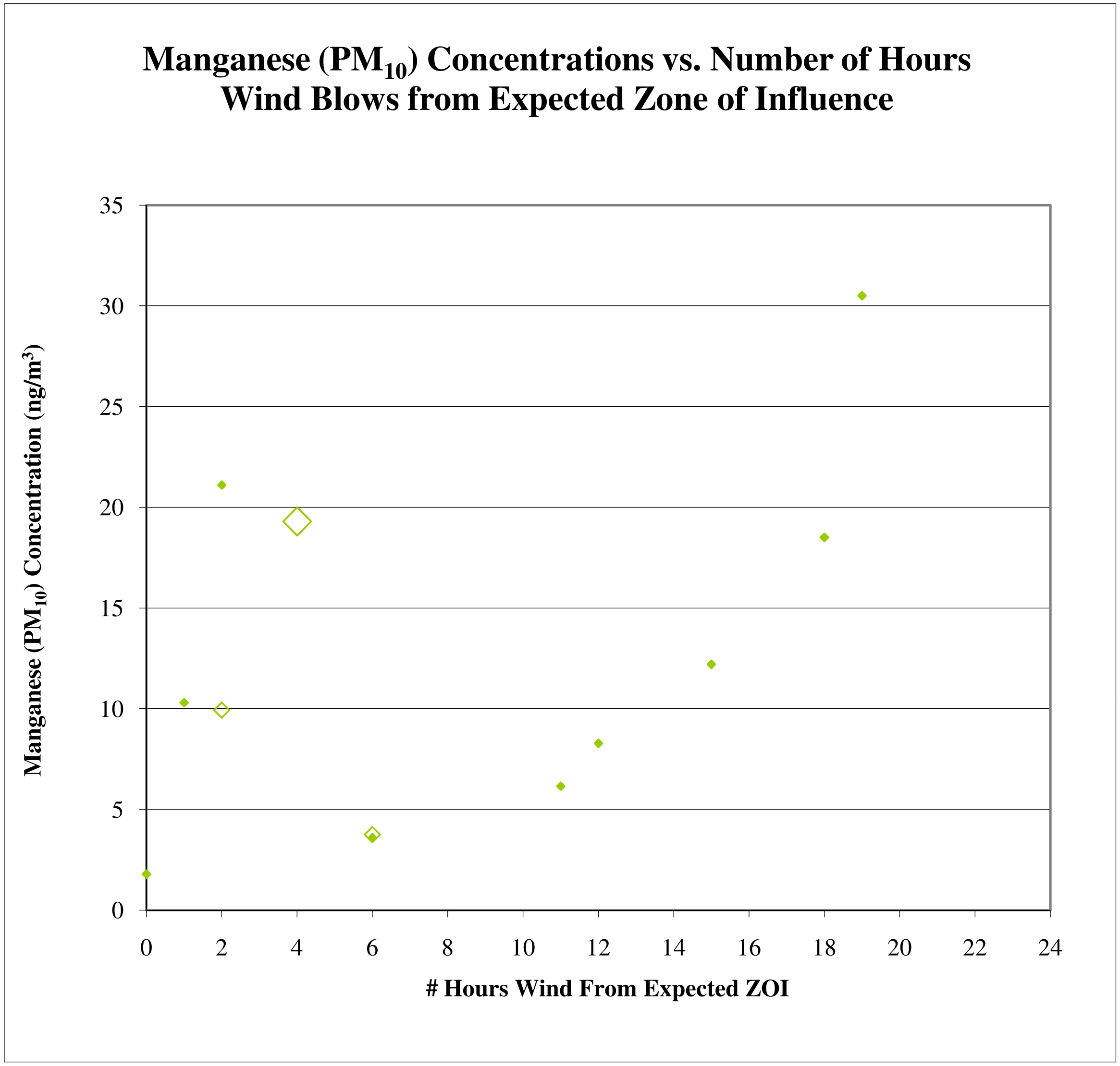
**Whitwell Elementary School
Composite Hourly Windrose
on Arsenic (PM_{10}), Manganese (PM_{10}), and
Benzo(a)pyrene Sample Days
(Jul. 30, 2009-Sep. 28, 2009)**



**Whitwell Elementary School
Composite Hourly Windrose
Across Sampling Period
(Jul. 30, 2009-Mar. 27, 2010)**

Expected Zone of Source Influence A

Figure 4a. Whitwell Elementary School - Manganese (PM_{10}) Concentration and Wind Information.



KEY

Whitwell Elementary School

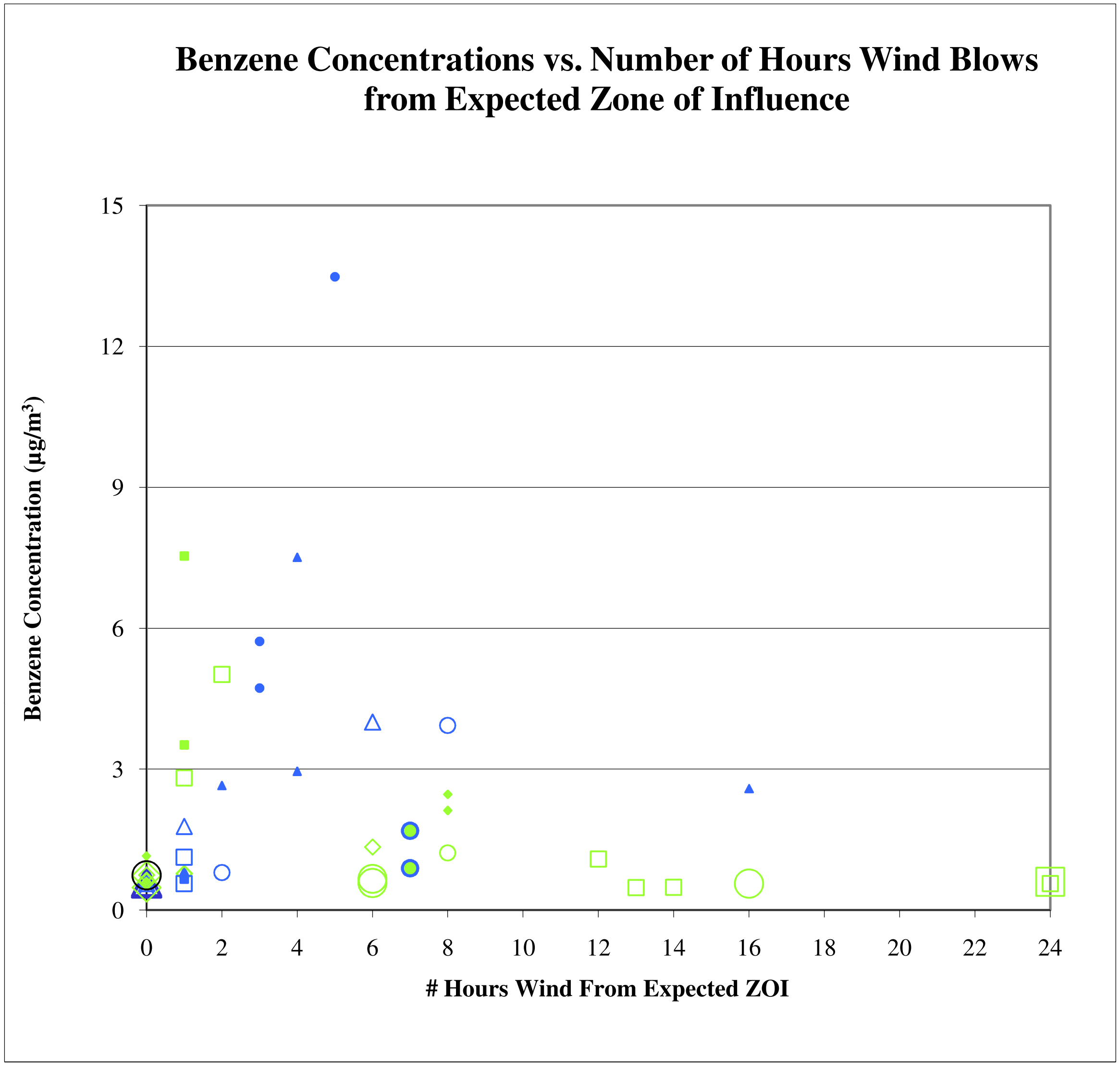
- Wind Speed: 0.1-2.5 mph (ZOI A)
- Wind Speed: 2.5-5.0 mph (ZOI A)
- Wind Speed: >5.0 mph (ZOI A)

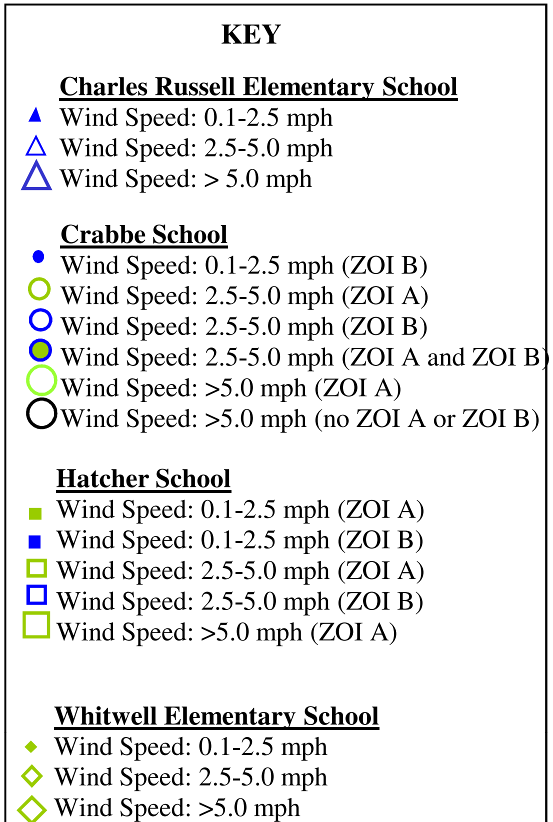
Pollutant: Manganese (PM_{10})
Timeframe: July 30, 2009-September 28, 2009

Note

Each symbol denotes a 24-hour collection of air for chemical analysis. The size of the symbol indicates the magnitude of the wind speed for that day (wind data shown in Table 2a). 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.

Figure 4b. Ashland, Kentucky and Ironton, Ohio Area Schools - Benzene Concentration and Wind Information.



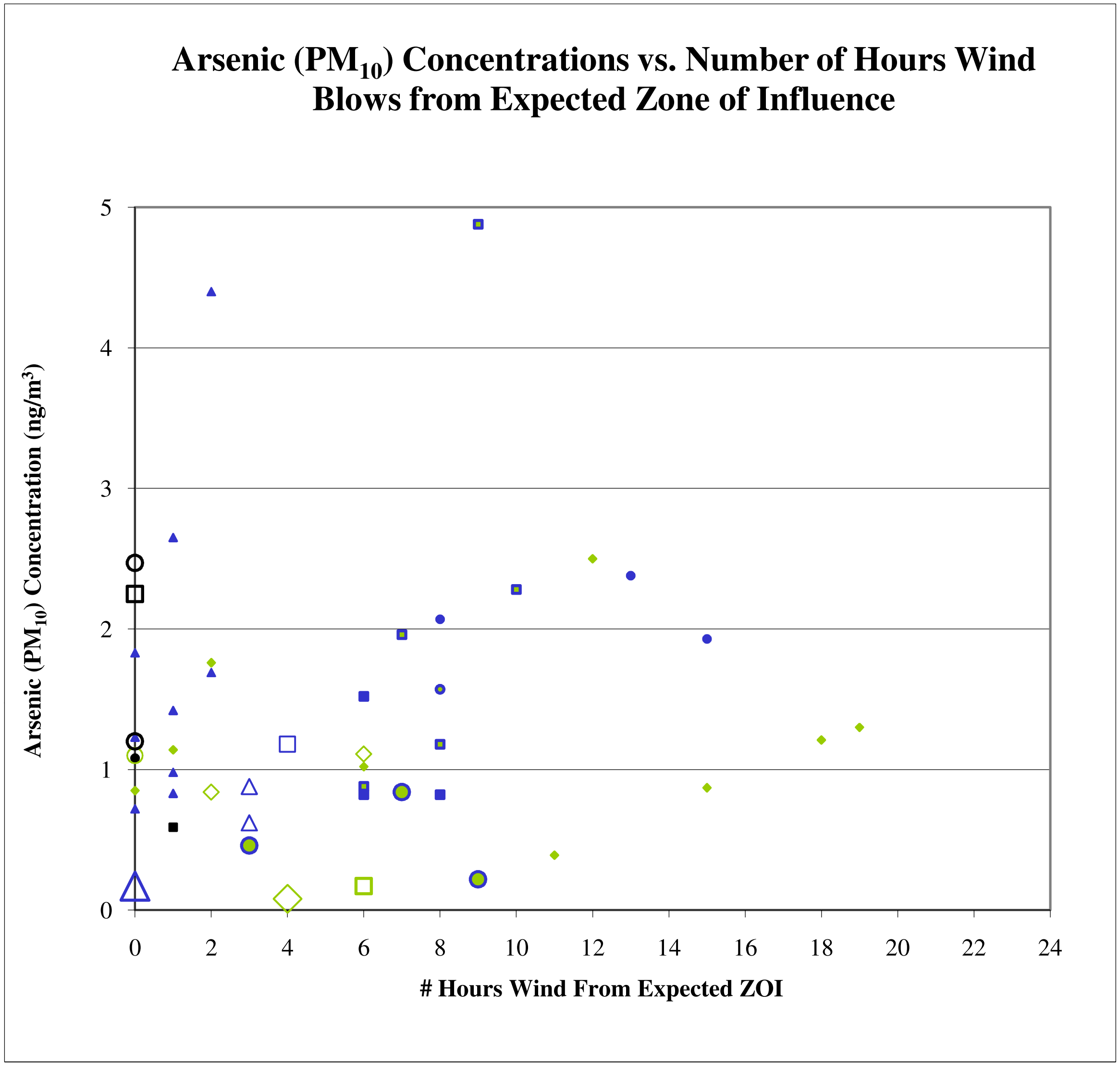


Pollutant: Benzene
Timeframe: January 20, 2010-April 2, 2010

Note

Each symbol denotes a 24-hour collection of air for chemical analysis. The size of the symbol indicates the magnitude of the wind speed for that day (wind data shown in Table 2b). 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.

Figure 4c. Ashland, Kentucky and Ironton, Ohio Area Schools - Arsenic (PM_{10}) Concentration and Wind Information.



KEY

Charles Russell Elementary School
- Wind Speed: 0.1-2.5 mph
- Wind Speed: 2.5-5.0 mph
- Wind Speed: >5.0 mph

Crabbe School
- Wind Speed: 0.1-2.5 mph (no ZOI A, ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI A and ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A)
- Wind Speed: 2.5-5.0 mph (no ZOI A, ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A and ZOI B)

Hatcher School
- Wind Speed: 0.1-2.5 mph (ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI A and ZOI B)
- Wind Speed: 0.1-2.5 mph (no ZOI A, ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A)
- Wind Speed: 2.5-5.0 mph (ZOI B)
- Wind Speed: 2.5-5.0 mph (no ZOI A, ZOI B)

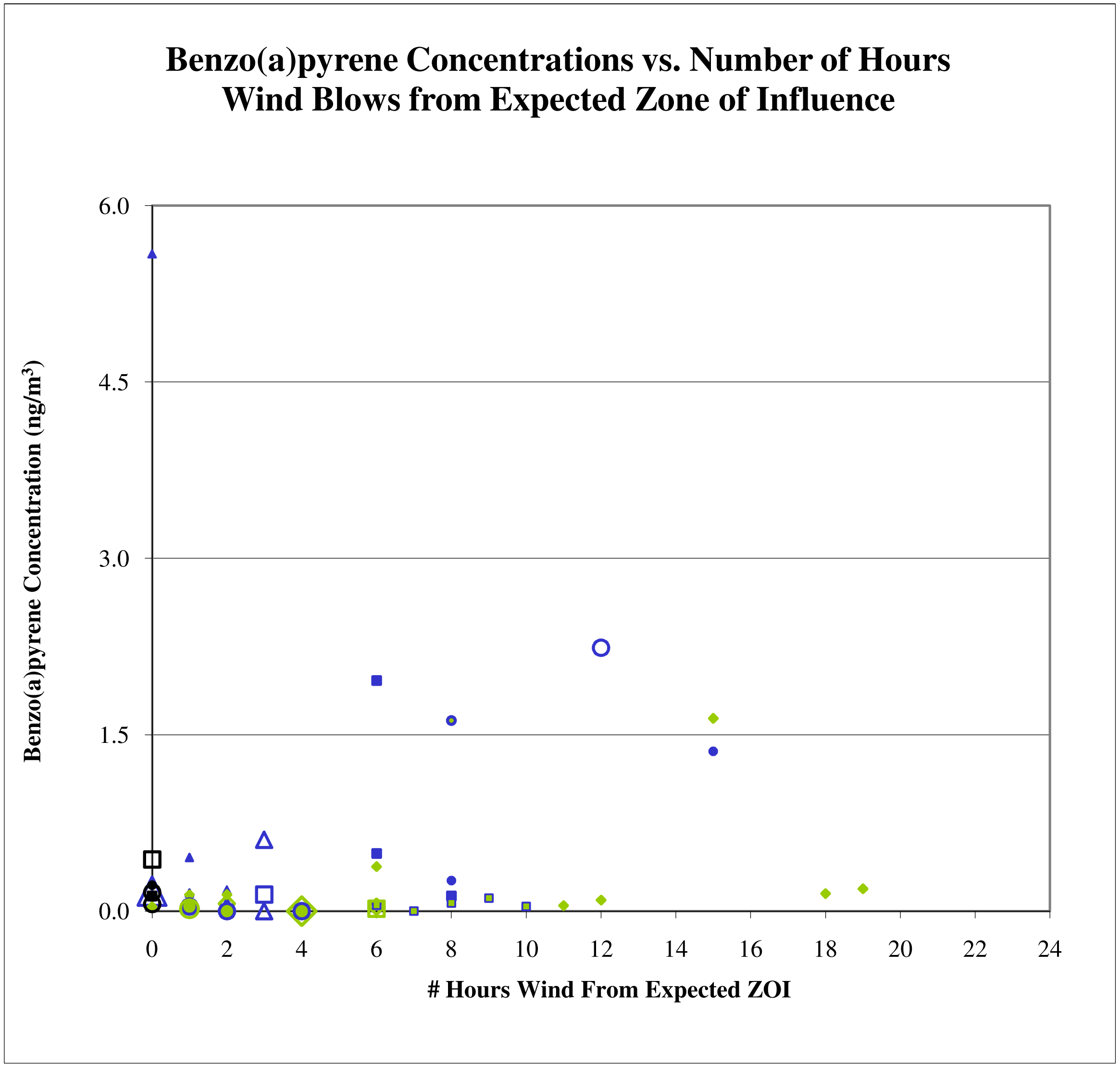
Whitwell Elementary School
- Wind Speed: 0.1-2.5 mph
- Wind Speed: 2.5-5.0 mph
- Wind Speed: >5.0 mph

Pollutant: Arsenic (PM_{10})
Timeframe: July 30, 2009-September 28, 2009

Note

Each symbol denotes a 24-hour collection of air for chemical analysis. The size of the symbol indicates the magnitude of the wind speed for that day (wind data shown in Table 2a). 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.

Figure 4d. Ashland, Kentucky and Ironton, Ohio Area Schools - Benzo(a)pyrene Concentration and Wind Information.



KEY

Charles Russell Elementary School

- Wind Speed: 0.1-2.5 mph (ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI B)
- Wind Speed: > 5.0 mph (no ZOI B)

Crabbe School

- Wind Speed: 0.1-2.5 mph (no ZOI A, ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI A and ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A)
- Wind Speed: 2.5-5.0 mph (ZOI B)
- Wind Speed: 2.5-5.0 mph (no ZOI A, ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A and ZOI B)

Hatcher School

- Wind Speed: 0.1-2.5 mph (ZOI B)
- Wind Speed: 0.1-2.5 mph (ZOI A and ZOI B)
- Wind Speed: 0.1-2.5 mph (no ZOI A, ZOI B)
- Wind Speed: 2.5-5.0 mph (ZOI A)
- Wind Speed: 2.5-5.0 mph (ZOI B)
- Wind Speed: 2.5-5.0 mph (no ZOI A, ZOI B)

Whitwell Elementary School

- Wind Speed: 0.1-2.5 mph
- Wind Speed: 2.5-5.0 mph
- Wind Speed: >5.0 mph

Pollutant: Benzo(a) pyrene
Timeframe: July 30, 2009-September 28, 2009

Note

Each symbol denotes a 24-hour collection of air for chemical analysis. The size of the symbol indicates the magnitude of the wind speed for that day (wind data shown in Table 2a). 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.

Appendix A. Summary Description of Long-term Comparison Levels

In addressing the primary objective identified above, to investigate through the monitoring data collected for key pollutants at the school whether levels are of a magnitude, in light of health risk-based criteria, to indicate that follow-up activities be considered, we developed two types of long-term health risk-related comparison levels. These two types of levels are summarized below.[25]

Cancer-based Comparison Levels

- For air toxics where applicable, we developed cancer risk-based comparison levels to help us consider whether the monitoring data collected at the school indicate the potential for concentrations to pose incremental cancer risk above the range that EPA generally considers acceptable in regulatory decision-making to someone exposed to those concentrations continuously (24 hours a day, 7 days a week) over an entire lifetime.[26] This general range is from 1 to 100 in a million.
- Air toxics with long-term mean concentrations below one one-hundredth of this comparison level would be below a comparably developed level for 1-in-a-million risk (which is the lower bound of EPA's traditional acceptable risk range). Such pollutants, with long-term mean concentrations below the Agency's traditional acceptable risk range, are generally considered to pose negligible risk.
- Air toxics with long-term mean concentrations above the acceptable risk range would generally be a priority for follow-up activities. In this evaluation, we compare the upper 95% confidence limit on the mean concentration to the comparison level. Pollutants for which this upper limit falls above the comparison level are fully discussed in the school monitoring report and may be considered a priority for potential follow-up activities in light of the full set of information available for that site.
- Situations where the summary statistics for a pollutant are below the cancer-based comparison level but above 1% of that level are fully discussed in Appendix C.

[25] These comparison levels are described in more detail *Schools Air Toxics Monitoring Activity (2009), Uses of Health Effects Information in Evaluating Sample Results*.
[26] While no one would be exposed at a school for 24 hours a day, every day for an entire lifetime, we chose this worst-case exposure period as a simplification for the basis of the comparison level in recognition of other uncertainties in the analysis. Use of continuous lifetime exposure yields a lower, more conservative, comparison level than would use of a characterization more specific to the school population (e.g., 5 days a week, 8-10 hours a day for a limited number of years).

Noncancer-based Comparison Levels

- To consider concentrations of air toxics other than lead (for which we have a national ambient air quality standard) with regard to potential for health effects other than cancer, we derived noncancer-based comparison levels using EPA chronic reference concentrations (or similar values). A chronic reference concentration (RfC) is an estimate of a long-term continuous exposure concentration (24 hours a day, every day) without appreciable risk of adverse effects over a lifetime.[27] This differs from the cancer risk-based comparison level in that it represents a concentration without appreciable risk *vs.* a risk-based concentration.
- In using this comparison level in this initiative, the upper end of the 95% confidence limit on the mean is compared to the comparison level. Air toxics for which this upper confidence limit is near or below the noncancer-based comparison level (i.e., those for which longer-term average concentration estimates are below a long-term health-related reference concentration) 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 below and may be considered a priority for follow-up activity if indicated in light of the full set of information available for the pollutant and the site.
- For lead, we set the noncancer-based comparison level equal to the level of the recently revised national ambient air quality standard (NAAQS). It is important to note that the NAAQS for lead is a 3-month rolling average of lead in total suspended particles. Mean levels for the monitoring data collected in this initiative that indicate the potential for a 3-month average above the level of the standard will be considered a priority for consideration of follow-up actions such as siting of a NAAQS monitor in the area.

In developing or identifying these comparison levels, we have given priority to use of relevant and appropriate air standards and EPA risk assessment guidance and precedents. These levels are based upon health effects information, exposure concentrations and risk estimates developed and assessed by EPA, the U.S. Agency for Toxic Substances and Disease Registry, and the California EPA. These agencies recognize the need to account for potential differences in sensitivity or susceptibility of different groups (e.g., asthmatics) or lifestages/ages (e.g., young children or the elderly) to a particular pollutant's effects so that the resulting comparison levels are relevant for these potentially sensitive groups as well as the broader population.

[27] EPA defines the RfC as "an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments." http://www.epa.gov/ncea/iris/help_gloss.htm#r

Appendix B. 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
Benzyl chloride	µg/m^3	3,046	9%	2.49	0.01	0.05	ND	ND	ND	ND	0.05
Bromoform	µg/m^3	2,946	4%	1.18	0.01	0.16	ND	ND	ND	ND	ND
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
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
Chloroprene	µg/m^3	2,341	11%	0.17	<0.01	0.03	ND	ND	ND	ND	0.02
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
Dichloromethane	µg/m^3	6,206	82%	214.67	0.59	0.34	ND	0.14	0.28	0.49	1.35

Appendix B. 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
Dichloropropane,1,2-	µg/m³	6,225	17%	1.80	0.01	0.03	ND	ND	ND	ND	0.04
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 dibromide	µg/m³	5,646	19%	4.15	0.01	0.05	ND	ND	ND	ND	0.05
Ethylene dichloride	µg/m³	6,143	38%	4.49	0.03	0.05	ND	ND	ND	0.04	0.09
Hexachlorobutadiene	µg/m³	3,727	20%	0.97	0.03	0.10	ND	ND	ND	ND	0.18
Methyl chloroform	µg/m³	5,944	73%	3.17	0.09	0.10	ND	ND	0.08	0.11	0.20
Methyl isobutyl ketone	µg/m³	2,936	60%	2.95	0.11	0.09	ND	ND	0.02	0.12	0.49
Methyl methacrylate	µg/m³	1,917	9%	14.05	0.13	0.49	ND	ND	ND	ND	0.53
Methyl *tert-* butyl ether	µg/m³	4,370	41%	20.50	0.28	0.12	ND	ND	ND	0.04	1.53
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
Trichlorobenzene, 1,2,4-	µg/m³	4,301	21%	45.27	0.07	0.10	ND	ND	ND	ND	0.16
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
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
Benzo(k)fluoranthene	ng/m³	1,122	67%	1.28	0.05	0.05	ND	ND	0.02	0.06	0.20
Chrysene (total tsp & vapor)	ng/m³	1,117	92%	3.85	0.22	0.15	ND	0.07	0.13	0.25	0.70
Dibenz(a,h)anthracene	ng/m³	69	4%	0.08	<0.01	0.08	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ng/m³	69	51%	0.55	0.06	0.08	ND	ND	0.02	0.07	0.30

Appendix B. 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
Naphthalene (total tsp & vapor)	µg/m³	1,099	100%	0.54	0.08	0.05	<0.01	0.03	0.06	0.10	0.20

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 C. Analysis of Other (non-key) Air Toxics Monitored at Each School and Multiple-pollutant Considerations.

At each school, monitoring has been targeted to get information on a limited set of key hazardous air pollutants (HAPs).[28] 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 Tables C-1 through C-4).

<u>**Other Air Toxics (HAPs)**</u>

- Do the monitoring data indicate elevated levels of any other air toxics or hazardous air pollutant (HAPs) that pose significant long-term health concerns?
  - → The longer-term concentration estimates for the other HAPs monitored at each school are below their individual long-term comparison levels.
    - Furthermore, for pollutants with cancer-based comparison levels, the longer-term concentration estimates for all but two of these (chromium at all four schools; naphthalene at Crabbe) are more than 10-fold lower and all but six (chromium and carbon tetrachloride at all four schools; naphthalene and 1,3-butadiene at Charles Russell, Crabbe, and Hatcher; tetrachloroethylene at Crabbe and Hatcher; and ethylbenzene at Crabbe and Hatcher) are more than 100-fold lower.[29]
  - → 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.[30]

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[28] 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. One of the criteria pollutants, lead, is also represented as lead compounds on the HAP list.

[29] For pollutants with cancer-based comparison levels, this would indicate longer-term estimates below continuous (24 hours a day, 7 days a week) lifetime exposure concentrations associated with 10^{-5} and 10^{-6} excess cancer risk, respectively.

[30] 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.*

Additional Information on Six HAPs:

- The first HAP mentioned above is chromium. The comparison values for chromium are conservatively based on the most toxic form of chromium (hexavalent chromium, Cr^{+6}), which is only a fraction of the chromium in the ambient air. Nonetheless, the longer-term concentration estimate for chromium (PM_{10}) is below even these very restrictive comparison values. For all four schools, the mean and 95 percent upper bound on the mean for chromium (PM_{10}) are approximately 30-44% of the cancer-based comparison level. As Cr^{+6} is commonly only a small fraction of chromium (PM_{10}),[31] the levels of Cr^{+6} in these samples would be expected to be appreciably lower than this. A review of information available at other sites nationally shows that while the mean concentration of chromium (PM_{10}) at Whitwell is between the 75th and 95th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites, the means for Charles Russell, Crabbe, and Hatcher fall between the 50th and 75th percentile (Appendix B).

- The second HAP mentioned above is naphthalene. For Crabbe, the mean and 95 percent upper bound on the mean for naphthalene are approximately 8-15% of the cancer-based comparison level. For Charles Russell, Hatcher, and Whitwell, the mean and 95 percent upper bound on the mean are approximately 4-7% of the cancer-based comparison level. A review of information available at other sites nationally shows that the mean concentration of naphthalene at Crabbe is above the 95th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites, while the mean concentrations at Charles Russell, Hatcher, and Whitwell are between the 75th and 95th percentile (Appendix B).

- The third HAP mentioned above is carbon tetrachloride. For all four schools, the mean and 95 percent upper bound on the mean for carbon tetrachloride are approximately 4-5% of the cancer-based comparison level. A review of information available at other sites nationally shows that the mean concentration of carbon tetrachloride at each school is between the 75th and 95th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites (Appendix B). Carbon tetrachloride is found globally as a result of its significant past uses in refrigerants and propellants for aerosol cans and its chemical persistence. Virtually all uses have been discontinued. However, it is still measured throughout the world as a result of its slow rate of degradation in the environment and global distribution in the atmosphere.

- The fourth HAP mentioned above is 1,3-butadiene. For all four schools, the mean and 95 percent upper bound on the mean for 1,3-butadiene is approximately 2-7% of the cancer-based comparison level. A review of information available at other sites nationally shows that the mean concentration of 1,3-butadiene at Charles Russell, Hatcher, and Whitwell is between the 50th and 75th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites, while the mean concentration at Crabbe is between the 75th and 95th percentile of samples (Appendix B).

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[31] Data in EPA's Air Quality System for locations that are not near a facility emitting hexavalent chromium indicate hexavalent chromium concentrations to comprise less than approximately 10% of total chromium concentrations.

- The fifth HAP mentioned above is tetrachloroethylene. For Crabbe and Hatcher Schools (not Charles Russell or Whitwell), the mean and 95 percent upper bound on the mean for tetrachloroethylene are approximately 2-6% of the cancer-based comparison level. A review of information available at other sites nationally shows that the mean concentration of tetrachloroethylene at these schools are between the 75th and 95th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites (Appendix B).

- The sixth HAP mentioned above is ethylbenzene. For Crabbe and Hatcher Schools (not Charles Russell or Whitwell), the mean and 95 percent upper bound on the mean for ethylbenzene are approximately 1% of the cancer-based comparison level. A review of information available at other sites nationally shows that the mean concentrations of ethylbenzene at these schools are between the 50th and 75th percentile of samples collected from 2004 to 2008 (the most recently compiled period) at the NATTS sites (Appendix B).

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.[32]

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 multiple air toxics monitored at this location were below the levels of significant concern that had been suggested by the modeling information (Appendix C). In addition, levels of air toxics are expected to have decreased further since the coke plant officially closed June 23, 2011.
    - In addition to the key pollutants benzene, arsenic, and manganese, the other HAPs monitored whose long-term concentration estimates are more than ten percent of their lowest comparison levels are chromium (PM_{10}) and naphthalene.

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

  - o The lowest comparison levels for benzene and naphthalene are based on carcinogenic risk. For Crabbe, Charles Russell, Hatcher, and Whitwell, when benzene and naphthalene are aggregated as a group, the fractions of the cancer-based comparison levels comprised by the longer-term concentration estimates for these pollutants are below 56%.
  - o The lowest comparison level for arsenic is based on effects considering several endpoints including development, while the lowest comparison level for manganese is based on non-carcinogenic effects to the central nervous system.
- The long-term concentration estimates for chromium (PM_{10}) for the 4 locations fall between 35% to 45% of its long-term comparison level. As described in the Other Air Toxics section above, however, the comparison levels for chromium are based on the most toxic form of chromium, hexavalent chromium.[33]

[33] 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 C-1. Charles Russell 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]	Long-term Comparison Level[b] Noncancer-Based[d]
Non-Key HAPs with mean greater than 10% of the lowest comparison level					
Chromium (PM_{10})	ng/m³	2.45	2.02 - 2.87	8.3 [e]	100 [e]
Manganese (PM_{10})	ng/m³	6.92	3.10 - 10.7	NA	50
Non-Key HAPs with mean lower than 10% of the lowest comparison level					
Naphthalene	µg/m³	0.15	0.09 - 0.20	2.9	3
Carbon tetrachloride	µg/m³	0.75	0.70 - 0.81	17	100
Butadiene, 1,3-	µg/m³	0.07	0.03 - 0.12	3.3	2
Dichloromethane	µg/m³	0.40	0.34 - 0.46	210	1000
Cadmium (PM_{10})	ng/m³	0.14	0.06 - 0.21	56	10
Chloromethane	µg/m³	1.20	1.13 - 1.27	NA	90
Benzo(a)anthracene	ng/m³	0.74	0 - 1.75	570	NA
Nickel (PM_{10})	ng/m³	0.74	0.38 - 1.11	420	90
Bromomethane	µg/m³	0.04	0.03 - 0.05	NA	5
Antimony (PM_{10})	ng/m³	1.42	0.37 - 2.48	NA	200
Ethylbenzene	µg/m³	0.21	0.12 - 0.29	40	1000
Xylene, *m/p-*	µg/m³	0.44	0.21 - 0.67	NA	100
Indeno(1,2,3-cd)pyrene	ng/m³	0.57	0 - 1.39	570	NA
Acetonitrile	µg/m³	0.18	0.12 - 0.25	NA	60
Chloroform	µg/m³	0.07	0.04 - 0.10	NA	98
Benzo(k)fluoranthene	ng/m³	0.40	0 - 0.95	570	NA
Benzo(b)fluoranthene	ng/m³	1.27	0 - 3.06	570	NA
Xylene, *o-*	µg/m³	0.21	0.10 - 0.32	NA	100
Cobalt (PM_{10})	ng/m³	0.06	0.03 - 0.10	NA	100
Toluene	µg/m³	1.05	0.57 - 1.54	NA	5000
Chrysene	ng/m³	1.19	0 - 2.70	5700	NA
Carbon disulfide	µg/m³	0.06	0.03 - 0.09	NA	700
Methyl isobutyl ketone	µg/m³	0.20	0.12 - 0.29	NA	3000
Selenium (PM_{10})	ng/m³	1.22	0.89 - 1.54	NA	20000
Mercury (PM_{10})	ng/m³	0.02	0.01 - 0.03	NA	300 [f]
Methyl chloroform	µg/m³	0.06	0.05 - 0.07	NA	5000
Tetrachloroethylene	µg/m³	0.10 [g]	0.05 - 0.16 [g]	17	270
Beryllium (PM_{10})	ng/m³	0.006 [h]	0.0003 - 0.012 [h]	42	20
Styrene	µg/m³	0.07 [i]	0.03 - 0.11 [i]	NA	1000
Non-Key HAPs with more than 50% ND results					
Ethylene dichloride	µg/m³	69% of results were ND[j]		3.8	2400
Dichlorobenzene, *p-*	µg/m³	69% of results were ND[k]		9.1	800
Dibenz(a,h)anthracene	ng/m³	64% of results were ND[l]		52	NA
Dichloropropylene, *cis* -1,3-	µg/m³	92% of results were ND[m]		25	20
Vinyl chloride	µg/m³	92% of results were ND[n]		11	100
Chloroethane	µg/m³	62% of results were ND[o]		NA	10000
No other HAPs were detected in any samples					

Table C-1. Charles Russell Elementary School - Other Monitored Pollutant Analysis.

ng/m^3 nanograms per cubic meter
$\mu g/m^3$ micrograms 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.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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 levels are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[f] 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).

[g] Tetrachloroethylene was detected in 9 of 13 samples, ranging from 0.06 to 0.29 $\mu g/m^3$. The MDL is 0.020 $\mu g/m^3$.

[h] Beryllium (PM_{10}) was detected in 5 of 12 samples, ranging from 0.003 to 0.030 ng/m^3. The MDL is 0.03 ng/m^3.

[i] Styrene was detected in 8 of 13 samples, ranging from 0.072 to 0.17 $\mu g/m^3$. The MDL is 0.0128 $\mu g/m^3$.

[j] Ethylene dichloride was detected in only 4 of 13 samples, ranging from 0.077 to 0.093 $\mu g/m^3$. The MDL is 0.008 $\mu g/m^3$.

[k] *p* -Dichlorobenzene was detected in 4 of 13 samples, ranging from 0.04 to 0.13 $\mu g/m^3$. The MDL is 0.024 $\mu g/m^3$.

[l] Dibenz(a,h)anthracene was detected in 4 of 11 samples, ranging from 0.03 to 1.06 ng/m^3. The MDL range is 0.0485 to 0.547 ng/m^3.

[m] *cis* -1,3-Dichloropropylene was detected in only 1 of 13 samples, with a value of 0.10 $\mu g/m^3$. The MDL is 0.014 $\mu g/m^3$.

[n] Vinyl chloride was detected in only 1 of 13 samples, with a value of 0.02 $\mu g/m^3$. The MDL is 0.005 $\mu g/m^3$.

[o] Chloroethane was detected in 5 out of 13 samples, ranging from 0.02 to 0.034 $\mu g/m^3$. The MDL is 0.005 $\mu g/m^3$.

Table C-2. Crabbe 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	2.64	2.11 - 3.18	8.3 [e]	100 [e]
Manganese (PM_{10})	ng/m^3	9.24	3.88 - 14.6	NA	50
Naphthalene	$\mu g/m^3$	0.24	0.04 - 0.44	2.9	3
Non-Key HAPs with mean lower than 10% of the lowest comparison level					
Butadiene, 1,3-	$\mu g/m^3$	0.15	0.05 - 0.24	3.3	2
Carbon tetrachloride	$\mu g/m^3$	0.78	0.71 - 0.85	17	100
Nickel (PM_{10})	ng/m^3	1.92	0.28 - 3.55	420	90
Tetrachloroethylene	$\mu g/m^3$	0.33	0.08 - 0.57	17	270
Cadmium (PM_{10})	ng/m^3	0.18	0.10 - 0.26	56	10
Chloromethane	$\mu g/m^3$	1.30	1.18 - 1.42	NA	90
Antimony (PM_{10})	ng/m^3	2.00	0.95 - 3.04	NA	200
Xylene, *m/p-*	$\mu g/m^3$	0.88	0.34 - 1.43	NA	100
Ethylbenzene	$\mu g/m^3$	0.35	0.18 - 0.51	40	1000
Chrysene	ng/m^3	1.28	0.35 - 2.20	5700	NA
Bromomethane	$\mu g/m^3$	0.03	0.02 - 0.05	NA	5
Carbon disulfide	$\mu g/m^3$	0.08	0.04 - 0.12	NA	700
Xylene, *o-*	$\mu g/m^3$	0.37	0.15 - 0.59	NA	100
Acetonitrile	$\mu g/m^3$	0.22	0.13 - 0.32	NA	60
Methyl isobutyl ketone	$\mu g/m^3$	0.26	0.19 - 0.32	NA	3000
Selenium (PM_{10})	ng/m^3	1.32	0.97 - 1.67	NA	20000
Benzo(b)fluoranthene	ng/m^3	1.48	0.14 - 2.82	570	NA
Dichloromethane	$\mu g/m^3$	0.46	0.34 - 0.58	210	1000
Mercury (PM_{10})	ng/m^3	0.01	0.001 - 0.01	NA	300 [f]
Benzo(a)anthracene	ng/m^3	0.82	0.09 - 1.54	570	NA
Indeno(1,2,3-cd)pyrene	ng/m^3	0.67	0.04 - 1.30	570	NA
Methyl chloroform	$\mu g/m^3$	0.06	0.04 - 0.08	NA	5000
Chloroform	$\mu g/m^3$	0.10	0.07 - 0.14	NA	98
Styrene	$\mu g/m^3$	0.13	0.06 - 0.19	NA	1000
Benzo(k)fluoranthene	ng/m^3	0.50	0.04 - 0.97	570	NA
Cobalt (PM_{10})	ng/m^3	0.07	0.03 - 0.12	NA	100
Toluene	$\mu g/m^3$	1.85	0.84 - 2.85	NA	5000
Non-Key HAPs with more than 50% ND results					
Vinyl chloride	$\mu g/m^3$	92% of results were ND[g]		11	100
Ethylene dichloride	$\mu g/m^3$	67% of results were ND[h]		3.8	2400
Acrylonitrile	$\mu g/m^3$	92% of results were ND[i]		1.5	2
Dichlorobenzene, *p-*	$\mu g/m^3$	75% of results were ND[j]		9.1	800
Dibenz (a,h) anthracene	ng/m^3	73% of results were ND[k]		52	NA
Trichloroethylene	$\mu g/m^3$	83% of results were ND[l]		50	600
Beryllium (PM_{10})	ng/m^3	64% of results were ND[m]		42	20
Chloroethane	$\mu g/m^3$	58% of results were ND[n]		NA	10000
No other HAPs were detected in any samples					

Table C-2. Crabbe School - Other Monitored Pollutant Analysis.

ng/m^3 nanograms per cubic meter
$\mu g/m^3$ micrograms 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.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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 levels are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[f] 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).

[g] Vinyl chloride was detected in only 1 of 12 samples, with a value of 0.02 $\mu g/m^3$. The MDL range is 0.005 to 0.033 $\mu g/m^3$.

[h] Ethylene Dichloride was detected in only 4 of 12 samples, ranging from 0.065 to 0.081 $\mu g/m^3$. The MDL range is 0.008 to 0.061 $\mu g/m^3$.

[i] Acrylonitrile was detected in only 1 of 12 samples, with a value of 0.11 $\mu g/m^3$. The MDL range is 0.033 to 0.059 $\mu g/m^3$.

[j] *p*-Dichlorobenzene was detected in only 3 of 12 samples, ranging from 0.096 to 0.16 $\mu g/m^3$. The MDL range is 0.024 to 0.060 $\mu g/m^3$.

[k] Dibenz(a,h)anthracene was detected in only 3 of 11 samples, ranging from 0.332 to 0.439 ng/m^3. The MDL range is 0.0485 to 0.13 ng/m^3.

[l] Trichloroethylene was detected in only 2 of 12 samples, ranging from 0.05 to 0.054 $\mu g/m^3$. The MDL range is 0.011 to 0.091 $\mu g/m^3$.

[m] Beryllium (PM_{10}) was detected in only 4 of 11 samples, ranging from 0.004 to 0.06 ng/m^3. The MDL is 0.03 ng/m^3.

[n] Chloroethane was detected in only 5 of 12 samples, ranging from 0.02 to 0.045 $\mu g/m^3$. The MDL range is 0.005 to 0.032 $\mu g/m^3$.

Table C-3. Hatcher 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	2.65	1.92 - 3.37	8.3 [e]	100 [e]
Manganese (PM_{10})	ng/m^3	8.32	3.23 - 13.4	NA	50
Non-Key HAPs with mean lower than 10% of the lowest comparison level					
Butadiene, 1,3-	µg/m^3	0.10	0.02 - 0.18	3.3	2
Naphthalene	µg/m^3	0.14	0.07 - 0.22	2.9	3
Carbon tetrachloride	µg/m^3	0.78	0.72 - 0.85	17	100
Tetrachloroethylene	µg/m^3	0.41	0.00 - 1.04	17	270
Cadmium (PM_{10})	ng/m^3	0.18	0.10 - 0.26	56	10
Nickel (PM_{10})	ng/m^3	1.36	0.51 - 2.22	420	90
Chloromethane	µg/m^3	1.28	1.12 - 1.44	NA	90
Antimony (PM_{10})	ng/m^3	2.20	0.79 - 3.62	NA	200
Carbon disulfide	µg/m^3	0.09	0.02 - 0.17	NA	700
Xylene, *m/p*-	µg/m^3	0.77	0.22 - 1.31	NA	100
Ethylbenzene	µg/m^3	0.30	0.12 - 0.48	40	1000
Chrysene	ng/m^3	0.57	0.12 - 1.02	5700	NA
Xylene, *o*-	µg/m^3	0.34	0.11 - 0.58	NA	100
Acetonitrile	µg/m^3	0.17	0.10 - 0.24	NA	60
Dichloromethane	µg/m^3	0.35	0.29 - 0.41	210	1000
Benzo(b)fluoranthene	ng/m^3	0.76	0 - 1.52	570	NA
Methyl isobutyl ketone	µg/m^3	0.21	0.14 - 0.28	NA	3000
Chloroform	µg/m^3	0.11	0.07 - 0.14	NA	98
Selenium (PM_{10})	ng/m^3	1.35	1.01 - 1.70	NA	20000
Cobalt (PM_{10})	ng/m^3	0.07	0.01 - 0.13	NA	100
Benzo(a)anthracene	ng/m^3	0.38	0.002 - 0.75	570	NA
Indeno(1,2,3-cd)pyrene	ng/m^3	0.36	0 - 0.73	570	NA
Benzo(k)fluoranthene	ng/m^3	0.23	0 - 0.49	570	NA
Toluene	µg/m^3	1.87	0.83 - 2.91	NA	5000
Mercury (PM_{10})	ng/m^3	0.01	0.004 - 0.02	NA	300 [f]
Methyl chloroform	µg/m^3	0.05	0.03 - 0.08	NA	5000
Bromomethane	µg/m^3	0.04 [g]	0.01 - 0.07 [g]	NA	5
Styrene	µg/m^3	0.08 [h]	0.03 - 0.14 [h]	NA	1000
Dichlorobenzene, *p*-	µg/m^3	0.03 [i]	0.01 - 0.06 [i]	9.1	800
Non-Key HAPs with more than 50% ND results					
Ethylene dibromide	µg/m^3	92% of results were ND[j]		0.17	9
Ethylene dichloride	µg/m^3	75% of results were ND[k]		3.8	2400
Trichloroethylene	µg/m^3	92% of results were ND[l]		50	600
Benzyl chloride	µg/m^3	92% of results were ND[m]		2	NA
Dibenz(a,h)anthracene	ng/m^3	67% of results were ND[n]		52	NA
Vinyl chloride	µg/m^3	92% of results were ND[o]		11	100
Beryllium (PM_{10})	ng/m^3	58% of results were ND[p]		42	20
Bromoform	µg/m^3	92% of results were ND[q]		91	NA

Table C-3. Hatcher 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]	Long-term Comparison Level[b] Noncancer-Based[d]
Trichlorobenzene, 1,2,4-	µg/m^3	92% of results were ND[r]		NA	200
Chlorobenzene	µg/m^3	92% of results were ND[s]		NA	1000
Chloroethane	µg/m^3	75% of results were ND[t]		NA	10000
No other HAPs were detected in any samples					

ng/m^3 nanograms per cubic meter
µg/m^3 micrograms 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.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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 levels are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[f] 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).

[g] Bromomethane was detected in 8 of 12 samples, ranging from 0.03 to 0.17 µg/m^3. The MDL range is 0.008 to 0.050 µg/m^3.

[h] Styrene was detected in 8 of 12 samples, ranging from 0.051 to 0.29 µg/m^3. The MDL range is 0.0128 to 0.0426 µg/m^3.

[i] *p*-Dichlorobenzene was detected in 6 of 12 samples, ranging from 0.03 to 0.11 µg/m^3. The MDL range is 0.024 to 0.060 µg/m^3.

[j] Ethylene dibromide was detected in only 1 of 12 samples, with a value of 0.06 µg/m^3. The MDL range is 0.008 to 0.092 µg/m^3.

[k] Ethylene dichloride was detected in only 3 of 12 samples, ranging from 0.065 to 0.077 µg/m^3. The MDL range is 0.008 to 0.061 µg/m^3.

[l] Trichloroethylene was detected in only 1 of 12 samples, with a value of 0.05 µg/m^3. The MDL range is 0.011 to 0.091 µg/m^3.

[m] Benzyl chloride was detected in only 1 of 12 samples, with a value of 0.04 µg/m^3. The MDL range is 0.010 to 0.088 µg/m^3.

[n] Dibenz(a)antrhacene was detected in only 4 of 12 samples, ranging from 0.0401 to 0.305 ng/m^3. The MDL range is 0.0453 to 0.109 ng/m^3.

[o] Vinyl chloride was detected in only 1 of 12 samples, with a value of 0.064 µg/m^3. The MDL range is 0.005 to 0.033 µg/m^3.

[p] Beryllium (PM_{10}) was detected in only 5 of 12 samples, ranging from 0.002 to 0.070 ng/m^3. The MDL is 0.03 ng/m^3.

[q] Bromoform was detected in only 1 of 12 samples, with a value of 0.07 µg/m^3. The MDL range is 0.114 µg/m^3.

[r] 1,2,4-Trichlorobenzene was detected in only 1 of 12 samples, with a value of 0.07 µg/m^3. The MDL range is 0.052 to 0.134 µg/m^3.

[s] Chlorobenzene was detected in only 1 of 12 samples, with a value of 0.046 µg/m^3. The MDL range is 0.009 to 0.064 µg/m^3.

[t] Choroethane was detected in only 3 of 12 samples, ranging from 0.02 to 0.1 µg/m^3. The MDL range is 0.005 to 0.032 µg/m^3.

Table C-4. Whitwell 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/m³	3.02	2.35 - 3.69	8.3 [e]	100 [e]
Non-Key HAPs with mean lower than 10% of the lowest comparison level					
Carbon tetrachloride	µg/m³	0.77	0.72 - 0.81	17	100
Butadiene, 1,3-	µg/m³	0.09	0.03 - 0.15	3.3	2
Naphthalene	µg/m³	0.12	0.07 - 0.17	2.9	3
Cobalt (PM_{10})	ng/m³	0.09	0.05 - 0.12	NA	100
Cadmium (PM_{10})	ng/m³	0.26	0.16 - 0.36	56	10
Chloromethane	µg/m³	1.21	1.13 - 1.29	NA	90
Benzo(a)anthracene	ng/m³	0.42	0 - 0.85	570	NA
Antimony (PM_{10})	ng/m³	2.25	0.66 - 3.85	NA	200
Nickel (PM_{10})	ng/m³	0.74	0.36 - 1.11	420	90
Ethylbenzene	µg/m3	0.20	0.12 - 0.28	40	1000
Acetonitrile	µg/m³	0.28	0 - 0.60	NA	60
Xylene, *m/p-*	µg/m³	0.46	0.23 - 0.69	NA	100
Chloroform	µg/m³	0.06	0 - 0.09	NA	98
Dichloromethane	µg/m³	0.83	0 - 1.87	210	1000
Xylene, *o-*	µg/m³	0.21	0.11 - 0.32	NA	100
Indeno(1,2,3-cd)pyrene	ng/m³	0.32	0 - 0.63	570	NA
Benzo(b)fluoranthene	ng/m³	0.71	0.05 - 1.38	570	NA
Benzo(k)fluoranthene	ng/m³	0.19	0.01 - 0.38	570	NA
Styrene	µg/m³	0.27	0.10 - 0.45	NA	1000
Toluene	µg/m3	0.94	0.52 - 1.35	NA	5000
Chrysene	ng/m³	0.67	0 - 1.26	5700	NA
Carbon disulfide	µg/m³	0.07	0.03 - 0.11	NA	700
Selenium (PM_{10})	ng/m³	1.30	1.02 - 1.59	NA	20000
Methyl isobutyl ketone	µg/m³	0.15	0.08 - 0.21	NA	3000
Methyl chloroform	µg/m³	0.05	0.03 - 0.07	NA	5000
Bromomethane	µg/m³	0.03 [f]	0.01 - 0.06 [f]	NA	5
Beryllium (PM_{10})	ng/m³	0.01 [g]	0 - 0.02 [g]	42	20
Mercury (PM_{10})	ng/m³	0.02 [h]	0.004 - 0.03 [h]	NA	300 [i]
Non-Key HAPs with more than 50% ND results					
Ethylene dichloride	µg/m³	60% of results were ND[j]		3.8	2400
Dibenz(a,h)anthracene	ng/m³	75% of results were ND[k]		52	NA
Tetrachloroethylene	µg/m³	60% of results were ND[l]		17	270
Dichlorobenzene, *p-*	µg/m³	70% of results were ND[m]		9.1	800
Vinyl chloride	µg/m³	90% of results were ND[n]		11	100
Chloroethane	µg/m³	90% of results were ND[o]		NA	10000
No other HAPs were detected in any samples					

Table C-4. Whitwell Elementary School - Other Monitored Pollutant Analysis.

ng/m^3 nanograms per cubic meter
$\mu g/m^3$ micrograms 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.

[c] Air toxics for which the upper 95% confidence limit on the mean concentration is above this cancer-based comparison 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 levels are specific to hexavalent chromium (recognized as the most toxic form) which is a fraction of the total chromium reported.

[f] Bromomethane was detected in 7 of 10 samples, ranging from 0.03 to 0.12 $\mu g/m^3$. The MDL range is 0.008 to 0.050 $\mu g/m^3$.

[g] Beryllium (PM_{10}) was detected in 6 of 12 samples, ranging from 0.0001 to 0.06 ng/m^3. The MDL is 0.03 ng/m^3.

[h] Mercury (PM_{10}) was detected in 8 of 12 samples, ranging from 0.00004 to 0.05 ng/m^3. The MDL range is 1.12 to 1.16 ng/m^3.

[i] 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).

[j] Ethylene dichloride was detected in only 4 of 10 samples, ranging from 0.077 to 0.081 $\mu g/m^3$. The MDL range is 0.008 to 0.061 $\mu g/m^3$.

[k] Dibenz (a,h) anthracene was detected in 3 of 12 samples, ranging from 0.0370 to 0.299 ng/m^3. The MDL range is 0.021 to 0.078 ng/m^3.

[l] Tetrachloroethylene was detected in only 4 of 10 samples, ranging from 0.068 to 0.231 $\mu g/m^3$. The MDL range is 0.020 to 0.075 $\mu g/m^3$.

[m] *p* -Dichlorobenzene was detected in only 3 of 10 samples, ranging from 0.04 to 0.084 $\mu g/m^3$. The MDL range is 0.024 to 0.060 $\mu g/m^3$.

[n] Vinyl Chloride was detected in only 1 of 10 samples, with a value of 0.026 $\mu g/m^3$. The MDL range is 0.005 to 0.033 $\mu g/m^3$.

[o] Chloroethane was detected in only 1 of 10 samples, with a value of 0.026 $\mu g/m^3$. The MDL range is 0.005 to 0.032 $\mu g/m^3$.

Appendix D-1. Charles Russell Elementary School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Benzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	2.59	0.607	2.65	0.831	0.575	0.563	0.579	0.476	2.96	0.671	4	1.78	7.51	30
Arsenic (PM_{10})	$\mu g/m^3$	1.69	1.23	2.65	0.83	0.98	0.72	0.62	1.83	0.88	1.42	4.4	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	150
Benzo(a)pyrene	ng/m^3	0.180	0.120	0.050	0.150	0.160	0.015	ND	5.590	0.610	0.460	0.080	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	6400
Chromium (PM_{10})	ng/m^3	1.68	2.08	3.33	2.30	3.80	2.09	2.16	2.70	3.27	2.22	2.04	1.70	--	--	--	--	--	--	--	--	--	--	--	--	--	580
Manganese (PM_{10})	ng/m^3	2.72	1.7	6.46	2.57	6.81	1.39	5.87	22.7	5.31	11.9	3.76	11.8	--	--	--	--	--	--	--	--	--	--	--	--	--	500
Naphthalene	$\mu g/m^3$	0.132	0.152	0.186	0.101	0.043	0.249	0.0397	0.258	0.179	0.193	0.196	0.014	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Carbon tetrachloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.755	0.57	0.692	0.881	0.692	0.655	0.818	0.781	0.856	0.85	0.793	0.705	0.724	200
Butadiene, 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.089	ND	0.243	0.022	0.022	ND	0.031	0.024	0.13	0.024	0.11	0.082	0.18	20
Dichloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.31	0.31	0.417	0.556	0.31	0.466	0.30	0.487	0.417	0.31	0.57	0.29	0.41	2000
Cadmium (PM_{10})	ng/m^3	0.09	0.05	0.45	0.07	0.1	0.15	0.09	0.25	0.12	0.17	0.06	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Chloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.18	1.14	1.05	1.2	1.05	1.07	1.25	1.14	1.25	1.47	1.27	1.27	1.21	1000
Benzo (a) anthracene	ng/m^3	0.28	0.24	0.11	0.18	0.11	0.27	--	5.70	1.17	0.74	0.10	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Nickel (PM_{10})	ng/m^3	0.27	0.36	1.72	0.4	1.45	ND	0.42	0.99	1.59	1	0.51	0.22	--	--	--	--	--	--	--	--	--	--	--	--	--	200
Bromomethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.039	0.039	0.039	0.039	0.039	ND	0.047	0.039	0.047	0.043	0.043	0.039	0.047	200
Antimony (PM_{10})	ng/m^3	0.50	0.42	6.38	0.48	1.72	1.28	0.95	2.33	0.60	1.34	0.78	0.29	--	--	--	--	--	--	--	--	--	--	--	--	--	2000
Ethylbenzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.17	0.13	0.39	0.13	0.087	0.15	0.096	0.061	0.36	0.11	0.29	0.13	0.556	40000
Xylene, *m/p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.48	0.17	1.04	0.22	0.09	0.27	0.14	0.11	0.8	0.17	0.71	0.28	1.25	9000
Indeno(1,2,3-cd)pyrene	ng/m^3	0.155	0.153	0.114	0.153	0.471	0.112	ND	4.64	0.693	0.387	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Acetonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.168	0.13	0.168	0.12	0.067	0.13	0.099	0.15	0.247	0.12	0.383	0.15	0.438	600
Chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.098	0.098	0.098	0.098	0.049	0.083	0.078	ND	0.11	0.1	ND	0.11	ND	500
Benzo (k) fluoranthene	ng/m^3	0.120	0.090	0.060	0.100	0.090	0.160	ND	3.110	0.610	0.390	0.040	0.040	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Benzo (b) fluoranthene	ng/m^3	0.400	0.340	0.230	0.300	0.360	0.580	0.060	10.20	1.560	1.060	0.150	0.040	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Xylene, *o-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.22	0.087	0.434	0.087	0.043	0.13	0.074	0.048	0.36	0.1	0.32	0.13	0.652	9000
Cobalt (PM_{10})	ng/m^3	0.01	0.006	0.2	0.007	0.12	ND	0.08	0.11	0.07	0.06	0.05	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	100
Toluene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.13	0.603	2.07	0.49	0.34	0.762	0.34	0.32	1.78	0.452	1.90	0.728	2.79	4000
Chrysene	ng/m^3	0.540	0.320	0.110	0.190	0.210	0.560	0.140	8.64	1.73	1.37	0.370	0.080	--	--	--	--	--	--	--	--	--	--	--	--	--	640000
Carbon disulfide	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.062	ND	0.031	0.031	0.031	0.02	0.041	0.02	0.081	0.053	0.19	0.044	0.13	7000
Methyl isobutyl ketone	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.533	ND	0.12	0.12	ND	0.18	0.2	0.066	0.32	0.25	0.27	0.14	0.32	30000
Selenium (PM_{10})	ng/m^3	0.9	1.1	1.38	0.99	1.24	0.51	1.03	1.67	0.86	2.48	1.58	0.86	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
Mercury (PM_{10})	ng/m^3	0.03	0.04	0.01	0.01	0.03	0.002	ND	0.003	ND	0.01	0.03	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	3000
Methyl chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.055	ND	0.055	0.055	0.055	0.06	0.071	0.066	0.082	0.066	0.076	0.066	0.071	10000
Tetrachloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.14	ND	0.2	ND	ND	ND	0.06	0.095	0.29	0.12	0.14	0.068	0.24	1400
Beryllium (PM_{10})	ng/m^3	ND	ND	ND	ND	0.03	ND	0.003	0.005	ND	0.008	0.01	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	20
Styrene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.13	ND	0.085	ND	ND	ND	0.072	ND	0.12	0.098	0.17	0.072	0.14	9000
Ethylene dichloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	0.08	ND	ND	0.085	0.093	0.077	ND	270
Dichlorobenzene, *p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	0.066	ND	0.13	0.04	0.096	10000

Appendix D-1. Charles Russell Elementary School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Dibenz (a,h) anthracene	ng/m^3	ND	ND	ND	0.03	--	ND	ND	1.06	0.13	0.07	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	5800
Dichloropropylene, *cis*- 1,3-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	ND	ND	40
Vinyl chloride	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND	ND	1000
Chloroethane	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	0.026	ND	ND	ND	ND	ND	0.02	ND	0.034	ND	0.032	ND	0.029	40000
Acrylonitrile	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Benzyl chloride	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	140
Bromoform	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6400
Chlorobenzene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10000
Chloroprene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloroethane, 1,1-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4400
Dichloroethylene, 1,1-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80
Dichloropropane, 1,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloropropylene, *trans*- 1,3-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Ethyl acrylate	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Ethylene dibromide	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Hexachloro-1,3-butadiene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	320
Methyl methacrylate	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Methyl *tert*-Butyl Ether	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Tetrachloroethane, 1,1,2,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	120
Trichlorobenzene, 1,2,4-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2000
Trichloroethane, 1,1,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	440
Trichloroethylene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10000

Key Pollutant
µg/m^3 micrograms per cubic meter
ng/m^3 nanograms per cubic meter
-- No sample was collected 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.

Appendix D-2. Crabbe School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Benzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.799	0.575	4.73	--	1.21	0.889	0.563	0.665	5.72	0.742	3.93	1.69	13.48	30
Arsenic (PM_{10})	ng/m^3	0.46	1.08	2.38	0.84	1.57	2.47	1.10	2.07	--	1.20	1.93	0.22	--	--	--	--	--	--	--	--	--	--	--	--	--	150
Benzo(a)pyrene	ng/m^3	ND	0.22	--	ND	1.62	0.06	0.02	0.26	2.24	0.16	1.36	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	6400
Chromium (PM_{10})	ng/m^3	2.18	1.95	4.19	1.84	2.06	3.07	3.4	3.65	--	1.99	2.23	2.51	--	--	--	--	--	--	--	--	--	--	--	--	--	580
Manganese (PM_{10})	ng/m^3	3.61	3.19	8.11	4.26	7.07	4.56	7.29	30.1	--	14.6	3.8	15	--	--	--	--	--	--	--	--	--	--	--	--	--	500
Naphthalene	$\mu g/m^3$	0.123	0.167	--	0.0587	0.539	0.0528	0.0509	0.133	0.405	0.0977	1.01	0.0421	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Butadiene, 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.332	--	0.089	0.11	0.031	0.049	0.305	0.046	0.2	0.095	0.491	20
Carbon tetrachloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.755	0.692	0.692	--	0.629	0.655	0.837	0.818	0.856	1.05	0.806	0.806	0.736	200
Nickel (PM_{10})	ng/m^3	0.45	0.34	2.29	0.39	1.18	6.51	7	0.91	--	0.66	1.14	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	200
Tetrachloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.27	--	0.068	0.14	0.088	1.28	0.39	0.909	0.24	0.12	0.43	1400
Cadmium (PM_{10})	ng/m^3	0.08	0.06	0.36	0.10	0.15	0.26	0.19	0.37	--	0.27	0.09	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Chloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.03	1.34	1.26	--	1.61	1.1	1.19	1.27	1.19	1.45	1.25	1.21	1.67	1000
Antimony (PM_{10})	ng/m^3	0.38	0.66	4.45	0.72	3	3.03	1.65	4.56	--	2.21	0.93	0.37	--	--	--	--	--	--	--	--	--	--	--	--	--	2000
Xylene, *m/p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.39	0.22	2.04	--	0.56	0.71	0.17	0.27	1.68	0.26	1.08	0.36	2.85	9000
Ethylbenzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.22	0.13	0.652	--	0.30	0.28	0.11	0.15	0.678	0.16	0.43	0.17	0.878	40000
Chrysene	ng/m^3	0.520	0.710	--	0.370	3.75	0.290	0.270	0.840	3.160	0.580	3.310	0.250	--	--	--	--	--	--	--	--	--	--	--	--	--	640000
Bromomethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	0.039	0.039	--	0.039	ND	0.047	0.03	0.047	0.043	0.039	0.03	0.058	200
Carbon disulfide	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.062	ND	0.093	--	0.062	0.11	0.044	0.031	0.12	0.037	0.10	0.044	0.24	7000
Xylene, *o-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.17	0.087	0.826	--	0.17	0.32	0.087	0.13	0.721	0.13	0.487	0.17	1.16	9000
Acetonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.13	0.15	0.269	--	0.168	0.13	0.10	0.12	0.311	0.14	0.36	0.15	0.623	600
Methyl isobutyl ketone	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.25	0.29	0.25	--	0.082	0.18	0.23	0.25	0.434	0.2	0.34	0.18	0.43	30000
Selenium (PM_{10})	ng/m^3	0.72	1.21	1.57	1.09	0.79	1.09	1.33	1.62	--	2.49	1.81	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
Benzo (b) fluoranthene	ng/m^3	0.200	0.650		0.120	5.540	0.190	0.110	0.810	4.300	0.470	3.77	0.150	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Dichloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.382	0.28	0.521	--	0.417	0.355	0.33	0.361	0.58	0.417	0.598	0.348	0.963	2000
Mercury (PM_{10})	ng/m^3	0.03	0.004	0.004	0.004	ND	0.002	ND	0.02	--	0.01	0.01	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	3000
Benzo (a) anthracene	ng/m^3	0.160	0.460		0.100	3.040	0.090	0.060	0.390	2.190	0.230	2.180	0.090	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Indeno(1,2,3-cd) pyrene	ng/m^3	0.051	0.262	--	0.037	1.800	0.082	ND	0.313	2.370	0.194	2.210	0.052	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Methyl chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	0.055	ND	--	0.055	0.066	0.076	0.066	0.071	0.076	0.071	0.06	0.093	10000
Chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.098	--	0.098	0.11	0.12	0.11	0.19	0.093	0.17	0.088	0.15	500
Styrene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.26	--	0.085	0.13	0.072	0.094	0.17	0.081	0.34	0.077	0.23	9000
Benzo (k) fluoranthene	ng/m^3	0.060	0.180		0.040	1.780	0.060	0.030	0.220	1.620	0.160	1.340	0.050	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Cobalt (PM_{10})	ng/m^3	0.05	0.009	0.21	0.01	ND	0.04	0.11	0.15	--	0.1	0.07	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	100
Toluene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.24	0.641	3.39	--	1.4	1.36	0.403	0.758	3.74	0.581	2.30	0.818	5.54	4000
Vinyl chloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	0.02	1000
Ethylene dichloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	0.077	0.065	ND	0.081	ND	0.069	ND	270
Acrylonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	0.11	ND	ND	ND	ND	ND	ND	200
Dichlorobenzene, *p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	0.096	ND	0.10	ND	0.16	10000
Dibenz (a,h) anthracene	ng/m^3	ND	ND	--	ND	0.345	ND	ND	ND	0.439	ND	0.332	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	5800
Trichloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	0.054	ND	ND	ND	ND	ND	ND	ND	0.05	10000

Appendix D-2. Crabbe School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Beryllium (PM_{10})	ng/m^3	ND	ND	0.004	ND	ND	ND	0.004	0.06	--	0.008	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	20
Chloroethane	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	0.026	ND	ND	ND	0.026	0.029	0.02	ND	0.045	40000
Benzyl chloride	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	140
Bromoform	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	6400
Chlorobenzene	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	10000
Chloroprene	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloroethane, 1,1-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	4400
Dichloroethylene, 1,1-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	80
Dichloropropane, 1,2-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloropropylene, *cis-1,3-*	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Dichloropropylene, *trans-1,3-*	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Ethyl acrylate	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Ethylene dibromide	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Hexachloro-1,3-butadiene	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	320
Methyl methacrylate	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Methyl *tert-* butyl ether	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Tetrachloroethane, 1,1,2,2-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	120
Trichlorobenzene, 1,2,4-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	2000
Trichloroethane, 1,1,2-	μg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	440

Key Pollutant

μg/m^3 micrograms per cubic meter

ng/m^3 nanograms per cubic meter

-- No sample was collected 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.

Appendix D-3. Hatcher School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Benzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.09	0.479	3.52	2.81	5.02	0.483	0.566	7.54	0.601	0.566	1.13	0.658	30
Arsenic (PM_{10})	ng/m^3	1.96	0.59	2.25	0.88	1.52	0.82	2.28	4.88	0.82	1.18	1.18	0.17	--	--	--	--	--	--	--	--	--	--	--	--	150
Benzo(a)pyrene	ng/m^3	ND	0.130	0.440	0.050	1.960	0.130	0.040	0.110	0.490	0.070	0.140	0.020	--	--	--	--	--	--	--	--	--	--	--	--	6400
Chromium (PM_{10})	ng/m^3	1.66	2.85	5.73	1.93	2.57	2.61	2.06	3.99	2.49	2.21	1.9	1.74	--	--	--	--	--	--	--	--	--	--	--	--	580
Manganese (PM_{10})	ng/m^3	2.43	2.45	6.76	3.99	5.67	9.65	6.79	31.4	3.31	11	3.01	13.4	--	--	--	--	--	--	--	--	--	--	--	--	500
Butadiene, 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.332	0.11	0.361	0.022	0.038	0.232	ND	0.02	0.035	0.069	20
Naphthalene	$\mu g/m^3$	0.0852	0.136	0.212	0.0507	0.44	0.0691	0.0631	0.098	0.224	0.0931	0.223	0.0207	--	--	--	--	--	--	--	--	--	--	--	--	30
Carbon tetrachloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.755	0.629	0.629	0.692	0.736	0.806	0.787	0.856	0.906	0.755	0.982	0.881	200
Tetrachloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.34	ND	0.27	ND	3.58	0.075	0.06	0.21	0.088	0.04	0.12	0.088	1400
Cadmium (PM_{10})	ng/m^3	0.11	0.09	0.37	0.15	0.12	0.41	0.15	0.38	0.1	0.17	0.06	0.05	--	--	--	--	--	--	--	--	--	--	--	--	30
Nickel (PM_{10})	ng/m^3	0.56	0.64	2.36	0.29	1.73	0.78	3.57	4.29	0.86	0.58	0.57	0.13	--	--	--	--	--	--	--	--	--	--	--	--	200
Chloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.03	1.3	1.22	1.07	1.1	1.12	1.29	1.37	1.26	1.13	1.45	1.98	1000
Antimony (PM_{10})	ng/m^3	0.91	0.63	5.34	0.65	6.63	0.89	2.21	5.45	0.98	1.63	0.8	0.3	--	--	--	--	--	--	--	--	--	--	--	--	2000
Carbon disulfide	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.031	0.062	0.062	0.062	0.081	0.03	0.05	0.12	0.031	0.044	0.09	0.47	7000
Xylene, *m/p* -	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.43	0.17	1.61	0.35	2.92	0.16	0.2	1.69	0.23	0.26	0.73	0.43	9000
Ethylbenzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.17	0.087	0.565	0.17	0.995	0.096	0.1	0.669	0.13	0.14	0.3	0.2	40000
Chrysene	ng/m^3	0.190	0.330	1.140	0.170	2.580	0.210	0.170	0.320	0.980	0.260	0.440	0.080	--	--	--	--	--	--	--	--	--	--	--	--	640000
Xylene, *o*-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.22	0.087	0.652	0.13	1.32	0.07	0.096	0.669	0.11	0.13	0.43	0.2	9000
Acetonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.12	ND	0.252	0.13	0.245	0.074	0.11	0.349	0.12	0.14	0.173	0.331	600
Dichloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.31	0.24	0.382	0.348	0.462	0.25	0.32	0.591	0.31	0.25	0.372	0.355	2000
Benzo(b)fluoranthene	ng/m3	0.080	0.350	1.210	0.130	4.390	0.400	0.190	0.400	1.260	0.200	0.410	0.060	--	--	--	--	--	--	--	--	--	--	--	--	64000
Methyl isobutyl ketone	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.29	0.37	ND	0.082	0.16	0.086	0.23	0.23	0.16	0.23	0.33	0.34	30000
Chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.098	0.098	0.15	0.098	0.17	0.078	ND	0.19	0.078	0.078	0.13	0.11	500
Selenium (PM_{10})	ng/m^3	2.01	1.17	1.52	1.01	1.08	0.6	1.24	1.68	0.86	2.54	1.64	0.9	--	--	--	--	--	--	--	--	--	--	--	--	20000
Cobalt (PM_{10})	ng/m^3	0.02	0.04	0.34	0.01	ND	0.02	0.09	0.11	0.04	0.06	0.05	0.04	--	--	--	--	--	--	--	--	--	--	--	--	100
Benzo(a)anthracene	ng/m^3	0.050	0.230	0.790	0.060	2.110	0.110	0.070	0.130	0.650	0.100	0.210	0.020	--	--	--	--	--	--	--	--	--	--	--	--	64000
Indeno(1,2,3-cd) pyrene	ng/m^3	ND	0.154	0.479	0.064	2.140	0.232	0.097	0.213	0.651	0.099	0.213	ND	--	--	--	--	--	--	--	--	--	--	--	--	64000
Benzo(k)fluoranthene	ng/m^3	0.030	0.090	0.420	0.030	1.460	0.090	0.050	0.100	0.370	0.030	0.110	0.020	--	--	--	--	--	--	--	--	--	--	--	--	64000
Toluene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.32	0.603	2.9	2.53	5.58	0.452	0.637	4.34	0.645	0.792	1.61	1.10	4000
Mercury (PM_{10})	ng/m^3	0.02	0.04	0.0006	0.0009	0.007	0.02	0.01	0.01	ND	0.02	0.01	ND	--	--	--	--	--	--	--	--	--	--	--	--	3000
Methyl chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.055	ND	ND	0.055	ND	0.071	0.06	0.076	0.066	0.055	0.076	0.12	10000
Bromomethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	0.039	ND	0.043	0.047	0.051	0.03	0.039	0.054	0.17	200
Styrene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.17	0.085	0.29	0.055	ND	0.20	0.06	0.051	ND	0.094	9000
Dichlorobenzene, *p*-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.06	ND	0.10	ND	ND	0.11	ND	0.03	0.04	0.06	10000
Ethylene dibromide	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.06	12
Ethylene dichloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	0.077	0.069	ND	ND	0.065	ND	ND	270

Appendix D-3. Hatcher School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Trichloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	10000
Benzyl chloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.04	140
Dibenz(a,h)anthracene	ng/m^3	ND	ND	0.105	ND	0.305	0.0401	ND	ND	0.122	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	5800
Vinyl chloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.064	1000
Beryllium (PM_{10})	ng/m^3	ND	0.02	ND	ND	ND	0.002	ND	0.07	ND	0.003	0.01	ND	--	--	--	--	--	--	--	--	--	--	--	--	20
Bromoform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.07	6400
Trichlorobenzene, 1,2,4-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.07	2000
Chlorobenzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.046	10000
Chloroethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	0.082	0.1	40000
Acrylonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Chloroprene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloroethane, 1,1-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4400
Dichloroethylene, 1,1-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80
Dichloropropane, 1,2-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200
Dichloropropylene, *cis*- 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Dichloropropylene, *trans*- 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Ethyl acrylate	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Hexachloro-1,3-butadiene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	320
Methyl methacrylate	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Methyl *tert*- butyl ether	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7000
Tetrachloroethane, 1,1,2,2-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	120
Trichloroethane, 1,1,2-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	440

Key Pollutant

g/m^3 micrograms per cubic meter

g/m^3 nanograms per cubic meter

-- No sample was colected 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.

Appendix D-4. Whitwell Elementary School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Manganese (PM_{10})	ng/m^3	8.28	3.6	18.5	6.15	30.5	1.79	9.93	21.1	3.75	10.3	12.2	19.3	--	--	--	--	--	--	--	--	--	--	--	--	--	500
Benzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.15	--	2.46	0.607	0.735	0.777	0.479	0.748	2.12	0.636	--	1.34	--	30
Arsenic (PM_{10})	ng/m^3	2.5	1.02	1.21	0.39	1.3	0.85	0.84	1.76	1.11	1.14	0.87	0.08	--	--	--	--	--	--	--	--	--	--	--	--	--	150
Benzo(a)pyrene	ng/m^3	0.100	0.380	0.150	0.050	0.190	0.040	0.060	0.140	0.040	0.140	1.64	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	6400
Chromium (PM_{10})	ng/m^3	2.15	2.81	5.25	3.4	3.83	2.01	3.11	4.51	2.2	2.4	2.7	1.86	--	--	--	--	--	--	--	--	--	--	--	--	--	580
Carbon tetrachloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.755	--	0.692	0.755	0.818	0.736	0.711	0.837	0.692	0.881	--	0.793	--	200
Butadiene, 1,3-	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	0.288	0.044	0.044	0.091	0.024	0.073	0.18	0.044	--	0.11	--	20
Naphthalene	$\mu g/m^3$	0.137	0.241	0.171	0.105	0.0803	0.053	0.0587	0.0945	0.0472	0.125	0.297	0.0308	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Cobalt (PM_{10})	ng/m^3	0.04	0.06	0.21	0.08	0.14	ND	0.12	0.12	0.07	0.08	0.1	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	100
Cadmium (PM_{10})	ng/m^3	0.4	0.27	0.54	0.11	0.42	0.11	0.11	0.26	0.11	0.49	0.18	0.12	--	--	--	--	--	--	--	--	--	--	--	--	--	30
Chloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.12	--	1.32	1.24	1.18	1.18	1.1	1.27	1.03	1.37	--	1.3	--	1000
Benzo (a) anthracene	ng/m^3	0.16	1.06	0.37	0.10	0.28	0.08	0.09	0.22	0.04	0.18	2.41	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Antimony (PM_{10})	ng/m^3	0.8	2.63	3.11	0.68	2.22	1.28	2.06	9.78	0.78	2.34	1.05	0.32	--	--	--	--	--	--	--	--	--	--	--	--	--	2000
Nickel (PM_{10})	ng/m^3	0.42	0.4	2.09	0.38	1.21	ND	1.22	0.45	0.57	0.61	1.31	0.19	--	--	--	--	--	--	--	--	--	--	--	--	--	200
Ethylbenzene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.17	--	0.434	0.087	0.13	0.22	0.087	0.16	0.38	0.11	--	0.22	--	40000
Acetonitrile	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.58	--	ND	0.084	0.084	0.15	0.077	0.262	0.237	0.15	--	0.14	--	600
Xylene, *m/p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.39	--	1.13	0.17	0.22	0.53	0.14	0.34	0.89	0.22	--	0.53	--	9000
Chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.098	--	0.098	0.049	0.049	ND	0.068	0.088	0.093	0.093	--	ND	--	500
Dichloromethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.31	--	5.00	0.24	0.31	0.375	0.33	0.452	0.577	0.34	--	0.368	--	2000
Xylene, *o-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.22	--	0.521	0.087	0.13	0.25	0.07	0.15	0.37	0.1	--	0.25	--	9000
Indeno(1,2,3-cd) pyrene	ng/m^3	0.123	0.656	0.289	0.083	0.229	0.076	0.094	0.234	ND	0.229	1.800	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	640000
Benzo (b) fluoranthene	ng/m^3	0.260	1.500	0.730	0.190	0.460	0.160	0.180	0.610	0.110	0.460	3.830	0.070	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Benzo (k) fluoranthene	ng/m^3	0.070	0.400	0.200	0.050	0.140	0.040	0.060	0.150	0.040	0.130	1.060	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	64000
Styrene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.852	--	0.38	0.043	0.085	0.18	0.077	0.452	0.25	0.12	--	0.29	--	9000
Toluene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	1.02	--	2	0.377	0.528	1.08	0.31	0.728	1.84	0.464	--	1.05	--	4000
Chrysene	ng/m^3	0.350	1.350	0.770	0.320	0.410	0.210	0.250	0.480	0.180	0.170	3.430	0.090	--	--	--	--	--	--	--	--	--	--	--	--	--	640000
Carbon disulfide	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.12	--	0.062	0.19	0.093	0.05	0.031	0.065	0.065	0.034	--	0.031	--	7000
Selenium (PM_{10})	ng/m^3	1.25	1.22	2.2	1.33	1.48	0.39	1.13	1.44	0.87	1.79	1.52	1.03	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
Methyl isobutyl ketone	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.29	--	ND	0.082	0.082	0.21	0.094	0.18	0.098	0.17	--	0.25	--	30000
Methyl chloroform	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	0.055	--	ND	0.055	0.055	0.071	ND	0.066	0.066	0.071	--	0.06	--	10000
Bromomethane	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	0.12	0.039	ND	0.03	0.03	0.043	0.039	--	0.039	--	200
Beryllium (PM_{10})	ng/m^3	ND	0.02	0.03	0.02	0.00009	ND	0.008	0.06	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	20
Mercury (PM_{10})	ng/m^3	0.05	0.04	0.05	0.03	0.004	0.00004	0.007	0.02	ND	ND	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	3000
Ethylene dichloride	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	0.081	ND	ND	ND	0.081	0.081	0.077	--	ND	--	270
Dibenz (a,h) anthracene	ng/m^3	ND	0.085	ND	ND	0.037	ND	ND	ND	ND	ND	0.299	ND	--	--	--	--	--	--	--	--	--	--	--	--	--	5800
Tetrachloroethylene	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	0.14	ND	ND	ND	ND	0.068	0.23	ND	--	0.075	--	1400.000
Dichlorobenzene, *p-*	$\mu g/m^3$	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	0.06	ND	ND	ND	ND	ND	0.084	ND	--	0.04	--	10000

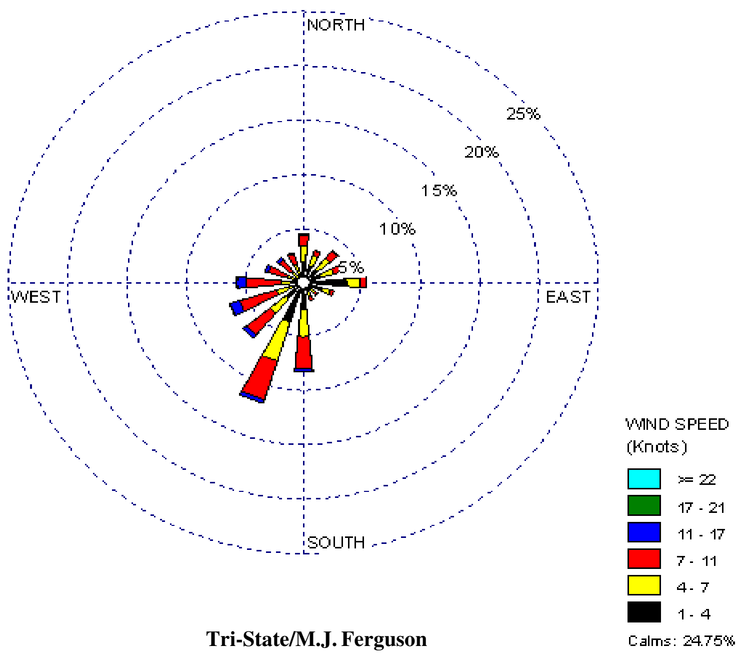
Appendix D-4. Whitwell Elementary School Pollutant Concentrations.

Parameter	Units	7/30/2009	8/5/2009	8/8/2009	8/11/2009	8/17/2009	8/23/2009	8/29/2009	9/4/2009	9/10/2009	9/16/2009	9/22/2009	9/28/2009	1/20/2010	1/26/2010	2/1/2010	2/7/2010	2/13/2010	2/19/2010	2/25/2010	3/3/2010	3/9/2010	3/15/2010	3/21/2010	3/27/2010	4/2/2010	Sample Screening Level[a]
Vinyl chloride	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	0.026	ND	ND	ND	ND	ND	ND	--	ND	--	1000
Chloroethane	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	0.026	ND	ND	ND	ND	ND	ND	--	ND	--	40000
Acrylonitrile	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	200
Benzyl chloride	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	140
Bromoform	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	6400
Chlorobenzene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	10000
Chloroprene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	200
Dichloroethane, 1,1-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	4400
Dichloroethylene, 1,1-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	80
Dichloropropane, 1,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	200
Dichloropropylene, *cis-* 1,3-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	40
Dichloropropylene, *trans* -1,3-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	40
Ethyl acrylate	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	7000
Ethylene dibromide	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	12
Hexachloro-1,3-butadiene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	320
Methyl Methacrylate	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	7000
Methyl *tert-* butyl ether	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	7000
Tetrachloroethane, 1,1,2,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	120
Trichlorobenzene, 1,2,4-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	2000
Trichloroethane, 1,1,2-	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	440
Trichloroethylene	µg/m^3	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--	10000

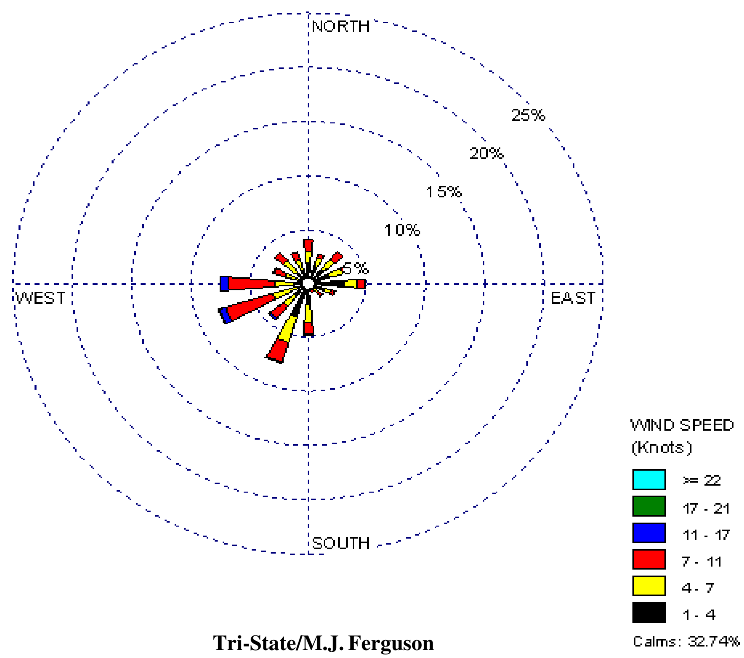
(yellow box)	Key Pollutant
/m^3	nanograms per cubic meter
g/m^3	micrograms per cubic meter
--	No sample was colected for this pollutant on this day or the sample was invalid.
ND	No detection of this chemical was registered by the laboratory analytical equipment.

[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.

Appendix E. Windroses for Tri-State/M.J. Ferguson Field Airport NWS Station.



Tri-State/M.J. Ferguson Airport NWS Station (2002-2007)[1]



Tri-State/M.J. Ferguson Airport NWS Station Across Sampling Period (Jul. 30, 2009-Apr. 2, 2010)[1]

[1] Tri-State/M.J. Ferguson Airport NWS Station (WBAN 03860) is 5.84 miles from Charles Russell Elementary School.
Tri-State/M.J. Ferguson Airport NWS Station (WBAN 03860) is 7.76 miles from Crabbe School.
Tri-State/M.J. Ferguson Airport NWS Station (WBAN 03860) is 8.35 miles from Hatcher School.
Tri-State/M.J. Ferguson Airport NWS Station (WBAN 03860) is 11.04 miles from Whitwell Elementary School.