School Air Toxics Ambient Monitoring Plan

July 8, 2009

Introduction

EPA has developed an initiative to implement Administrator Lisa Jackson's commitment to assess potentially elevated air toxics levels at some of our nation's schools. This plan describes the initial phase of ambient air monitoring efforts that are a fundamental part of this initiative.

Section 1: Project Description

1.1 Overview

EPA has developed a list of 62 priority schools as locations for an initial round of 60 to 90 day monitoring. This monitoring will target the site-specific pollutants of particular interest. The priority school monitoring candidate list was initially developed using results from the USA Today analysis (which is based on EPA's RSEI Model and 2005 Toxics Release Inventory) and EPA's 2002 NATA, and subsequently refined using additional and updated relevant information, largely provided by local and state air quality agencies.

1.2 Project Objectives

This ambient air monitoring effort is intended to 1) yield location-specific ambient air quality data sufficient to initially screen for potential impacts from toxic air pollution at our nation's schools, and 2) provide a basis for additional actions by EPA, state, and local agencies including, but not limited to, additional monitoring and/or enforcement or other risk mitigation efforts.

Section 2: Project Monitoring Design

2.1 Site Selection

As stated in Section 1.1, the specific schools to be included in this program were identified by a cooperative effort between EPA, and affected state and local agencies. The schools are listed and described in Appendix A.

2.2 Monitor Siting

Monitors must be sited on school grounds. Reasonable effort should be made to follow the monitor siting criteria detailed in Code of Federal Regulations (CFR) Chapter 40 Section 58, Appendix E, where relevant. Though strict compliance with standard siting criteria cannot be expected for a monitoring exercise of this scope and objectives, due consideration must be given to monitor placement guidelines such as the following:

- Locating the sampler in an area that has an unobstructed air flow, especially in the direction of any recognized sources of target analytes.
- Avoiding locations that are directly influenced by nearly adjacent, school-based biasing emission sources (e.g., boiler stacks, backup generators, school-bus idling areas).

- Avoiding locations where reactive surfaces may cause chemical changes in the air sampled.
- Placing the intake probe(s) of samplers at a representative height between 2 and 15 m above ground level (AGL).
- Recognition of personnel and apparatus security issues, and related accessibility concerns during weekdays and weekends/holidays.

Document the sampler siting location with typically provided information such as digital pictures of the site from the eight cardinal directions, and precise GPS coordinates (as accurate as possible given available technology).

2.3 Meteorological Measurements

At a minimum, in situ measurement of wind speed and direction are required as part of this monitoring effort; EPA will provide meteorological monitoring equipment to achieve this requirement.

As with siting of the air sampling equipment, strict compliance with standard meteorological monitoring equipment siting criteria (Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements Version 2.0) cannot be realistically expected in a monitoring effort of this scope. Rather, meteorological monitoring equipment should be sited in accordance with the same guidelines as previously specified for the air sampling equipment. Although the collocating of meteorological and air sampling equipment is considered the default situation, the consideration of alternative locations on the same school grounds for meteorological monitoring is acceptable if it will result in more representative meteorological measurements. Siting documentation should likewise be consistent with that of the air sampling equipment.

Other meteorological parameter measurements may be useful when interpreting the resultant data but are typically considerably less spatially variable; therefore, rather than performing additional in situ meteorological monitoring, each site must provide location and parameter details of the closest off-site meteorological monitoring station (i.e., National Weather Service, local airport, etc.).

2.4 Measured Pollutants

At a minimum, the site-specific pollutants of principle interest must be monitored. The site-specific pollutants are identified with each listed school in Appendix A. The inclusive list of pollutants and required method detection limits are presented in Appendix B.

Section 3: Monitoring Protocols

3.1 Sampling and Analysis Methods and Minimum Detection Limits (MDLs)

<u>Sampling and Analysis Methods</u>
Measurement consistency is necessary to achieve the program objectives described above. The ability to accurately detect pollutant concentrations, and evaluate the resultant

data to assess the degree to which associated health risks may be present, requires a considerable level of standardization.

It is clear that there may be some variability in sampling apparatus and associated operating protocols from site to site. For example, in some cases routine (a.k.a. fixed) monitoring may be a viable option (i.e., equipment is available for deployment to the site, and any necessary infrastructure such as AC power, shelter if applicable, etc. either exists or can be readily arranged. In cases where either routine equipment and/or suitable infrastructure is/are not readily available, more portable monitoring will be employed (for all pollutants except PAHs). *Note that in either case, fixed or portable, the equipment must be sited in a secure location.* Further information regarding appropriate monitoring approaches is provided in Section 3.3 of this document.

Regarding the analytical methodology (and thus associated sampling media) *needed to achieve the necessary minimum detection limits (MDLs),* there is essentially no flexibility. The following table lists the principle target analytes, and associated methods and sampling media which provide the best opportunity to meet the detection goals.

Note: Sampling and analysis methods for any target analytes not covered in the following table must be approved by OAQPS and incorporated into the QAPP prior to monitoring.

Target Analytes	Method	Sampling Media
VOCs	EPA TO-15	Air (via canister)
Carbonyls	EPA TO-11A	DNPH-coated silica gel cartridge
PM10 HAP Metals	EPA IO-3.5	47mm Teflon filter
TSP HAP Metals	EPA IO-3.5	8x10"quartz (or 47mm Teflon) filter
TSP Hexavalent Chromium	EPA-modified CARB 039	47mm acid-washed sodium bicarbonate impregnated cellulose filter
PAHs	TO-13A (or ASTM D6209)	PUF / XAD-2
Diisocyanates	OSHA No. 42	Glass fiber filter coated with 1-(2-pyridyl)piperazine
4,4'-methylenedianiline	NIOSH No. 5029	Acid treated glass fiber filters

Minimum Detection Limits

Minimally acceptable MDLs have been established for the target analytes and are presented, as part of an inclusive target analyte listing (Appendix B). EPA expects that monitoring agencies will utilize a designated national contract laboratory for all preparation and analyses of sample media supporting this project. This decision was made to maximum the compatibility and comparability of data generated during the study, and to provide efficiencies in the completion of required quality assurance activities and oversight duties. With this goal in mind, monitoring agencies who still wish to use their own laboratories should contact OAQPS to determine the technical requirements that would be involved to provide analysis support that is deemed adequate and comparable to the contract lab. Please note that OAQPS has not reserved additional funds to support the participation of other labs in this effort.

3.2 Sampling Frequency, Duration, and Quantity

Ambient air sampling shall be conducted on a 1 in 6 day schedule, details of which must be coordinated with the EPA and national contract laboratory. Unless otherwise specified (i.e., diisocyanates and 4,4'-methylenedianaline), each sampling date will begin at 00:00 Local Standard Time (LST) and end at 23:59 LST that same day. Start dates will vary by site as a function of monitoring setup completion. Once monitoring operations have commenced, the base (i.e., minimum duration) sampling period is 60 days; given a 1 in 6 sampling schedule, the base sampling period is intended to result in 10 valid samples. There may be cases in which the 60 day sampling period is deemed to be insufficient (e.g., invalidated sample(s), insufficiently representative data, etc.) and thus extended, typically not to exceed a total duration of 90 days.

Missed or Invalidated Samples

- Must be made up ***only*** *on the established site-specific 1 in 6 day schedule* (i.e., extend the base 60 day sampling period to include the required number of makeup samples to achieve a minimum of 10 valid samples)
- For sites where multiple sampling methodologies are employed (e.g., PM_{10} HAP metals, VOCs, and PAHs), if a sample from one of the sampling methodologies is missed or invalidated, the other remaining valid samples from that date shall analyzed, and a makeup date for all sample methodologies at that site types scheduled by extending the sampling period from 60 days to 66 days. Using the example of a site where PM_{10} HAP metals, VOCs, and PAHs are measured, if one of the PAH samples was missed or invalidated, the 60 day base period would be extended to 66 days and the resultant number of valid samples would be 11 for PM_{10} HAP metals and VOCs, and 10 for PAHs.

Note that for all pollutants, except VOCs, an additional 20% field blanks will be analyzed yielding a grand total of 12 samples per pollutant category at each site. Also note that there will be duplicate samplers at some sites for selected measurements; the intent is to achieve approximately 15% collocation for each pollutant or category of pollutants.

Additional Samples

- Monitoring agencies are authorized to collect up to three additional *random (i.e., dates which deviate from the established site-specific 1 in 6 day schedule*) samples.
    - Note: random sample events must include all methodologies employed by a site (e.g., site X monitors for carbonyls and VOCs; the random sample event must include both).
- The number (up to 3) and timing of the additional samples are at the discretion of the responsible monitoring agency.
    - To ensure samples are readily available to the S/L monitoring agency, the national contract lab will ensure that each site has three samples (per method) available on each 1 in 6 sampling date.
    - Each S/L monitoring agency must notify the EPA and national contract lab of each random sample event on or before the random sample event date.
- The additional random sample dates should be selected considering forecast meteorological conditions, and other factors such as source operating characteristics, that may be anticipated to result in elevated ambient concentrations of target pollutant(s).

- As winds are a key factor in determining optimal conditions for source impact, examples of useful wind forecasting tools are as follows:
    - http://www.emc.ncep.noaa.gov/mmb/nammeteograms/
        - Click on the desired region, then on the star closest to your location
        - Select most current meteogram *(see GMT time axis at bottom of each plot)*
    - http://www.wunderground.com/
        - Begin by typing the relevant zip code in the "Search" box
        - The five day forecast will appear at the top of the right column; clicking on the hourly link will reveal the National Weather Service Forecast for several parameters to include wind speed and direction
        - Another viable wind forecast is available by scrolling down the page and clicking on the link titled "Alternate Computer Forecast: AVN MOS Weather Graph"

End of Sampling

- Sampling will cease upon collection of the tenth regularly scheduled (i.e., 1 in 6 day) sample, with the following exception:
    - If any of the samples are known to be invalid as a result of problems arising during the sample collection or laboratory analysis, AND there are insufficient discretionary or "wild card" samples to assure 10 valid samples during the 60 day base period, then sampling will be extended for as many samples as needed to assure 10 valid samples are achieved.
- It will take approximately two (2) weeks for EPA to ensure that the last few samples are valid.
    - If one or more of the last few samples is invalidated (such that the total number of valid samples is less than 10), a sufficient number of additional samples will be collected to ensure that ten (10) valid samples are achieved.
        - The number of additional samples will be decided upon jointly by both EPA and the jurisdictional state or local agency.
- Once it is determined that at least ten (10) valid samples have been achieved, EPA will endeavor to make an assessment of all the data within 30 days, and report that assessment to the jurisdictional state or local agency.
- EPA and the jurisdictional state or local agency will discuss the assessment and consider next steps such as
    - No additional monitoring needed; jointly plan next use of equipment
    - Additional / longer term monitoring at that school in order to have more confidence in the findings (equipment may remain thus in place)
    - Note: if many schools reach the end of the planned monitoring at about the same time, data assessment and follow-up discussion with some of the jurisdictional state and local agencies may not occur within the 30 day time-frame cited above
- *Note: the monitoring equipment must remain in place until the joint (EPA and jurisdictional state or local agency) determination that no further monitoring is warranted at that site.*

3.3 Monitoring Approach: Process, Roles, and Responsibilities

Upon being notified of schools on the 60-day monitoring list, affected (jurisdictional) State and local agencies are responsible for the following actions:

- Contacting the school and discussing the purpose and scope of the proposed monitoring project. Note that the initial contact may include the participation of EPA Regional Office personnel.
- Asking what access may be granted regarding monitor siting, AC power, equipment security, etc.
    - Note that this is particularly important in the context of "fixed" monitoring (notable "ground" footprint, AC power requirements, etc.)
    - Further note that (for all but PAHs and TSP Lead by high volume sampling) portable monitoring (negligible or no "ground" footprint, battery power, etc.) is a viable option. These monitoring approaches are discussed in Appendix C.
- Arranging for a school site walk-through to identify potential locations for monitoring equipment and to discuss specific requirements with regard to power and security.
    - In these discussions with school officials, it's important to ensure that the host school is willing to provide the needed space, power, and security to accommodate this instrument for a period of at least 60 days with the possibility of up to a year).
    - If an existing air monitoring site is located on the school grounds, please report that fact to your Region along with the applicable AQS site ID number.
- Assessing personnel capability to support the study for the duration of sampling.
- Inventorying the availability of suitable air monitoring or meteorological equipment that meets the requirements described in the individual method descriptions in Appendix C. Report any available assets and site access to the EPA contact for your Region.
    - Note that EPA's expects that monitoring agencies will require new sampling and calibration equipment for this program, and equipment purchases are being centrally coordinated by EPA to support this assumption. Agencies should provide appropriate shipping locations so that vendors can drop-ship equipment directly to designated State or local program offices or laboratories. Equipment provided to participating agencies will remain with their programs to support future initiatives.
- In addition to the above, the jurisdictional State or local agency (or other entity) is responsible for the following:
    - Establishing and operating the monitoring site(s) as described in this plan and applicable sampling and analysis methodology, and
    - Complying with all other standards and protocols as described in this plan including timely handling of incoming and outgoing sample media.
    - In the event that the jurisdictional State or local agency is not capable of establishing and/or operating the monitoring site, said agency will notify the US EPA as soon as such determination is made. The EPA will employ contract support to establish and/or operate the monitoring site, as needed.
- EPA is principally responsible for establishing the monitoring program framework and associated guidelines, procuring needed equipment and analytical support, and paying for all monitor and sample shipping costs, as well as needed contractor support.
    - The national contract laboratory will supply all sampling media.

- EPA will work jointly with monitoring agencies to support data analyses and development of plans for follow-up actions, if required
- Monitoring Equipment Disposition
    - The School Air Toxics (SAT) monitoring equipment is EPA property (to be entered into EPA's property management database) and will be loaned to the participant state and local agencies for a period of two (2) years.
    - Each agency receiving equipment will, upon receipt, provide Edward Sanders (USEPA/OARM-RTP, sanders.edward@epa.gov) and Michael Jones (jones.mike@epa.gov) with the following equipment-specific information: manufacturer, model, serial number.
    - The property will be assigned an EPA property number, documentation for which will be provided by Mr. Sanders to the each receiving (now termed custodial) agency's principle property contact for this equipment who will 1) establish and maintain an appropriate property file, and 2) place the EPA decal(s) on the property as instructed by the USEPA/OARM-RTP.
    - Each agency must sign a standard EPA equipment loan agreement.
    - On or about the first anniversary of the equipment loan, the custodial agency will be asked by USEPA/OARM-RTP to verify the equipment location and condition.
    - On the second anniversary of the equipment loan, the equipment will have sufficiently depreciated such that the EPA will declare the equipment as surplus and formally transfer ownership by donation from the USEPA to the custodial agency.

Section 4: Quality Assurance Project Plan

All environmental data operations are required to develop planning documents in compliance with EPA regulation. Consistent with EPA requirements as stated in QA/G5 "Guidance for Quality Assurance Project Plans" (http://www.epa.gov/quality/qa_docs.html), the Office of Air Quality Planning and Standards (OAQPS) has developed a national QAPP with which all environmental data operations associated with this air toxics ambient monitoring program must fully comply.

Section 5: Data Reporting Requirements

Sample Analyses

- Quality assured ambient monitoring data will typically be reported to the U.S. EPA's Air Quality System (AQS) Database (http://www.epa.gov/ttn/airs/airsaqs) within 21 calendar days following sample collection.
    - The national contract laboratory will report these data biweekly.
- All data, to include values below MDL, will be reported to AQS. Under no circumstances are data value substitutions (e.g., ½ MDL) acceptable**.**
- Data will be reported to AQS according to the following unit guidelines:
    - VOCs and carbonyls will be reported in ppb_v
    - PAHs, TSP and PM_{10} metals will be reported in ng/m^3
    - Diisocyanates and 4,4'-methylenedianaline will be reported in $\mu g/m^3$

- Standard vs. Local Conditions
    - All samples are collected as representing local conditions; all resultant data will be submitted to AQS under local conditions.
    - For PM_{10} and TSP metals *(to include hexavalent chromium)*, parameter / unit codes exist for both standard and local conditions; for this study, data will be entered into AQS using the local conditions parameter / unit codes.
    - For diisocyanates and 4,4'-methylenedianaline, only local condition parameter / unit codes are available.
    - For all other HAPs, local condition parameter / unit codes are currently unavailable; local condition data will be reported to AQS under standard condition parameter / unit codes.
- Null and QA flags presented in Section 5 (Data Management) of the National Air Toxics Trends Station (NATTS) Technical Assistance Document (TAD) will be employed.
    - Section 5 is available at http://www.epa.gov/ttn/amtic/airtox.html.

Meteorological

- Monitoring agencies will download hourly wind speed and direction data from the data loggers concurrent with sample pickup from each site (i.e., every 6th day) and submit to Jon Miller of EPA at miller.jonathan@epa.gov for data processing and reporting to AQS. EPA will assist monitoring agencies with the processing of meteorological data by providing a utility to convert data logger output files into AQS transactions.

Appendix A: Schools Recommended For Initial Air Toxics Ambient Monitoring

Listed Alphabetically by State

U.S. Environmental Protection Agency

School Name	Street Address	City	County	State	Pollutants to be Monitored [1]
North Birmingham Elementary School [2]	2620 35th Ave N	Birmingham	Jefferson	AL	Metals in PM10, Metals in TSP, PAH, VOCs
Lewis Elementary School	2015 26thSt	Birmingham	Jefferson	AL	Metals in PM10, Metals in TSP, PAH, VOCs
Riggins School	3177 44th Ct N	Birmingham	Jefferson	AL	Metals in PM10, Metals in TSP, PAH, VOCs
Tarrant Elementary School	1269 Portland Street	Tarrant City	Jefferson	AL	Metals in PM10, Metals in TSP, PAH, VOCs
Felton Elementary School	10417 Felton Ave	Lennox	Los Angeles	CA	Metals in TSP, PAH, VOC
Santa Anita Christian Academy [3]	4434 Santa Anita Ave	El Monte	Los Angeles	CA	Metals in TSP, PAH, VOCs
Soto Street Elementary School	1020 S. Soto Street	Los Angeles	Los Angeles	CA	Metals in TSP, PAH, VOCs
Stevens Creek Elementary School	10300 Ainsworth Dr	Cupertino	Santa Clara	CA	Cr+6
Roland-Story High School	1009 Story St	Story City	Story	IA	Diisocyanates
Saint Josaphat School	2245 N Southport Ave # 1	Chicago	Cook	IL	Cr+6 , Metals in PM10, Metals in TSP
Pittsboro Elementary School	206 N Meridian St	Pittsboro	Hendricks	IN	Metals in PM10
Lincoln Elementary	203 N Lincoln St	Warsaw	Kosciusko	IN	Metals in PM10, VOCs
Abraham Lincoln Elementary School	2001 E. 135th St	East Chicago	Lake	IN	Metals in PM10, Metals in TSP, PAH, VOCs
Jefferson Elementary School	601 Jackson St.	Gary	Lake	IN	Metals in PM10, PAH, VOCs
Colvin Elementary	2820 S Roosevelt St	Wichita	Sedgwick	KS	Cr+6, VOCs
Charles Russell Elementary School	1100 Russell St	Ashland	Boyd	KY	Metals in PM10, PAH, VOCs
Crabbe School	520 17th St	Ashland	Boyd	KY	Metals in PM10, PAH, VOCs
Hatcher School	1820 Hickman St	Ashland	Boyd	KY	Metals in PM10, PAH, VOCs
Eden Gardens Fundamental Elementary School	626 Eden Blvd	Shreveport	Caddo	LA	Carbonyls, Cr+6
Lincoln Park Elementary School	2951 Leon St	Muskegon	Muskegon	MI	Cr+6, Metals in PM10
Spain Elementary School	3700 Beaubien St	Detroit	Wayne	MI	VOCs
Minnesota International Middle Charter School	277 12th Ave N	Minneapolis	Hennepin	MN	Cr+6, Diisocyanates, Metals in PM10
Enterprise High School	501 S River Rd	Enterprise	Clarke	MS	VOCs
Paulsboro High School	670 N Delaware St # 1	Paulsboro	Gloucester	NJ	VOCs, Carbonyls, Metals in PM10
Mabel Holmes Middle School	436 1st Avenue	Elizabeth	Union	NJ	VOCs, Carbonyls, Metals in PM10
Olean Middle School	401 Wayne St	Olean	Cattaraugus	NY	Diisocyanates, VOC
Intermediate School 143	515 W 182nd St	New York	New York	NY	VOCs
La Croft Elementary School	1417 Etruria St	East Liverpool	Columbiana	OH	Metals in PM10
Elm Street Elementary School	440 E Elm St	Wauseon	Fulton	OH	Diisocyanates, VOCs,
Whitwell Elementary School	2220 S 5th St	Ironton	Lawrence	OH	Metals in PM10, PAH, VOCs
Life Skills of Trumbull County [4] *Academy of Arts and Humanities* [5]	458 Franklin St SE *261 Elm Road*	Warren	Trumbull	OH	Metals in PM10, Metals in TSP, PAH, VOCs
The Ohio Valley Educational Service Center	115 Victory Place	Marietta	Washington	OH	Metals in PM10, Metals in TSP
Warren Elementary School	16855 State Route 550	Marietta	Washington	OH	Metals in PM10, Metals in TSP
Toledo Elementary School	600 SE Sturdevant	Toledo	Lincoln	OR	Carbonyls, Metals in PM10, VOCs
Harriet Tubman Middle School	2231 N Flint Ave	Portland	Multnomah	OR	Carbonyls, Metals in PM10, VOCs
Clairton Educational Center	501 Waddell Ave	Clairton	Allegheny	PA	Metals in PM10, PAH, VOCs
South Allegheny Middle/High School	2743 Washington Blvd	McKeesport	Allegheny	PA	Metals in PM10, PAH, VOCs
Sto-Rox Elementary School [4] *Sto-Rox Middle School*	300 Ewing Rd *298 Ewing Road*	McKees Rocks	Allegheny	PA	Cr+6, Metals in PM10, PAH, VOCs
Riverside Elementary School	1400 Centre Ave	Reading	Berks	PA	Cr+6
Kreutz Creek Valley Elementary School	50 N Lee St	Hallam	York	PA	Cr+6
Chicora Elementary School	1912 Success Avenue	Charleston	Charleston	SC	Carbonyls, Cr+6, Metals in PM10, VOCs
Ashland City Elementary School	108 Elizabeth St	Ashland City	Cheatham	TN	Metals in PM10
West Greene High School	275 W Greene Dr	Mosheim	Greene	TN	Diisocyanates
Lakeview Elementary School	802 Long Street	New Johnsonville	Humphries	TN	Metals in PM10
Vonore Middle School [4] *Vonore Elementary School*	414 Hall St *1135 Hwy 411*	Vonore	Monroe	TN	Diisocyanates

Appendix A: Schools Recommended For Initial Air Toxics Ambient Monitoring

Listed Alphabetically by State

U.S. Environmental Protection Agency

School Name	Street Address	City	County	State	Pollutants to be Monitored [1]
Temple Elementary School	400 Ash St	Diboll	Angelina	TX	VOCs
NW Harllee Elementary School	1216 E 8th St	Dallas	Dallas	TX	Carbonyls, VOCs
Lamkin Elementary	11521 Telge Rd	Cypress	Harris	TX	Cr+6
San Jacinto Elementary School [4] *Deer Park Junior High School*	601 E 8th Street *410 East 9th St*	Deer Park	Harris	TX	PAH, VOCs
Young Scholars Academy	1809 Louisiana St	Houston	Harris	TX	VOCs
I C Evans Elementary School	1015 S Berry St	Burkburnett	Wichita	TX	4,4-Methylenedianiline
Solid Rock Academy/Early Learning Center	380 Colony Road	Madison Heights	Amherst	VA	Metals in PM10, Metals in TSP
St. Helen's Elementary School	431 27th Ave	Longview	Cowlitz	WA	Carbonyls, Metals in PM10, VOCs
Concord Elementary School	723 S Concord St	Seattle	King	WA	Metals in PM10, Metals in TSP, Cr+6, VOCs
Follansbee Middle School [4] *Jefferson Primary School*	1400 Main St *1098 Jefferson St.*	Follansbee	Brooke	WV	Metals in PM10, PAH, VOCs
Cabell County Career Technology Center	1035 Norway Ave	Huntington	Cabell	WV	Metals in PM10
Neale Elementary School	2305 Grand Central Ave	Vienna	Wood	WV	Metals in PM10

[1] Pollutants to be measured have been selected based on emission sources in the vicinity of each school.

4,4-Methylenedianiline: A chemical compound used mainly for making polyurethane foams

Carbonyls: Also known aldehydes (e.g., formaldehyde and acetaldehyde).

Cr+6: Hexavalent chromium

Diisocyanates: Chemical compounds used in manufacturing foam-containing products; three of these compounds will be measured.

Metals in PM10: Toxic metals contained in particulate matter that is 10 micrometers in diameter or smaller (e.g., lead, nickel and manganese).

Metals in TSP: Toxic metals contained in total suspended particulate matter (e.g., lead, nickel and manganese).

PAH: Polycyclic Aromatic Hydrocarbons (e.g., naphthalene, benzo(a)pyrene).

VOC: Volatile Organic Compounds (e.g., benzene, vinyl chloride).

Note: The groups of chemicals identified for each school as "pollutants to be monitored" include both the specific individual pollutants within the group that our current information indicates may be present at each school at levels of potential concern (i.e., the "driver pollutants") and some other pollutants that can be inexpensively measured at the same time. While we will be analyzing air samples for both sets of pollutants in each chemical group and will review all the data in drawing conclusions for each school, we intend to focus our data analysis activities primarily on the individual "driver pollutants".

[2] Previously listed school, Hudson K-Eight is to be demolished this summer, this school represents same pollutants of interest.

[3] The March 31, 2009 verson of the list indicated that Metals in PM10 would be monitored. This was a typographical error. Metals in PM10 will not be monitored at this school.

[4] These schools are located close to each other. Our goal is to use one monitor to characterize both schools.

[5] School formerly known as Notre Dame Queen of Peace

Appendix B. Target Analytes and Required Method Detection Limits (*4/10/09*)

The MDLs provided in the far right column below are those that can be achieved by the EPA's air toxics contract laboratory and are thus considered to be the requisite / minimally acceptable MDLs for the School Air Toxics monitoring initiative. These concentration values were compared with those labeled as "Lower Bound of Concentration Range of Potential Risk-Related Interest" so as to evaluate sufficiency for health-based decision making. With the exception of eight chemicals, the laboratory reported MDLs fall below the lower bound of the concentration range that might be of potential risk-related interest when measuring ambient concentrations. In all cases (including those eight chemicals for which the laboratory MDLs are higher than the lower bound concentrations), the MDL presented is considered sufficient for this initiative. The target analytes listed below include 1) any chemical identified as risk drivers on the 3/31/09 schools-for-monitoring list, and 2) any other chemicals captured and reported out by the analytical methods used in this project.

HAP Compound		Lower Bound of Concentration Range of Potential Risk-related Interest[1]	REQUIRED METHOD DETECTION LIMIT (MDL)[2]
CHEMICAL NAME	**CAS NO.**	**ug/m3**	**ug/m3**
Acetaldehyde	75-07-0	4.5E-01	9.0E-03
Acetonitrile	75-05-8	6.0E+00	9.7E-02
Acetone	67-64-1	No Value	1.0E-02
Acetylene	74-86-2	No Value	1.3E-02
Acrolein	107-02-8	2.0E-03	3.5E-02 [3]
Acrylonitrile	107-13-1	1.5E-02	3.1E-02 [3]
Antimony compounds	7440-36-0	0.02 [6]	6.7E-06 [4]
Arsenic compounds	7440-38-2	2.3E-04	9.2E-06 [4]
Benzene	71-43-2	1.3E-01	2.0E-02
Benzyl chloride	100-44-7	2.0E-02	8.0E-03
Benzaldehyde	100-52-7	No Value	1.0E-03
Beryllium compounds	7440-41-7	4.2E-04	1.8E-06 [4]
Bromochloromethane	74-97-5	No Value	2.4E-02
Bromodichloromethane	75-27-4	No Value	1.6E-02
Bromoform	75-25-2	9.1E-01	2.0E-02
1,3-Butadiene	106-99-0	3.3E-02	6.0E-03
Butyr/Isobutyraldehyde	123-72-8	No Value	6.0E-02
Cadmium compounds	7440-43-9	5.6E-04	2.9E-05 [4]
Carbon disulfide	75-15-0	7.0E+01	7.0E-03
Carbon tetrachloride	56-23-5	6.7E-02	1.2E-02
Chlorobenzene	108-90-7	1.0E+02	1.1E-02
Chloroform	67-66-3	9.8E+00	1.2E-02
Chloroprene	126-99-8	7.0E-01	1.1E-02
Chromium Compounds (all species)	7440-47-3	No Value	3.4E-04 [4]
Chromium (VI) compounds	18540-29-9	8.3E-05	4.3E-06
cis -1,2-Dichloroethylene	156-59-2	No Value	6.9E-02
trans- 1,2 -Dichloroethylene	75-69-4	No Value	1.0E-02
Cobalt compounds	7440-48-4	1.0E-02	5.5E-06 [4]
Crotonaldehyde	123-73-9	No Value	5.0E-03
p-Dichlorobenzene	106-46-7	9.1E-02	2.3E-02
1,3-Dichloropropene	542-75-6	2.5E-01	0.011 (cis), 0.014 (trans)
Dibromochloromethane	124-48-1	No Value	1.1E-02
Dichlorodifluoromethane	75-71-8	No Value	1.9E-02

Dichlorotetrafluoroethane	76-14-2	No Value	1.0E-02
2,5,- Dimethylbenzaldehyde	5779-94-2	No Value	2.0E-03
Ethyl acrylate	140-88-5	No Value	2.5E-01
Ethyl benzene	100-41-4	1.0E+02	1.5E-02
Ethyl chloride	75-00-3	1.0E+03	4.0E-03
Ethyl tert-Butyl Ether	637-92-3	No Value	2.8E-02
Ethylene dibromide	106-93-4	1.7E-03	1.1E-02 [3]
Ethylene dichloride	107-06-2	3.8E-02	8.0E-03
Ethylidene dichloride (1,1-Dichloroethane)	75-34-3	6.3E-01	8.0E-03
Formaldehyde	50-00-0	9.8E-01	4.4E-02
Hexachlorobutadiene	87-68-3	4.5E-02	0.13 [3]
Hexaldehyde	66-25-1	No Value	5.0E-03
Hexamethylene-1,6-diisocyanate	822-06-0	1.0E-03	2.5E-01 [3, 5]
Isovaleraldehyde	590-86-3	No Value	4.0E-03
Lead compounds	7439-92-1	1.5E-01	5.6E-05 [4]
m -Dichlorobenzene	541-73-1	No Value	2.4E-02
Manganese compounds	7439-96-5	5.0E-03	5.7E-05 [4]
Mercury Compounds		0.03 [6]	1.7E-05 [4]
Methyl bromide	74-83-9	5.0E-01	7.0E-03
Methyl chloride	74-87-3	9.0E+00	1.3E-02
Methyl chloroform (1,1,1-Trichloroethane)	71-55-6	5.0E+02	8.0E-03
Methyl Ethyl Ketone	78-93-3	No Value	1.2E-01
Methyl isobutyl ketone	108-10-1	3.0E+02	2.5E-02
Methyl methacrylate	80-62-6	7.0E+01	1.1E-01
Methyl tert-butyl ether	1634-04-4	3.8E+00	5.1E-02
Methylene chloride	75-09-2	2.1E+00	2.6E-02
Methylene diphenyl diisocyanate	101-68-8	6.0E-02	2.23E-02 [5]
4,4'-Methylenedianiline	101-77-9	2.2E-03	0.025 [3, 5]
n -Octane	111-65-9	No Value	1.8E-02
Naphthalene	91-20-3	2.9E-02	2.4E-04
Nickel compounds	7440-02-0	0.0042 [7]	1.3E-04 [4]
Acenaphthene	83-32-9	No Value	4.2E-05
Acenaphthylene	206-96-8	No Value	4.8E-05
Anthracene	120-12-7	No Value	5.2E-05
Benzo(a)anthracene	56-55-3	9.1E-03	6.3E-05
Benzo(b)fluoranthene	205-99-2	9.1E-03	5.9E-05
Benzo(k)fluoranthene	207-08-9	9.1E-03	5.9E-05
Benzo(g,h,i)perylene	191-24-2	No Value	3.3E-05
Benzo(a)pyrene	50-32-8	9.1E-04	6.1E-05
Benzo(e)pyrene	192-97-2	No Value	4.9E-05
Chrysene	218-01-9	9.1E-02	4.0E-05
Coronene	191-07-1	No Value	4.3E-02
Cyclopenta(c,d)pyrene	27208-37-3	No Value	6.4E-02
Dibenz(a,h)anthracene	53-70-3	8.3E-04	4.9E-05
Fluoranthene	206-44-0	No Value	4.6E-05
9-Fluoranthene	486-25-9	No Value	4.7E-05
Fluorene	86-73-7	No Value	3.8E-05
Indeno(1,2,3-cd)pyrene	193-39-5	9.1E-03	4.0E-05
o- Dichlorobenzene	95-50-1	No Value	2.5E-02
Phenanthrene	85-01-8	No Value	5.9E-05
Pyrene	129-00-0	No Value	5.9E-05

Perylene	1985-5-0	No Value	2.8E-02
Retene	483-65-8	No Value	5.7E-02
Propionaldehyde	123-38-6	No Value	1.2E-02
Propylene	115-07-1	No Value	6.3E-02
Propylene dichloride	78-87-5	5.3E-02	1.5E-02
Selenium compounds	7782-49-2	20 [7]	1.3E-05 [4]
Styrene	100-42-5	1.0E+02	1.3E-02
1,1,2,2-Tetrachloroethane	79-34-5	1.7E-02	1.9E-02 [3]
tert-Amyl Methyl Ether	994-05-8	No Value	2.8E-02
Tetrachloroethene	127-18-4	1.7E-01	1.8E-02
Toluene	108-88-3	5.0E+02	3.0E-02
2,4/2,6-Toluene diisocyanate mixture (TDI)	26471-62-5	7.0E-03	0.025 [3, 5]
o-Tolualdehyde	529-20-4	No Value	9.0E-03
m-Tolualdehyde	620-23-5	No Value	9.0E-03
p-Tolualdehyde	104-87-0	No Value	9.0E-03
1,2,4-Trichlorobenzene	120-82-1	2.0E+01	5.2E-02
1,1,2-Trichloroethane	79-00-5	6.3E-02	1.5E-02
1,2,4-Trimethylbenzene	95-63-6	No Value	5.2E-02
1,3,5-Trimethylbenzene	108-67-8	No Value	1.8E-02
Trichloroethylene	79-01-6	5.0E-01	8.0E-03
Trichlorofluoromethane	75-69-4	No Value	1.2E-02
Trichlorofluoroethane	76-13-1	No Value	2.4E-02
Valeraldehyde	110-62-3	No Value	5.0E-03
Vinyl chloride	75-01-4	1.1E-01	5.0E-03
Vinylidene chloride	75-35-4	2.0E+01	1.2E-02
o-Xylene	95-47-6	No Value	1.5E-02
Xylenes (mixed)	1330-20-7	1.0E+01	0.028 (mixed m,p)

[1] The value shown is the lower of the continuous lifetime exposure concentration associated with an HQ of 0.1 or a cancer risk of 1 x 10-6 (using OAQPS chronic toxicity values: http://www.epa.gov/ttn/atw/toxsource/summary.html, updated where needed).

[2] The values in this column reflect MDLs reported by ERG for use in the national lab contract for this project.

[3] The MDL for this constituent is higher than the lower bound of the concentration range of potential risk-related interest (i.e., concentrations below which risks are typically considered negligible). For this Schools Project, this MDL will be considered sufficient.

[4] The MDL value given is for the metal (e.g., antimony, arsenic, etc.). The analytical methodology being used in this project does not distinguish among various metal compounds. Only the total amount of metal will be measured and reported. (Note that some schools will be targeted for Cr^{+6} analysis. At these schools, a special monitor will be deployed that can determine the amount of Cr^{+6} present in air.)

[5] The MDL is estimated; a calculated MDL will be established prior to monitoring.

[6] This value is for a specific metal compound among multiple compounds in a group.

[7] For nickel and selenium, the value presented is the lowest for the types of compounds expected to be present in ambient air.

Appendix C: Monitoring Approaches

Sample Recovery: EPA requires that samples be recovered within 72 hours of completion, and strongly advises that samples be recovered the day after sampling. More stringent sample recovery timelines are required for TSP Cr^{+6} and 4,4'-methylenedianaline.

VOCs

- Passive Canisters
    - Small, easy to place / site
    - Canister, flow regulator, and timer must be shielded from direct sunlight
        - One simple yet effective solution: white cotton laundry bag w/ draw string
            - Place sampling apparatus in the bag to just above the pressure valve; draw the string to hold in position
    - A means of elevating the apparatus such that the inlet will be at or near the 2 meter minimum height will be necessary
    - Power: passive via critical orifice; air sampling timer is battery powered
    - Equipment Specifications *(EPA will provide sampling equipment)*

      Air Toxics Sample Canister
        - 6-liter internal volume, Summa-treated
        - SS4H inlet bellows valve
        - ¼ inch tube fitting sample line connection

      Passive Air Vacuum Regulators
        - 304 or 316 stainless steel
        - 2-micron frit or filter and washer located prior to critical orifice
        - Orifice size .0012" (flow range between 2-4 cc / min)

      Canister Air Sampling Timer / Solenoid Valve
        - Compatible with any canister and passive flow controller
        - 7 day / 24 hr programmable timer capable of automated sampling
        - Battery operated capable of accommodating 24 hr sample collection
        - 1/4" Swagelok® inlet and outlet fittings
        - Stainless steel flow path
    - Sampling duration and rate: 24 hours at 3.5 cc / min
    - Sample medium: ambient air in canister
    - Analysis method: TO-15 (MS operated in SIM)

Carbonyls

- Low Volume Portable Air Sampling Pump
    - Small, easy to place / site
    - Pump must be protected from precipitation *(EPA will provide enclosure)*
    - Power: AC not needed (internal or external battery / battery pack) though AC capable
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - Operate on DC or AC (110v/60Hz)
        - Battery-powered operations; capacity to run for 36 hours on a single charge
        - Primary and secondary (spare / backup) battery or battery pack
        - Operational range 0.8 SLM to 5 L / min; vary and control flow rate
        - Programmable timer capability (unattended start / stop operations)
        - Calibrated rotameter
    - Sampling duration and rate: 24 hours at 0.9 L / min
    - Sample medium: DNPH-coated silica gel cartridge (preceded by ozone scrubber)
    - Analysis method: TO-11A

PM_{10} Metals

- Low volume particulate sampler with PM_{10} head
    - Place / site / mount via tripod or other
    - No shelter requirements for sampler; external batteries must be protected from precipitation (e.g., outdoor NEMA enclosure)
    - Power: DC
        - Though the sampler comes with a 24 hour rated internal battery, two deep cycle marine batteries and necessary power cable assembly will also be provided
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - 16.7 LPM controlled flow rate
        - Standard 47mm filter holder/inlet assembly
        - Programmable 7-day timer with battery back-up
        - Operate on DC or AC (110v/60Hz)
        - Electrical cable assembly for external battery
        - Two deep cycle marine batteries (700 or greater cold cranking amps)
        - Field calibration kit
    - Sampling duration and rate: 24 hours at 16.7 L / min
    - Sample medium: 47mm Teflon filter
    - Analysis method: IO-3.5

TSP Hexavalent Chromium (Cr^{+6})

- Specially configured low volume particulate sampler
    - Place / site / mount via tripod or other
    - No shelter requirements for sampler; external batteries must be protected from precipitation (e.g., outdoor NEMA enclosure)
    - Power: DC
        - Though the sampler comes with a 24 hour rated internal battery, two deep cycle marine batteries and necessary power cable assembly will also be provided
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - 15 LPM controlled flow rate
        - Standard 47mm filter holder/inlet assembly
        - Programmable 7-day timer with battery back-up
        - Operate on DC or AC (110v/60Hz)
        - Electrical cable assembly for external battery
        - Two deep cycle marine batteries (700 or greater cold cranking amps)
        - Field calibration kit
    - Sampling duration and rate: 24 hours at 15.0 L / min
    - Sample medium: 47mm acid washed sodium bicarbonate impregnated cellulose filter
    - Analysis method: EPA-modified CARB 039
    - *Sample recovery is required not later than noon local the day after sampling*

TSP Lead (Pb)

Sample collection by particulate matter sampler – low or high volume
[If AC power and siting allows, the high volume sampler is the default approach]

- High Volume TSP Particulate Sampler
    - No shelter requirements for sampler
    - Power: AC (110v/60Hz)
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - Meets Code of Federal Regulation Part 50 Appendix B specifications
        - Flow controlled 110v/60Hz brushless motor
        - 7-Day mechanical timer and elapsed time indicator
        - Field calibration kit
    - Sampling duration and rate: 24 hours at ~ 1100-1400 L / min
    - Sample medium: 8” x 10” quartz fiber filter
    - Analysis method: IO-3.5

- Low volume particulate sampler with TSP head
    - Place / site / mount via tripod or other
    - No shelter requirements for sampler; external batteries must be protected from precipitation (e.g., outdoor NEMA enclosure)
    - Power: DC
        - Though the sampler comes with a 24 hour rated internal battery, two deep cycle marine batteries and necessary power cable assembly will also be provided
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - 16.7 LPM controlled flow rate
        - Standard 47mm filter holder/inlet assembly
        - Programmable 7-day timer with battery back-up
        - Operate on DC or AC (110v/60Hz)
        - Electrical cable assembly for external battery
        - Two deep cycle marine batteries (700 or greater cold cranking amps)
        - Field calibration kit
    - Sampling duration and rate: 24 hours at 16.7 L / min
    - Sample medium: 47mm Teflon filter
    - Analysis method: IO-3.5

PAHs

- Polyurethane Foam (PUF) High Volume Sampler
    - No shelter requirements for sampler
    - Power: AC (110v/60Hz)
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - Meets EPA Compendium Method TO-13 specifications
        - 4” particulate / vapor sampling module
        - Flow indicator includes 0-100” magnehelic gage
        - 7-Day mechanical timer and elapsed time indicator
        - 110v/60Hz brushless motor
        - Sampler calibration kit
    - Sampling duration and rate: 24 hours at ~ 210 L / min
    - Sample medium: PUF / XAD-2 ® preceded by 102 mm quartz fiber filter
    - Analysis method: TO-13A

Diisocyanates

- Low Volume Portable Air Sampling Pump
    - Small, easy to place / site
    - Pump must be protected from precipitation *(EPA will provide enclosure)*
    - Power: AC not needed (internal or external battery / battery pack) though AC capable
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - Operate on DC or AC (110v/60Hz)
        - Battery-powered operations; capacity to run for 36 hours on a single charge
        - Primary and secondary (spare / backup) battery or battery pack
        - Operational range 0.8 SLM to 5 L / min; vary and control flow rate
        - Programmable timer capability (unattended start / stop operations)
        - Calibrated rotameter
    - Sampling duration: 4 sequential samples, each of 5 hours duration over a 24 hour period (beginning at 00:00, 06:00, 12:00, and 18:00 LST)
    - Sampling rate: 0.9 L / min
    - Sample medium: glass fiber filter coated with 1-(2-pyridyl)piperazine
    - Analysis method: OSHA No. 42

4,4'-Methylenedianiline

- Low Volume Portable Air Sampling Pump
    - Small, easy to place / site
    - Pump must be protected from precipitation *(EPA will provide enclosure)*
    - Power: AC not needed (internal or external battery / battery pack) though AC capable
    - Equipment Specifications *(EPA will provide sampling equipment)*
        - Operate on DC or AC (110v/60Hz)
        - Battery-powered operations; capacity to run for 36 hours on a single charge
        - Primary and secondary (spare / backup) battery or battery pack
        - Operational range 0.8 SLM to 5 L / min; vary and control flow rate
        - Programmable timer capability (unattended start / stop operations)
        - Calibrated rotameter
    - Sampling duration: 2 sequential samples, each of 10 hours duration over a 24 hour period (beginning at 06:00 and 18:00 LST)
    - Sampling rate: 0.9 L / min
    - Sample medium: sulfuric acid treated glass fiber filters
    - Analysis method: NIOSH No. 5029
    - *Sample recovery is required within four hours following sample completion*
        - *Each of the two filter pairs employed on a given sampling date must be transferred to a common glass vial containing 4 ml of methanolic KOH solution*
        - *The contract laboratory will provide the sampling media and glass vials with methanolic KOH solution*