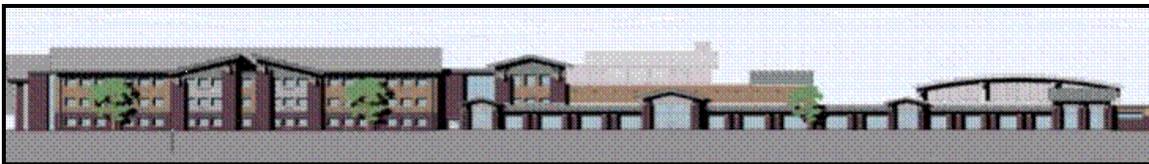


Sampling Results for the Keith Middle School Foundation Vent Stack and Indoor Air for Polychlorinated Biphenyls

January 2013 Monitoring Round



Prepared for:

Department of Environmental Stewardship
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TRC Project No. 115058

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EXECUTIVE SUMMARY

TRC Environmental Corporation (TRC) of Lowell, Massachusetts was retained by the City of New Bedford (the City) to provide sampling support in conducting foundation vent stack and indoor air sampling for polychlorinated biphenyls (PCBs) at the Keith Middle School (KMS) in New Bedford, Massachusetts. This report documents the indoor air and vent stack sampling performed by TRC during January 2013.

The sampling and analysis of vent stack and indoor air for the KMS is described in the *Revised Long-Term Monitoring and Maintenance Implementation Plan (LTMMIP)*, revision 5.5, dated August 2012. The indoor air PCB sampling program involved the collection of one indoor air sample from the ground floor of each of the three school building sections (Building A, Building B, and Building C). Concurrently with the indoor air sampling, air sampling of the sub-slab foundation ventilation system for PCBs was performed from four selected rooftop vent stacks, including VS-1 which vents building Section A west side (near the front of the school), VS-4 which vents building Section A east side (near the front of the school), VS-8 which vents Section B (near the auditorium), and VS-10 which vents Section B (near the auditorium). The passive sub-slab ventilation system was installed to allow sub-slab soil vapors to migrate from beneath the vapor barrier to the vent stacks, installed through the school building roof. An air sample was also collected immediately outside of the school during this round to provide comparative background results.

The samples were analyzed for PCBs according to EPA Method 680 (PCB homologues) by Pace Analytical Services of Schenectady, New York. This PCB method reliably quantifies total PCB concentrations, making analytical results directly comparable to total PCB concentration data for indoor air at New Bedford High School.

During the January 2013 sampling round, PCBs were detected at the three indoor air sampling locations. However, PCBs were not detected in any of the vent stack air samples or the corresponding outdoor air background sample.

Detected concentrations for PCBs in indoor air samples were generally consistent with urban ambient air background levels. PCB concentrations in indoor air have fluctuated slightly between August 2006 and January 2013, consistent with background conditions, but all detected concentrations are below indoor air concentrations that would be of concern for the health of building occupants.

PCB indoor air concentrations were compared to site-specific outdoor air concentrations and risk-based air concentrations (RBACs). Two PCB RBACs have been developed for the KMS, assuming occupational exposures within the school (8 hours/day, 250 days/year, for 25 years). The first RBAC is the Action Level (AL; 0.05 ug/m^3), which is used as an initial indicator that PCB air concentrations above background levels have been detected. The second RBAC is the Acceptable Long-Term Average Exposure Concentration (ALTAEC; 0.3 ug/m^3), indicative of the maximum acceptable air concentration that should not be exceeded for an extended time period. PCB indoor air concentrations were also compared to EPA's Public Health Level (PHL) (USEPA, 2009; 0.45 ug/m^3) developed to be protective of indoor school air exposures for adult

employees and 12 to <15 year-old students. Indoor air PCB concentrations were lower than RBACs and EPA's PHL.

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1.0 INTRODUCTION

1.1 Overview

TRC Environmental Corporation (TRC) of Lowell, Massachusetts was retained by the City of New Bedford (the City) to provide sampling support in conducting foundation vent stack and indoor air sampling for polychlorinated biphenyls (PCBs) at the Keith Middle School (KMS) in New Bedford, Massachusetts. This report documents the indoor air and vent stack sampling performed by TRC during January 2013.

Soil gas sampling was performed under the location of the KMS building in December 2001. In addition to PCBs present in soil at this location, volatile organic compounds (VOCs) were also detected in the soil gas samples. The results of the December 2001 soil gas sampling event were evaluated for potential adverse impacts on indoor air quality, assuming no vapor barrier was installed. Despite the conclusion that no significant risk to human health is posed by the measured soil gas concentrations, the City and School Department decided to install a vapor barrier on top of the soil beneath the school building concrete floor as an added layer of protection against intrusion of any gases that may accumulate under the building. Passive ventilation has been installed to allow any sub-slab soil gases to migrate from beneath the vapor barrier to the vent stacks, installed through the school building roof.

Sampling and analysis of vent stack and indoor air was performed between July 2007 and April 2012 as part of United States Environmental Protection Agency (EPA) approved *Long-Term Monitoring and Maintenance Implementation Plan (LTMMIP)*, revision 4, dated October 20, 2006. The LTMMIP was prepared by The BETA Group, Incorporated (BETA) in accordance with the August 31, 2005 *Approval for Risk-Based PCB Cleanup and Disposal under 40 CFR §761.6(c)* letter issued by EPA to the City. The LTMMIP set forth a vent stack and indoor air sampling schedule consisting of three monitoring events per year for the first year (July/August, December, April 2007), with the understanding that the City may submit a written request to EPA to reduce the indoor air sampling frequency after the first year of monitoring. However, per the order of the Mayor of the City, vent stack and indoor air monitoring took place monthly during the period of September 2006 to July/August 2007. Following the July/August 2007 sampling event, monitoring was reduced to once every four months, consistent with the 2006 LTMMIP. Monitoring from September 2006 through February 2007 was conducted by BETA and is reported elsewhere.

The sampling program described in the 2006 LTMMIP consisted of the collection of indoor air quality and vent stack samples for the analysis of PCBs and VOCs. Sampling of indoor air quality and vent stack air for PCBs and VOCs has been conducted for 29 monitoring events between July 2007 and April 2012 to confirm the proper functioning of the passive ventilation system. Between 2007 and 2012, PCBs and VOCs were detected in both indoor air and vent stack air samples. However, concentrations of PCBs and VOCs in indoor air samples were consistently lower than those observed in vent stack air samples. The presence of higher levels of VOCs and PCBs in vent stack air samples is an expected finding for a sub-slab ventilation system and indicates that the passive ventilation system is performing as designed.

Based on the sampling data collected between 2007 and 2012, VOCs were determined to be present in indoor air due to off-gassing from building materials and the storage and use of cleaners, adhesives, paints, and other VOC-containing products indoors at the school. Concentrations of PCBs detected in indoor air samples are consistent with background levels measured in outdoor air samples collected simultaneously. Levels of VOCs detected in indoor air fluctuated and demonstrated noticeable decreasing trends over time.

Although PCBs and VOCs were measured in indoor air and vent stack air samples, the concentrations detected were determined to not pose a significant risk to human health, based on the comparison of concentrations to both background concentrations and applicable risk-based criteria (TRC, 2008a, 2008b, 2008c, 2008d, 2009a, 2009b, 2009c, 2010a, 2010b, 2011a, 2011b, 2011c, 2011d, 2012a and 2012b).

In 2011, the City proposed modifying the 2006 LTMMIP to reflect the detailed understanding of the site conceptual model (e.g., impacts from indoor use of commercially available cleaners, paints, adhesives, etc.), the relationship between vent measurements and historical soil gas measurements that illustrate the proper functioning of the passive sub-slab ventilation system, and long-term downward trends for indoor air and passive vent system concentrations of VOCs originating from building materials.

On August 27, 2012, USEPA approved the City's proposed revision to the LTMMIP, revision 5.5. This report presents monitoring data collected during January 2012, the second round of air sampling data collected under the 2012 LTMMIP. The results for the first round of air sampling data collected under the 2012 LTMMIP are presented in TRC, 2012d. The 2012 LTMMIP differs from the 2006 LTMMIP in a number of ways that are reflected in this report:

1. Analysis of indoor air and vent stack air samples for VOCs has been eliminated because VOCs are not the principal contaminants in soil and fill, and air monitoring conducted to date indicates that the remedy implemented for the KMS site is functioning as intended.
2. Indoor air and vent stack air sampling frequency has been reduced from three times per year to two times per year because air monitoring conducted to date demonstrates that the remedy implemented for the KMS site is preventing airborne release of PCBs that remain in the soil to the building.
3. The number of background air samples has been reduced from two samples to one sample because the single sample is sufficient to determine outdoor air concentrations of PCBs.
4. PCB analysis of indoor air and vent stack air samples includes quantification of homologue groups, but not Aroclors or individual congeners, because the homologue groups provide a sufficient and accurate measure of total PCB concentrations in air.
5. The comparison of vent stack air samples to health-based air concentrations has been eliminated because vent samples are not representative of the air that people breathe.

Therefore, vent stack air concentrations are not comparable to the health-based air concentrations.

1.2 Scope of Work

Sampling and analysis of vent stack and indoor air is performed as part of United States Environmental Protection Agency (EPA) approved *Long-Term Monitoring and Maintenance Implementation Plan* (LTMMIP), revision 5.5, dated August 2012 and approved by EPA on August 27, 2012.

The January 2013 sampling occurred during a weekend. Details concerning the sample collection procedures and analytical methods are described in Appendix A. Sampling data sheets are provided in Appendix B and the reduced data are presented in Appendix C. The calibration certifications can be found in Appendix D. Laboratory analytical results are presented in Appendix E.

Field sampling data were validated by the Field Team Leader and/or the Field Quality Control Coordinator based on their review of adherence to each approved sampling protocol and written sample collection procedure. Details concerning quality assurance procedures are described in Appendix A. The laboratory data validation memoranda can be found in Appendix F.

The following sections describe those features of the field sampling program, quality assurance/quality control (QA/QC) program, and data analysis that are specific to the January 2013 event. Generic information on the sampling and QA/QC programs and data analysis procedures can be found in Appendices A and G, respectively.

2.0 SAMPLING LOCATIONS

2.1 Indoor Air Quality Sample Locations

During the sampling event, one indoor air PCB sample was collected from the ground floor of each of the three school building sections (Building A, Building B, and Building C). Each sampling location was selected to be representative of portions of the school building normally occupied by students and teachers. The Building A sampling location is located within a hallway in an area of student classrooms. A duplicate sample was collected from the Building A sampling location. The Building B sampling location is located in the school cafeteria. The Building C sampling location is in the hallway between the auditorium and community room. These indoor air sampling locations have remained consistent throughout TRC's sampling program, with the exception of the December 2007 Building B sample which was collected in the school cafeteria at the request of the City. An outdoor air sample was collected from near the flagpole area immediately outside of the school to provide comparative background results.

Figure 2-1 presents the approximate locations of indoor air sampling. Table 2-1 summarizes the indoor air samples collected during the January 2013 sampling event. These samples were assigned sample identification numbers that include (1) the letter A, B, or C to identify the building section from which the sample was collected; and (2) a unique sample identification suffix indicating the sampling event number (e.g., A-31).

2.2 Foundation Vent Air Monitoring Sample Locations

The KMS foundation venting system is comprised of six sub-slab vapor collection zones, each vented by two or four vent stacks penetrating the roof. A total of four vent stacks are sampled during each round, including VS-1 and VS-4 which vent from the two collection zones located under building Section A (classrooms), and two other vent stacks which are rotated to cover the remaining collection zones. PCB concentrations in vent stack air were compared to the outdoor air sample described in Section 2.1 that define background conditions.

Figure 2-2 presents the approximate locations of the vent stack sample locations. Table 2-1 summarizes the vent stack samples collected during the January 2013 sampling event. Vent stack samples collected during the January 2013 sampling event were designated with the vent stack number (e.g., VS-4) and a unique sample identification suffix indicating the sampling event number (e.g., VS-4-31).

3.0 QUALITY ASSURANCE

This section highlights the results of the QA/QC review for the January 2013 sampling event. Please refer to Appendix A for additional QA/QC details.

3.1 Data Validation Summary

Limited (Tier II) validation was performed on the data for 10 air samples and two trip blank samples collected at the Keith Middle School in New Bedford, Massachusetts. The samples were collected on January 28, 2013 and submitted to Pace Analytical Services (Pace) in Schenectady, New York for analysis. All air vent samples were collected on polyurethane foam (PUF) cartridges in accordance with EPA method TO-10A; all indoor and background outdoor air samples were collected on particulate filters and PUF cartridges in accordance with EPA method TO-4A. The samples were analyzed for polychlorinated biphenyl (PCB) homologues using EPA method 680. Pace reported the results under job number 12090001.

The sample results were assessed using the *EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*, revised December 1996. Modification of these guidelines was performed to accommodate the non-CLP methodology.

In general, the data appear to be valid as reported and may be used for decision-making purposes. Appendix F contains the complete Laboratory Data Validation Memoranda.

3.2 Collocated Sampler Precision

Samples A-31/A-31 DUP and VS-8-31/VS-8-31 DUP were submitted as the field duplicate (collocated) pairs with this sample set. PCBs were not detected in samples VS-8-31 and VS-8-31 DUP. Tables 3-1 and 3-2 summarize the RPDs of the detected analytes in sample pair A-31/A-31 DUP and VS-8-31/VS-8-31 DUP, respectively. As shown in Table 3-1, RPDs of dichlorobiphenyl, trichlorobiphenyl and tetrachlorobiphenyl in sample pair A-31/A-31 DUP were not within the acceptance criteria of 20%RPD or the difference of <2 times the reporting limit (RL). Therefore, potential uncertainty exists for the results for dichlorobiphenyl, trichlorobiphenyl, tetrachlorobiphenyl, and total PCBs in samples A-31 and A-31 DUP due to high relative percent differences in the evaluation of the field duplicate pair. This issue has a minor impact on the data usability; all results are still usable for project objectives.

4.0 SUMMARY OF RESULTS

Table 2-1 provides a summary of the types, numbers, and locations of the samples collected. Appendices E and F contain the laboratory data reports and data validation memoranda, respectively. Along with the samples, TO-4A and TO-10A trip blanks were analyzed as a quality assurance measure to check for shipping and laboratory-related sources of contamination.

All results represent “total PCB” concentrations. PCBs were not detected in the indoor air quality or vent stack air trip blanks. Low level fluctuations of PCB concentrations in indoor air are generally consistent with urban indoor background levels. Sporadic detected concentrations of PCBs in vent stack air are expected, and indicate that the passive ventilation system is performing as designed.

4.1 Indoor Air Quality Results

On January 28, 2013, TRC collected three indoor (plus one duplicate) and one outdoor background 24-hour TO-4A air samples at the KMS. Table 4-1 provides a summary of PCB indoor air results. Table 4-3 provides a complete list of total PCB indoor air results from August 2006 thru January 2013.

PCBs were detected in the three indoor air samples and in the duplicate sample. PCBs were not detected in the background outdoor air sample. PCB concentrations in the indoor air samples ranged from 0.00657 ug/m³ to 0.0033 ug/m³ in the Building A sample and its duplicate to 0.0039 ug/m³ in Building B. The PCB concentration in the Building A sample is consistent with the maximum concentrations reported in the April 2009, August 2010, April 2011 and August 2012 sampling rounds.

4.2 Vent Stack Air Results

On January 28, 2013, TRC collected four (plus one duplicate) vent stack 4-hour TO-10A samples at the KMS. Table 4-2 provides a summary of results for the vent stack samples, and the results of the outdoor background 24-hour TO-4A air sample.

PCBs were not detected in the vent stack samples. As previously stated in Section 4.1, PCBs were not detected in the background outdoor air sample.

5.0 COMPARISON OF INDOOR AIR PCB RESULTS TO RISK-BASED AIR CONCENTRATIONS

This section of the report compares PCB concentrations in indoor air to outdoor air and risk-based air concentrations (RBACs). These concentrations are presented in Table 5-1. PCB concentrations that exceed the RBACs are highlighted on this table.

A detailed discussion of the RBACs can be found in Appendix G. Two PCB RBACs have been developed for the KMS. The first RBAC is the Action Level (AL; 0.05 ug/m^3) used as an initial indicator that PCB air concentrations above background levels have been detected. The second RBAC is the Acceptable Long-Term Average Exposure Concentration (ALTAEC; 0.3 ug/m^3), indicative of the maximum acceptable air concentration that should not be exceeded for an extended time period. The ALTAEC could be exceeded over the short-term and still result in acceptable risk levels. In September 2009, EPA published Public Health Levels (PHLs) which are indoor air concentrations that EPA believes protect building occupants (USEPA, 2009). PHLs were calculated for all ages of children from toddlers in day care to adolescents in high school as well as for adult school employees. In this report, indoor air PCB concentrations are compared to the PHL for adult school employees and children 12 to <15 years old, representative of the middle school age range.

Indoor air sampling results, outdoor air background results, and RBACs are presented in Table 5-1. As noted in Section 4.1, PCBs were detected at all three of the indoor air sampling locations (Buildings A, B, and C), but not in the outdoor air background sample. The highest indoor air PCB concentration (Building A sample) was approximately 8-fold lower than the PCB AL and roughly 45-fold lower than the ALTAEC; the Building B and Building C samples displayed concentrations of PCBs up to 13-fold lower than the AL and 75-fold lower than the ALTAEC. Because the PCB AL is used as an initial indicator that PCB air concentrations above background levels for indoor air have been detected and the detected concentrations of PCBs are significantly less than the AL, concentrations of PCBs in indoor air are consistent with levels associated with ambient conditions. The indoor air samples were also between 70- and 110-fold lower than the EPA PHL. Because there are no indoor air PCB concentrations in excess of the RBACs, no specific follow-up actions are recommended at this time.

Temporal trends for PCB indoor air concentrations at the sampling locations in Building A (classrooms), Building B (auditorium), and Building C (faculty dining area) are shown in Figure 5-1. Figure 5-1 also shows concentration trends at the outdoor air background sampling location. Data included on this figure are for the time period August 2006 to January 2013. The highest indoor air PCB concentration was detected during the April 2009 sampling event when the school was likely experiencing lower than normal air exchange (school vacation) and the potential for volatilization of PCBs from outdoor ambient sources is greater due to the warmer weather. The lowest indoor air PCB concentration was detected during the November 2006 sampling event.

No clear trends are noted for PCB concentrations in indoor air. Measured concentrations fluctuate over time, with slightly higher concentrations noted during the summer school vacation period when the building is experiencing lower than normal air exchange and the potential for

volatilization of PCBs from outdoor ambient sources is greatest due to warmer weather. The low level PCB indoor air concentrations are generally consistent with urban ambient background conditions. Based on the PCB indoor air results collected between August 2006 and January 2013, it appears that there is variability in indoor air concentrations and the slightly higher concentrations sporadically detected are not part of a trend.

6.0 CONCLUSIONS

Indoor air quality and vent stack air sampling was conducted at the KMS during January 2013 for PCBs. Indoor and vent stack air data were evaluated for quality and reliability, and indoor air concentrations were compared to risk-based air concentrations and analyzed for concentration trends over the period August 2006 to January 2013. The following summarizes the conclusions of the air sampling data evaluation.

In general, all TO-4A and TO-10A data collected during January 2013 were determined to be valid as reported and usable for decision-making purposes.

PCBs were detected in the three indoor air samples plus a duplicate, but not in the outdoor air background sample. The detected PCB concentrations for the indoor air samples were below risk-based action levels. The low level fluctuations of PCB indoor air concentrations are generally consistent with concentrations found in urban ambient air background.

PCBs were not detected in the four vent stack air samples. The sporadic presence of PCBs in vent stack air is expected, and indicates that the passive ventilation system is performing as designed.

July or August 2013 is the date for the next sampling event.

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TABLES

**Table 2-1. January 2013 Sample Summary
Keith Middle School
New Bedford, Massachusetts**

Sample ID	Sample Location	Sample Collected	Sample Type
A	Building A, center of west hallway	XX	IAQ
B	Building B, Cafeteria	X	IAQ
C	Building C, Hallway between auditorium and community room	X	IAQ
BG	Background, flagpole area outside main entrance to Building A	X	IAQ
VS-1	Building A, vent stack 1	X	Vent Stack
VS-4	Building A, vent stack 4	X	Vent Stack
VS-5	Building B, vent stack 5		Vent Stack
VS-7	Building B, vent stack 7		Vent Stack
VS-8	Building B, vent stack 8	XX	Vent Stack
VS-9	Building B, vent stack 9		Vent Stack
VS-10	Building B, vent stack 10	X	Vent Stack
VS-11	Gymnasium , vent stack 11		Vent Stack
VS-12	Gymnasium, vent stack 12		Vent Stack
VS-13	Gymnasium, vent stack 13		Vent Stack
VS-14	Gymnasium, vent stack 14		Vent Stack
VS-16	Building A , vent stack 16		Vent Stack
VS-BG	On the ground at main entrance to Building A		Vent Stack

X - Sample collected at this location during this sampling round.

XX - Sample and duplicate collected at this location during this sampling round.

**Table 3-1. Comparison of PCB Indoor Air Sample Results - Collocated Sampler Precision
Keith Middle School
New Bedford, Massachusetts**

Analysis	Analyte	Jan-13		
		A-31	A-31 Dup	RPD (%)
PCBs (µg/m ³)	monochlorobiphenyl	< 0.0000310	< 0.0000280	NC
	dichlorobiphenyl	< 0.0000310 UJ	0.000149 J	NC, Not within 2xRL
	trichlorobiphenyl	0.00333 J	0.0054 J	47.40
	tetrachlorobiphenyl	< 0.0000610 UJ	0.00102 J	NC, Not within 2xRL
	pentachlorobiphenyl	< 0.0000610	< 0.0000570	NC
	hexachlorobiphenyl	< 0.0000610	< 0.0000570	NC
	heptachlorobiphenyl	< 0.0000920	< 0.0000850	NC
	octachlorobiphenyl	< 0.0000920	< 0.0000850	NC
	nonachlorobiphenyl	< 0.0001530	< 0.0001420	NC
	decachlorobiphenyl	< 0.0001530	< 0.0001420	NC
(µg/m ³)	Total PCBs	0.00333 J	0.00657 J	65.40

Notes:

RPD - Relative Percent Difference = $\text{ABS}(\text{Dup-Sample}) / ((\text{Dup} + \text{Sample}) / 2) * 100$

NC - Not Calculated; RPD could not be calculated due to a non-detect in one or both of the collocated samples

Detected values are shown in bold

**Table 3-2. Comparison of PCB Vent Stack Air Sample Results - Collocated Sampler Precision
Keith Middle School
New Bedford, Massachusetts**

Analysis	Analyte	Jan-13		
		VS-8-31	VS-8-31 DUP	RPD (%)
PCBs (µg/m ³)	monochlorobiphenyl	< 0.00625	< 0.00435	NC
	dichlorobiphenyl	< 0.00625	< 0.00435	NC
	trichlorobiphenyl	< 0.00625	< 0.00435	NC
	tetrachlorobiphenyl	< 0.01250	< 0.00870	NC
	pentachlorobiphenyl	< 0.01250	< 0.00870	NC
	hexachlorobiphenyl	< 0.01250	< 0.00870	NC
	heptachlorobiphenyl	< 0.0188	< 0.0130	NC
	octachlorobiphenyl	< 0.0188	< 0.0130	NC
	nonachlorobiphenyl	< 0.0313	< 0.0217	NC
	decachlorobiphenyl	< 0.0313	< 0.0217	NC
(µg/m ³)	Total PCBs	< 0.00625	< 0.00435	NC

Notes:

RPD - Relative Percent Difference = $ABS(Dup-Sample)/((Dup+Sample)/2)*100$

NC - Not Calculated; RPD could not be calculated due to a non-detect in one or both of the collocated samples

Detected values are shown in bold

Table 4-1. Indoor Air Quality Sample Results - January 2013
Keith Middle School
New Bedford, Massachusetts

Analysis	Analyte	Sample Locations				Background	QA/QC
		A-31	A-31-DUP	B-31	C-31	BG-31	Trip Blank
PCBs ($\mu\text{g}/\text{m}^3$)	monochlorobiphenyl	< 0.0000310	< 0.0000280	< 0.0000290	< 0.0000290	< 0.0000160	< 0.005 ug
	dichlorobiphenyl	< 0.0000310 UJ	0.000149 J	0.0000189	< 0.0000290	< 0.0000160	< 0.005 ug
	trichlorobiphenyl	0.00333 J	0.0054 J	0.00334	0.00414	< 0.0000160	< 0.005 ug
	tetrachlorobiphenyl	< 0.0000610 UJ	0.00102 J	< 0.0000580	< 0.0000580	< 0.0000310	< 0.01 ug
	pentachlorobiphenyl	< 0.0000610	< 0.0000570	0.000374	< 0.0000580	< 0.0000310	< 0.01 ug
	hexachlorobiphenyl	< 0.0000610	< 0.0000570	< 0.0000580	< 0.0000580	< 0.0000310	< 0.01 ug
	heptachlorobiphenyl	< 0.0000920	< 0.0000850	< 0.0000870	< 0.0000870	< 0.0000470	< 0.015 ug
	octachlorobiphenyl	< 0.0000920	< 0.0000850	< 0.0000870	< 0.0000870	< 0.0000470	< 0.015 ug
	nonachlorobiphenyl	< 0.0001530	< 0.0001420	< 0.000145	< 0.000145	< 0.0000780	< 0.025 ug
	decachlorobiphenyl	< 0.0001530	< 0.0001420	< 0.000145	< 0.000145	< 0.0000780	< 0.025 ug
($\mu\text{g}/\text{m}^3$)	Total PCBs	0.00333 J	0.00657 J	0.0039	0.0041	< 0.0000160	< 0.025 ug

Notes:

$\mu\text{g}/\text{m}^3$ - micrograms per cubic meter

PCBs - polychlorinated biphenyls

μg - micrograms; trip blank results are presented in micrograms (μg) due to no air volume being collected during analysis.

Reporting Limit for Total PCBs is the highest individual homolog PQL (practical quantitation limit) per sample.

Values in **Bold** indicate the compound was detected.

< - less than laboratory reporting limit

J - Detected result reported is estimated

UJ - Non-Detect result reported is estimated

Table 4-2. Vent Stack Sample Results - January 2013
Keith Middle School
New Bedford, Massachusetts

Analysis	Analyte	Sample Locations					Background	QA/QC
		VS-1-31	VS-4-31	VS-10-31	VS-8-31	VS-8-31-DUP	BG-31	Trip Blank-VS
(µg/m ³)	monochlorobiphenyl	< 0.00556	< 0.00550	< 0.00420	< 0.00625	< 0.00435	< 0.0000160	< 0.005 ug
	dichlorobiphenyl	< 0.00556	< 0.00550	< 0.00420	< 0.00625	< 0.00435	< 0.0000160	< 0.005 ug
	trichlorobiphenyl	< 0.00556	< 0.00550	< 0.00420	< 0.00625	< 0.00435	< 0.0000160	< 0.005 ug
	tetrachlorobiphenyl	< 0.01110	< 0.01100	< 0.00840	< 0.01250	< 0.00870	< 0.0000310	< 0.01 ug
	pentachlorobiphenyl	< 0.01110	< 0.01100	< 0.00840	< 0.01250	< 0.00870	< 0.0000310	< 0.01 ug
	hexachlorobiphenyl	< 0.01110	< 0.01100	< 0.00840	< 0.01250	< 0.00870	< 0.0000310	< 0.01 ug
	heptachlorobiphenyl	< 0.0167	< 0.0165	< 0.0126	< 0.0188	< 0.0130	< 0.0000470	< 0.015 ug
	octachlorobiphenyl	< 0.0167	< 0.0165	< 0.0126	< 0.0188	< 0.0130	< 0.0000470	< 0.015 ug
	nonachlorobiphenyl	< 0.0278	< 0.0275	< 0.0210	< 0.0313	< 0.0217	< 0.0000780	< 0.025 ug
	decachlorobiphenyl	< 0.0278	< 0.0275	< 0.0210	< 0.0313	< 0.0217	< 0.0000780	< 0.025 ug
(µg/m ³)	Total PCBs	< 0.00556	< 0.00550	< 0.00420	< 0.00625	< 0.00435	< 0.0000160	< 0.025 ug

Notes:

µg/m³ - micrograms per cubic meter

PCBs - polychlorinated biphenyls

µg - micrograms; trip blank results are presented in micrograms (µg) due to no air volume being collected during analysis.

Reporting Limit for Total PCBs is the highest individual homolog PQL (practical quantitation limit) per sample.

Values in **Bold** indicate the compound was detected.

< - less than laboratory reporting limit

J - Detected result reported is estimated

UJ - Non-Detect result reported is estimated

**Table 4-3. Total PCB Results in KMS Indoor Air Quality (IAQ) Samples
August 2006 through January 2013 (24hr Sample, Method TO-4A [ug/m³])**

Sampling Date	Hallway Building A	Auditorium Building B	Faculty Dining Building C	Background Outside	Background Outside (DUP)
AL	0.05	0.05	0.05	0.05	0.05
ALTAEC	0.3	0.3	0.3	0.3	0.3
8/5/2006	0.0000069	0.00000683	0.00000725	0.0006	NS
8/19/2006	0.00000665	0.00023	0.00000665	0.00031	NS
9/15/2006	0.00273	0.0011	0.00052	0.00989	0.00995
10/24/2006	0.00087	0.00027	0.00008	0.00007	NS
11/30/2006	0.00105	0.00079	0.00003	0.00014	0.00014
12/29/2006	0.00005	0.0000066	0.00005	0.00008	0.00004
1/20/2007	NS	NS	NS	NS	NS
3/31/2007	0.0015	0.00064	0.00037	0.000185	0.00019
4/18/2007	0.0013	0.00031	0.0016	0.000095	0.000095
5/19/2007	0.00038	0.001	0.00051	0.000105	0.0001
6/21/2007	0.003	0.0032	0.0016	0.0001	0.0001
8/1/2007	0.0018	0.00019	0.0057	0.000075	0.000075
12/27/2007	0.003	0.00094	0.0011	0.000185	0.00035
4/25/2008	0.00007	0.000036	0.0000355	0.0000355	0.0000355
7/16/2008	0.0018	0.0075	0.0017	0.00007	0.000037
12/29/2008	NS	NS	NS	NS	NS
2/19/2009	0.00019	0.00019	0.000075	0.00004	0.000039
4/23/2009	0.013	0.0034	0.0095	0.00004	0.00004
8/20/2009	0.00875	0.00577	0.00366	0.000759	0.00072
12/29/2009	0.00288	0.00165	0.00616	0.00003885	NS
4/20/2010	0.006163	0.000384	0.000882	0.0000614	0.000226
8/24/2010	0.0064	0.0049	0.0114	0.0029	0.0029
12/29/2010	0.0012	0.0027	0.0135	0.00005	NS
4/21/2011	0.0036	0.0040	0.0115	0.000038	0.0002
8/24/2011	0.0062	0.0090	0.0085	0.0000425	0.0005
12/29/2011	0.0036	0.0057	0.0054	0.000034	0.000033
4/18/2012	0.00499	0.0130	0.00578	0.000832	0.000033
8/30/2012	0.00452	0.0061	0.01090	0.00158	0.0000395
1/28/2013	0.00333	0.0039	0.00414	0.000078	NS

AL = Action Level = 0.05 ug/m³

ALTAEC = Acceptable Long-Term Average Exposure = 0.3 ug/m³

NS = Not Sampled

BOLD = Positive Detection

Table 5-1. Comparison of PCB Indoor Air Quality Sample Results to Risk-Based Air Concentrations - January 2013
Keith Middle School
New Bedford, Massachusetts

Analysis	Analyte	Sample Locations				Background Location	QA/QC Trip Blank	Comparison Values		
		A-31	A-31 Dup	B-31	C-31	BG-31		AL*	ALTAEC*	PHL**
PCBs ($\mu\text{g}/\text{m}^3$)	Total PCBs	0.00333	0.00657	0.0039	0.0041	<0.000016	< 0.025 ug	0.05	0.3	0.45

Notes:

$\mu\text{g}/\text{m}^3$ - micrograms per cubic meter

PCBs - polychlorinated biphenyls

ug - micrograms; trip blank results are presented in micrograms (ug) since no air volume is collected for the trip blank

PCB results for indoor air are compared to contemporary outdoor air (background) sample and MassDEP indoor air background values.

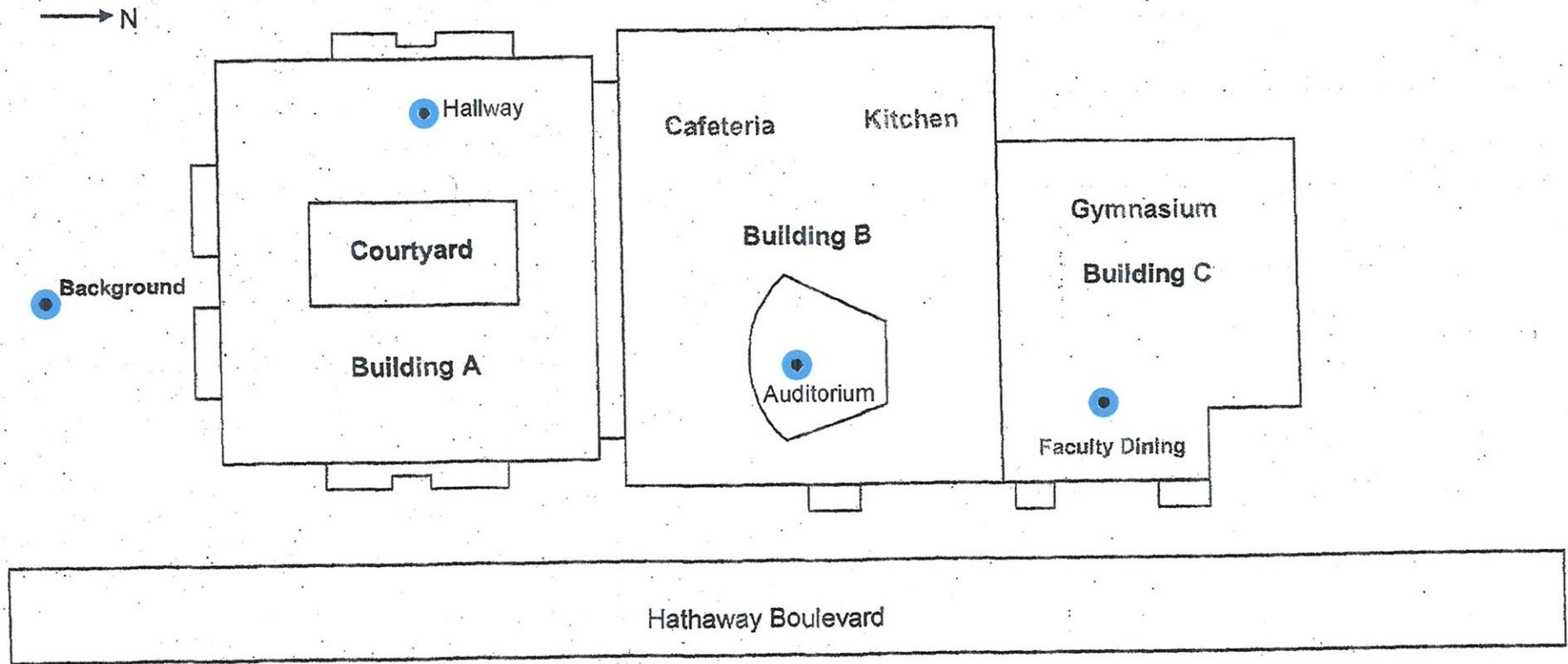
* PCBs are compared to the EPA site specific Action Level (AL) and the Acceptable Long-Term Average Exposure Concentration (ALTAEC).

** PCBs are compared to the lowest of the EPA Public Health Level for PCBs in School Indoor Air (September 2009) for adult employees and children 12-<15 year olds (<http://www.epa.gov/pcbincaulk/>)

Reporting Limit for Total PCBs is the highest individual homolog PQL (practical quantitation limit) per sample.

FIGURES

Keith Middle School Indoor Air Sampling Locations



● = Indoor Air Sampling Point

● = Sample Locations

**KEITH MIDDLE SCHOOL
NEW BEDFORD, MASSACHUSETTS**

INDOOR AIR SAMPLING LOCATIONS



Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

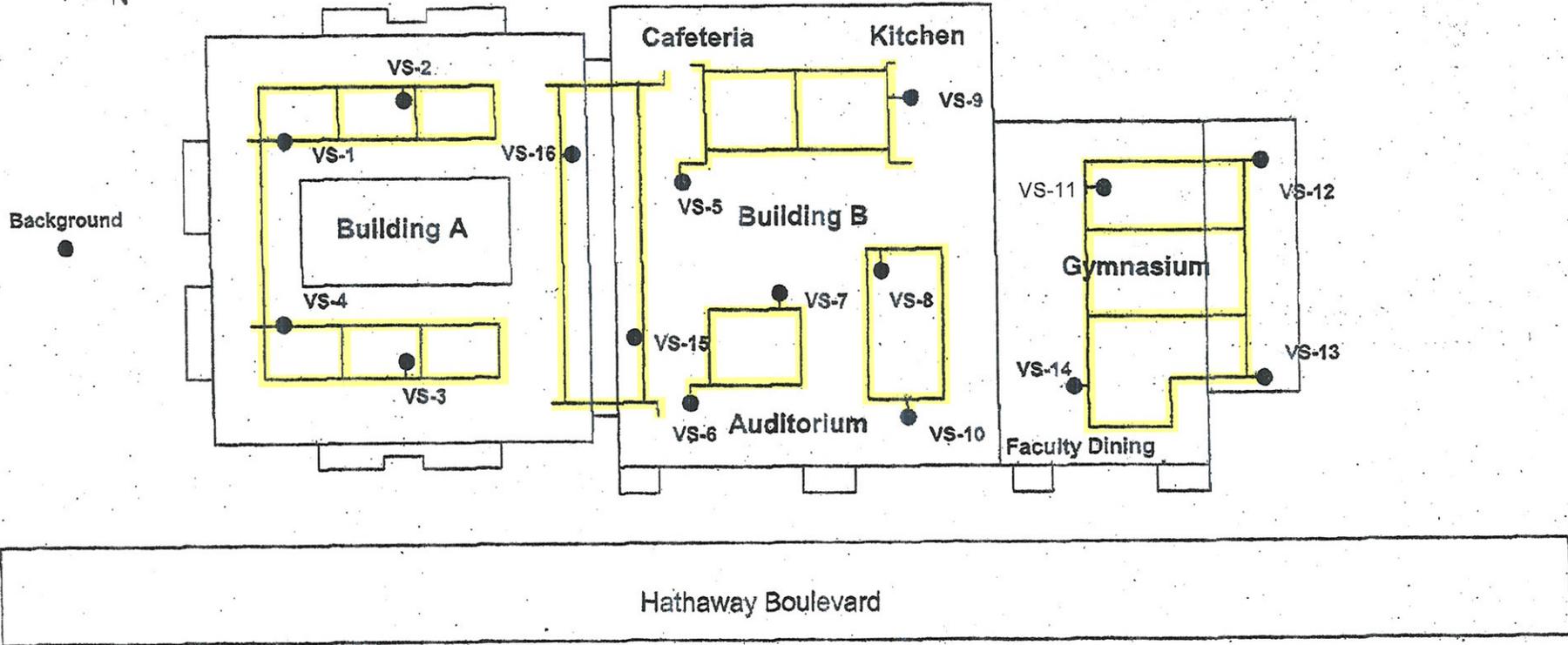
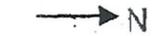
FIGURE

2-1

DRAWN BY: ---
CHECKED BY: DMS

DATE:
MAY 2008

Keith Middle School Foundation Venting System



- = Vent Riser / Vent Stack Sampling location
- = Passive Venting and Collection System

KEITH MIDDLE SCHOOL
NEW BEDFORD, MASSACHUSETTS

VENT STACK SAMPLE LOCATIONS



Wannancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

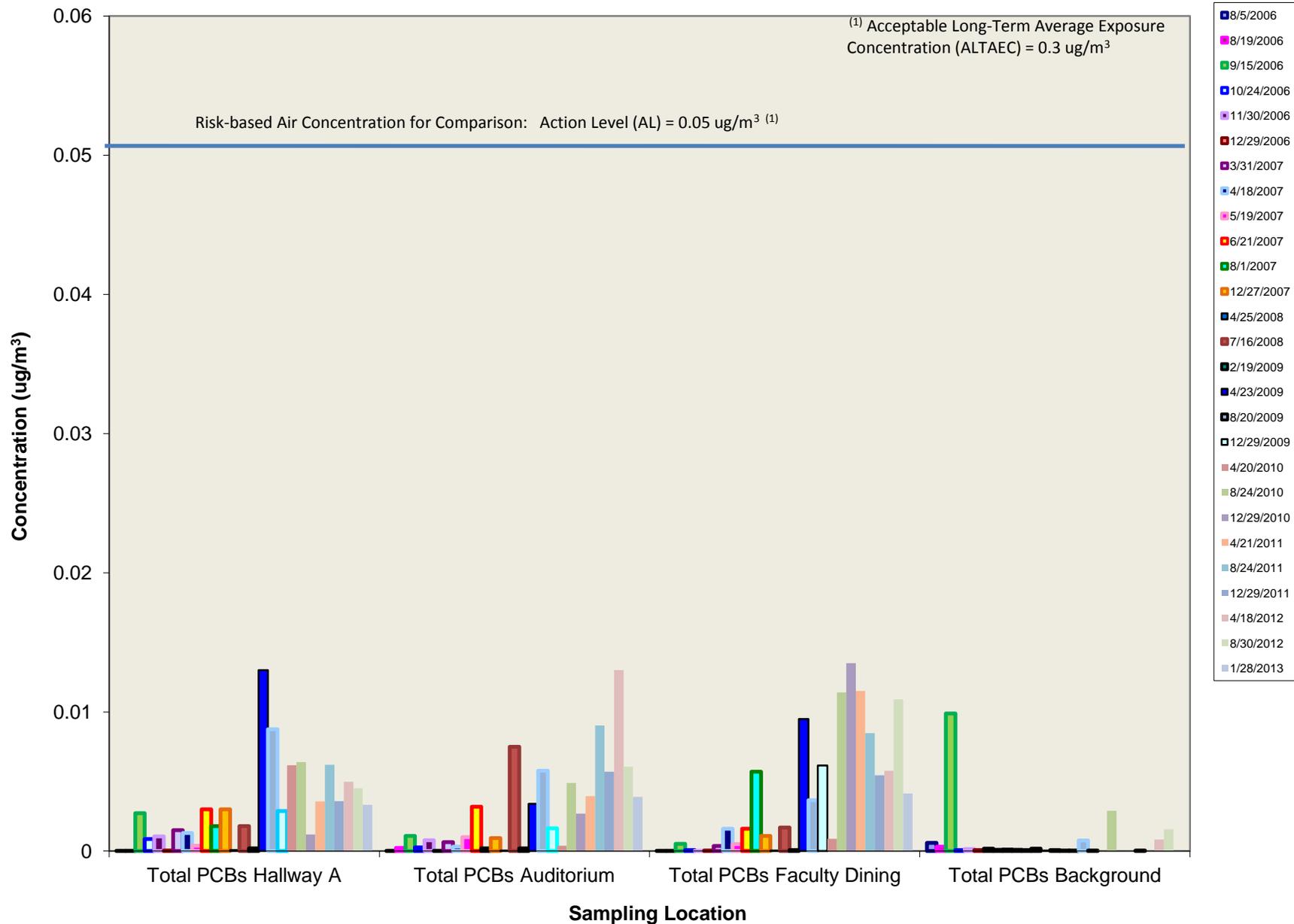
FIGURE

2-2

DRAWN BY: ---
CHECKED BY: DMS

DATE:
MAY 2008

Figure 5-1. Total PCB Trends in KMS Indoor Air Quality (IAQ) Samples - August 2006 through January 2013



Each bar represents a single measurement. Bars outlined in black represent values reported by the laboratory as nondetect. For charting purposes these nondetect values are plotted as one half the reporting limit.

APPENDIX A

SUMMARY OF FIELD SAMPLING PROGRAM, ANALYTICAL PROGRAM, AND QUALITY ASSURANCE

1.0 FIELD SAMPLING PROGRAM

1.1 Overview

This section describes the procedures that TRC followed during the field sampling program.

1.2 Indoor Air Quality Sampling

Each of the indoor air quality field samples was collected by TRC over the course of one 24-hour test period. Indoor air quality samples were collected for analysis of PCBs by EPA Method TO-4A.

Indoor air quality (IAQ) samples were collected for PCBs following the procedures described in the EPA Compendium Method TO-4A, *Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)*, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition*, USEPA, January 1999.

TRC placed a high volume sampler at each PCB indoor air sampling location. A multi-point calibration was performed on each high volume sampler prior to sample collection using a calibrated orifice. A polyurethane foam (PUF) sampling cartridge was then unsealed and inserted into the high volume sampler and the sampler turned on. The start time, elapsed hours counter reading, and flow rate (magnehelic reading) were then recorded on a data sheet. After 24 hours of sampling, the elapsed hours counter reading and flow rate (magnehelic reading) were recorded on a data sheet along with the stop time. The PUF cartridge was then removed from the sampler, sealed, and labeled. A single-point post sampling calibration audit was performed to document that the high volume sampler remained calibrated.

Following the collection of the TO-4A samples, the total volume of ambient air sampled for each cartridge was calculated based on the duration of sampling and the average flow rate, as determined from the initial and final flow rates.

The data sheets are provided in Appendix B and the reduced data are presented in Appendix C. The calibration certifications of the critical orifice can be found in Appendix D.

1.3 Foundation Vent Air Sampling

Each of the vent air field samples was collected by TRC over the course of a 4-hour test period. Vent air samples were collected for analysis of PCBs by EPA Method TO-10A. Prior to sampling, all of the foundation vents were temporarily capped for approximately 24 hours. Just prior to sampling, TRC removed the caps from all vent stacks that were not being sampled to allow for the inflow of air. This approach is a modification to the procedure outlined in the LTMMIP to improve representativeness by allowing sample air to be drawn from the entire vent stack zone without potential stagnation of flow impacted by capped vent stacks.

Vent stack air samples were collected for PCBs following the procedures described in the EPA Compendium Method TO-10A, *Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)*, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition*, USEPA, January 1999.

In order to sample each vent stack without collecting ambient air, a cap with Teflon™ tubing penetrating through it was placed over the vent stack. Prior to capping the stack, a PUF sampling cartridge was unsealed and connected to the length of tubing that would extend inside the vent stack. The tubing on the opposite side of the cap (that would be outside of the vent stack after the cap was installed) was attached to a Dawson® vacuum pump. A vacuum was applied to the tubing and cartridge using the pump and the vacuum was adjusted so that a flow rate of five liters per minute (LPM) of air was flowing through the PUF. The flow rate was confirmed using a Bios Defender™ 520 primary gas flow calibrator. The cap was then placed over the vent stack with the PUF cartridge suspended in the stack. The start time and flow rate was then recorded on a data sheet. After 4 hours of sampling, the flow rate was confirmed using the bubble meter. The final flow rate and stop time are then recorded on the data sheet. The PUF cartridge was then disconnected from the tubing, sealed with the supplied end caps, placed into a sample jar and labeled.

Following the collection of all the TO-10A samples, the total volume of ambient air sampled for each cartridge was calculated based on the duration of sampling and the average flow rate, as determined from the initial and final flow rates.

The data sheets can be found in Appendix B and the reduced data can be found in Appendix C. The calibration certifications of the Bios Defender™ 520 primary gas flow calibrator can be found in Appendix D.

2.0 ANALYTICAL PROGRAM

Samples collected by EPA Method TO-10A and TO-4A were prepared by the Soxhlet Extraction Method (EPA Method 3540C/TO-4A) and analyzed by gas chromatography/mass spectroscopy (EPA Method 680) for PCB Homologue distribution. The homologue analytical method is a reliable method to quantify total PCBs to levels below the EPA Action Level ($0.05 \mu\text{g}/\text{m}^3$) and Acceptable Long-Term Average Exposure Concentration ($0.3 \mu\text{g}/\text{m}^3$) described in Section 5 and Appendix G. By quantifying PCB homologues, total PCB air data gathered at the KMS are directly comparable to total PCB air data gathered at the high school since both are based on homologues rather than congeners, which greatly facilitates communication and discussion with the general public on the results of analyses.

Laboratory analytical results are presented in Appendix E.

3.0 QUALITY ASSURANCE

3.1 Overview

TRC management is fully committed to an effective Quality Assurance/Quality Control (QA/QC) Program whose objective is the delivery of a quality product. For much of TRC's work, that product is data developed from field measurements, sampling and analysis activities, engineering assessments, and the analysis of gathered data for planning purposes. TRC's QA/QC Program works to provide complete, precise, accurate, representative data in a timely manner for each project, considering both the project's needs and budget.

This section highlights the specific QA/QC procedures that were followed during this sampling and analysis program.

3.2 Field Quality Control Summary

Calibrations of the field sampling equipment were performed prior to the field sampling effort. Copies of the calibration sheets were submitted to the Field Team Leader to take onsite and placed in the project file. Calibrations were performed as described in the EPA 40 CFR Part 50 Appendix B. All calibrations were available for review during the test program. Copies of the equipment calibration forms can be found in Appendix D. All instrument calibrations met the performance criteria defined in 40 CFR 50 Appendix B.

3.3 Data Reduction and Validation

Specific QC measures were used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in all projects.

3.3.1 Field Data Reduction

Appendix B of this document presents the standardized forms that were used to record field sampling data. The data collected was reviewed in the field by the Field Team Leader and at least one other field crewmember. Errors or discrepancies were noted in the field book.

3.3.2 Data Validation

TRC supervisory and QC personnel used validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data were maintained, including that judged as an "outlying" or spurious value. The persons validating the data have sufficient knowledge of the technical work to identify questionable values.

Field sampling data was validated by the Field Team Leader and/or the Field QC Coordinator based on their review of adherence to each approved sampling protocol and written sample collection procedure.

The following criteria were used to evaluate the field sampling data:

- Use of approved test procedures;
- Proper operation of the process being tested;
- Use of properly operating and calibrated equipment;
- Proper chain-of-custody maintained.

Laboratory analytical data was validated by TRC chemists. The sample results were assessed using the EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, revised December 1996. Modification of these guidelines was performed to accommodate the non-CLP methodology.

Sample data were reviewed for the following parameters:

- Agreement of analyses conducted with TRC requests
- Holding times and sample preservation
- Gas chromatography/mass spectrometry (GC/MS) tunes
- Initial and continuing calibrations
- Method blanks
- System Monitoring Compound recoveries
- Laboratory control sample (LCS) and LCS Duplicate (LCSD) results
- Internal standard performance
- Field duplicate results
- Quantitation limits and sample results

The laboratory data validation memoranda can be found in Appendix F. All data are reported in standard units depending on the measurement and the ultimate use of the data.

3.4 Collocated Sampler Precision

Single collocated sampler pairs were included for both indoor and vent stack air during each sampling event. Collocated samplers were operated for the same duration at near identical flow rates and were in close proximity to each other so as to represent near identical air space. The data resulting from the analyses of the collocated sampler pairs were used to define the precision of the combined sample collection and analyses scheme.

Precision was determined by the collection and analysis of replicate samples and is expressed as the relative percent difference (RPD), which is determined according to the following equation:

$$RPD = \left[\frac{X_1 - X_2}{\frac{X_1 + X_2}{2}} \right] \times 100$$

where X_1 and X_2 are the measurement results of each replicate sample expressed as an absolute value (always positive).

APPENDIX B

SAMPLING DATA

Keith Middle School Sampling Data Sheet Ambient Air Sampling

Setup Date: 1/27/13
Recovery Date: 1/28/13

Sampler(s): DG / EM
Sampler(s): DG / EM

TO-15A							
Location	Time		Vacuum (in Hg)		SUMMA Serial No.:	Flow Controller Serial No.:	Starting Flow Rate
	Start	Stop	Start	Finish			
V5-1	954	514	e				
V5-4	1000	524	e				

TO-4A								
Location	Time		PUF Number	Serial Number	Counter (Hrs)		Flow Rate (Mag Reading)	
	Start	Stop			Start	Finish	Initial	Final
C	1405	1409	-	3	610.77	634.72	55	49
B	1416	1415	-	5	610.09	635.00	55	48
A	1417	1420	-	1	557.37	557.47	48	45
A Dup	1417	1421	-	2	214.14	238.21	55	53
BG	1419	1427	-	4	632.76	656.91	55	50

* USE Dup times
Both Instruments STARTED
AND STOPPED SAME TIME.



Keith Middle School Sampling Data Sheet

Vent Air Sampling

Setup Date: 1/28/13
 Recovery Date: 1/28/13

Sampler(s): DG/EM
 Sampler(s): DG/EM

TO-15A							
Location	Time		Vacuum (in Hg)		SUMMA Serial No.:	Flow Controller Serial No.:	Starting Flow Rate
	Start	Stop	Start	Finish			

TO-10A				
Location	Time		Flow Rate (LPM)	
	Start	Stop	Start	Finish
VS-1	952	1351	5.14	2.46
VS-4	1000	1359	5.22	2.36
VS-8	939	1335	5.11	1.69
VS-8 Dup	939	1335	5.14	4.58
VS-10	944	1338	5.22	4.93

Lots of moisture in line
Freezing Problem with TUBES
Low Post Flow rate



APPENDIX C

FIELD REDUCED DATA

INDOOR SAMPLING LOCATIONS

Average Temp (oF/ K) 68.0 293.0

Average Baro. Press ("Hg / mmHg): 30.40 772.2

Monday, January 28, 2013

Location	Serial #	m _s	b _s	Start Reading ("H2O)	Start Reading (lpm)	Stop Reading ("H2O)	Stop Reading (lpm)	Avg. Reading ("H2O)	RPD of Start and Stop Readings	Avg. Flow (lpm)	Start time (hr)	Stop Time (hr)	Total Sample Time (min)	Total Actual Sample Volume (m ³)
A-31 Hallway	TO-4A 825	0.031	-0.304	48		45		46.5	6.45	226	*	*	1444	326.2
A-31 Dup	TO-4A 820	0.033	-0.867	55		53		54	3.70	244	214.14	238.21	1444	353.1
B-31 Café	TO-4A 821	0.034	-0.808	55		48		51.5	13.59	231	610.09	635.00	1495	344.7
C-31 Lounge hallway	TO-4A 823	0.035	-1.372	55		49		52	11.54	241	610.77	634.72	1437	345.7

Note:

* Timer is broken use the dup time since they were started and stopped at the same time

*Data Entered DSG
1/29/13*

VAM 2-413

OUTDOOR SAMPLING LOCATIONS

Average Temp (°F/K): 23.1 288.1

Average Baro. Press (°Hg / mmHg): 30.40 772.2

Monday, January 28, 2013

Location	Serial #	m _s	b _s	Start Reading (°H ₂ O)	Start Reading (ppm)	Stop Reading (°H ₂ O)	Stop Reading (ppm)	Avg. Reading (°H ₂ O)	RPD of Start and Stop Readings	Avg. Flow (ppm)	Start time (hr)	Stop Time (hr)	Total Sample Time (min)	Total Actual Sample Volume (m ³)
BG-31	TO-4A	822	0.034	-0.845	56	60		52.5	9.52	223	6:32.76	6:56.91	1448	322.5
VS-1-31	TO-10A				5.14		2.46		70.53	3.80	9:54	13:51	237	0.90
VS-4-31	TO-10A				5.24		2.36		75.79	3.80	10:00	13:59	239	0.91
VS-8-31	TO-10A				5.11		1.69		100.59	3.40	9:39	13:35	236	0.80
VS-8-31-DUP	TO-10A				5.14		4.58		11.52	4.88	9:39	13:35	236	1.15
VS-10-31	TO-10A				6.22		4.93		5.71	5.08	9:44	13:36	234	1.19

Data Entered 1/29/13 PSG

✓ EMM 2-4-13

APPENDIX D

EQUIPMENT CALIBRATION SHEETS

Keith Middle School PS1 Calibration Data Sheet

Sampler ID: 003
 Sampler Location: Acad Blud c hallum

Initial Calibration <u>1315</u>			
Magnehelic Reading	Manometer		total
	Left	Right	
70	2.3 3.4	3.2 3.2	5.7 6.6
60	2.9	3.0	5.9
50	2.6	2.5	5.1
40	2.1	2.1	4.2
30	1.6	1.6	3.2

Post Calibration —			
Magnehelic Reading	Manometer		total
	Left	Right	
50	2.55	2.55	5.10

Sampler ID: 005
 Sampler Location: B - CAFE

Initial Calibration <u>1320</u>			
Magnehelic Reading	Manometer		total
	Left	Right	
70	3.3	3.2	6.5
60	2.9	2.9	5.8
50	2.5	2.5	5.0
40	2.0	2.0	4.0
30	1.5	1.5	3.0

Post Calibration —			
Magnehelic Reading	Manometer		total
	Left	Right	
50	2.5	2.5	5.0

Sampler ID: 001
 Sampler Location: A

Initial Calibration <u>1335</u>			
Magnehelic Reading	Manometer		total
	Left	Right	
70	3.6	3.5	7.1
60	3.1	3.0	6.1
50	2.6	2.6	5.2
40	2.1	2.0	4.1
30	1.6	1.5	3.1

Post Calibration —			
Magnehelic Reading	Manometer		total
	Left	Right	
50	2.6	2.6	5.2

Sampler ID: 002
 Sampler Location: A-DUP

Initial Calibration <u>1335</u>			
Magnehelic Reading	Manometer		total
	Left	Right	
70	3.4	3.3	6.7
60	2.0	2.9	5.9
50	2.6	2.5	5.1
40	2.1	2.0	4.1
30	1.6	1.5	3.1

Post Calibration —			
Magnehelic Reading	Manometer		total
	Left	Right	
50	2.6	2.6	5.2

Sampler ID: 4
 Sampler Location: BG

Initial Calibration <u>1400</u>			
Magnehelic Reading	Manometer		total
	Left	Right	
70	3.3	3.2	6.5
60	2.9	2.9	5.8
50	2.5	2.4	4.9
40	2.0	2.0	4.0
30	1.5	1.5	3.0

Post Calibration —			
Magnehelic Reading	Manometer		total
	Left	Right	
50	2.5	2.6	5.1

Pre OUTSIDE Temp 27
 Post OUTSIDE Temp 32

Orifice ID: 946 Cal. Date: 8/1/12
 Initial Cal Temp: 68 (F) / C
 Initial Cal Press: 30.37 (inHg) / mmHg
 Post Cal Temp: 68 (F) / C
 Post Cal Press: 30.25 (inHg) / mmHg

M = 9.42071
 b = -0.04726



Network: New Bedford Site: Keith Middle Serial #: 1-825 Station #: A
 Technician: EM/DG Date: 1/27/2013 OrificeS/N: 946 Orif. Cal. Date: 1-Aug-12
 Reason for Puff Sampler Calibration: Monthly Recal

Amb. Temp, Ta (°C) 20.0 Bar. Press., Pa (in Hg) 30.37
 Amb. Temp, Ta (K) 293.0 Bar. Press., Pa (mmHg) 771.4

Orifice Data

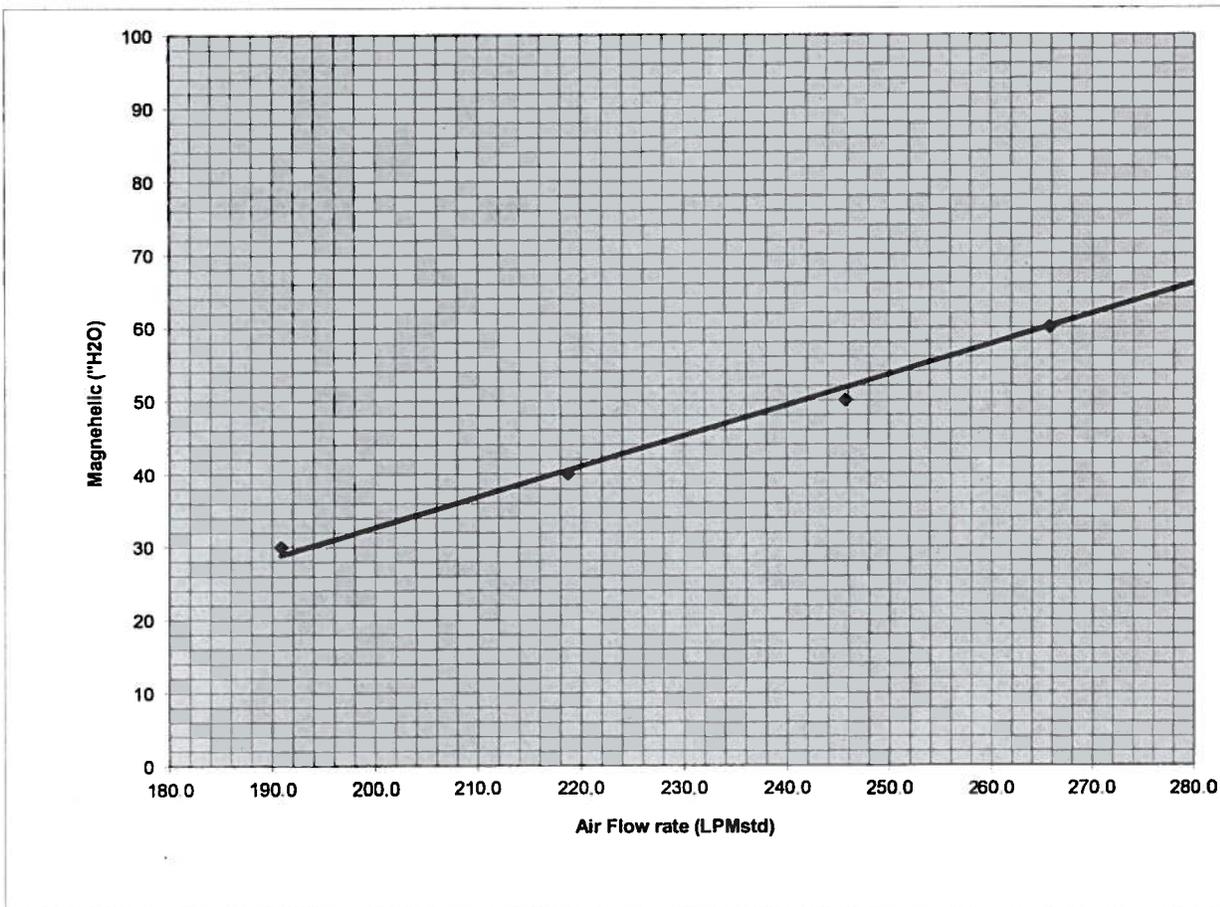
Qstd (m_o) = 9.62071 Qstd (b_o) = -0.04726 Qstd (r_o) = 0.99998⁹

ΔH	Q _{std}	l	l _c
7.10	286.315	70	8.50
6.10	265.747	60	7.87
5.20	245.737	50	7.18
4.10	218.754	40	6.43
3.10	190.856	30	5.56

$l_c = \sqrt{l \times 0.392 \times (Pa/Ta)}$

$Qstd = \{(1/m_o) \times \sqrt{DH \times (Pa/760) \times (298/Ta) - b_o}\} \times 1000$

m_s = 0.031 b_s = -0.30388 r_s = 0.99964



Desired Flow Rate (lpm): 250

Sampler Setting: 53.6

m_{mag} = 0.418

b_{mag} = -50.85371

r_{mag} = 0.99681

DATA Entered 1/27/13
 ✓ 2-4-13

DSG
 [Signature]

Network: New Bedford Site: Keith Middle Serial #: 2-820 Station #: A-DUP
 Technician: EM/DG Date: 1/27/2013 OrificeS/N: 946 Orif. Cal. Date: 1-Aug-12
 Reason for Puff Sampler Calibration: Monthly Recal

Amb. Temp, Ta (°C) 20.0 Bar. Press., Pa (in Hg) 30.37
 Amb. Temp, Ta (K) 293.0 Bar. Press., Pa (mmHg) 771.4

Orifice Data

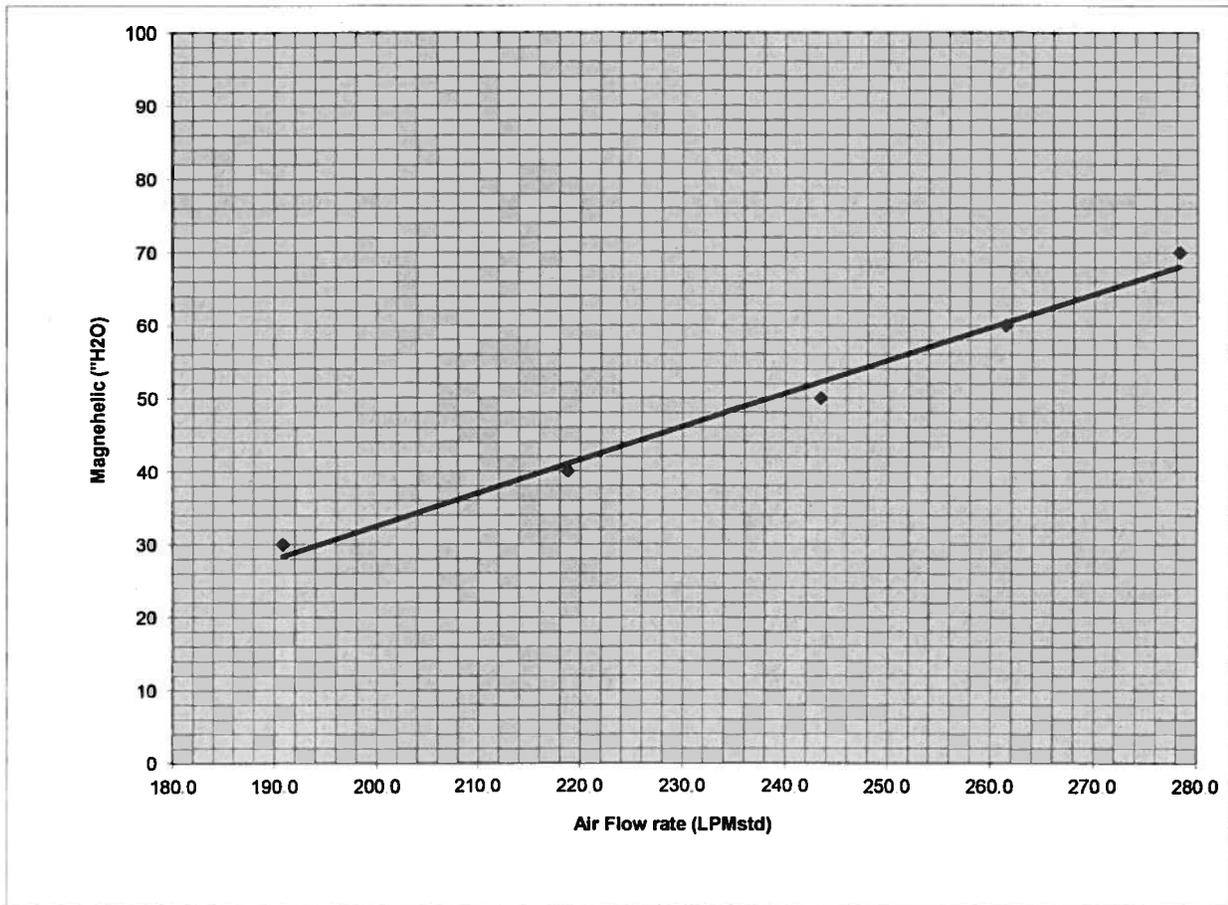
Qstd (m_o) = 9.62071 Qstd (b_o) = -0.04726 Qstd (r_o) = 0.999989

ΔH	Q _{std}	l	l _c
6.70	278.274	70	8.50
5.90	261.435	60	7.87
5.10	243.410	50	7.18
4.10	218.754	40	6.43
3.10	190.856	30	5.56

$l_c = \sqrt{l} \times 0.392 \times (\text{Pa}/\text{Ta})$

$Q_{std} = \{ (1/m_o) \times \sqrt{DH \times (\text{Pa}/760) \times (298/\text{Ta}) - b_o} \} \times 1000$

m_s = 0.033 b_s = -0.86696 r_s = 0.99863



Desired Flow Rate (lpm): 250

Sampler Setting: 55.2

m_{mag} = 0.454

b_{mag} = -58.28094

r_{mag} = 0.99366

DATA Entry 1/27/13

DJG

✓ 2-4-13

DM

Network: New Bedford Site: Keith Middle Serial #: 5-821 Station #: B
 Technician: EM/DG Date: 1/27/2013 OrificeS/N: 946 Orif. Cal. Date: 1-Aug-12
 Reason for Puff Sampler Calibration: Monthly Recal

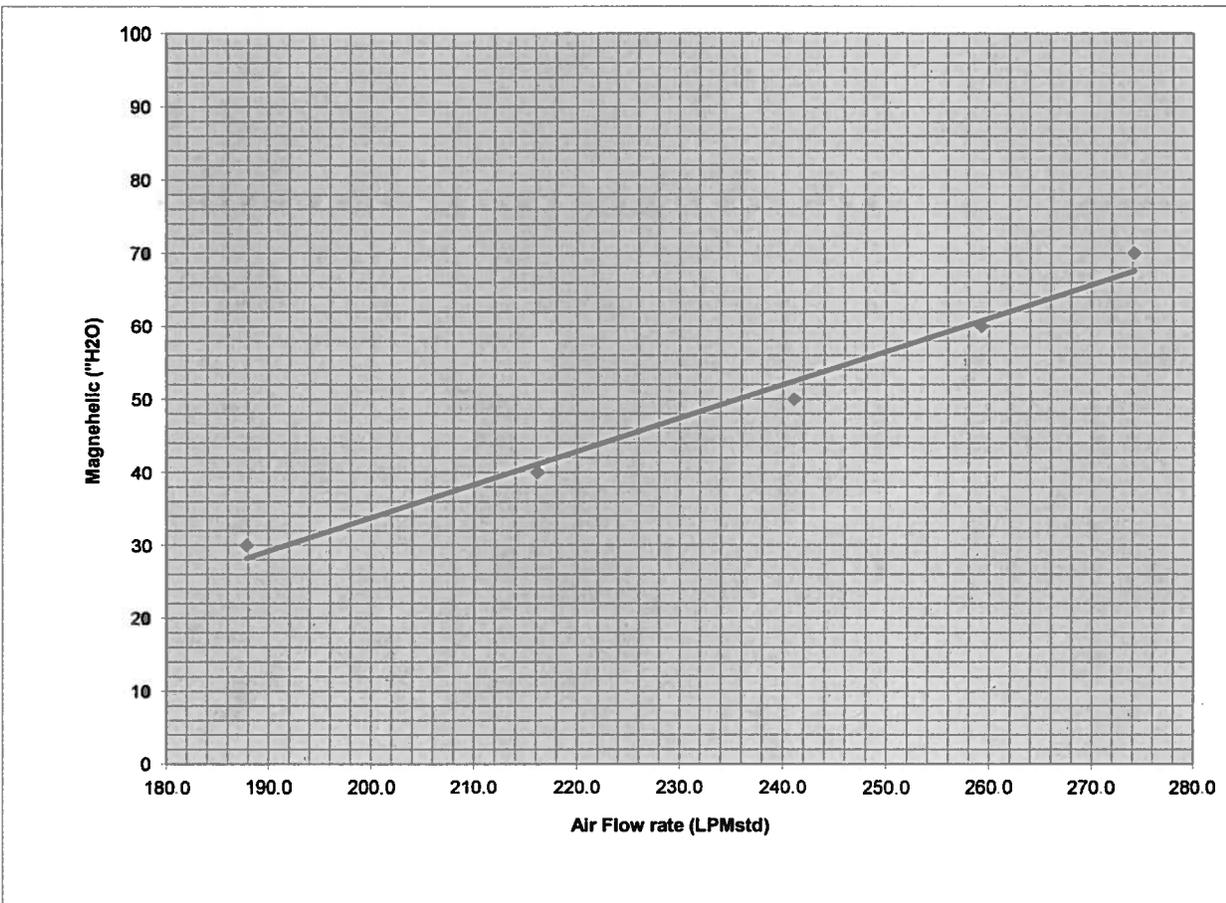
Amb. Temp, Ta (°C) 20.0 Bar. Press., Pa (in Hg) 30.37
 Amb. Temp, Ta (K) 293.0 Bar. Press., Pa (mmHg) 771.4

Orifice Data
 Qstd (m_o) = 9.62071 Qstd (b_o) = -0.04726 Qstd (r_o) = 0.99998^{ca}9

ΔH	Q _{std}	l	l _c
6.50	274.163	70	8.50
5.80	259.252	60	7.87
5.00	241.061	50	7.18
4.00	216.130	40	6.43
3.00	187.832	30	5.56

$l_c = \sqrt{l \times 0.392 \times (Pa/Ta)}$ $Qstd = \{(1/m_o) \times \sqrt{DH \times (Pa/760) \times (298/Ta) - b_o}\} \times 1000$

m_s = 0.034 b_s = -0.80806 r_s = 0.99753



Desired Flow Rate (lpm): 250 Sampler Setting: 56.5

m_{mag} = 0.456 b_{mag} = -57.35884 r_{mag} = 0.99143

DATA Entry 1/27/13 DSC
✓ 2-4-13 SM

Network: New Bedford Site: Keith Middle Serial #: 3-823 Station #: C
 Technician: EM/DG Date: 1/27/2013 OrificeS/N: 946 Orif. Cal. Date: 1-Aug-12
 Reason for Puff Sampler Calibration: Monthly Recal

Amb. Temp, Ta (°C) 20.0 Bar. Press., Pa (in Hg) 30.37
 Amb. Temp, Ta (K) 293.0 Bar. Press., Pa (mmHg) 771.4

Orifice Data

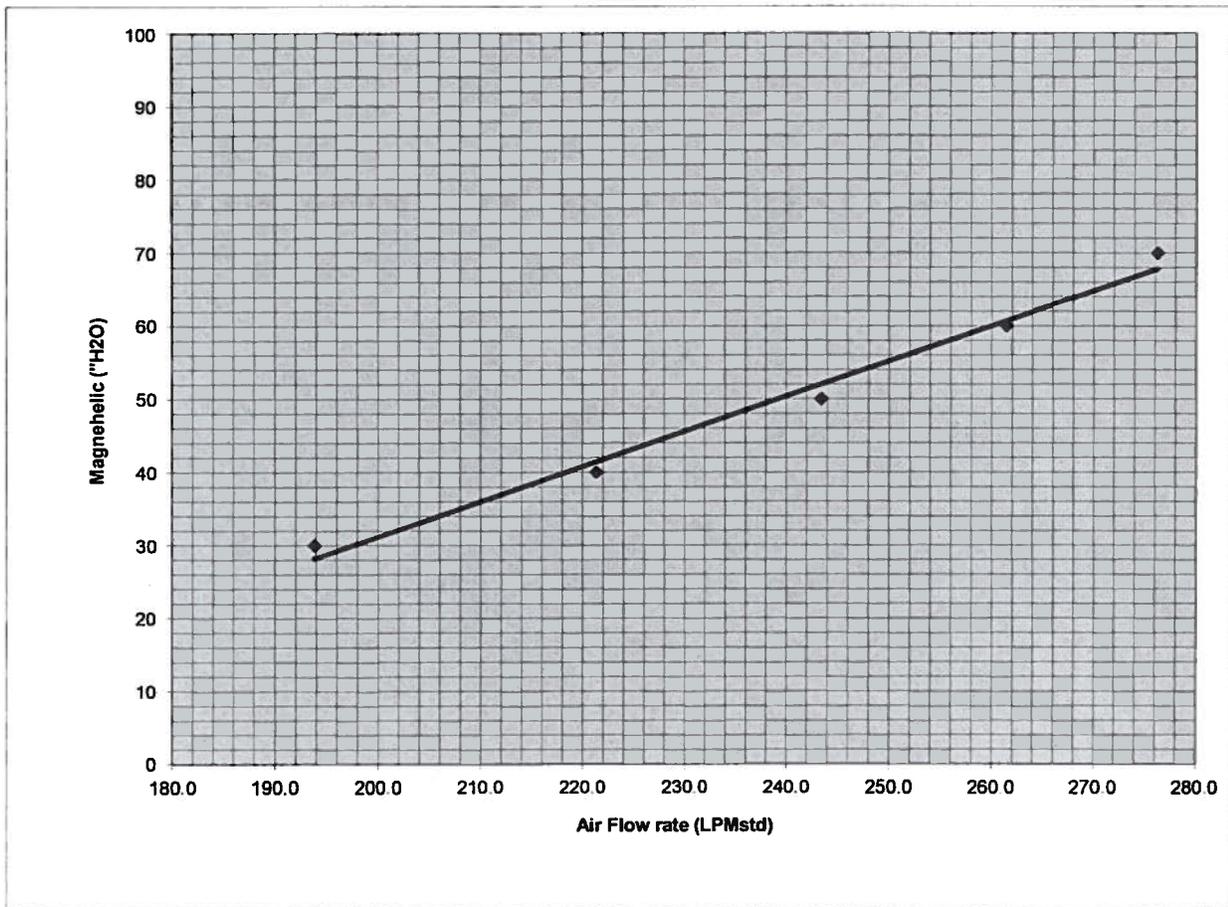
Qstd (m_o) = 9.62071 Qstd (b_o) = -0.04726 Qstd (r_o) = 0.999989

ΔH	Q _{std}	l	l _c
6.60	276.226	70	8.50
5.90	261.435	60	7.87
5.10	243.410	50	7.18
4.20	221.346	40	6.43
3.20	193.831	30	5.56

$l_c = \sqrt{l \times 0.392 \times (Pa/Ta)}$

$Qstd = \{ (1/m_o) \times \sqrt{DH \times (Pa/760) \times (298/Ta) - b_o} \} \times 1000$

m_s = 0.035 b_s = -1.37155 r_s = 0.99822



Desired Flow Rate (lpm): 250

Sampler Setting: 55.2

m_{mag} = 0.481

b_{mag} = -65.05976

r_{mag} = 0.99263

Data Entered 1/27/13

DJG

✓ 2-4-13

SMR

Network: New Bedford Site: Keith Middle Serial #: 4-822 Station #: BG
 Technician: EM/DG Date: 1/27/2013 OrificeS/N: 946 Orif. Cal. Date: 1-Aug-12
 Reason for Puff Sampler Calibration: Monthly Recal

Amb. Temp, Ta (°C) -2.8 Bar. Press., Pa (in Hg) 30.37
 Amb. Temp, Ta (K) 270.2 Bar. Press., Pa (mmHg) 771.4

Orifice Data

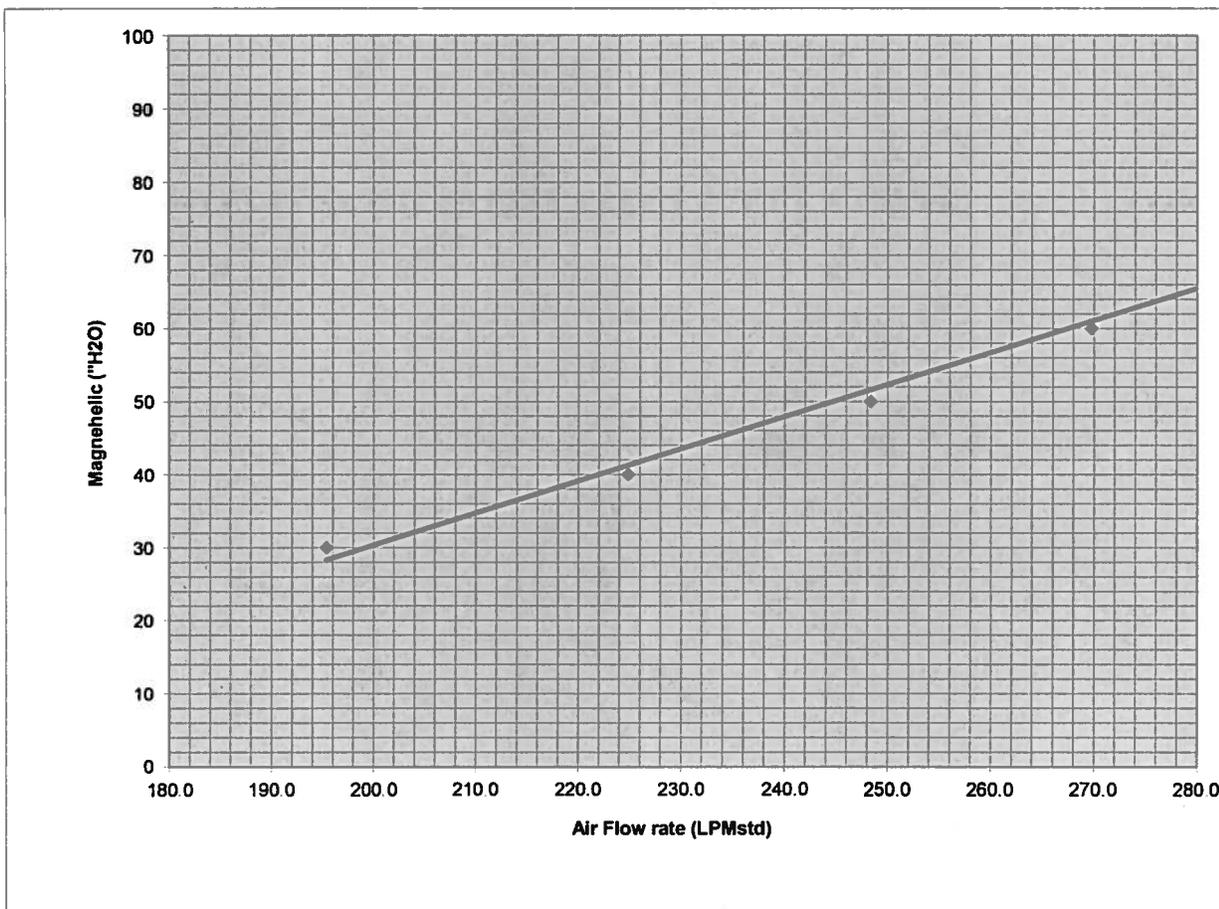
Qstd (m_o) = 9.62071 Qstd (b_o) = -0.04726 Qstd (r_o) = 0.999989

ΔH	Q _{std}	l	l _c
6.50	285.281	70	8.85
5.80	269.754	60	8.19
4.90	248.341	50	7.48
4.00	224.852	40	6.69
3.00	195.385	30	5.79

$l_c = \sqrt{l \times 0.392 \times (Pa/Ta)}$

$Qstd = \{(1/m_o) \times \sqrt{DH \times (Pa/760) \times (298/Ta)} - b_o\} \times 1000$

m_s = 0.034 b_s = -0.84535 r_s = 0.99862



Desired Flow Rate (lpm): 250

Sampler Setting: 52.3

m_{mag} = 0.439

b_{mag} = -57.53055

r_{mag} = 0.99363

DATA Entered 1/27/13 DS9
 ✓ SM 2-4-13

PS-1 Post-Sampling Flow Audit

$$Q_{std\ Orifice} (m^3/min) = (1/m_o) * (SQRT(H_o * (T_{std}/P_{std})) - b_o)$$

$$Q_{std\ Sampler} (m^3/min) = (1/m_s) * (SQRT(H_s * (T_{std}/P_{std})) - b_s) / 1000$$

$$\% \text{ Difference} = ((Q_{act\ Orifice} - Q_{act\ Sampler}) / Q_{act\ Orifice}) * 100$$

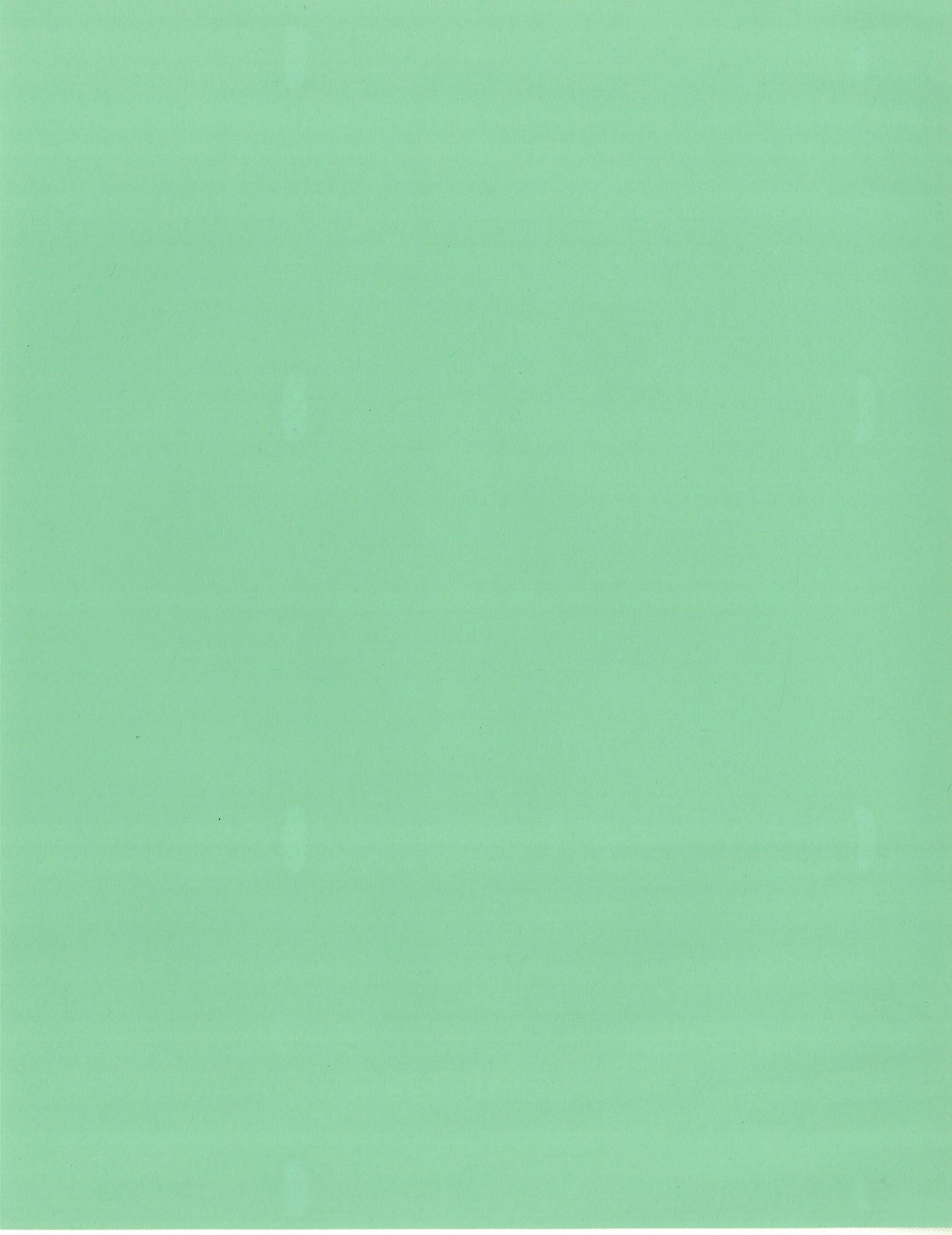
1/28/2013			Press ("Hg): 30.25							Press - P _s (mmHg): 768.4				
	Temp (°C):	Temp - T _s (K):	Sampler Serial #	Sampler Reading - H _s ("h20)	Orifice Reading - H _o ("h20)	Orifice #	Orifice Slope - m _o	Orifice Intercept - b _o	Qstd Orifice	Sampler #	Sampler Slope - m _s	Sampler Intercept - b _s	Qstd Sampler	% Difference
A-31	20.0	293.0	825	50	5.20	946	9.62071	-0.04726	0.245	825	0.031	-0.30388	0.241	1.70
B-31	20.0	293.0	821	50	5.00	946	9.62071	-0.04726	0.241	821	0.034	-0.80806	0.235	2.47
C-31	20.0	293.0	823	50	5.10	946	9.62071	-0.04726	0.243	823	0.035	-1.37155	0.244	-0.46
BG-31	0.0	273.0	822	50	5.10	946	9.62071	-0.04726	0.252	822	0.034	-0.84535	0.243	3.25
A-DUP-31	20.0	293.0	820	50	5.20	946	9.62071	-0.04726	0.245	820	0.033	-0.86696	0.244	0.70

Acceptance Limit <= 10% Difference

Data Entered
1/28/13 DS9

✓ VMM 24-13

DATE	Time (est)	Wind (mph)	Vis. (mi.)	Weather	Sky Cond	Temperature (°F)				Relative Humidity	Pressure		Precipitation (in.)			
						Air	Dwpt	6 hour			altimeter (in.)	sea level (mb)	1 hr	3 hr	6 hr	
								Max	Min							
29	6:53	Calm	4	Fog/Mist	OVC004	31	29	31	31	92%	30.08	1018.7				
29	5:53	N 3	4	Fog/Mist	OVC004	31	29			92%	30.06	1018.1				
29	4:53	N 3	5	Fog/Mist	BKN004 OVC023	31	30			96%	30.04	1017.1				
29	3:53	Calm	3	Fog/Mist	OVC002	31	30			96%	30.02	1016.6				
29	2:53	Calm	1	Fog/Mist	OVC002	31	30			96%	30.01	1016.4				
29	1:53	N 3	0.75	Unknown Precip Fog/Mist	VV003	31	30			96%	30.01	1016.3				
29	0:53	Calm	1.75	Fog/Mist	OVC003	31	30	32	29	96%	29.99	1015.6			0.01	
28	23:53	Calm	3	Unknown Precip Fog/Mist	OVC003	31	30			96%	30	1015.9	0.01			
28	22:53	Calm	3	Fog/Mist	OVC003	32	30			92%	29.99	1015.7				
28	21:53	Calm	5	Light Freezing Rain Fog/Mist	OVC003	32	30			92%	30.01	1016.2				
28	20:53	E 3	2	Fog/Mist	OVC003	31	30			96%	30.04	1017.3				
28	19:53	E 7	2	Light Snow Fog/Mist	OVC005	30	29			96%	30.05	1017.7				
28	18:53	E 6	2.5	Light Snow Fog/Mist	OVC007	29	27	33	29	92%	30.08	1018.8	0.02		0.08	
28	17:53	E 5	1	Light Snow Fog/Mist	BKN007 OVC011	30	28			92%	30.11	1019.8	0.04			
28	16:53	E 3	1.25	Light Snow Fog/Mist	BKN014 BKN022 OVC028	30	27			88%	30.14	1020.6	0.01			
28	15:53	SE 3	1	Light Snow Fog/Mist	OVC021	29	27			92%	30.15	1021	0.01	0.01		
28	14:53	W 3	2	Light Snow Fog/Mist	BKN025 OVC036	30	25			82%	30.21	1023.1				
28	13:53	SW 10	2	Light Snow	BKN034 OVC046	32	19			58%	30.25	1024.3				
													Post Cal Pressure			
28	12:53	SW 7	10	Overcast	OVC065	33	12	33	15	42%	30.28	1025.6				
28	11:53	SW 7	10	Overcast	OVC080	32	8			36%	30.34	1027.4				
28	10:53	S 5	10	Overcast	BKN075 OVC085	30	7			38%	30.38	1028.7				
28	9:53	Calm	10	Partly Cloudy	SCT070	29	9			43%	30.4	1029.4				
28	8:53	Calm	10	Overcast	BKN080 OVC100	23	12			63%	30.41	1029.8				
28	7:53	Calm	10	Fair	CLR	17	10			74%	30.41	1029.7				
28	6:53	Calm	10	A Few Clouds	FEW075	15	8	19	13	74%	30.41	1029.8				
28	5:53	Calm	10	Fair	CLR	14	7			73%	30.42	1030.1				
28	4:53	Calm	10	Mostly Cloudy	BKN095	16	5			62%	30.42	1030.1				
28	3:53	SW 3	10	Fair	CLR	15	5			64%	30.43	1030.6				
28	2:53	Calm	10	Fair	CLR	17	3			54%	30.43	1030.6				
28	1:53	Calm	10	Mostly Cloudy	BKN110	19	2			47%	30.44	1030.9				
28	0:53	Calm	10	Fair	CLR	20	0	24	15	41%	30.44	1030.9				
27	23:53	Calm	10	Fair	CLR	21	2			43%	30.44	1031				
27	22:53	Calm	10	Fair	CLR	17	3			54%	30.45	1031.3				
27	21:53	SW 3	10	Fair	CLR	18	3			52%	30.45	1031.1				
27	20:53	W 6	10	Fair	CLR	21	2			43%	30.44	1030.9				
27	19:53	Calm	10	Fair	CLR	22	2			42%	30.45	1031				
27	18:53	Calm	10	Fair	CLR	23	2	31	22	40%	30.43	1030.5				
27	17:53	NW 6	10	Fair	CLR	26	2			35%	30.41	1029.8				
27	16:53	W 6	10	Fair	CLR	27	2			34%	30.38	1028.9				
27	15:53	NW 5	10	Fair	CLR	31	1			28%	30.36	1028.1				
27	14:53	NW 9 G 17	10	Fair	CLR	31	0			26%	30.36	1028.1				
27	12:53	NW 12 G 20	10	Fair	CLR	29	3	30	13	33%	30.36	1028.1				
													Average Temp		Average Press	
													23.1		30.40	
													Pre Cal Pressure			
27	11:53	NW 14 G 24	10	Fair	CLR	27	1			32%	30.37	1028.6				
27	10:53	NW 9 G 20	10	Fair	CLR	24	1			36%	30.38	1028.8				
27	9:53	NW 13 G 21	10	Fair	CLR	21	1			41%	30.38	1028.7				
27	8:53	NW 15 G 22	10	Fair	CLR	18	2			49%	30.36	1028.2				
27	7:53	NW 7 G 18	10	Fair	CLR	15	1			53%	30.35	1027.7				
27	6:53	NW 10	10	Fair	CLR	13	1	15	13	59%	30.32	1026.9				
27	5:53	NW 9	10	Fair	CLR	14	1			56%	30.31	1026.4				
27	4:53	W 10	10	Fair	CLR	13	1			59%	30.29	1025.8				
27	3:53	NW 10 G 17	10	Fair	CLR	15	0			51%	30.28	1025.5				
27	2:53	NW 10 G 16	10	Fair	CLR	15	0			51%	30.27	1025.1				
27	1:53	NW 7	10	Fair	CLR	14	-1			51%	30.27	1024.9				
27	0:53	W 10 G 18	10	Fair	CLR	15	-1	21	15	49%	30.24	1024.1				
26	23:53	NW 7	10	Fair	CLR	15	-2			46%	30.23	1023.8				
26	22:53	NW 9 G 16	10	Fair	CLR	16	-3			43%	30.22	1023.4				
26	21:53	NW 8 G 18	10	Fair	CLR	17	-3			41%	30.19	1022.5				
26	20:53	NW 13 G 22	10	A Few Clouds	FEW110	18	-5			35%	30.17	1021.7				
26	19:53	NW 10 G 23	10	Overcast	OVC120	20	-9			27%	30.15	1021				
26	18:53	NW 12 G 22	10	Fair	CLR	21	-5	26	20	31%	30.12	1020				
26	17:53	NW 5	10	Fair	CLR	21	-2			36%	30.09	1019.1				
26	16:53	NW 7 G 18	10	Fair	CLR	23	-2			33%	30.08	1018.5				
26	15:53	NW 7	10	Fair	CLR	25	4			40%	30.04	1017.2				
26	14:53	NW 5	10	Fair	CLR	25	5			42%	30.01	1018.4				
26	13:53	W 14 G 18	10	Fair	CLR	25	7			46%	30.01	1016.2				
26	12:53	NW 12 G 17	10	Fair	CLR	24	6	24	12	46%	30	1016.1				
26	11:53	NW 6	10	Fair	CLR	23	6			48%	30.02	1016.5				
26	10:53	Vrbl 6	10	Fair	CLR	21	6			52%	30.04	1017.2				
26	9:53	Vrbl 6	10	Fair	CLR	18	7			62%	30.04	1017.4				
26	8:53	NW 7	10	Fair	CLR	15	7			70%	30.03	1017				
26	7:53	NW 6	10	Fair	CLR	13	8			81%	30.03	1016.9				





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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5040A

Date - Aug 01, 2012 Rootsmeter S/N 0438320 Ta (K) - 298
 Operator Jim Tisch Orifice I.D. - 0946 Pa (mm) - 749.3

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	6.5180	3.6	2.00
2	NA	NA	1.00	3.9330	10.1	5.50
3	NA	NA	1.00	3.1560	15.5	8.50
4	NA	NA	1.00	2.6980	21.0	11.50
5	NA	NA	1.00	2.3900	26.5	14.50
6	NA	NA	1.00	2.2330	30.2	16.50

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9811	0.1505	1.4042	0.9951	0.1526	0.8919
0.9726	0.2473	2.3286	0.9865	0.2508	1.4790
0.9655	0.3059	2.8949	0.9793	0.3103	1.8386
0.9582	0.3551	3.3672	0.9719	0.3602	2.1386
0.9510	0.3979	3.7810	0.9646	0.4036	2.4014
0.9462	0.4237	4.0333	0.9597	0.4298	2.5617
Qstd slope (m) =		9.62071	Qa slope (m) =		6.02433
intercept (b) =		-0.04726	intercept (b) =		-0.03002
coefficient (r) =		0.99999	coefficient (r) =		0.99999

y axis = SQRT[H2O(Pa/760) (298/Ta)]

y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)
 Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
 Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{ [SQRT(H2O(Pa/760) (298/Ta))] - b}
 Qa = 1/m{ [SQRT H2O(Ta/Pa)] - b}

APPENDIX E

LABORATORY DATA REPORTS (ON CD)

APPENDIX F

LABORATORY DATA VALIDATION
MEMORANDA



Memo

To: David Sullivan
From: Lorie MacKinnon
CC:
Date: 03/14/13
Re: Data Validation Review: Air Samples: Keith Middle School/New Bedford, MA: SDG 13010279

SUMMARY

Limited (Tier II) validation was performed on the data for 10 air samples and two trip blank samples collected at the Keith Middle School in New Bedford, Massachusetts. The samples were collected on January 28, 2013 and submitted to Pace Analytical Services, Inc. in Schenectady, New York for analysis. All air vent samples were collected on polyurethane foam (PUF) cartridges in accordance with EPA method TO-10A; all ambient air samples were collected on particulate filters and PUF cartridges in accordance with EPA method TO-4A. The samples were analyzed for polychlorinated biphenyl (PCB) homologues using EPA method 680. NEA reported the results under job number 13010279.

The sample results were assessed using the *EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*, revised December 1996. Modification of these guidelines was performed to accommodate the non-CLP methodology.

In general, the data appear to be valid as reported and may be used for decision-making purposes. Potential uncertainty exists for the results for dichlorobiphenyl, trichlorobiphenyl, tetrachlorobiphenyl, and total PCBs in samples A-31 and A-31 DUP due to high relative percent differences in the evaluation of the field duplicate pair. This issue has a minor impact on the data usability; all results are still usable for project objectives.

SAMPLES

Samples included in this review are listed below:

VS-1-31	VS-4-31	VS-8-31
VS-8-31 DUP (1)	VS-10-31	VS-TB-31
A-31	B-31	C-31
BG-31	A-31 DUP (2)	TB-31

- (1) Field duplicate of VS-8-31
- (2) Field duplicate of A-31

REVIEW ELEMENTS

Sample data were reviewed for the following parameters:

- Agreement of analyses conducted with TRC requests
- Holding times and sample preservation
- Gas chromatography/mass spectrometry (GC/MS) tunes
- Initial and continuing calibrations
- Blanks
- Surrogate spike recoveries
- Laboratory control sample (LCS) results
- Internal standard performance
- Field duplicate results
- Quantitation limits and sample results

DISCUSSION

Agreement of Analyses Conducted with TRC Requests

Sample reports were checked to verify that the results corresponded to analytical requests as designated on the chain-of-custody and any correspondence between TRC and the laboratory.

Holding Times and Sample Preservation

All samples were extracted and analyzed within the method-specified holding time.

GC/MS Tunes

The frequency and abundance of all decafluorotriphenylphosphine (DFTPP) tunes were within the acceptance criteria. The samples were analyzed within 12 hours from the DFTPP tunes. Window defining mixtures were analyzed following each DFTPP tune.

Initial and Continuing Calibrations

The %RSDs and %Ds of all PCB congeners used in the initial and continuing calibrations were within the acceptance criteria.

Blanks

Target compounds were not detected in the laboratory method blanks or trip blanks associated with the PCB homologue analyses.

Target compounds were not detected in the VER PUF sample (Lot #s 38888-1, 010813-0, 010813-1, and 010813-2) and VER Filter sample (Lot # 010813-4) which were analyzed and reported under job numbers 12120121 and 13010067.

Surrogate Spike Recoveries

All recovery criteria were met.

LCS Results

An LCS and LCSD was extracted and analyzed with each extraction batch. All recovery and precision criteria were met.

Internal Standard Performance

The following table lists the internal standards recovered outside of the control limits and the resulting validation actions.

Sample	Internal Standard	Recovery (%)	Control Limits	
B-31	Phenanthrene-d10	133.5	70-130	Validation action was not required as this internal standard was not used for compound quantitation.

Field Duplicate Results

Samples VS-8-31/VS-8-31 DUP (PUF) and A-31/A-31 DUP (PUF/Filter) were submitted as the field duplicate (collocated) pairs with this sample set. PCBs were not detected in samples VS-8-31/VS-8-31 DUP.

The following table summarizes the RPDs of the detected analytes in sample pair A-31/A-31 DUP, which were not within the acceptance criteria of 20%RPD or the difference of <2 times the reporting limit (RL). The positive and nondetect results for dichlorobiphenyl, trichlorobiphenyl, tetrachlorobiphenyl, and total PCB in samples A-31 and A-31 DUP were estimated (J/UJ).

Parameter	A-31 (ug/m3)	A-31 DUP (ug/m3)	RPD (%)
Dichlorobiphenyl	0.0000310 U	0.000149	NC, Not within 2xRL
Trichlorobiphenyl	0.00333	0.00540	47.4
Tetrachlorobiphenyl	0.0000610 U	0.00102	NC, Not within 2xRL
Total PCB	0.00333	0.00657	65.4

NC - Not calculable

Quantitation Limits and Sample Results

The quantitation limits met the requirements in the Sampling Plan for this program.

Due to sample matrix, two fold dilutions were performed on samples A-31, B-31, C-31, and A-31 DUP. Quantitation limits were elevated accordingly in these samples.

APPENDIX G

**DISCUSSION OF RISK-BASED COMPARISON
CRITERIA**

DISCUSSION OF RISK-BASED COMPARISON CRITERIA

Two PCB risk-based air concentrations (RBACs) have been developed for the KMS, assuming occupational exposures within the school (8 hours/day, 250 days/year, for 25 years). Both non-carcinogenic and carcinogenic health endpoints were considered in the calculation of the RBACs; however, RBACs are based on noncarcinogenic effects as the most sensitive endpoint. The first RBAC is the Action Level (AL; 0.05 ug/m^3) used as an initial indicator that PCB air concentrations above background levels have been detected. The risk basis for the AL is a noncarcinogenic hazard index of approximately 0.2. The second RBAC is the Acceptable Long-Term Average Exposure Concentration (ALTAEC; 0.3 ug/m^3), indicative of the maximum acceptable air concentration that should not be exceeded for an extended time period. The ALTAEC could be exceeded over the short-term and still result in acceptable risk levels. The risk basis for the ALTAEC is a noncarcinogenic hazard index of one.

Both RBACs were developed to be applied to a total PCB air concentration. PCB homologues have been quantified and summed to generate total PCB air concentrations. By quantifying PCB homologues, total PCB air data gathered at the KMS are directly comparable to total PCB air data gathered at the high school since both are based on homologues rather than congeners, which greatly facilitates communication and discussion with the general public on the results of analyses.

In September 2009, EPA published Public Health Levels (PHLs) for PCBs which are calculated indoor air concentrations that maintain PCB exposures below a level that EPA believes does not cause harm. PHLs were calculated for all ages of children from toddlers in day care to adolescents in high school as well as for adult school employees. In this report, indoor air PCB concentrations are compared to the PHL (0.45 ug/m^3) for adult school employees and children 12 to <15 years old, representative of the middle school age range. In calculating the PHL, EPA considered average PCB exposures from both school (e.g., school indoor and outdoor air, indoor dust and nearby outside soils) and non-school (e.g., diet, outside soils, indoor dust, and indoor and outdoor air) environments. EPA assumed that middle school children spend 6.5-hours per day at school (with 6 hours spent inside the school) for a 180-day school year.