

**ADDITIONAL
INDOOR SAMPLE RESULTS
LEDERLE GRADUATE RESEARCH COMPLEX
UNIVERSITY OF MASSACHUSETTS
AMHERST, MASSACHUSETTS**

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LIST OF ABBREVIATIONS & ACRONYMS

Conte building	Conte National Center for Polymer Research
EH&E	Environmental Health & Engineering, Inc.
EPA	U.S. Environmental Protection Agency
LGRC	Lederle Graduate Research Complex
NIOSH	National Institute for Occupational Safety and Health
PCB	polychlorinated biphenyl
ppm	parts per million
REL	recommended exposure limit
UMass Amherst	University of Massachusetts Amherst
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
$\mu\text{g}/100 \text{ cm}^2$	micrograms per 100 square centimeters

1.0 INTRODUCTION

Environmental Health & Engineering, Inc. (EH&E) is pleased to present this addendum summary of additional indoor samples associated with the ongoing building investigation of the Lederle Graduate Research Complex (LGRC) at the University of Massachusetts (UMass Amherst) in Amherst, Massachusetts. EH&E summarized its preliminary sample results in the report, *Preliminary Report of Building-Related Polychlorinated Biphenyls Assessment Lederle Graduate Research Complex University of Massachusetts, Amherst, Massachusetts (the Preliminary Report)*, dated October, 12, 2006. This report summarizes follow-up sampling to characterize and document the nature and extent of any polychlorinated biphenyls (PCBs) inside the building that may be associated with the discovery of PCB caulking in two of the LGRC buildings.

This report does not address exterior sample results or soil sample results, both of which have been summarized under separate covers to the appropriate regulatory agencies.

2.0 EXECUTIVE SUMMARY

As requested by UMass Amherst, EH&E executed a detailed sampling program to characterize the nature and extent of exterior PCB-containing (e.g., greater than [$>$] 50 parts per million [ppm]) exterior caulking on the façade of Towers A, B, C, and the low-rise identified as part of the Renovation Project. As part of the overall sampling program, EH&E collected wipe and air samples from occupied areas within the LGRC to assess potential occupant exposures from exterior building-related PCB products. Initial results were summarized in the Preliminary Report.

As part of a commitment to the occupants of the Engineering Library (the library), UMass Amherst has requested that EH&E collect periodic air sampling of the library to ensure that air concentrations within the library were reduced following the implementation of mitigation measures (increased ventilation rates, increased pressurization, operation sequencing).

Sample results collected by EH&E indicate the following:

- On September 22, 2006, EH&E collected additional wipe samples from horizontal surfaces within the library following cleaning activities in the library. Sample results ranged from below reporting limit <0.01 to 0.98 micrograms per 100 square centimeters ($\mu\text{g}/100 \text{ cm}^2$). These samples suggest that cleaning within the library was successful in reducing residual PCBs on surfaces.
- Air samples collected on September 22, 2006, ranged from 0.14 to 0.66 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) measured as the sum of PCB homologs. EH&E analyzed these air samples for PCB homologs in order to support the development of risk based occupancy criteria for Tower A and the low-rise building. The risk based occupancy criteria are submitted for review under separate cover.
- On January 4, 2007, EH&E collected air samples in the library of the low-rise building as part of the periodic air monitoring. Results ranged from 0.2 to 0.4 $\mu\text{g}/\text{m}^3$.

- Dust thimble samples collected on September 22, 2006, from high traffic carpeted areas and from a third floor conference room indicate the presence of PCBs in dust at concentrations greater than one ppm. The highest calculated concentration was seen in a third floor conference room at 26 ppm. Currently the conference room is closed until an abatement plan to clean or remove carpeting is approved for implementation. Under a separate cover, EH&E will submit an abatement plan to address the carpeting in the room.

Please note that this Report is subject to the Limitations in Appendix A. Appendix B provides sample results.

3.0 BACKGROUND

EH&E summarized initial sample results taken from the LGRC in the Preliminary Report. This addendum summarizes additional indoor sample results subsequent to EH&E's issuance of the Preliminary Report.

As previously noted, the LGRC consists of three towers (Towers A, B, and C), a low-rise building, and the Conte National Center for Polymer Research (Conte building). Tower A and the low-rise were completed in 1972 and Towers B and C were completed in 1974. The Conte building was constructed in the 1990s. Towers A, B, and C are each 17 stories and the low-rise building is three stories.

EH&E has identified that exterior caulking from Tower A and the low-rise building contains PCBs in concentrations in excess of 50 ppm. However, exterior caulking associated with Tower B and C do not contain PCBs in excess of 50 ppm, and are authorized for use under the Toxic Substances Control Act regulations.

As part of ongoing monitoring efforts in preparation for an approved abatement, EH&E has collected additional air, wipe, and dust thimble samples from the Engineering library; the area where levels of PCBs in the air and on a few surfaces tested slightly above federal guidelines. These additional samples have been collected to document that mitigation measures have helped reduce air concentrations in the library.

4.0 SAMPLING PROGRAM AND ANALYSIS METHODS

4.1 AIR SAMPLES

Initial air samples were taken from locations throughout the LGRC. Samples were taken in representative locations to characterize airborne levels of PCBs within the LGRC. Additional samples were collected outdoors and from the Conte Building for comparison purposes. Subsequent air samples focused on the Engineering library of the low-rise building, where comparatively higher concentrations were seen.

For samples collected on January 4, 2007, air was drawn through the sampling train by a calibrated pump. The sampling train consisted of a glass fiber filter and a florasil tube in series, which captures both particulate and vapor phase PCBs. In order to characterize potential occupant inhalation exposures, samples were generally collected on desktops and at working levels (three to five feet above the floor). Field blank and duplicate samples were collected for quality control purposes. All samples were collected and analyzed in accordance with National Institute for Occupational Safety and Health (NIOSH) Method Number 5503. EH&E sent the collected samples under chain of custody to Galson Laboratories (Syracuse, New York) for analysis.

4.2 WIPE SAMPLES

Wipe samples were collected from numerous locations to assess PCB concentrations in dust on surfaces throughout the LGRC. Each wipe sample was obtained by wiping a prescribed, controlled surface area (e.g., one square foot). Duplicate samples, method blanks, and field blanks were collected for quality control purposes. Wipe samples were collected using sterile gauze soaked in hexane. Analysis for and PCBs was conducted by Groundwater Analytical, Inc. using gas chromatography/electron capture detection (GC/ECD) following U.S. Environmental Protection Agency (EPA) Method 8082, respectively.

4.3 CARPET DUST SAMPLES

Bulk dust samples were collected via cellulose dust extraction thimbles (Whatman International, Maidstone, England) attached to a vacuum cleaner. EH&E collected dust

samples by vacuuming a measured surface area in each sample location. Bulk samples were purposefully collected upon completion of air sampling to minimize the possibility of skewing the air sample results due to the bulk sampling activities. Blank cellulose thimbles were analyzed for quality control purposes. Initial samples were sent under chain of custody to Groundwater Analytical (Buzzards Bay, Massachusetts) and analyzed utilizing EPA method 8082. Samples collected on September 22, 2006, were sent for analysis utilizing EPA Method 8082 to Alpha Analytical (Westborough, Massachusetts).

5.0 SAMPLE RESULTS

During the fall of 2006, EH&E collected samples from interior surfaces and indoor air. Samples were originally collected throughout the LGRC, but subsequent sampling focused on the Engineering library based on initial sampling results that revealed comparatively higher levels of PCBs in the library. These additional sample results not summarized in the Preliminary Report are summarized in this report.

5.1 AIR SAMPLE RESULTS

On August 21, 2006, EH&E collected initial air samples from all five buildings of the LGRC to address occupant concerns about potential exposure to PCBs from exterior caulking on the building. EH&E sampled the Conte building to control for building age, since the Conte building was constructed well after PCBs were phased out of commercial use. Those results were summarized in the Preliminary Report.

Subsequent air sample numbers and results are summarized in Table 5.1.

Table 5.1 Air Sample Results Summary, Lederle Graduate Research Complex, Amherst, Massachusetts			
Sample Date	Homogenous Unit	Samples¹	PCBs > 1.0 µg/m³ (Number)
9/22/06	Library	4	No
1/4/07	Library	3	No

PCB polychlorinated biphenyl
> greater than
µg/m³ micrograms per cubic meter

¹ Includes duplicate samples, but does not include other quality control samples.

Additional air samples were collected in the library on September 22, 2006, to evaluate if the additional cleaning in the library had an effect in further reducing air concentrations in the library. EH&E collected these samples for homolog analysis, in order to support risk-based occupancy criteria for Tower A and the low-rise buildings; sample results ranged from 0.14 to 0.36 µg/m³ indicating a further reduction of indoor air PCB

concentrations. Sample results are reported as the sum of the homologs as reported by the laboratory.

On January 4, 2007, EH&E collected additional air samples from the library following the completion of the installation of temporary backer rods between exposed panel joints. Air sample results from the library ranged from 0.28 to 0.40 $\mu\text{g}/\text{m}^3$ based on total Aroclors.

5.2 WIPE SAMPLE RESULTS

Initial hexane wipe samples collected from the low-rise and Tower A were generally well below the EPA PCB clean-up standard for unrestricted use ($10 \mu\text{g}/100 \text{ cm}^2$) as summarized in the Preliminary Report. These initial samples generally ranged from non-detect (nominal detection limit of $0.1 \mu\text{g}/100 \text{ cm}^2$) to $3 \mu\text{g}/100 \text{ cm}^2$. However one sample collected in the library tested at $34 \mu\text{g}/100 \text{ cm}^2$ (see Preliminary Report). EH&E collected this sample from a low window ledge in the main reading room of the library. Based upon these results, EH&E recommended additional sampling and cleaning of the library.

Subsequent EH&E wipe samples are summarized in Table 5.2.

Table 5.2 Wipe Sample Results Summary, Lederle Graduate Research Complex, Amherst, Massachusetts				
Sample Date	Homogenous Unit	Wipe Sampling Category	Number of Samples¹	PCBs > $10 \mu\text{g}/100 \text{ cm}^2$ (Number)
9/22/06	Library	Work Surfaces	1	No
9/22/06	Library	Window Ledges	9	No
PCB polychlorinated biphenyl > greater than $\mu\text{g}/100 \text{ cm}^2$ micrograms per 100 square centimeters ¹ Includes control samples.				

On September 22, 2006, EH&E collected additional wipe samples from the library to verify the effectiveness of the cleaning effort. EH&E's sampling focused on window ledge surfaces where previously higher results were located. Sample results ranged

from 0.06 $\mu\text{g}/100\text{ cm}^2$ to 3.1 $\mu\text{g}/100\text{ cm}^2$, well below the EPA's acceptance criterion for non-porous surfaces.

5.3 DUST SAMPLE RESULTS

As part of the follow-up sampling process to understand the initial air sample results, EH&E collected dust thimble samples from locations in the library. EH&E collected the dust samples by vacuuming carpet areas where air samples had been collected. Results from the initial dust thimble samples ranged from 10 to 37 ppm. The highest sample was from a conference room on the third floor. EH&E understands that the room was used as the meeting room for the Renovation Project prior to the discovery of PCBs in the caulking material. As a precaution, EH&E requested the conference room remain closed until an abatement action can be determined for the room.

Dust thimble sample numbers and results are summarized in Table 5.3.

Table 5.3 Dust Thimble Sample Results Summary, Lederle Graduate Research Complex, Amherst, Massachusetts				
Sample Date	Homogenous Unit	Dust Thimble Sampling Category	Number of Samples¹	PCBs > 1 ppm (Number)
9/6/06	Library	Carpeted surfaces	3	Yes (3)
9/22/06	Library	Carpeted surfaces	3	Yes (2)
PCB polychlorinated biphenyl > greater than ppm parts per million ¹ Includes control samples.				

On September 22, 2006, EH&E collected additional dust samples from the library. EH&E's sampling focused on areas where the previous sampling occurred. Calculated sample results ranged from 0.84 to 26.3 ppm.¹ The 26.3 ppm sample result was from the same conference room. EH&E recommends that under a remediation plan the carpet be replaced in the conference room and disposed as PCB remediation waste.

¹ The dust thimble samples analyzed by Alpha Analytical were reported as micrograms of polychlorinated biphenyls. In order to derive a concentration (parts per million), EH&E used the average sample weight from dust thimble samples collected on September 6, 2006.

6.0 CONCLUSION

As noted in the Preliminary Report, PCBs in excess of 50 ppm have been identified in exterior caulking of Tower A and the low-rise building. However, indoor samples from Tower A and the low-rise building were generally below post-remediation criteria, even before abatement. Initial indoor air results from Tower A were low and below the NIOSH recommended exposure limit (REL) for all air samples. Within the low-rise, initial air sample results were slightly higher than the NIOSH REL. Subsequent sample results have shown a steady decrease in air concentrations in the library as several temporary mitigation measures have been implemented.

Initial wipe sample results from the LGRC indicate that surface concentrations are generally below the EPA acceptance criterion of 10 $\mu\text{g}/100\text{ cm}^2$ for non-porous surfaces. Window ledges prior to cleaning had concentrations greater than 10 $\mu\text{g}/100\text{ cm}^2$ that may have been the result from pressure washing activities. Sample results collected on September 22, 2006, following cleaning indicate that surfaces are currently below 10 $\mu\text{g}/100\text{ cm}^2$. Carpet dust samples indicate that the closed third floor conference room should have the carpets replaced, and that a thorough cleaning of carpeted areas will be required to ensure that carpet dust will be below 1 ppm. This room is secured and will not be used until it can be remediated

APPENDIX A
LIMITATIONS

LIMITATIONS

1. Environmental Health & Engineering, Inc.'s (EH&E) indoor air assessment described in the attached report number 14680, *Additional Indoor Sample Results, Lederle Graduate Research Complex, University of Massachusetts, Amherst, Massachusetts* (hereafter "the Report"), was performed in accordance with generally accepted practices employed by other consultants undertaking similar studies at the same time and in the same geographical area; and EH&E observed that degree of care and skill generally exercised by such other consultants under similar circumstances and conditions. The observations described in the Report were made under the conditions stated therein. The conclusions presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services.
2. Observations were made of the site as indicated within the Report. Where access to portions of the site was unavailable or limited, EH&E renders no opinion as to the presence of chemical residues, or to the presence of indirect evidence relating to chemical residues in that portion of the site.
3. The observations and recommendations contained in the Report are based on limited environmental sampling and visual observation, and were arrived at in accordance with generally-accepted standards of industrial hygiene practice. The sampling and observations conducted at the site were limited in scope and, therefore, cannot be considered representative of areas not sampled or observed.
4. When an outside laboratory conducted sample analyses, EH&E relied upon the data provided and did not conduct an independent evaluation of the reliability of these data.
5. The purpose of the Report was to assess the characteristics of the subject site as stated within the Report. No specific attempt was made to verify compliance by any party with all federal, state, or local laws and regulations.

APPENDIX B
SAMPLE RESULTS

Table B.1 Air Sample Results from Engineering Library at the Lederle Graduate Research Center, University of Massachusetts, Amherst, Massachusetts, September 22, 2006

Sample ID	Location, Description	Air Volume (liters)	Concentration ($\mu\text{g}/\text{m}^3$) (Total Homologs)
79701	Third floor, northeast shelves 04-05	4,271	0.14
79702	Duplicate of 79701	4,275	0.20
79703	Second floor, library office cubicle	4,297	0.23
79704	First floor, west end near shelf 72	4,322	0.36
79705	Outdoor, main entrance	4,340	0.03
79706	Field blank	NA	ND<0.06 μg

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter
 NA not applicable
 μg micrograms

National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for total PCBs is 1 $\mu\text{g}/\text{m}^3$.

Samples analyzed by Alpha Analytical (Westborough, Massachusetts) following EPA method TO-10. Results reported as the sum of total homologs.

Table B.2 Air Sample Results from Engineering Library at the Lederle Graduate Research Center, University of Massachusetts, Amherst, Massachusetts, January 04, 2007

Sample ID	Location, Description	Air Volume (liters)	Concentration ($\mu\text{g}/\text{m}^3$)
78193-4	Third floor, northeast shelves 04-05	1301	0.28
78195-6	Duplicate of 78193-4	NA	Pump fault
78197-8	Second floor, library office cubicle	1220	0.31
78199-00	First floor, west end near shelf 72	1302	0.40
78201-2	Outdoor, main entrance	NA	Pump fault
78203-4	Field blank	NA	ND<0.06 μg

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter
 NA not applicable
 μg micrograms

National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for total PCBs is 1 $\mu\text{g}/\text{m}^3$.

Samples analyzed by Galson Laboratories (Syracuse, New York) following NIOSH Method 5503.

Table B.3 Calculated Wipe Sample Results Collected from Engineering Library, Lederle Graduate Research Center, University of Massachusetts, Amherst, Massachusetts, September 22, 2006

Sample ID	Floor	Location	Sample Description	Aroclor 1254* ($\mu\text{g}/100\text{ cm}^2$)	Notes	Wipe Area (ft^2)
80230	3 rd	Library south wall	Window ledge	0.28	NA	0.91
80231	3 rd	Library north wall	Window ledge	0.10	NA	1.0
80232	3 rd	Library south wall	SW end, window ledge	0.13	NA	0.91
80233	2 nd	Library south wall	Window ledge	0.19	NA	0.75
80234	2 nd	Library south wall	SW end window ledge	0.98	NA	1.0
80235	2 nd	Library south wall	SE end window ledge	0.20	NA	1.0
80236	1 st	Library south wall	SW end window ledge	0.23	NA	0.75
80237	1 st	Library south wall	Center, window ledge	0.78	NA	1
80238	1 st	Library south wall	SE end window ledge	0.64	NA	1
80239	1 st	Library	Shelving Row 53	ND<0.07	NA	0.78
80240	NA	Field blank	Field blank	ND<0.5 μg	NA	NA

$\mu\text{g}/100\text{ cm}^2$ micrograms per 100 square centimeters
 ft^2 square feet

2C Confirmation concentration reported from second column quantification

μg microgram

ND non-detect

NA not applicable

* Aroclor 1016, 1221, 1232, 1242, 1248, and 1260 were also tested, but concentrations were below reporting limits.

Concentrations calculated based on wipe surface area.

Analysis performed by Alpha Analytical, Inc. (Westborough, Massachusetts) following U.S. Environmental Protection Agency (EPA) Method 8082 (GC/ECD).

Table B.4 Dust Thimble Results from Engineering Library, Lederle Graduate Research Center, University of Massachusetts, Amherst, Massachusetts, September 6, 2006

Sample ID	Building	Floor	Description	Aroclor 1254 ^{1,2} (ppm)	Notes
79770	Low-rise library	1	South wall, table chair area 32" x 119" vacuumed surface area	10	2C(8.6)
79771	Low-rise library	2	Carpet at entrance 67.5" x 142" vacuumed surface area	10	2C(9.1)
79772	Low-rise library	3	Under table, conference room A365A 4' x 6' vacuumed surface area	37	2C(35)
79773	NA	NA	Field blank; dust thimble	BRL<0.7	NA

ppm parts per million
 2C Confirmation concentration reported from second column quantification
 BRL Below reporting limits
 NA Not applicable

¹ Polychlorinated biphenyl (PCB) concentration analysis performed by Groundwater Analytical, Inc., using U.S. Environmental Protection Agency (EPA) method 8082 (GC/ECD).
² Aroclor 1016, 1221, 1232, 1242, 1248, and 1260 also tested. All results below reporting levels, unless noted.

Table B.5 Dust Thimble Estimated Results from Engineering Library, Lederle Graduate Research Center, University of Massachusetts, Amherst, Massachusetts, September 22, 2006

Sample ID	Building	Floor	Description	Detected (µg)	Calculated Aroclor 1254 ^{1,2} (ppm)	Notes
80241	Low-rise library	3	Under table, conference room A365A 4' x 8' vacuumed surface area	86	26.38	Sample diluted
80242	Low-rise library	2	South side, staff office hallway near cubicles	11.2	3.44	Sample diluted
80243	Low-rise library	1	Hallway near shelves 53	2.75	0.84	NA
80250	NA	NA	Field blank; dust thimble	ND	BRL<0.7	NA

ppm parts per million
 2C Confirmation concentration reported from second column quantification
 BRL Below reporting limits
 NA Not applicable

¹ Polychlorinated biphenyl (PCB) concentration analysis performed by Alpha Analytical, Inc. (Westborough, Massachusetts), using U.S. Environmental Protection Agency (EPA) method 8082 (GC/ECD).

² Aroclor 1016, 1221, 1232, 1242, 1248, and 1260 also tested. All results below reporting levels, unless noted.

Sample weights not calculated by laboratory, calculation estimated based on the average sample weight from dust thimble samples collected on 9/06/06 (3.26 grams).