PCB INTERIM MEASURES PLAN

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1. INTRODUCTION

This Interim Measures Plan has been prepared to document proposed interim measures to be taken to address interior window glazing sealant[1] containing polychlorinated biphenyls (PCBs) at concentrations greater than 50 parts per million (ppm). The glazing sealant has been identified at the University of Massachusetts (UMass) Lederle Graduate Research Center (LGRC) Tower A and low rise building, located at 710-740 North Pleasant Street on the UMass campus in Amherst, Massachusetts.

1.1 PROJECT BACKGROUND

The LGRC complex was constructed in the early 1970's as a facility for classroom, library, laboratory, and office space. The complex consists of a three-story low-rise building ("the low-rise") and an attached 17-story tower identified as Tower A ("the high-rise"). The Site is located toward the northern end of the UMass campus at the intersection of North Pleasant Street and Governors Drive. A Site Locus Map is provided as Figure 1-1 and a Site Plan is included as Figure 1-2.

In March 2009, a limited hazardous building materials investigative survey and assessment was conducted to identify asbestos-containing materials, lead in paint, PCBs, and other hazardous building materials in anticipation of renovations planned at the LGRC low rise building. During the assessment, a sample of the interior window glazing sealant from the third floor conference room of the Science Library was collected and analyzed for PCBs. This sample and a duplicate of this sample detected total PCBs at concentrations of 12,000 ppm and 11,000 ppm, respectively.

Given that these concentrations exceeded regulatory thresholds per Federal regulations (40 CFR 761) for PCBs in a non-totally enclosed manner, UMass and Woodard & Curran (W&C) have been working to develop an approach and plan to address these conditions. Primary issues are that this glazing sealant is integral to the window units (e.g., it cannot be removed without removing the entire window unit), there are approximately 900 windows in Tower A and the low rise building, and UMass does not have any current capital improvement plans to replace all the windows.

Upon gaining knowledge of the PCB concentrations in the window glazing sealant (March 2009), the following activities were initiated/conducted in support of developing an approach to address this issue:

- April 2009 - Inspection and inventory of all accessible windows in the LGRC low-rise and Tower A high rise buildings;
- May 2009 - Collection of window glazing sealant samples to confirm initial results from locations throughout the buildings, surface wipes from interior locations, and indoor air samples from representative locations throughout the buildings; and
- May 2009 - Public notifications and outreach through informational postings and a meeting with building occupants and stakeholders.

Following discussions with United States Environmental Protection Agency (EPA), a draft Interim Measures Plan was submitted on July 31, 2009, which included a plan, based on pilot testing of several products, to implement an interim

[1] Window glazing sealant is defined for the purposes of this plan as the sealant located in between the window glass and the metal window pane.

measure to reduce exposure potential to the window glazing sealant until a long-term solution can be implemented. This interim measure was a combination of decontamination procedures followed by an encapsulation of the glazing sealant.

Following submittal of this draft plan, the following activities have been continued or conducted in support of EPA's review and approval:

- November 2009 – UMass personnel met with EPA personnel to review the plan and potential next steps in EPA's approval process. During this meeting, the topic of a Consent Agreement was discussed as a potential mechanism to manage the window glazing sealant and implement the Interim Measures plan;
- March 2010 – EPA provided a draft Consent Agreement to UMass for review. This has been followed by subsequent comments and discussions to the Agreement language;
- February – October 2010 – Additional monitoring of the pilot test areas (wipe and bulk sample collection and analyses) as well as implementation of an expanded pilot test of different products was conducted;
- November 2010 – Project status and informational meeting with building occupants and stakeholders;
- February 2011 – Revised draft Interim Measures Plan submitted to EPA; and
- May 2011 and January 2012 – Additional monitoring of the pilot test areas.

Currently, the results of subsequent testing have been used to modify the proposed interim measure, as detailed in this plan. Based on discussions with EPA, it is the intent for this plan to become an attachment or appendix to the Consent Agreement, which is the reason it has been prepared as a separate, stand alone document specific to the LGRC interior window glazing sealant.

1.2 PLAN ORGANIZATION

This Interim Measures Plan is organized into the following six sections:

Section 1: Introduction (This section)

Section 2: Initial Assessment and Screening of Remedial Alternatives

A summary of the previously collected data and screening of remedial alternatives to address removal of the interior window glazing sealant is provided and discussed.

Section 3: Pilot Testing

A summary of pilot test activities conducted between July 2009 and January 2012 is provided including a data review of different cleaning products and primary and secondary barriers.

Section 4: Interim Measure Implementation

This section provides a summary of the selected interim measure including the products to be used, initial inspections, and verification testing of the selected measure.

Section 5: Long Term Maintenance and Monitoring

This section provides a description of the proposed long-term maintenance and monitoring activities to be implemented following the interim measures. Details of routine inspections and testing, action levels and corrective measures, training requirements, reporting, and communications are provided.

Section 6: Schedule

This section provides a schedule and timing for the implementation of the interim measures and a discussion on overall timing for window removal and replacement.

2. INITIAL ASSESSMENT AND SCREENING OF REMEDIAL ALTERNATIVES

The results from the initial data collected to assess the nature and extent of the interior window glazing sealant and an initial screening of potential remedial alternatives is presented in this section.

2.1 INITIAL ASSESSMENT

As indicated previously, an initial assessment/data collection was completed in April and May of 2009. The results of these activities were presented in a "*Status Update - Interior Window Glazing"* memorandum submitted to EPA on July 10, 2009 and included as Appendix A of this plan (excluding analytical data, which was submitted in July 2009). A brief summary of these results is provided in the following paragraphs.

Results of the window inspections and inventory indicated that glazing sealant similar in appearance was observed on the majority of window joints throughout the low rise, the walkway, and Tower A. The glazing sealant was black in color and had very little plasticity. Below surficial portions, the material was observed to be softer and in one location (glazing sample location LGRC-GZ-008 High Rise Location) an increase in the overall plasticity was observed. In general, the sealant appears in good condition; there are some areas (e.g., bottom frame exposed to direct sunlight) that exhibit signs of deterioration. Based on window construction drawings and field observations, the glazing sealant appears to be present on both the interior and exterior sides of the window glass and on all four sides of the window glass and the metal pane.

In addition to the interior inspection, an inventory of windows was taken from the outside of the low rise and Tower A buildings to develop an estimate of number of windows and approximate total linear footage of windows on each building. Total linear footage of windows was calculated based on the dimensions of the inspected windows and the exterior window inventory. There are also some windows that are located solely within the interior of the buildings (e.g., no window face exposed to the exterior of the building). Approximately 900 separate window units are present throughout the buildings with about 500 windows in the low rise building and 400 windows in Tower A representing over approximately 20,000 linear feet of glazing sealant.

A standard window construction was observed in the majority of windows in both the low rise building and Tower A of the high rise. Within this standard construction, a variety of window sizes and shapes were noted. Windows were typically constructed of metal framing set back approximately 1 inch from the face of interior walls. At the base of the majority of windows a tile or stone shelf/ledge was observed ranging in width from 6 to 12 inches. For windows at which the ledges were present, the majority also had vents associated with the building's HVAC system either directly next to or adjacent to the window units. Windows on the walkway connecting the low rise to high rise building were constructed in a similar manner; however, window ledges were not observed. In addition, repair caulking/sealant material was observed on windows throughout portions of the walkway as an apparent temporary patch due to past leakages.

During the inspection, some windows with slightly different construction were observed on the first floor of the library and in the walkway. These windows were visibly different in two ways; the type of metal stripping in place perpendicular to the window face and the type of material present in the joints. The subject joints surrounding each of these windows contained a black repair caulking/sealant material, which was highly plastic and generally found to be in good condition. Inspection of the joints was not able to determine whether black glazing sealant was present beneath the repair caulking/sealant. Given this condition, two samples of this repair caulking/sealant were collected and analyzed for PCBs. The results indicated concentrations of total PCBs of 82.2 and 129 ppm, which were lower than the glazing sealant sample results. Given these concentrations, these materials are planned to be managed the same as the glazing sealant found on the majority of the windows.

A gasket material was also observed on select windows during the interior window inspections. The gasket material was a black, rubberized material. The width of the gasket varied between ⅛ inch and ¼ inch wide. The gasket material was observed on doors and windows of the main building entrances and windows adjacent to the low rise main stairwell. Gasket material was also observed on the main library entrance windows. Given the nature of this material and window/door construction, samples were not collected for analyses and it is assumed that PCBs would not be present in this molded, rubber.

Photographs of typical window units are provided below.

Library Conference Room 365A

Typical Window Joint with Glazing Sealant

Based on the current understanding of the LGRC buildings and their use, potential receptors to interior window glazing sealant include adult workers within the buildings (UMass staff) and college-age students, including graduate students. No children would be present in the inside of the buildings, except during short duration visits to the library or with UMass staff.

Potential transport pathways for PCBs from the glazing sealant include deterioration or weathering and generation of dust or particulate matter that may become airborne or deposit on an interior building surface. Potential exposure pathways include:

- Inhalation of indoor air that may contain PCBs;
- Dermal contact; and
- Incidental ingestion following dermal contact (e.g., hand to mouth contact) with PCBs present as particulate matter on surfaces.

In summary, the results of the initial data collected indicate the following:

- Interior window glazing sealant on the majority of the windows at the low-rise and Tower A contain PCBs in excess of 50 ppm and up to 2% chrysotile asbestos (average PCB concentration is 9,660 ppm);
- Overall, the glazing sealant appears in good condition and is present at over 900 separate window units throughout the buildings representing approximately 20,000 linear feet. There are some areas (e.g., bottom frame exposed to direct sunlight) that exhibit signs of deterioration;

- Potential transport and exposure pathways for the PCB containing glazing sealant to potential receptors include direct contact and/or generation of dust or particulate matter that may become airborne or rest on interior surfaces; and
- Existing data indicate minimal PCB exposures to building occupants:
  - All post Exterior Building Abatement Project indoor air samples (July 2008 and May 2009) collected from Tower A and the low-rise building show a decrease in concentration with time compared to the samples collected during the Exterior Building Abatement Project. As a general comparison, all indoor air results (2008 and 2009) were below EPA's recently published public health levels of PCBs in school indoor air[2]. EPA's comparable level for the LGRC buildings is the level published for students age 19 and over and adults, which is 450 nanograms per cubic meter (ng/m^3). The July 2008 data reported an average indoor air concentration of 213 ng/m^3 with the highest concentration reported as 256 ng/m^3. The May 2009 data reported an average indoor air concentration of 71 ng/m^3 with the highest concentration reported as 160 ng/m^3.
  - Interior surface wipe samples collected during the Exterior Building Abatement Project exhibited higher concentrations of PCBs on the window ledges than on other interior surfaces (tables, desks, etc.). The majority of the sample results were below EPA's high occupancy criteria of 10 µg/100cm^2. Surface cleaning of the ledges has been shown to be effective in reducing PCB concentrations. All 19 post Exterior Building Abatement Project samples and the June 2009 window ledge wipe samples were below EPA's high occupancy criteria of 10 µg/100cm^2.

2.2 INITIAL SCREENING OF REMEDIAL ALTERNATIVES

Based on a review of the existing data, the glazing sealant is not likely to represent a continuing significant source of PCBs to either indoor air or surfaces not in direct contact with the sealant. However, given that the glazing sealant contains PCBs at concentration greater than 50 ppm in a non-totally enclosed manner, it is considered an unauthorized use per 40 CFR Part 761.

As part of a decision process given the above information, an initial screening of alternatives to remove the glazing sealant was performed. The two alternatives screened for the complete removal and off-site disposal of the sealant included:

- Disassemble the window unit, remove sealant and window, decontaminate window unit, replace window with existing glass; or
- Remove entire window unit and replace with new window.

Each alternative was screened based on the following criteria:

- Effectiveness – An evaluation of the method's effectiveness in meeting the remedial goals based on experience and reliability of the method;
- Implementability – An evaluation of the logistical issues for each alternative including availability of personnel and equipment, site-specific features, health and safety concerns, volume of waste generated, etc.; and
- Cost – Budgetary/planning level costs were estimated to aid in the direct comparison of methods.

[2] Public Health Levels for PCBs in Indoor School Air, EPA, September 2009.

A summary of this initial screening evaluation is presented on Table 2-1. As indicated on this table, source removal and decontamination of the window units would not be an effective alternative; therefore, the alternative for source removal is considered to be a window replacement project.

2.3 SUMMARY AND CONCLUSIONS

As indicated previously, there are over 900 windows within the buildings and UMass does not have any current capital plans or approved funding for window replacement in these buildings at this magnitude as a stand-alone project. Recent indoor air and interior surfaces data indicate minimal PCB exposure potential to building occupants. Given this information, it is proposed to implement an interim measure to reduce exposure potential to the PCB containing glazing sealant until a long-term solution can be implemented. This approach is consistent with *EPA's Current Best Practices for PCBs in Caulk - Interim Measures for Assessing Risk and Taking Action to Reduce Exposures, October 2009*.

Based on the initial assessment, the proposed interim measure consists of the following three components:

- Removal of dust and debris from the window units using a vacuum equipped with HEPA filtration followed by a general cleaning of the window units and surrounding surfaces using a standard industrial/commercial cleaner;
- Containment of the glazing sealant through a barrier/encapsulating material to eliminate/reduce potential exposures; and
- Implementation of a monitoring program to verify effectiveness of the interim measure.

To aid in determining the specific products to be implemented and their effectiveness as an interim measure, pilot test activities are being conducted and are described in the next section. Additional discussion on the timing of the interim measure and eventual window (source material) removal is presented in Section 6 Schedule.

3. PILOT TESTING

Commencing in July 2009, pilot testing activities have been conducted on windows in the LGRC complex to assess proposed techniques for cleaning windows, window frames, ledges, and surrounding areas and techniques for containing/encapsulating interior window glazing sealant. The tests were designed to evaluate: effectiveness in achieving the interim measure goals; practicality of application and use; level of effort required to implement the alternative; and the final appearance of the window unit. A remediation contractor (Triumvirate Environmental) and a specialty coatings contractor (P.J. Spillane Co.) supported the pilot testing activities.

3.1 GENERAL CLEANING

Three windows on the third floor of the library (low-rise) and one window on the third floor of the Tower A high rise building were selected for the pilot test, which was conducted on July 9, 2009. At each location, following preparation of the pilot test area (polyethylene sheeting, barrier tape, removal of moveable furniture, etc.), a general cleaning using standard industrial cleaners of the window and adjacent surfaces was conducted to:

- Removal all visible dust and debris;
- Reduce the concentrations of PCBs on non-porous accessible surfaces to below the clean up level of 10 µg/100cm^2; and
- Prepare the surfaces for application of the selected containment encapsulant.

General cleaning consisted of the following three components: 1) removal of loose glazing sealants; 2) vacuuming of each window, window frames, blinds (when present), and ledges as well as the recessed areas and heating ducts beneath each window; and 3) application of a cleanser. Three types of cleaners were tested (Simple Green All Purpose Cleaner, Klean Strip TSP Plus, and IAQ 2000 non-phosphate cleaner). The effectiveness of the cleaning was verified via visual observations/inspections and verification wipe samples collected from the window ledges beneath the three pilot test areas representing the three different types of cleaners. Analytical results indicated that the concentrations of PCBs in wipe samples collected were below the high occupancy clean up level of 10 µg/100 cm^2. Reported concentrations ranged from 0.5 to 1.0 µg/100 cm^2. Laboratory data reports are provided in Appendix B.

As shown below, results of the evaluation indicate that all three of the cleaning products were effective and easily implementable; however, based on slight odor issues and final appearance of the windows, the Klean-Strip TSP Plus cleaner was retained for use during the full-scale implementation of the Interim Measure. A summary of the findings are presented in the table below.

Table 3-1: Results of the Pilot Test Activities – Cleaning Product Evaluation

Cleaning Product	Effectiveness	Implementability	Aesthetics/Other	Retained for Use
HEPA Vacuum	Majority of dust and debris removed	Good; smaller vacuum tip used in some areas	Dust controlled through HEPA	Yes
Simple Green All Purpose Cleaner	Good; window ledge wipe = 0.5 µg/100 cm^2	Good; efficient process	Strong odor in immediate area; residual film remained on glass	No
Klean-Strip TSP Plus	Good; window ledge wipe = 0.9 µg/100 cm^2	Good; efficient process	Slight odor in immediate area	Yes

Cleaning Product	Effectiveness	Implementability	Aesthetics/Other	Retained for Use
IAQ 2000 Industrial Cleaner	Good; window ledge wipe = 1.0 µg/100 cm^2	Good; efficient process	Moderate odor in immediate area; residual film remained on glass	No

3.2 INSTALLATION OF CONTAINMENT BARRIER

Containment of either the window glazing alone or both the glazing and window frame was evaluated through the application of three different types of products as described below. During the pilot test, specific observations were noted for each option and included: product specifications for surface preparation; application time (time per linear foot); odors and cure times; adhesion of selected encapsulant to the glazing sealant and metal surfaces; ease of application; overall effectiveness at encapsulating glazing sealant and frames as applicable; and final appearance.

Each option was evaluated on two primary considerations:

- Results of verification wipe testing to assess the concentration of PCBs on the surface of the encapsulant (remedial goal of ≤ 1 µg/wipe); and
- Practicality of application and final aesthetics.

The three types of products included:

- *Caulking/Sealant:* A bead of caulking/sealant was applied to the existing metal to glass joint over the existing glazing sealant. The bead was of sufficient width to allow for full coverage of the existing sealant and joint. The following products were tested – Dow 795 Silicone caulk; Phenoseal Vinyl caulk; DAP Acrylic caulk, and DAP 3.0 Silicone caulk.
- *Molded Silicone Seal:* A molded silicone adhesive barrier (Dow-1,2,3 Silicone Seal) was applied over the existing glazing sealant and window frame. The application is conducted by first applying a bead of silicone sealant along each edge to be covered and then the barrier is applied and rolled smooth.
- *Acrylic Paint/Coating:* An acrylic paint (SW DTM Acrylic paint) was applied to the glazing sealant and window frames. Prior to application, window units and frames were taped as required to prevent the spread of paint to window glass and outer vertical frames.

Following the cleaning process described above, the selected sealant was applied to either the glazing sealant or the glazing sealant and window frames. On July 14, 2009, following a five day curing period, wipe samples were collected from the surface of the sealants and any exposed portion of the window frames to evaluate the sealant's effectiveness. Analytical laboratory reports are provided in Appendix B. A summary of the analytical results is provided in the table below:

Table 3-2: Summary of Initial Wipe Sample Results – Pilot Test

Product	Sample ID	Total PCB Concentrations (µg/wipe)	Sample Area (cm^2) and material
Dow 795 Silicone Caulk	LGRC-PT-WP-007	6.0	100 (caulk and frame)
DAP Acrylic Latex Caulk	LGRC-PT-WP-008	1.1	100 (caulk and frame)

Product	Sample ID	Total PCB Concentrations (µg/wipe)	Sample Area (cm2) and material
PhenoSeal Vinyl Caulk	LGRC-PT-WP-009	0.6	100 (caulk and frame)
Dow 1-2-3 Silicone Seal	LGRC-PT-WP-006	1.6	100 (seal only)
Acrylic Latex Paint	LGRC-PT-WP-005	4.3	100 (painted surface)

As indicated on the table above, analytical results indicate that the concentrations of PCBs ranged from 0.6 to 6.0 µg/100 cm^2, which indicated that PCBs were present on the surfaces at four of the five wipe locations at concentrations > 1 µg/wipe. However, as noted above, the wipe samples for the caulk products tested were collected from both the surface of the sealant and the exposed portions of the window frames. There is a potential that the detection of PCBs were associated with PCBs on the adjacent metal window frame and/or the sealant had not cured effectively. For the silicone seal, analytical results indicated that PCBs were present at a concentration of 1.6 µg/100cm^2. However, given that migration of PCBs through the silicone stripping was not considered likely in this short duration, the results of the analysis (only one sample) were considered to be inconclusive.

As described above, the evaluation of the different containment products focused on the effectiveness of the product in containing PCBs, the implementability of the product, and aesthetics and impacts to surrounding spaces. Observations made during the pilot test activities are presented on Table 3-3 and summarized in Table 3-4 below.

Table 3-4: Results of the Pilot Test Activities – Encapsulation Product Evaluation

Encapsulant	Effectiveness	Implementability	Aesthetics	Retained for Additional Consideration
DOW 1-2-3	Inconclusive	Fair	Fair	Yes
DOW 795 Silicone Caulk	Inconclusive	Good	Good	Yes
DAP Acrylic Latex Caulk	Inconclusive	Good	Good	Yes
PhenoSeal Vinyl Caulk	Poor	Good	Poor - shrinking	No
Sherwin William Acrylic Paint	Poor	Poor	Poor –streaking, partial coverage	No

The initial evaluation was effective in eliminating two products for additional consideration. The acrylic latex paint was eliminated due to ineffectiveness in encapsulating the PCBs, significant labor required to apply the paint, and aesthetic considerations. The vinyl caulk was eliminated due to significant shrinkage observed following curing of the product and other aesthetic considerations.

Based on the initial wipe samples of the sealant and silicone seal, additional testing of the effectiveness of two of the retained products (Dow 1-2-3 silicone seal and Dow 795 silicone caulk) was conducted to determine if the reported concentrations of PCBs from the initial wipe samples were due to residual PCB impacts from the uncovered metal window frames, the migration of PCBs through the encapsulants after application, or any changes based on additional cure time, and to increase the number of samples to more fully evaluate these products.

Additional wipe samples were collected from these products on July 20, 2009. In addition, wipe testing of a second silicone caulk product, DAP 3.0 Clear Silicone, was conducted to evaluate a second silicone product. A modified wipe procedure was utilized due to the small width of the sample areas (approximately 1/4 - inch on the sealant and 3/8 - inch on the exposed window frames). At each location a hexane saturated gauze was folded and grasped using forceps. The gauze was then wiped across the sealant and/or window frame (separately), refolded, and wiped again in the opposite direction. Tape was applied to isolate the sealant from the frame and the sealant and frame were wiped with a soapy cloth and dried prior to sample collection (to remove any residual dust from the sample area).

A summary of the analytical results is provided in Table 3-5 below:

Table 3-5: Additional Wipe Test Sample Results

Product	Sample Location	Total PCB Concentrations (µg/wipe)	Sample Area (cm^2)
Dow 795 Silicone Caulk	Left side of window	<0.5	100
	Right side of window	0.7	100
	Base of window	1.0	100
Metal frame adjacent to Dow 795 Silicone Caulk	Left side of window	<0.5	150
	Right side of window	<0.5	150
	Base of window	<0.5	150
DAP 3.0 Silicone Caulk	Side of window	<0.5	37.5
Metal frame adjacent to DAP 3.0 Silicone Caulk	Side of window	0.533	37.5
Dow 1-2-3 Silicone Seal	Top of window	0.9	100
	Left side of window	0.7	100
	Right side of window	0.3	100
	Base of window	2.1	100

Analytical results indicated similar to lower concentrations of PCBs were detected in the samples compared to the initial results and support the finding that either the silicone caulk or silicone seal appear effective in containing PCBs given that all samples with exception of one sample, were $\leq$ 1 µg/wipe. The one sample was only slightly over 1 µg/wipe (2.1 µg/wipe).

Based on the three evaluation criteria, the silicone sealant was retained for continued monitoring while the Interim Measure approval process was on-going. A photograph depicting the contained glazing sealant by the silicone sealant is presented below.

3.3 CONTINUED PILOT TEST MONITORING

To evaluate the continued effectiveness of the silicone sealant, additional samples were collected in February, August, and September 2010. Wipe samples were collected following the wipe sample procedures described above. A summary of analytical results is presented on Table 3-6 and in the following sections. Laboratory reports are provided in Appendix B.

February 2010

Visual inspection indicated that the encapsulant was in good physical condition with no observed cracking, peeling, or discoloration of the sealant and no observed separation from the glazing and window frames.

Wipe samples were collected from the left vertical and lower horizontal Dow 795 caulked joints to allow for direct comparison to previous analytical results. This data represents 219 days from initial application. Analytical results indicated that the concentration of PCBs had increased since sealant application with reported PCB concentrations of 2.6 and 6.5 µg/100cm^2 as compared to concentrations of < 0.5 and 1.0 µg/100cm^2 in samples collected six days after installation of the sealant. Two wipe samples were also collected from the adjacent window frames. Both of these samples were non-detect for PCBs (< 0.5 µg /100cm^2).

These results indicated that the cleaning process and new sealant encapsulation utilized in the pilot test is maintaining its effectiveness at reducing PCB concentrations on accessible non-porous surfaces. Overall, these results indicate that the caulk is effective in reducing the concentrations of PCBs readily available for direct contact (e.g., low µg/wipe results compared to thousands of ppm in the underlying glazing sealant). Long-term monitoring will be used to monitor this effectiveness over time.

August 2010

To evaluate whether or not the results from the February round of sampling were indicative of an increasing trend in PCB concentrations in the sealant, additional wipe samples and a bulk sample were collected from the Dow 795 silicone sealant in August 2010 (413 days following initial application). To aid in determining if the extractant used in the wipe tests were influencing the data results, wipe samples were collected using hexane, isopropyl alcohol (IPA), and saline (to emulate typical direct contact by human skin).

A bulk sample was also collected by removing a portion of the Dow 795 sealant from the window and removing a thin layer of this caulking formerly in direct contact with the glazing sealant using a utility razor knife in order to ensure that only the silicone sealant was analyzed.

Visual inspection indicated that the encapsulant was in good physical condition with no observed cracking, peeling, or discoloration of the new sealant and no observed separation from the glazing and window frames.

Results of this testing indicated that the concentration of PCBs in the hexane wipe sample increased from 0.7 µg/100cm^2 six days after installation to 30 µg/100cm^2 413 days after installation. Results from the other wipe samples using different extractants indicated that the concentration of PCBs were 12 µg/100cm^2 in the sample collected with isopropyl alcohol and < 0.5 µg/100cm^2 in the sample collected with saline. Results from the bulk sample indicated that the concentration of PCBs was 604 ppm.

Three wipe samples of the adjacent metal window frames and one wipe sample from the window ledge were also collected for laboratory analyses. All results were non-detect for PCBs (< 0.5 µg/100cm^2).

This data indicates that PCBs have migrated into the new sealant following application and can be extracted out of this porous material using a hexane or IPA extractant. No PCBs were detected in the wipe sample using saline as the extractant, which suggests limited to no transfer of PCBs would be expected under a direct contact with human skin scenario.

September 2010

Based on the August results, additional evaluation of the DAP 3.0 Silicone Caulk and the DAP Acrylic Latex Caulk was conducted through wipe testing and bulk sample analysis. Wipe (using hexane) and bulk samples of each sealant were collected on September 28, 2010 following the procedures described above.

Analytical results from the wipe tests indicated that the concentration of PCBs in the DAP 3.0 silicone and the DAP Acrylic Latex caulking had increased over time from concentrations of < 0.5 and 1.1 µg/100cm^2 immediately after the full cure time to 1.7 and 2.1 µg/100cm^2, respectively (446 days after installation). These results were lower than observed at the Dow 795 caulk test area. Results from the bulk samples indicated that the concentrations of PCBs were 159 ppm in the DAP 3.0 Silicone and 1,100 ppm in the DAP Acrylic Latex caulking.

These data are consistent with the Dow 795 data, which indicates that new caulking is effective at covering the glazing sealant and reducing potential exposures (through direct contact or subsequent particulate migration); however, PCB migration into the newly applied caulk barrier is occurring.

3.4 SECONDARY BARRIER PILOT TEST

Given the PCB migration results into the new sealant described above, pilot testing of a secondary barrier that would be installed in between the new sealant and the glazing sealant was conducted. The working model for the PCB migration is that the initial migration of PCBs to the new sealant may be occurring during the initial "wet" application or while the material is curing and then a subsequent "wicking" effect over time. To prevent this direct contact point, a secondary barrier test, such as a tape installed in between the products to "block" this migration, was conducted.

Several products were evaluated based on the following criteria:

- Ease of application;
- Availability of appropriate standard width (the glazing sealant is approximately 1/8 – inch wide); and
- Bonding capabilities with glass, metal, and silicone or latex sealant.

Following a product review, two products were selected; a 5-mil thick soft aluminum foil tape and a 3-mil thick utility grade PVC tape.

For the pilot test, three windows were selected from the third floor of the LGRC low-rise library. The interior glazing sealant on each of the three windows was encapsulated using both tapes and one of the three caulking/sealants; Dow 795 black silicone, DAP 3.0 clear silicone, or DAP black acrylic latex. On each window, the foil tape was applied to the bottom horizontal joint and the PVC tape was applied to the right vertical joint. Following application, a new bead of the designated sealant was applied as the final encapsulant over the joints. For comparisons purposes to previous tests, a new bead of sealant was also applied to the left vertical joint directly to the glazing sealant (i.e., no secondary barrier).

Comparisons of the aluminum foil and PVC tapes indicated that both products were easy to apply and that each of the three sealant materials appeared to bond sufficiently to them. However, the PVC tape did not bond as well to the glass and could be moved following application and curing of the sealant through direct application of pressure to the sealant (as observed through the bead of clear silicone sealant).

Following a 9 day cure time, wipe samples were collected from the surface of the newly installed sealant on October 7, 2010. At each window, wipe samples (using hexane) were collected from each of the vertical joints and the lower horizontal joint following the sampling procedures described above. A summary of the analytical results is presented on Table 3-7 and provided below:

- Results from all samples collected from sealant installed over the aluminum foil tape and over the PVC tape were below the minimum laboratory reporting limit of 0.5 µg/100cm^2 (three samples of each product); and
- Results from the three samples collected from sealant installed directly to the glazing sealant without a secondary barrier indicated that PCB concentrations were 1.4 µg/100cm^2 (Dow 795 Silicone), < 0.5 µg/100cm^2 (DAP 3.0 Silicone), and 0.7 µg/100cm^2 (DAP Acrylic Latex).

To evaluate the continued effectiveness of the secondary barrier, additional samples were collected in May 2011 and January 2012. A summary of analytical results is presented on Table 3-7 and in the following sections. Laboratory reports are provided in Appendix B.

May 2011

Nine wipe samples were collected, one from each sealant and barrier configuration and submitted for PCB analysis. Samples were collected following the procedures described above. Analytical results from the wipe samples indicated that PCBs were non-detect (i.e., below the minimum laboratory reporting limit of 0.5 µg/100cm^2) in the six samples collected from sealant applied over the secondary barriers. Analytical results from the wipe samples collected from sealant applied directly to the glazing sealants indicated that the concentrations of PCBs were 1.3 (DAP 3.0 Silicone), 1.8 (DAP Acrylic Latex), and 6.4 µg/100cm^2 (DOW 795 Silicone).

These results were consistent with those collected nine days after installation of the secondary barriers indicating that this combination continues to be effective in encapsulating the PCBs (no PCBs present on the surface of the new sealant over the secondary barrier tape).

January 2012

Continued evaluation of the three sealants and secondary barriers was conducted through wipe testing on January 6, 2012. Wipe samples from the nine configurations were collected following the wipe procedures described above.

Analytical results from the wipe tests indicated that the concentration of PCBs in wipe samples collected from materials without the secondary barrier increased overtime from 1.4 µg/100cm^2 (Dow 795), < 0.5 µg/100cm^2 (DAP 3.0), and. 0.7 µg/100cm^2 (DAP Latex) nine days after application to 3.5, 4.4, and 1.2 µg/100cm^2, respectively 465 days after installation. Data also indicated that PCBs were reported at concentrations above the minimum reporting limits in two of the three samples associated with both the aluminum and PVC tape secondary barriers; however, the concentrations reported were below those reported for areas without the secondary barriers installed.

Conclusions

The results of the monitoring completed to date indicate:

- The application of a new sealant over the glazing sealant continues to reduce the level of PCBs available for direct contact. The use of secondary barriers (PVC or aluminum tape) between the glazing sealant and the new sealant further reduces the levels of PCBs; PCB concentrations were either non-detected or detected at low levels in wipe samples collected from the surface of the sealant with the secondary barrier.
- Higher concentrations of PCBs were detected in the samples collected from the sealant without the secondary barrier than those with the secondary barrier.
- Based on aesthetic considerations, durability, longevity, and implementation, as well as the performance data collected to date, the silicone sealant (Dow 795 black or DAP 3.0) with the aluminum tape as the secondary barrier is the preferred combination for encapsulation.

3.5 PILOT TEST CONCLUSIONS

Results of the pilot test activities indicated that:

- Remedial goals for removal of dust and debris (as confirmed by visual inspection) from all accessible areas and within the heating ducts can be achieved by vacuuming with HEPA controls. Remedial goals for the recessed areas beneath each window (as confirmed by visual inspection) can be achieved by using a combination of vacuuming and cleaning and allowing cleaner to soak in the recessed area prior to removal/wiping;
- Remedial goals for the windows, window frames, and surrounding surfaces can be achieved (as confirmed by visual inspection and verification wipe sampling of window ledges and window frames) using the industrial/commercial cleaner - Klean-Strip TSP Plus cleaner; and
- Remedial goals to reduce direct contact and reduce exposure potential to the window glazing sealant until a long-term solution can be implemented can be achieved through the use of an overlying barrier system (i.e., new sealant application with an aluminum tape secondary barrier over the existing window glazing sealant).

In order to evaluate the continued effectiveness of the secondary barrier, additional inspections and wipe sampling of the pilot test locations will be performed over time. Specifically, as part of the National Institute of Health (NIH) renovation project in Tower A, the interim measures will be conducted on the elevator lobby windows and wipe samples will be collected and monitoring will be performed at these windows.

4. INTERIM MEASURE IMPLEMENTATION

4.1 SELECTED INTERIM MEASURE

The Interim Measure will be implemented on all windows with PCB-containing glazing sealant within the LGRC low rise and Tower A buildings. The specific components and remedial goals of the interim measure to be implemented are:

- General cleaning of the window units and surrounding surfaces via removal of dust and debris using a vacuum equipped with HEPA filtration followed by cleaning of surfaces with a standard industrial/commercial cleaner (Klean-Strip TSP Plus):
  - Removal of dust and debris to the maximum extent practical to be confirmed through visual observations; and
  - Surrounding accessible areas (window ledges) to achieve the high occupancy clean up level of $\leq$ 10 µg/100cm^2.
- Containment of the glazing sealant through the installation of barrier/encapsulating materials (aluminum foil tape followed by a bead of silicone sealant) to reduce potential direct contact exposures:
  - Covering of existing glazing sealant to be confirmed through visual observations; and
  - Remedial goal is to achieve $\leq$ 1 µg/wipe on the exposed surface of newly applied sealant.
- Implementation of a monitoring program to verify effectiveness of the interim measure.

A description of each component is provided in the following sections.

4.2 WINDOW CLEANING

The general cleaning process will serve two functions:

- To reduce the concentrations of PCBs on accessible surfaces to below the clean up level of 10 µg/100cm^2; and
- To prepare the surface of the glazing sealant and windows for application of the containment barriers.

Cleaning activities will focus on two primary aspects:

- Removal of dust and debris using a vacuum equipped with a HEPA ventilation system; and
- General cleaning of surfaces with a standard industrial/commercial cleaner.

A remediation contractor, who specializes in this type of decontamination work, will be retained to perform the cleaning activities. All work will follow applicable Federal and State regulations including OSHA regulations, respiratory protection, personal protective equipment, etc. A project specific health and safety plan will be prepared and followed for all work activities. All work areas will be cordoned-off and contained during active work activities. Access to the work areas will be controlled through barriers, signage and controlled access points.

A general cleaning of each window, window frame, window ledge, and recessed area beneath each window will be conducted by an initial vacuuming of all surfaces followed by the use of the selected cleaner (Klean-Strip TSP Plus). Any loose glazing sealant will be removed during this cleaning to prepare for the new sealant installation. Intact glazing sealant will remain in place. Heating ducts and flooring immediately beneath each window will be cleaned by vacuuming accessible areas. Due to the presence of asbestos in the glazing sealants, standards of practice for asbestos abatement will be incorporated into the cleaning and surface preparation steps including the use of polyethylene cover on surrounding areas and wet removal techniques.

Contaminated rags, cleaning material, and vacuum debris will be placed in appropriately marked drums or containers for disposal as ≥ 50 ppm PCB wastes to a landfill permitted to accept the wastes. Prior to off-site disposal, all waste materials will be marked and stored consistent with 40 CFR 761.40 and 40 CFR 761.65. Given that the glazing sealant also contains asbestos, this material will also be managed and disposed of as asbestos-containing material. Following cleaning, a checklist sheet will be posted indicating that the subject area has been cleaned. The Engineer or designee will then conduct the visual inspection and sign-off that the area is clear for the new caulk installation.

4.3 CONTAINMENT OF PCB CONTAINING WINDOW GLAZING SEALANT

The interior glazing sealant is to be contained/encapsulated through the application of a 5-mil thick soft aluminum foil tape followed by a bead of silicone sealant along the glass to window frame joint covering the existing glazing sealant. Following the cleaning process, a final dry wipe of the joints will be conducted to remove any residual cleaners from the surface. A contractor, who specializes in this type of work, will apply a layer of aluminum foil tape to the existing metal to glass joint over the existing glazing sealant. Following application of the tape, a bead of silicone sealant will be applied to the joint. The bead will be of sufficient width to fully cover the aluminum tape and joint.

Following new sealant installation, the posted checklist sheet will be updated indicating that the new sealant and tape has been installed in the subject area. The Engineer will then conduct the visual inspection and verification or baseline sampling (see below).

4.4 VERIFICATION AND BASELINE SAMPLING

Verification of the cleaning process will be conducted through visual confirmation of dust and debris removal from accessible areas within the heating ducts and recessed areas beneath the windows and through the collection of wipe samples from window ledges. Verification of the containment process will be conducted through visual inspection to confirm that the glazing sealant has been covered with the tape and that the tape has been covered with the new sealant. In addition, following curing, baseline wipe samples of the newly applied sealant and metal window frame will be collected to evaluate its effectiveness and establish a baseline for long-term monitoring. The verification samples from the window ledges will also be used to establish the baseline data set for implementation of the analytical testing portions of the long-term maintenance and monitoring plan.

Based on the previous window ledge and pilot test data, wipe sample locations will be selected at an approximate frequency of 5%, which is specifically described for each of the major portions of the LGRC below.

Library Windows:

Within the low rise library, windows are present in common areas of all three floors on the south side of the building, but only on the third floor on the north side of the building (north side windows on the second floor have been included in the walkway windows). Based on a maximum of 70 windows per floor (total number of windows on the third floor) and the 5% frequency, four wipe sample locations will be selected from each of the three floors. All 12 wipe sample locations will be selected from common areas within the library with the specific window and location randomly selected as described below.

Low-Rise North Wing Windows:

Within the north wing of the LGRC, the majority of windows are located on the east and west building elevations. Limited numbers of windows are located within stairwells and at interior locations on the first and second floors. Based on the total number of windows per floor and the 5% sample frequency, the following number of wipe sample locations are scheduled to be selected:

- First Floor (103 individual windows) – 6 sample locations;
- Second Floor (128 individual windows) – 7 sample locations; and
- Third Floor (145 individual windows) – 8 sample locations.

The specific window and location will be randomly selected as described below.

High-Rise Windows:

Within the Tower, there is a total of 14 floors with windows located in laboratory settings (14 windows per floor), and in the elevator lobby areas (two sets of windows per lobby). Based on the number of windows per floor (16 windows) and the 5% sample frequency, one wipe sample location will be selected from each floor.

Based on the transitory nature of the elevator lobby areas in comparison to the laboratories, the majority of the sample locations will be selected from the laboratory windows. The specific window and location will be randomly selected as described below. Of the 14 sample locations, ten will be selected from laboratory windows and four will be selected from elevator lobby area windows.

Walkway Windows:

Two walkways are present within the subject area, one connecting the LGRC Low Rise building to the LGRC High Rise Tower and one connecting the LGRC High Rise Tower to the Goessmann Building to the south. There are a total of 82 windows on the walkways, 58 on the walkway between the low rise and high rise buildings and 24 on the walkway between the high rise and Goessmann building. Based on the number of windows and the 5% sample frequency, four wipe sample locations will be selected from the walkways.

Based on the transitory nature of the stairwells within the buildings, wipe samples are not planned to be collected from stairwell windows at this time; however, if results from the proposed wipe testing of other windows indicate that PCBs are present at concentrations above the action levels, the inclusion of the stairwell windows will be re-evaluated.

At each of the 51 locations, two wipe samples will be collected for a total of 102 individual wipe samples. The two samples at each location will consist of a sample of the adjacent window ledge (verify window cleaning of adjacent surfaces task) and a sample of the newly applied sealant/adjacent window frame (baseline data to evaluate encapsulant effectiveness).

The locations of the wipe samples will be randomly selected as follows:

- Each window unit will be assigned a number based on the total number of units in the space;
- The window unit will then be selected using a random number generator; and
- The location of the wipe sample will be randomly selected based on the total width of the window frame or window ledge beneath the selected window unit.

Further details regarding the sampling are provided below.

- Wipe samples will be collected in accordance with the standard wipe test method as described in 40 CFR 761.123. At each sample location, a 2-inch square gauze pad, saturated with hexane, will be wiped across a 100 square centimeter template area. Due to the narrow width of some of the surfaces, wipe samples will be collected using a modified sampling procedure to ensure a 100 square centimeter area is sampled. The wipe will be folded and grasped using forceps and wiped across the surface, refolded, and wiped again in the opposite direction;
- All samples will be transported to the laboratory under standard Chain of Custody procedures, extracted using USEPA Method 3540C (Soxhlet extraction), and analyzed for PCBs using USEPA Method 8082;
- In addition to the primary samples indicated above, duplicate samples and field equipment blanks will be collected at a frequency of one per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection procedures;
- Upon receipt of the analytical results and data validation, the verification sample data of the window ledges will be compared to the clean-up levels:
  - If $\leq$ 10 µg/100 cm^2 – the clean-up will be considered complete;
  - If > 10 µg/100 cm^2, additional cleaning of surfaces represented by the verification sample will be conducted as described above and verification samples collected at the frequency indicated above using offset sampling locations; and
  - Given the use of the building for classroom, library, laboratory space, and office uses, a high occupancy use cleanup level, as indicated above, will be applied for the window frame and adjacent surfaces (non-porous surfaces). However, it is noted that the windows frames and ledges would not routinely be contacted on a frequent basis given their location and accessibility (especially in the Tower A laboratories where laboratory benches are frequently installed in front of the windows). It is noted that all post-cleaning wipe samples from the window ledges to date have been either non-detect (with reporting limits < 1 ug/100cm^2) or detected at concentrations ≤ 1 ug/100cm^2.
- The results of this initial wipe sampling of the newly applied sealant will be used to support the long term monitoring and maintenance program (refer to the next section).

4.5 REPORTING

A completion report will be submitted within 90 days of completing the Interim Measure activities. The completion report will include a description of the completed activities, verification analytical results (with laboratory reports), and copies of waste manifests and disposal documentation.

4.6 DEED NOTICE

A deed notice will be prepared, complying with the requirements of 40 CFR 761.61(a)(8), to communicate the location and encapsulation of the PCB-containing interior window glazing sealant. A certificate of recordation will be submitted to EPA within 60 days of completion of the Interim Measure.

5. LONG TERM MAINTENANCE AND MONITORING

This long term monitoring and maintenance implementation plan (LTMMIP) presents the monitoring and maintenance activities that will be conducted to assess the long-term effectiveness of the encapsulant applied to interior window glazing sealant as an interim measure within the LGRC Tower A and low rise buildings.

5.1 BASELINE SAMPLE SUMMARY

As indicated in the previous sections, baseline samples have been or will be collected to compare to the long term monitoring data to be collected following implementation of the Interim Measure. This data includes:

- Accessible non-porous surfaces – 51 wipe samples from adjacent window ledges following cleaning;
- Encapsulated surfaces – 51 wipe samples from the encapsulated glazing sealant following aluminum foil tape covered by new silicone sealant application; and
- Indoor air – 11 indoor air samples collected in May 2009 from representative locations throughout the LGRC Tower A and low rise building.

5.2 INSPECTION AND MONITORING ACTIVITIES

Initially, the long term monitoring activities at the LGRC complex will be conducted on an annual basis. These activities will be completed by June 30th of each year. Representative surface wipe samples of encapsulated and non-porous surfaces and indoor air samples will be collected for laboratory analyses. In addition to sampling, a visual inspection of the encapsulated surfaces will be conducted at this time. As described further below, pending the results of these activities, the frequency of inspection or monitoring may be modified over time. This modification request will be made in the report prepared documenting the results of the monitoring and maintenance activities.

5.2.1 Visual Inspections

Visual inspections of the encapsulated surfaces will be conducted at the LGRC Tower A high rise and low rise buildings. The inspections will consist of an assessment of the following:

- Physical condition of the new caulk (cracking, peeling, discoloration, etc.);
- Signs of separation between the silicone sealant and the glazing sealant, window frame, or glass;
- Signs of disturbance of the new sealant; and
- A general inspection of the surrounding areas.

The specific windows to be visually inspected will include the window unit randomly selected for sampling (see below method) plus the window units on both sides of the selected window (total of three windows per sample location). Upon completion of the visual inspections, corrective actions will be implemented, if needed, as described below. All inspections will be recorded and included in the report to the EPA. This report will include a recommendation for continuing or refining the inspection frequency based on the results.

5.2.2 Accessible Non-Porous Surfaces

Fourteen (14) surface wipe samples will be collected from representative locations on the accessible non-porous surfaces cleaned as part of the interim measures (window ledges). In general, samples will be collected in accordance with the verification and baseline sampling program described above. The specific location of each sample will be randomly selected as follows:

- Library Windows: One wipe sample will be collected from each floor of the library (total of 3 wipes);
- Low-Rise North Wing Windows: One wipe sample will be collected from each floor (total of 3 wipes);
- High-Rise Windows: One wipe sample will be collected from every other floor (total of 7 wipes); and
- Walk Way Windows: One wipe sample will be collected from the walkways (total of 1 wipe).

Specific windows for the wipe samples will be selected from random locations following the procedures described in Section 4.4. Further details regarding the sampling are provided below.

- Wipe samples will be collected in accordance with the standard wipe test method as described in 40 CFR 761.123. At each sample location, a 2-inch square gauze pad, saturated with hexane, will be wiped across a 100 square centimeter template area. Due to the narrow width of some of the surfaces, wipe samples will be collected using a modified sampling procedure to ensure a 100 square centimeter area is sampled. The wipe will be folded and grasped using forceps and wiped across the surface, refolded, and wiped again in the opposite direction;
- All samples will be transported to the laboratory under standard Chain of Custody procedures, extracted using USEPA Method 3540C (Soxhlet extraction), and analyzed for PCBs using USEPA Method 8082; and
- In addition to the primary samples indicated above, duplicate samples and field equipment blanks will be collected at a frequency of one per 20 primary samples and submitted to the laboratory as part of the QA/QC procedures associated with the sample collection procedures.

Upon receipt of the analytical results and data validation, the sample data will be compared to the action levels as described below and documented in the report submitted to EPA. This report will include a recommendation for continuing or refining the sample frequency based on the results.

5.2.3 Encapsulated Surfaces

Fourteen (14) surface wipe samples will be collected from the same window units as described above for the accessible non-porous surfaces. Samples will be collected from the newly applied sealant/window frame consistent with the baseline sampling program and methods described in Section 4.4 and above.

Upon receipt of the analytical results and data validation, the sample data will be compared to the action levels as described below and documented in the report submitted to EPA. This report will include a recommendation for continuing or refining the sample frequency based on the results.

5.2.4 Indoor Air

On May 26, 2009, eleven indoor air samples were collected from representative locations throughout the LGRC Tower A high rise and low rise buildings. In summary, analytical results indicated that the concentrations of PCBs reported in the samples ranged from 33 to 160 ng/m^3. These results were lower than the results from the July 2008 post-abatement air sampling results, which ranged from 101 to 269 ng/m^3. The results were also below EPA's September 2009 public health levels of PCBs in school indoor air for ages 19 plus and adults (set at 450 ng/m^3). The results from the May 26, 2009 will be used as the baseline data for indoor air results.

Eleven indoor air samples and one ambient outdoor sample will be collected from representative locations throughout the LGRC Tower A and low rise buildings. In general, indoor air samples will be distributed in a manner consistent with the 2009 baseline sampling event. Indoor air samples will be collected from Tower A high rise (five samples), the north wing of the low rise (one sample per floor), and the library (one sample per floor). Specific locations within each area will be based on the locations of previous air samples collected in 2009 and distribution throughout the LGRC complex to obtain representative data from rooms of varying uses (classrooms, office space, etc.). Prior to sample collection, and within 60 days of the effective date of the CAFO, a work plan for the initial air monitoring will be submitted to EPA for approval.

Air samples will be collected in accordance with USEPA Compendium Method TO-10A *"Determination of Pesticides and Polychlorinated Biphenyls In Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)"* and submitted for laboratory analysis of PCBs homologs. At each of the sample locations a low volume PUF cartridge will be connected to a personal air pump (SKC AIRCHEK Sampler or equivalent) with flexible tubing. The cartridge will be positioned at the appropriate height using a telescoping tubing stand or placed on a desk or table.

To achieve the desired minimum laboratory reporting limit of 50 nanograms/m^3, samples will be collected at a rate of 2.5 L/min for two hours for a total sample volume of 300 liters. The flow rates will be set by the equipment rental supply company prior to delivery and verified and adjusted as needed in the field using a BIOS digital flow rate calibrator or equivalent. Atmospheric information (ambient temperatures and barometric pressures) will be obtained from a portable commercially available weather monitoring station (indoor conditions) and from on-line sources from the nearest monitoring station (outdoor conditions). Pumps and flow rates will be monitored periodically throughout the sample collection period and observations will be recorded. One duplicate sample will be collected as part of the overall project QA/QC measures. The duplicate sample will be collected in an identical manner to the primary samples. At the end of the required sample interval, the pump will be shut off and the cartridge will be placed in aluminum foil, labeled, and placed on ice for delivery to the analytical laboratory.

Upon receipt of the analytical results and data validation, the sample data will be compared to the action levels as described below and documented in the report submitted to EPA. This report will include a recommendation for continuing or refining the sample frequency based on the results.

5.3 ACTION LEVELS AND CORRECTIVE MEASURES

A combination of visual inspections and laboratory sample results will be used to verify the continued effectiveness of the interim measure. Upon receipt of the laboratory results after each monitoring round, the data will be compared to the following action levels to determine whether additional monitoring or corrective measures are needed.

- For accessible non-porous surfaces cleaned as part of the interim measures:
    - If $\leq$ 10 µg/100 cm^2 – no additional action, long term maintenance and monitoring to continue in accordance with this plan.
    - If > 10 µg/100 cm^2 – additional cleaning of surfaces represented by the verification sample will be conducted as described in the Interim Measures Plan and verification samples collected at the frequency indicated above using offset sampling locations.
- For encapsulated surfaces:
    - If ≤ 1 µg/100 cm^2 – no additional action, long term maintenance and monitoring to continue in accordance with this plan.
    - In areas where encapsulation deterioration is observed or PCBs are reported at concentrations > 10 µg/100 cm^2 additional encapsulant (e.g., new bead of caulk or other liquid encapsulant) will be applied and follow-up wipe samples will be collected. If analytical results indicate that PCBs are

still present at concentrations > 10 µg/100 cm^2 after the prescribed re-application, UMass will evaluate alternative solutions in conjunction with EPA.

  - If > 1 and ≤ 10 µg/100 cm^2 – continued monitoring will occur to establish patterns or trends in concentration. If increasing concentrations are determined, then additional coatings may be applied and/or alternative solutions will be discussed with EPA.

    NOTE: These levels are considered appropriate for this project given the small area and isolated location of the window sealant in comparison to potential direct contact exposures and to maintain consistency with the levels being used for the adjacent non-porous surfaces.

- For indoor air results:
  - If < 450 ng/m^3 – no additional action, long term maintenance and monitoring to continue in accordance with this plan;
  - If > 450 ng/m^3 – results and alternative solutions will be evaluated by UMass in conjunction with EPA; and

    NOTE: This action limit is based on EPA's September 2009 public health levels of PCBs in school indoor air for ages 19 plus and adults. As described on Section 2.1, potential receptors to interior window glazing sealant include adult workers within the buildings (UMass staff) and college-age students, including graduate students. No children would be present in the inside of the buildings, except during short duration visits with UMass staff. There are no child care facilities within the buildings.

All analytical results and corrective measures will be reported to EPA (see Section 5.6). This report will include a recommendation for continuing or refining the sample frequency based on the results. In addition, if the results for the sampling and analyses indicate any exceedances of project-specific action levels, EPA will be notified within 30 days of receipt of the analytical data.

It should be noted that there is currently a lack of substantial long-term or short-term monitoring data for products being used as encapsulants over PCB containing building materials from this or any comparable PCB remediation site. Additional research into this issue is currently being conducted by the EPA. These results/data will be incorporated into any decision regarding additional interim/corrective measures at this Site.

5.4 ROUTINE MAINTENANCE ACTIVITIES

Based on a review of the products' technical specifications and applied locations (interior metal to glass window joints), it is not anticipated that the sealant will require any additional or routine maintenance activities other than potential corrective measures that may be deemed necessary as a result of visual inspections.

5.5 TRAINING REQUIREMENTS

Based on discussions with UMass Facilities Department, it is not anticipated that any workers would come in routine contact with the encapsulated surfaces beyond routine cleaning and planned maintenance activities. It is not anticipated that workers performing routine cleaning would require any special training or need to take extra precautions due to the presence of the new encapsulant; however, UMass will conduct general awareness training for cleaning personnel to ensure they are aware of the importance of maintaining the sealant/encapsulant. The University will incorporate this training into its routine and scheduled training for asbestos-containing materials consistent with the asbestos regulations. This one-time training is conducted once per month. The University will prepare an annual awareness update on the window conditions and make this available to personnel via e-mail or postings.

For any non-routine projects or maintenance activities that involve work on the windows, relevant and appropriate worker training requirements and procedures specific to the task will be developed and implemented. Current UMass procedures dictate that all work that impacts building materials, including window glazing sealants, must undergo an "all hazard review". This review would indicate that the LGRC window glazing sealant has been flagged as a PCB and asbestos-containing material. As such, any work that will disturb the window glazing sealant will be conducted by appropriately trained workers following the necessary work procedures for containments (polyethylene sheeting, etc.) and disposal. Any window glazing removed will be disposed as ≥ 50 ppm PCB wastes. These activities will be reported to EPA in the referenced report.

5.6 COMMUNICATIONS AND REPORTING

The results of the long-term monitoring and maintenance activities will be documented in a report and submitted to the EPA. Initially, this report will be submitted within 90 days following the monitoring activities (anticipated to be by September 30th of each year), and document the following:

- Results from the visual inspections;
- Results from the sampling and analyses;
- Comparisons to action levels and recommendations for corrective measures;
- Any corrective measures implemented;
- Any non-routine major projects conducted at the buildings that encountered the encapsulants and the training and protective measures that were implemented;
- Any proposed modifications to the monitoring and maintenance program (e.g., based on the sampling results, the frequency of the program may be modified);
- A statement on the continued effectiveness of the encapsulant; and
- An update and status on plans to perform window replacement activities (e.g., source removal) (refer to Section 6 of this document for additional discussion).

A summary of this information will also be made available for review by the LGRC occupants, users, or other project stakeholders. This communication will be completed via information meetings and posting of data to the UMass EHS web site following the same schedule as indicated above for the report submittal to EPA.

5.7 MODIFICATIONS TO THE LTMMIP

It is possible that results of long term monitoring may warrant or require modifications to this plan. In the event that a modification to the LTMMIP is necessary, such an amendment will be proposed to EPA for approval as part of the scheduled report. UMass will work in conjunction with EPA to develop and implement any such modifications.

6. SCHEDULE

As indicated previously, there are over 900 windows associated with the buildings and UMass does not have any current capital plans or approved funding for window replacement in these buildings at this magnitude as a stand-alone project. Current cost estimates for window removal/replacement are in the $3,000,000 range. Recent indoor air and interior surfaces data indicate minimal PCB exposure potential to building occupants. Given this information, it has been proposed to implement an interim measure to further reduce exposure potential to the PCB containing glazing sealant until a long-term solution can be implemented.

6.1 INTERIM MEASURE TIMING

The Interim Measure, as outlined in this plan, is anticipated to be implemented upon EPA Approval of the plan and the signing of the Consent Agreement by all parties for this work. Given the State mandated procurement process, access, and scheduling requirements (including design, bidding, and award phases), it is anticipated that these upfront tasks (prior to IM field work initiation) could take up to 12 months.

Based on the level of disruption anticipated to occur during the implementation of the Interim Measure, UMass will work with the selected Remediation Contractor to conduct these activities using multiple crews over multiple working shifts with the goal of completing the activities during times when school is not in full sessions, if applicable. Priority will also be applied, if feasible, to IM implementation at windows with higher potential for access (e.g., low rise library windows vs. narrow inaccessible windows in laboratories). Given the above process, it is anticipated that the IM activities will be completed within 24 months of the effective date of the CAFO.

6.2 WINDOW REMOVAL AND REPLACEMENT TIMING

The University is committed to implementing the Interim Measures to stabilize site conditions and ensure there are no significant risks to building occupants and users. UMass is also committed to appropriately removing the PCB containing window glazing sealant ≥ 50 ppm; however, the timing of this removal must be managed in the context of the overall financial resources available to the University for deferred maintenance and other required Code improvements to keep campus buildings open, safe, and usable to maintain the overall academic and research mission of the University.

Through discussions, EPA and the University have agreed to a 15 year time frame for the replacement of the LGRC windows, and have also agreed to engage in discussions during years 5 and 10 to allow the University to discuss the reasonableness of the 15-year deadline, which might be affected by the success or failure of the interim measures, the University's finances, and the status of new regulations or science regarding PCB's in caulk and glazing sealant. Consequently, the University may propose an extension of up to five years to the 15-year schedule for specific renovation projects that require procuring new space (including constructing new buildings) for functions that are currently in LGRC but that may not be allowed to continue following renovation due to revised building codes.

As previously discussed, renovations on Floors 3, 7, and 8 of Tower A were initiated in the Fall of 2011. UMass has used this project to remove and replace approximately 40 windows within the work areas. Consistent with the December 8, 2011 Notice of PCB Remediation Activity, the laboratory windows on Floors 3, 7, and 8 were removed for off-site disposal as PCB Bulk Product Waste in February 2012.

Over time, a similar approach will be followed to effectively manage and dispose of the windows in the LGRC buildings. Before removing any windows that contain PCB-contaminated window glazing sealant, window frames, or other PCB-contaminated materials, notice will be provided to EPA 30 days prior to any such removals. If over time, an alternate remedial approach is developed based on project-specific conditions, a work plan will be prepared for Approval prior to removing any windows or window components that will describe the revised removal and or disposal plans. Updates to the status of projects and University plans for window replacements with the LGRC complex will be included in the scheduled report submitted to EPA documenting the results of the long term monitoring and maintenance activities.

Table 2-1
Initial Screening of Removal Alternatives
Proposed Interim Measures
LGRC Low Rise and High Rise Tower A - UMass Amherst

Alternative	Effectiveness	Implementability	Estimated Costs[1]
Source removal of the glazing sealant by physical means and decontamination Assumptions: -Prep work area (poly, etc.) -Disassemble window unit -Remove window glass from unit -Remove glazing from glass and unit by physical means -Decontaminate glass, window frame and adjacent ledges -Install temporary plywood -Verification -Dispose of PCB containing materials off-site -Meet closure criteria -Re-install window (existing or new glass)	-Relatively effective at removing the source material; however, not as efficient as removing the entire window unit. -Additional decon of metal window frames may be needed following verification. - Full removal of glazing sealant from window may not be achieved without window glass damage.	-Removal of impacted material relatively straight-forward; however complete removal may not be possible. -Supplemental decontamination work on the window unit may be needed depending on verification. -Access to the exterior of the window unit would be required (based on initial Contractor discussions). -Trained Contractors readily available.	Total Estimated Costs: $3,280,000
Source removal of the glazing sealant by removal and replacement of entire window unit Assumptions: -Prep work area (poly, etc.) -Remove entire window unit -Dispose of entire window unit as PCB-containing material -Decontaminate adjacent ledges -Replace with new window unit	-Most effective option at removing the source material since the entire window unit is removed and replaced with a new unit. Therefore the alternative would be effective at eliminating exposure risk.	-The process of removing each window is straight-forward; however access to the exterior of the window unit would be required (based on initial Contractor discussions). -Trained Contractors readily available	Total Estimated Costs: $3,040,000

[1] Estimated costs exclude architectural design costs and UMass facility/personnel costs.

Table 3-3
Evaluation of Containment Products - Pilot Test Activities
Proposed Interim Measures
LGRC Low Rise and High Rise Tower A - UMass Amherst

Product	Effectiveness	Implementability	Aesthetics/Impacts to Surroundings
DOW 795 Silicone Caulk Bead of black caulking applied to glazing sealant	• Achieved visual coverage of glazing sealant • No change in appearance or plasticity in caulk after wipe sample collected, some transfer of caulk to wipe • Verification Wipe Result of Caulk/Window Frame: 6.0 ug/wipe • Verification Wipe Result of Caulking: <0.5, 0.7, 1.0 ug/wipe	• Simple to apply • Areas of protruding glazing sealant result in larger bead of caulking required • Corner locations require additional care to fully cover glazing sealant • Full cure 4-5 days	• Slight odor in immediate vicinity, odor may increase in smaller areas with limited ventilation • Final appearance similar to typical window construction
Phenoseal Vinyl Adhesive Caulk Bead of white (clear) caulking applied to glazing sealant *Use of vinyl caulk selected on day of pilot test to compare to silicone caulk option.	• Achieved visual coverage of glazing sealant • After 5 days caulk shrunk to result in very thin coverage in some areas with one portion of glazing sealant protruding out • Verification Wipe Result of Caulk/Window Frame: 0.6 ug/wipe	• Simple to apply • Areas of protruding glazing sealant result in larger bead of caulking required • Corner locations require additional care to fully cover glazing sealant • Full cure time variable • Increased likelihood of shrinkage, cracking	• Final appearance of vinyl caulk is poor with visible air bubbles and thin coverage • Clear coloration reduces the aesthetic qualities of caulk
DAP ALEX Plus Acrylic/Silicone Caulk Bead of black caulking applied to glazing sealant *Use of acrylic caulk selected on day of pilot test to compare to silicone caulk option.	• Achieved visual coverage of glazing sealant • After 5 days caulk has full coverage of glazing sealant • Verification Wipe Result of Caulk/Window Frame: 1.1 ug/wipe	• Simple to apply • Areas of protruding glazing sealant result in larger bead of caulking required • Corner locations require additional care to fully cover glazing sealant • Full cure time variable	• Final appearance similar to typical window construction
DAP 3.0 Silicone Caulk Applied after initial tests based on discussion with product vendor	• Achieved visual coverage of glazing sealant • After 5 days caulk has full coverage of glazing sealant • Verification Wipe Result of Caulking: <0.5 ug/wipe	• Simple to apply • Areas of protruding glazing sealant result in larger bead of caulking required • Corner locations require additional care to fully cover glazing sealant • Full cure time variable	• Final appearance similar to typical window construction

Table 3-3
Evaluation of Containment Products - Pilot Test Activities
Proposed Interim Measures
LGRC Low Rise and High Rise Tower A - UMass Amherst

Product	Effectiveness	Implementability	Aesthetics/Impacts to Surroundings
SW DTM Acrylic Paint Acrylic Paint applied to glazing sealant and window frame	• Multiple coats required to achieve visual coverage of glazing sealant and frames • After 1 coat 100% coverage not achieved • After 5 days fewer streaks observed than day of application • No change in appearance after wipe sample collected, no transfer of paint to wipe • Verification Wipe Result: 4.3 ug/wipe	• Longest application time, may require multiple coats (more than 1 day) • Gaps in glazing sealant will require filling prior to paint application	• Slight paint odor in vicinity, may be problematic in smaller work areas with limited ventilation • Final appearance after one coat is streaky
DOW 1-2-3 Silicone Seal Seal applied to glazing sealant and window frame	• Small gaps at window edge, can be reduced by allowing caulk to protrude from beneath seal strip. • Achieved visual coverage of glazing sealant and majority of frames (does not cover outer edge of frame) • After 5 days seal has pulled away from corners on continuous run portion and some gaps observed along glass – will need to have caulk protrude from underneath seal to eliminate • Verification Wipe Results: 1.6 , 0.9, 0.7, 0.3, and 2.1 ug/wipe	• Additional trimming of protruding glazing sealant required to achieve smooth finish • Labor costs increased if trimming required • Highest material costs	• Silicone seal stands out on final inspection (additional color selection could alleviate) • Has ragged appearance due to cutting to width (pre-order required width to alleviate)

Table 3-6
Long Term Product Evaluation and Pilot Testing
Proposed Interim Measures
LGRC Low Rise and High Rise Tower A - UMass Amherst

Wipe Samples Over Time

	Initial Sample			6 days			219 days			413 days		
	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)
DOW 795 Silicone	No Sample			7/20/2009	LGRC-PT-WP-016 (left side)	<0.5	2/18/2010	LGRC-PT-WP-024 (left side)	2.6	8/31/2010	LGRC-PT-WP-032 (left side)	12 (IPA)
	No Sample			7/20/2009	LGRC-PT-WP-018 (right side)	0.7	No Sample			8/31/2010	LGRC-PT-WP-030 (right side)	30
	7/14/2009	LGRC-PT-WP-007 (base)	6	7/20/2009	LGRC-PT-WP-020 (base)	1.0	2/18/2010	LGRC-PT-WP-022 (base)	6.5	8/31/2010	LGRC-PT-WP-031 (base)	<0.5 (saline)

	Initial Sample			6 days			219 days			441 days		
DAP 3.0 Silicone	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)
	7/20/2009	LGRC-PT-WP-010	<0.5	No Sample			No Sample			9/28/2010	LGRC-PT-WP-006	1.7

	Initial Sample			6 days			219 days			446 days		
DAP Acrylic Latex	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)
	7/14/2009	LGRC-PT-WP-008	1.1	No Sample			No Sample			9/28/2010	LGRC-PT-WP-005	2.1

Bulk Samples

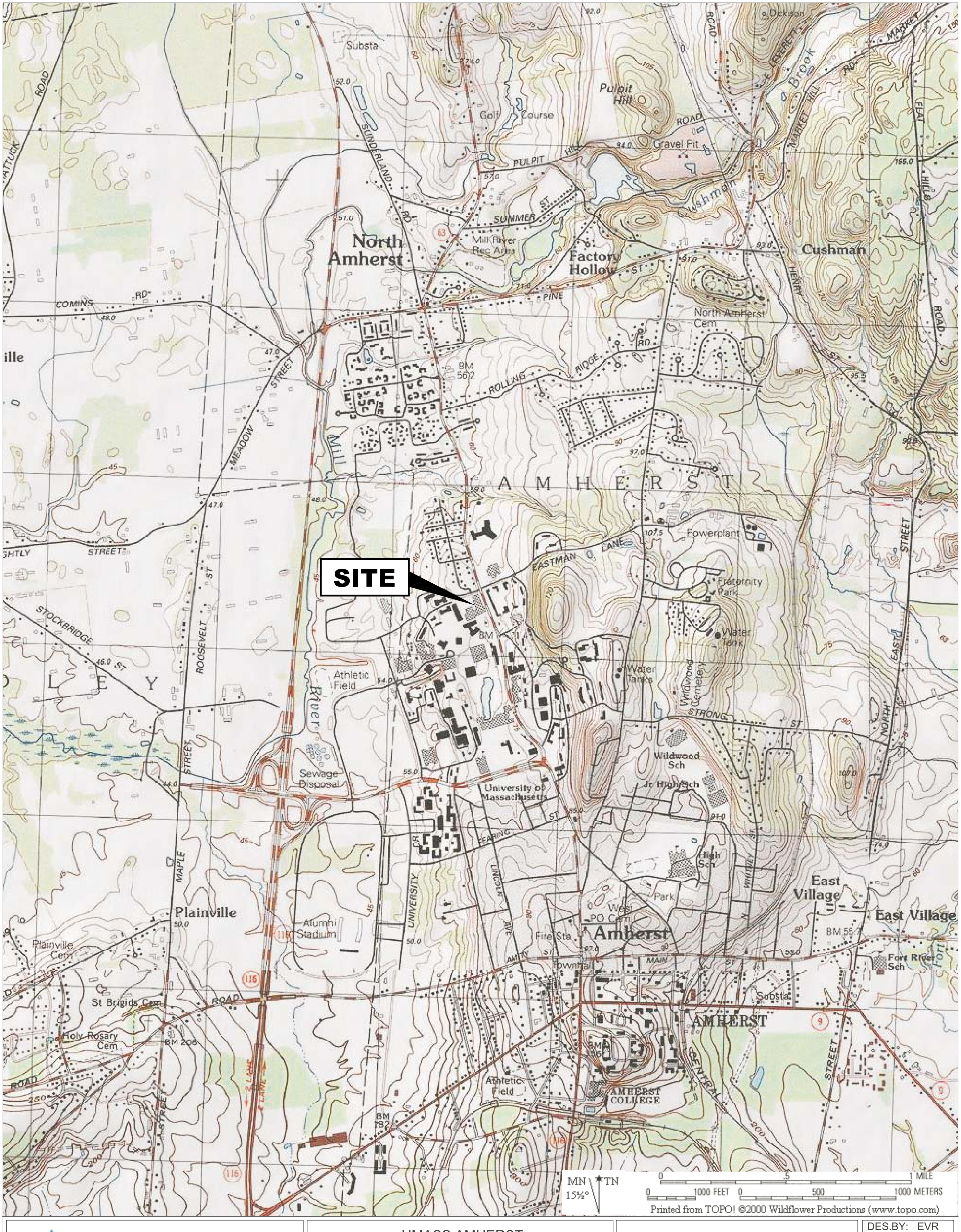
DOW 795 Silicone (413 days after installation)	8/31/2010	LGRC-PT-CBC-033	604 ppm
DAP 3.0 Silicone (441 days after installation)	9/28/2010	LGRC-PT-CK-007	159 ppm
DAP Acrylic Latex Plus (446 days after installation)	9/28/2010	LGRC-PT-CK-008	1,100 ppm

Notes:
All wipe samples collected with hexane-soaked wipes, except as noted, using modified wipe sample procedure (use of tweezers).
IPA: Isoprpyl alcohol

Table 3-7
Secondary Barrier Pilot Test Wipe Sampling Results
Interim Measures Activities
UMass-LGRC

Wipe Sample Results										
Elapsed Time	Date Installed	9/28/2010	Elapsed Time (Days): 9			Elapsed Time (Days): 238			Elapsed Time (Days): 465		
Caulking	Joint	Tape	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)	Date	Sample ID	Total PCBs (µg/100cm^2)
DOW 795 Silicone	Left Vertical	None	10/7/2010	LGRC-PT-WP-009	1.4	5/24/2011	LGRC-PT-WP-0018	6.4	1/6/2012	LGRC-PT-WP-031	3.5
	Right Vertical	PVC	10/7/2010	LGRC-PT-WP-011	<0.5	5/24/2011	LGRC-PT-WP-020	<0.5	1/6/2012	LGRC-PT-WP-033	<0.5
	Lower Horizontal	Aluminum	10/7/2010	LGRC-PT-WP-010	<0.5	5/24/2011	LGRC-PT-WP-019	<0.5	1/6/2012	LGRC-PT-WP-032	1.4
DAP 3.0 Silicone	Left Vertical	None	10/7/2010	LGRC-PT-WP-012	<0.5	5/24/2011	LGRC-PT-WP-021	1.3	1/6/2012	LGRC-PT-WP-035	4.4
	Right Vertical	PVC	10/7/2010	LGRC-PT-WP-014	<0.5	5/24/2011	LGRC-PT-WP-023	<0.5	1/6/2012	LGRC-PT-WP-037	1.6
	Lower Horizontal	Aluminum	10/7/2010	LGRC-PT-WP-013	<0.5	5/24/2011	LGRC-PT-WP-022	<0.5	1/6/2012	LGRC-PT-WP-036	2.3
DAP Acrylic Latex	Left Vertical	None	10/7/2010	LGRC-PT-WP-015	0.7	5/24/2011	LGRC-PT-WP-024	1.8	1/6/2012	LGRC-PT-WP-038	1.2
	Right Vertical	PVC	10/7/2010	LGRC-PT-WP-017	<0.5	5/24/2011	LGRC-PT-WP-026	<0.5	1/6/2012	LGRC-PT-WP-040	0.7
	Lower Horizontal	Aluminum	10/7/2010	LGRC-PT-WP-016	<0.5	5/24/2011	LGRC-PT-WP-025	<0.5	1/6/2012	LGRC-PT-WP-039	<0.5

Notes:
All wipe samples collected with hexane-soaked wipes using modified wipe sample procedure (use of tweezers) over 31 inches of caulked joint based on a bead width of 1/2" except LGRC-PT-WP-009 and LGRC-PT-WP-018 collected over 62 inches based on a bead width of 1/4".
N/A = Not Applicable



WOODARD & CURRAN
35 New England Business Center
Andover, MA 01810
COMMITMENT & INTEGRITY DRIVE RESULTS

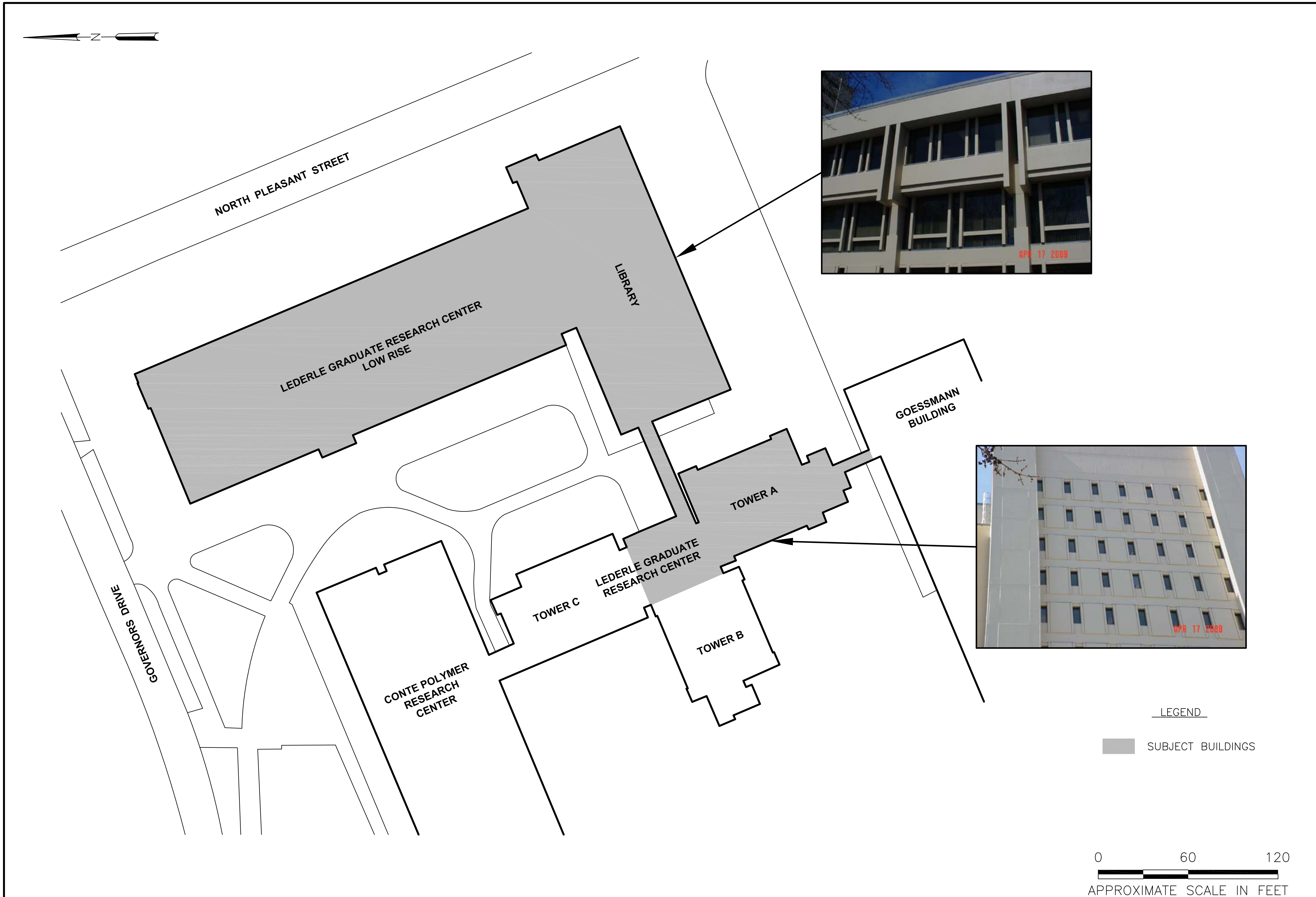
UMASS AMHERST
LEDERLE GRADUATE RESEARCH CENTER
AMHERST, MASSACHUSETTS

SCALE: AS NOTED	JOB NO.: 210918
DATE: MAY 2012	FILE: Figure 1-1.cnv

SITE LOCUS

DES.BY: EVR
DR.BY: EVR
CK.BY: AM

1-1



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COMMITMENT & INTEGRITY DRIVE RESULTS

SITE PLAN

DESIGNED BY: ALW
DRAWN BY: EVR
CHECKED BY: JAH
Figure 1-2.dwg

UMASS AMHERST
LEDERLE GRADUATE RESEARCH CENTER

INTERIM MEASURES PLAN

JOB NO: 210918
DATE: NOVEMBER 2010
SCALE: AS NOTED

FIGURE 1-2

APPENDIX A: STATUS UPDATE MEMORANDUM – JULY 10, 2009

COMMITMENT & INTEGRITY
DRIVE RESULTS

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MEMORANDUM

TO: Kimberly Tisa
FROM: Jeff Hamel
DATE: July 10, 2009
RE: Status Update – Interior Window Glazing
UMass Amherst – Lederle Graduate Research Center

The following is a brief status update on the interior window glazing project at the Lederle Graduate Research Center (LGRC) on the UMass Amherst campus. UMass became aware of PCBs in the window glazing from a hazardous material assessment being performed as part of an upcoming electrical upgrade project to be conducted within the buildings. This report was issued on March 25, 2009 and included only one sample of the glazing for PCBs. Since that time a number of activities have been and continue to be conducted, as summarized below.

INSPECTIONS/SAMPLING

April 6 and 16-17, 2009 - site inspections were conducted by UMass and W&C personnel to visually inspect interior windows/glazing in the low-rise and Tower A of the LGRC. A sampling plan was developed to collect representatives samples of the glazing to confirm the initial results and an inventory of the windows completed.

April 20-21, 2009 - 12 samples of glazing and interior replacement caulking were collected and analyzed for PCBs. Results of the glazing ranged from 4,040 to 14,000 ppm. A summary table of the results is provided in Attachment 1.

May 5, 2009 - additional samples collected in support of the development of options to address this condition. Six samples were collected and consisted of surface wipe samples from the glazing/window frame (pre and post cleaning), surface wipe samples of the adjacent window ledge (pre and post cleaning), and bulk samples of accumulated particulate matter adjacent to the windows and exterior window glazing. A summary of the results is provided in Attachment 2.

May 26, 2009 - 11 indoor air samples were collected from the low-rise and Tower A following EPA Method TO-10A procedures. Concentrations were decreased from those detected in July 2008 and ranged from 0.033 ug/m^3 to 0.16 ug/m^3. A summary of the results is provided in Attachment 3.

June 5, 2009 – As a follow-up to the May 27, 2009 Informational Meeting (see below), four wipe samples were collected for PCB analysis from window ledges in select rooms of the low rise building. A summary of the results is provided in Attachment 4.

PUBLIC NOTIFICATIONS/OUTREACH

May 15, 2009 - UMass sent/posted a notice to all GRC occupants and other interested parties describing the findings known to date regarding this issue.

May 15, 2009 - Summary memorandum prepared documenting the April and May 2009 sample results as well as presenting all interior surface wipe and indoor air sample results collected within the building during the exterior abatement project (including post-abatement sample results). Memorandum posted to UMass EH&S project web-site.

May 27, 2009 - Informational Meeting held on campus for all GRC occupants and interested parties. Findings and next steps discussed.

SUMMARY

The results of the data collected to date indicate the following:

- Interior window glazing on the majority of the windows at the low-rise and Tower A contain PCBs in excess of 50 ppm.
- Overall, the glazing appears in good condition and is present at over 800 separate window units throughout the buildings. There are some areas (e.g., bottom frame exposed to direct sunlight) that exhibit signs of deterioration.
- Potential transport and exposure pathways for the PCB containing glazing to potential receptors include direct contact and/or generation of dust or particulate matter that may become airborne of rest on interior surfaces.
- Existing indoor data indicate minimal exposures to building occupants:
    - All post Exterior Building Abatement Project indoor air samples (July 2008 and May 2009) collected from Tower A and the low-rise building show a decrease in concentration with time compared to the samples collected during the Exterior Building Abatement Project. For general comparison purposes, these results are also below the site specific risk-based criteria derived as part of the exterior work (0.29 ug/m^3).
    - Interior surface wipe samples collected during the Exterior Building Abatement Project exhibited higher concentrations of PCBs on the window ledges than on other interior surfaces (tables, desks, etc.). The majority of the sample results were below EPA's high occupancy criteria. Surface cleaning of the ledges has been shown to be effective in reducing PCB concentrations. All 19 post Exterior Building Abatement Project samples and the June 2009 window ledge wipe samples were below EPA's high occupancy criteria.

NEXT STEPS

- Assess Interim Actions to potentially include cleaning of windows and ledges, HEPA vacuuming of dust/particulate matter, interim sealing of glazing, and indoor air monitoring.
    - Developed list of potential "sealers" to pilot test, including paints/coatings, new caulking, and physical barriers.
    - Met with remediation contractors to develop work scope, schedule, and costs. Bid walks conducted on June 4th and 5th. Selected contractor to perform a pilot test of various techniques.
    - A pilot test was performed on July 9, 2009 to conduct tests on cleaning agents and "sealing" products prior to potentially implementing on a full-scale. The goal is to determine the best products and techniques based first on the results of verification sampling and then ease of application and aesthetics.
    - Prepare and submit workplan to EPA for conducting interim action.
- Once above tasks completed, implement an interim action to contain glazing until long-term and permanent remedial action can be developed and implemented.

ATTACHMENT 1

Summary of Interior Window Glazing Sample Locations
LGRC low Rise and High Rise Tower A
UMass Amherst

Building	Sample Location	Sample ID	Analytical Results (mg/kg)	Sealant Observed	Notes
Low-Rise Library	First floor eastern most window. Lower horizontal joint, 0-50" from bottom left corner.	LGRC-GZ-002	82.2 J	Black caulking material, dissimilar to glazing observed elsewhere. High level of plasticity, approximate 1/4" bead.	Material observed on windows with different construction. Metal framing along edges of panes different than that of the majority of windows.
	First floor second window from east. Lower left side vertical joint, 0-16" from bottom.	LGRC-GZ-003	7,520	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Green paint observed on window frames.
	Second floor library study area. Eastern most window, lower horizontal joint (0-16") and lower right vertical joint (0-5") as measured from lower right corner	LGRC-GZ-012	12,900	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Green paint observed on window frames.
	Third Floor Conference Room 365A. Lower horizontal joint, Center Window, 2.0 ft from bottom left corner.	LGRC-GZ-001	14,000	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Collected from same window as original glazing sample to confirm sample results.
Low-Rise North Wing	First floor Room 141A, middle window pane, right vertical joint, 0-18" from bottom right corner.	LGRC-GZ-005	11,700	Black glazing material, hard, varying condition. Approximately 1/4" bead.	No paint on frames.
	Second floor Room A251 office space, Lower horizontal and lower left vertical joint, 0-12" in both directions from lower left corner.	LGRC-GZ-006	9,080	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Black window frame finish wearing off, bronze appearance underneath.
	Third Floor Classroom A301, southern most window. Lower horizontal joint and lower left vertical joint 0-12" along both joints.	LGRC-GZ-004	4,040	Black glazing material, hard, varying condition. Approximately 1/4" bead.	No paint on frames.
Walkway	Third window grouping on north side from east end of walkway, large window pane, lower left horizontal joint, 0-24" from bottom left corner and lower left vertical joint 0-10" from lower left corner.	LGRC-GZ-007	129	Black caulking material, dissimilar to glazing observed elsewhere. High level of plasticity, approximate 1/4" bead.	Material observed on windows with different construction. Metal framing along edges of panes different than that of the majority of windows.
High Rise Tower A	Fifth floor window units south of elevators (over walkway). Second window from south, entire lower horizontal joint.	LGRC-GZ-008	12,400	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Material has increased plasticity underneath.
	Third floor window units north of elevators. Right window, 0-12" along horizontal and vertical joint from lower left corner.	LGRC-GZ-011	6,480	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Glazing appears to be more brittle than other samples of similar material.
	West side laboratory window, Room 1212. Crankcase type window. 0-12" along lower horizontal joint and 0-18" along right vertical joint as measured from bottom right corner.	LGRC-GZ-009	7,070	Black glazing material, hard, varying condition. Approximately 1/4" bead.	Lab space recently renovated. Windows not included in renovation.
	East side conference Room 701E. Entire lower horizontal joint and lower 6" of both vertical joints.	LGRC-GZ-010	11,400	Black glazing material, hard, varying condition. Approximately 1/4" bead.	

mg/kg = milligrams per kilogram
J = estimated concentration

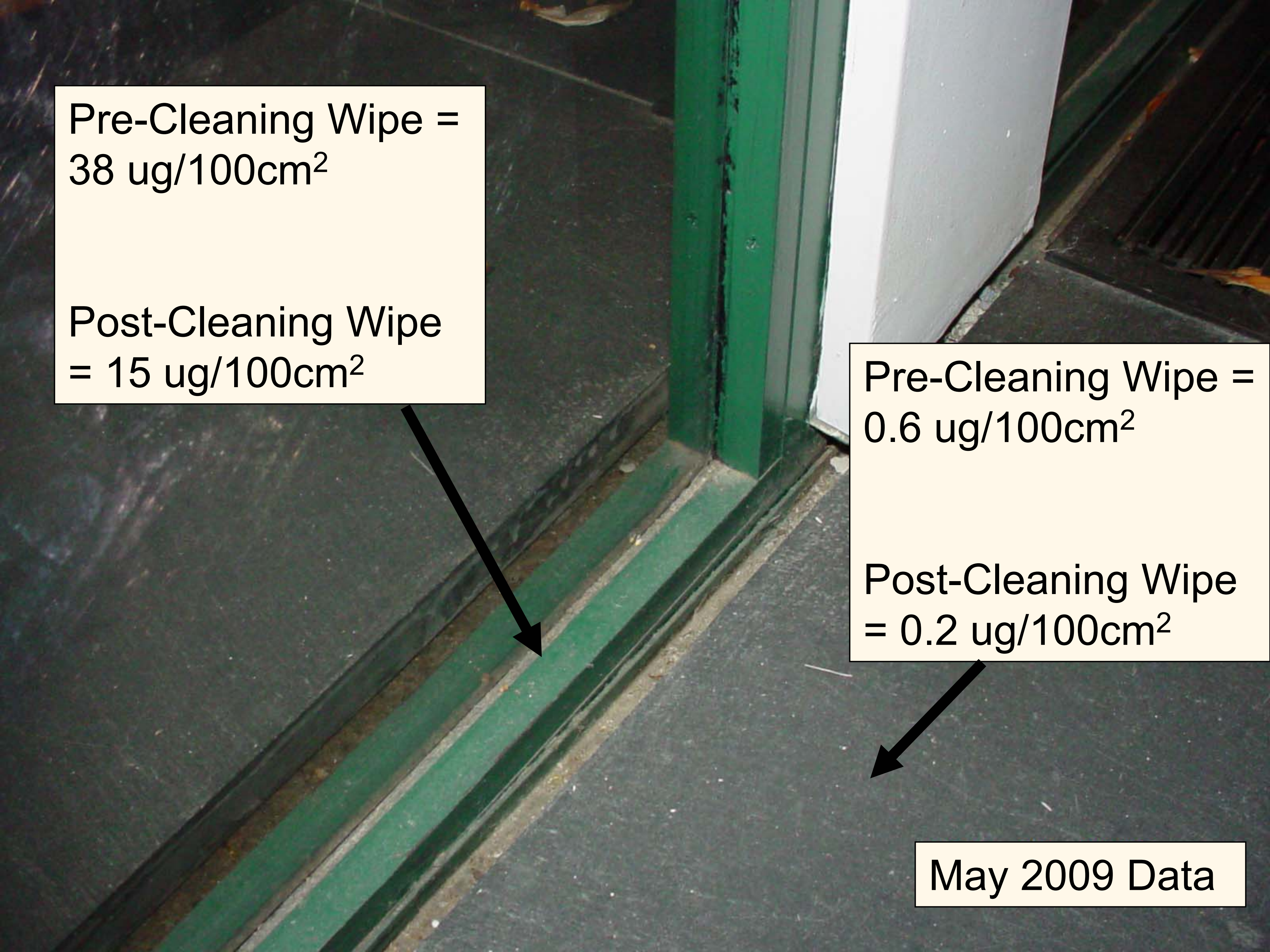
ATTACHMENT 2

Additional Sampling Conducted in May 2009

A set of samples from the glazing and adjacent materials at the LGRC complex was collected on May 5, 2009 to support the development of options to address this condition. The scope was developed based upon an evaluation of potential exposure pathways and with the intent of gathering data that will assist in developing potential abatement/mitigation plans. The location for the sampling was the previous sample location LGRC-GZ-003 collected from the first floor library (second window from east wall). The location was selected because this area is easily accessible, a bulk glazing sample has already been collected from this unit (7,520 ppm PCBs), and an exterior glazing sample can easily be collected from the outside first floor. A photograph of a typical window unit is provided on the following page.

Specifically, six samples were collected and included:

1. Surface wipe samples of the interior glazing and adjacent window framing to assess the potential for PCB exposure through direct contact with the glazing.
    a. Pre-Cleaning Wipe: One wipe sample was collected to assess current "as-is" potential exposures.
        i. A total PCB concentration of 38 ug/100cm^2 was detected in the sample.
    b. Post-Cleaning Wipe: One wipe sample was collected after cleaning of the window frame and glazing with a commercially available general cleaner to assess the effectiveness of standard cleaning methods in reducing potential exposure.
        i. A total PCB concentration of 15 ug/100cm^2 was detected in the sample.
    c. Discussion: Both wipe samples exceed EPA's cleanup level for high occupancy areas (10 ug/100cm^2). Concentrations decreased after surface cleaning, which suggests that the PCBs may be related to particulates on the surface that can be removed by general cleaning.
2. Surface wipe samples of the adjacent window ledge to assess the presence of PCBs away from the glazing and to compare this result to the total and surface wipe sample results of the glazing from the same window unit.
    a. Pre-Cleaning Wipe: One wipe sample was collected to assess current "as-is" potential exposures.
        i. A total PCB concentration of 0.6 ug/100cm^2 was detected in the sample.
    b. Post-Cleaning Wipe: One wipe sample was collected after cleaning of the ledge with a commercially available general cleaner to assess the effectiveness of standard cleaning methods in reducing potential exposure.
        i. A total PCB concentration of 0.2 ug/100cm^2 was detected in the sample.
    c. Discussion: Both samples were much lower in PCB concentration compared to the wipe samples of the glazing/frame and were detected at concentrations below the EPA's cleanup level for high occupancy areas. The data also showed a decrease in concentration following general surface cleaning.
3. Bulk Sample of Dust: A bulk sample of dust and particulate matter found in the narrow recessed area adjacent to the window frame located adjacent to the window was collected to assess the presence of PCBs in accumulated material that may require removal.
    a. A total PCB concentration of 671 ppm was detected in this sample, which indicates that accumulated dust/particulate from the glazing is present in this recessed portion of the window system in excess of EPA cleanup levels.
4. Bulk Sample of Exterior Glazing: Engineering drawings of the window construction details indicate that the glazing appears to have been installed in the base of the frame and around both the interior and exterior portions of the window. The exterior glazing appears visually different from the interior, although this may be a result of weathering. This sample result aids in the understanding and development of potential actions to address the PCB impacted glazing (both interior and exterior locations).
    a. A total PCB concentration of 82.7 ppm was detected in the sample. This sample is two orders of magnitude lower than the interior glazing sample; however, the concentration is still in excess of the 50 ppm regulatory threshold.


Pre-Cleaning Wipe = 38 ug/100cm^2
Post-Cleaning Wipe = 15 ug/100cm^2
Pre-Cleaning Wipe = 0.6 ug/100cm^2
Post-Cleaning Wipe = 0.2 ug/100cm^2
May 2009 Data

ATTACHMENT 3

Results of the Interior Air Monitoring
UMass Amherst Lederle Graduate Research Center

A summary of the interior air sampling for PCBs conducted at the low rise building and Tower A of the Lederle Graduate Research Center (LGRC) is presented below. The specific objectives for the air sampling were:

- To evaluate indoor air concentrations of PCBs at representative locations in the high rise Tower A, the low rise north wing, and the low rise library with respect to risk-based levels; and

- To obtain data over time for comparison and trend analysis.

On May 26, 2009 Woodard & Curran personnel collected eleven air samples from designated locations throughout the low rise and Tower A of the LGRC. The eleven air samples were collected in accordance with the procedures described in the May 2009 Interior Air Monitoring Plan. The locations were selected based on three primary factors:

- Locations of existing glazing samples with known PCB concentrations;
- Distribution throughout the LGRC complex to obtain representative data from rooms of varying uses (classrooms, office space, etc.); and
- Location of previous air samples collected, primarily Post-Abatement (exterior façade project) air samples collected on July 22 and 23, 2008.

Air samples were collected in accordance with USEPA Compendium Method TO-10A *"Determination of Pesticides and Polychlorinated Biphenyls In Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)"* and submitted for laboratory analysis of PCBs homologs.

At each of the sample locations an individually certified low volume PUF cartridge was connected to a personal air pump (SKC AIRCHEK Sampler) with flexible tubing. The cartridge was positioned at the appropriate height using a telescoping tubing stand or placed on a desk or tables as specified on Table 1 below.

To achieve the desired minimum laboratory reporting limit of 50 nanograms/m^3, samples were collected at a rate of 2.5 L/min for the desired timeframe for a total sample volume of approximately 300 liters. One duplicate sample was collected as part of the overall project Quality Assurance and Quality Control measures. At the end of the time interval, the pump was shut off and the cartridge was placed in aluminum foil, labeled, and placed on ice for delivery to the analytical laboratory.

Sample Results

A summary of the air sample results are presented on the following page with the laboratory report attached. Analytical results indicate that the concentrations of PCBs reported in the samples ranged from 0.033 to 0.160 µg/m^3. These results are slightly lower than the results from the July 2008 post-abatement air sampling results, which ranged from 0.101 to 0.269 µg/m^3. Where applicable, a direct comparison between the July 2008 and May 2009 data points is included on Table 1. As a general comparison, the analytical results were also below the post-abatement re-occupancy criteria developed as part of the exterior abatement project (0.29 µg/m^3).

Table 1

Building	Air Sample	Sample Location	Total PCBs (µg/m³)	
			26-May-09	22-23- Jul-08
Low-Rise Library	LGCR-IA-005	First floor, Southeast corner. Placement on table adjacent to windows.	0.160 J	0.239/0.256
	LGRC-IA-006	Second floor, Main study area to west of library desks. Placement on tables.	0.045 J	0.237
	LGRC-IA-004	Third Floor, Conference Room 365A. Placement on conference table.	0.110	0.257
Low-Rise North Wing	LGRC-IA-001	First floor, Room 125C, Office Space. Placement near windows at a height of 3-5 feet.	0.055 J	0.224
	LGRC-IA-003	Second floor, Room A251 office space. Placement near window at a height of 3-5 feet.	0.061 J	none
	LGRC-IA-002	Third Floor, Classroom A301; placement on first row of desks near windows.	0.058 J	none
High Rise Tower A	LGRC-IA-007	Fifth floor, elevator lobby. Placement near windows south of elevators at height of 3-5 feet.	0.065 J	none
	LGRC-IA-009/500	Room 801, Laboratory office space. Placement 3-5 feet.	0.033/<0.033	0.101
	LGRC-IA-010	West side laboratory Room 1208. Placement at 3-5 feet.	0.127	none
	LGRC-IA-011	Room 1606, Common study area. Placement at 3-5 feet.	0.037 J	0.200
	LGRC-IA-008	East side conference Room 701E. Placement on conference room table.	0.035	none

Note: Flow rates ranged from 2.52 – 2.57 liters/minute over a 120 to 134 minute duration.
µg/m³ = micrograms per cubic meter
J = estimated concentration due to surrogate recovery

These results are being evaluated as part of the ongoing activities associated with the PCB containing glazing materials identified in the LGRC complex.

ATTACHMENT 4

Results of Interior Wipe Samples
UMass Amherst Lederle Graduate Research Center

On June 5, 2009 at the request of UMass, Woodard & Curran personnel collected four wipe samples for PCB analysis from window ledges in the Lederle Graduate Research Center (LGRC) low rise building. Wipe samples were collected in accordance with standard wipe test methods. At each sample location, a 2-inch square gauze pad, saturated with hexane, was wiped across a 100 square centimeter sample area. All samples were transported to the laboratory under standard Chain of Custody procedures, extracted using USEPA Method 3540C (Soxhlet extraction), and analyzed for PCBs using USEPA Method 8082. A summary of the sample locations and analytical results is presented in the table below.

Summary of Interior Wipe Samples

Sample Identification	Sample Location	Analytical Results (μg/100cm^2)
LGRC-WP-A331	Room A331 Window Ledge	<0.5
LGRC-WP-A221	Room A221 Window Ledge	<0.5
LGRC-WP-A217	Room A217 Window Ledge	<0.5
LGRC-WP-A117	Room A117 Window Ledge	<0.5

As indicated on the table above, analytical results indicate that the concentrations of PCBs in all four of the wipe samples collected were below the minimum laboratory reporting limits and below the high occupancy cleanup criteria for non-porous surfaces of 10 μg/100cm^2.

APPENDIX B: ANALYTICAL LABORATORY REPORTS