DMS-7209030-PPR-02

Sampling and Analysis Plan For PCBs – Above-Slab Building Characterization Old Town Phase 1 Demolition

Rev 2

June 2015

Rev.	Reason for Revision	Originator	Date	Reviewer	Date
1	Updated org chart and incorporated comments received from K. Bazzell and A. Sulczynski	C. Kennedy	05-28-2015	D. Norman	05-28-2015
2	Responses to comments from Carmen Santos & responses to review by Agata Sulczynski	P. Jespersen	6-24-2015	C. Kennedy	6-24-15

Sampling and Analysis Plan
For PCBs – Above-Slab Building Characterization
Rev 2, June 2015

Prepared by: ______________________________

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Approved by: ______________________________

Jeffry Parkin, DMS Project Manager

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
COC	Chain-of-custody
D&D	Deactivation & Demolition
DMS	Dynamic Management Solutions, LLC
EDD	electronic data deliverable
EPA	US Environmental Protection Agency
LBNL	Lawrence Berkeley National Laboratory
LCD	Laboratory Control Duplicate
LCS	Laboratory Control Sample
LOD	limit of detection
LOQ	limit of quantitation
OTD	Old Town Demolition
PCB	Polychlorinated Biphenyl
Project	Old Town D&D Phase I Project
QA	quality assurance
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
TSCA	Toxic Substances Control Act of 1976

1 INTRODUCTON

1.1 Objectives and Scope

This Sampling and Analysis Plan (SAP) presents the rationale and strategy for collecting supplemental polychlorinated biphenyl (PCB) samples of above-slab building materials (excluding the concrete slabs) and equipment from Buildings 5 and 16/16A at the Lawrence Berkeley National Laboratory (LBNL) in support of the Old Town Deactivation and Demolition (D&D) Project Phase 1 (Project). Supplemental sampling of select building materials and equipment is required to fill data gaps from previous characterization campaigns to determine if US Environmental Protection Agency (EPA)-regulated PCB remediation waste or PCB bulk product waste is present in Buildings 5 and 16/16A. PCB sampling and analysis of building materials, fluids, caulking, paint, porous, and other non-porous surfaces was conducted as part of reconnaissance level characterization efforts. Those results are reported in the following documents:

- *Non-Radiological Reconnaissance Level Characterization Report University of California, Lawrence Berkeley National Laboratory Buildings 5, 16, 16A and Miscellaneous Equipment, One Cyclotron Road, Berkeley, California, Rev. 0* (Northgate Environmental Management Inc., 2014)
- *Reconnaissance-Level Characterization Report for Buildings 5, 14, 25A, 40, 41, 44, 44A, 44B, 52, and 52A at the Lawrence Berkeley National Laboratory, Berkeley, California, Rev. 0* (Weiss Associates, 2010)

Sampling results from the reconnaissance level characterization efforts for Buildings 5 and 16/16A indicate that there is no PCB liquid waste, PCB bulk product waste, or PCB remediation waste as defined in 40 Code of Federal Regulations (CFR) Section 761.3. This SAP will fill PCB data gaps to assure that all materials and equipment are properly profiled prior to initiating above-grade building demolition and disposal activities. Previously compiled inventory lists will be updated to include results from the data gaps sampling for LBNL concurrence before building demolition activities are initiated.

1.2 Site Setting

The "Old Town" area of the LBNL site is located in Berkeley, California (**Figure 1**). Phase 1 of the overall project includes deactivation, demolition and disposal of the remaining "Old Town" above-grade structures, specifically Buildings 5 and 16/16A (**Figure 2**). These structures were initially constructed in the 1940s and 1950s when PCB additives were common in construction materials.

1.3 Responsible Agency

DMS will execute this SAP under the oversight of LBNL.

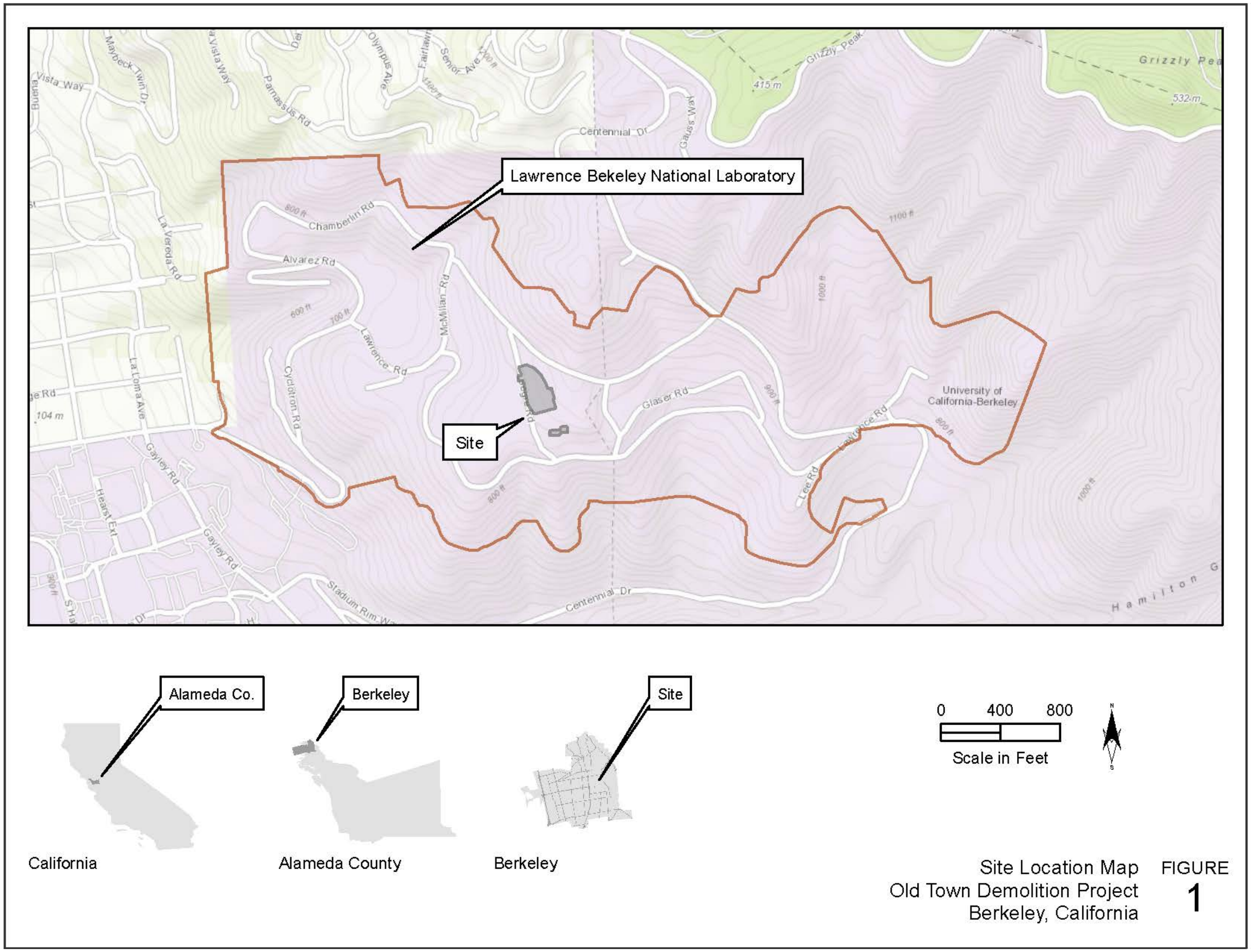

Figure 1. LBNL Location Map

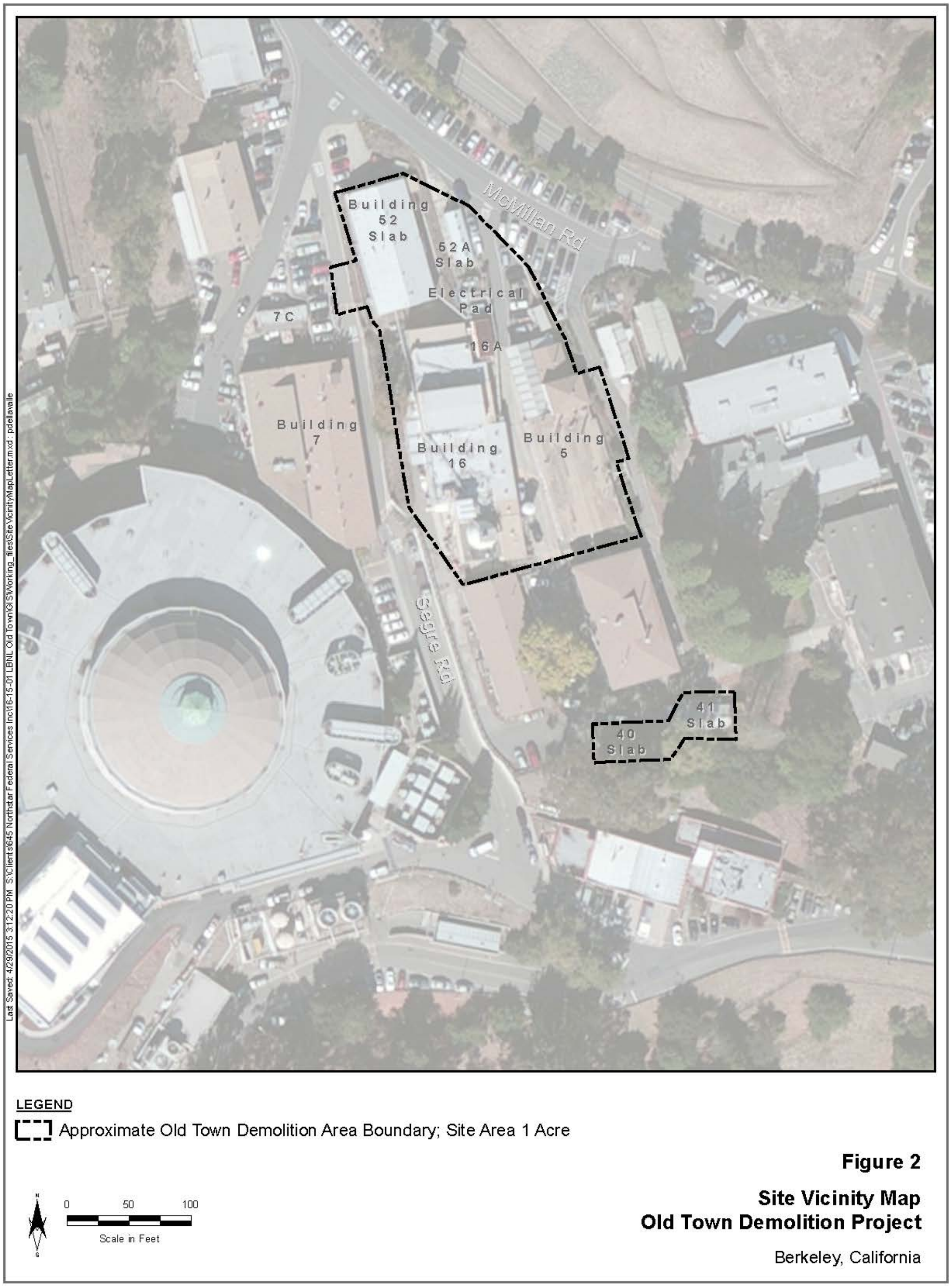

Figure 2. Site Vicinity Map

1.4 Project Organization

The key project personnel, contact information, and responsibilities are listed below in **Table 1**. The project organization chart is shown on **Figure 3**.

Table 1. Key Project Personnel Contact Information and Responsibilities

Title	Name	Phone Number Email Address	Responsibilities
Contractor Project Manager (include Company Name)	Jeffry Parkin DMS, LLC	707-430-3601 jparkin@dmsmp.com	Oversee project activities
Contractor Quality Assurance Officer	Pamela Jespersen DMS, LLC	925-783-8712 pjespersen@dmsmp.com	Oversee chemical data quality
Contractor Field Team Leader	Mitch Walker	859-803-0389 mitchellwalker@dmsmp.com	Oversee site activities
Laboratory Quality Assurance Officer	Teresa Morrison Curtis and Tompkins, Ltd.	510-204-2237 Teresa.Morrison@ctberk.com	Oversee laboratory operations and assure control of data quality

1.5 Report Organization

This SAP is organized into the following sections:

- Section 1—Introduction
- Section 2—Regulatory Framework
- Section 3—Background
- Section 4—Project Objectives
- Section 5—Sampling Rationale
- Section 6—Request for Analyses
- Section 7—Field Methods and Procedures
- Section 8—Sample Containers, Preservation and Holding Times
- Section 9—Sample Documentation and Shipment
- Section 10—Quality Control
- Section 11—Field Variances
- Section 12—Field Health and Safety Procedures
- Section 13—References

Tables and figures follow their first reference in the text. The text is followed by appendices, which provide supporting information.

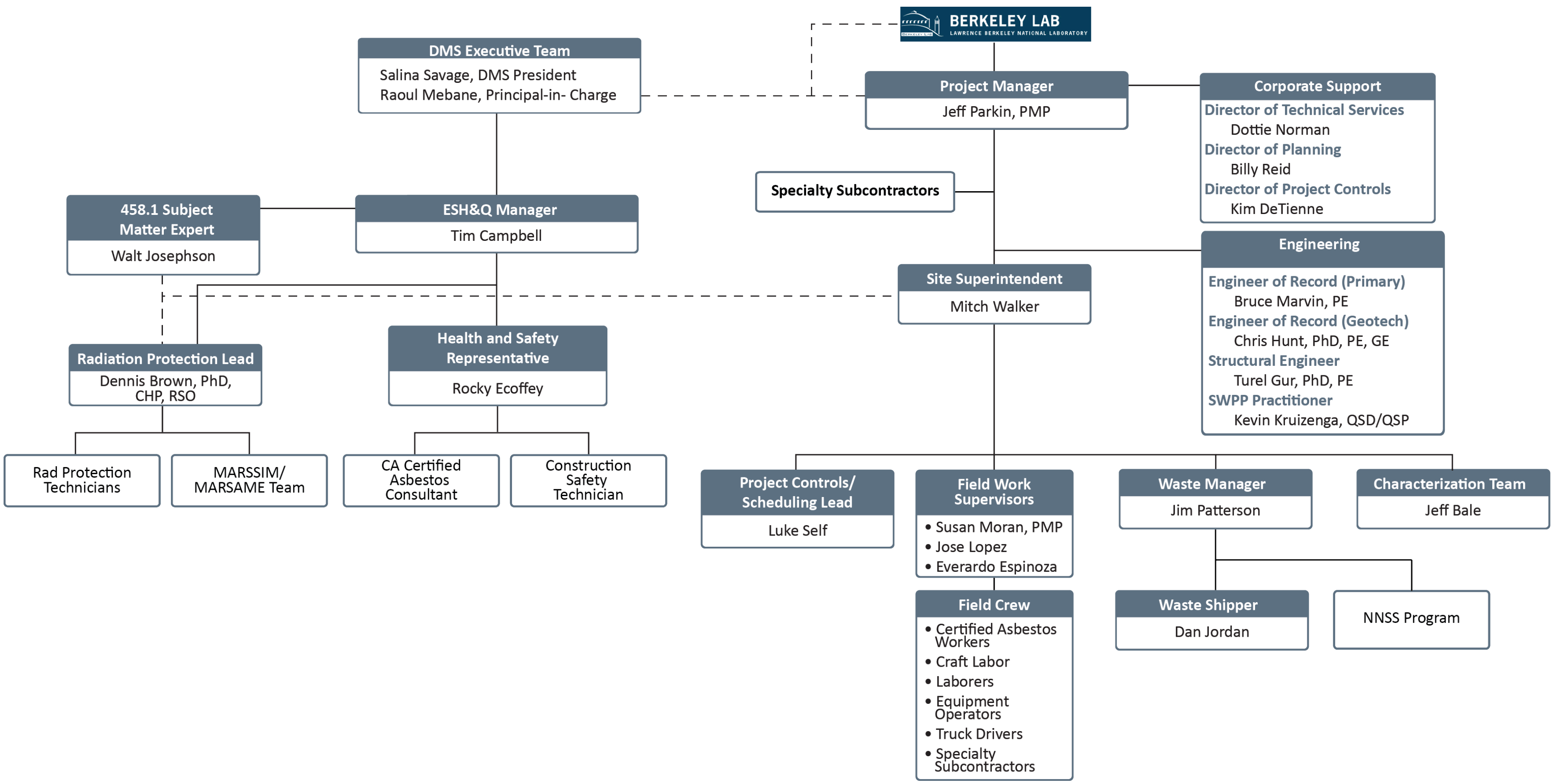

Figure 3. Project Organization

2 REGULATORY FRAMEWORK

The Toxic Substances Control Act (TSCA) regulates the storage and disposal of PCBs. EPA regulations implementing TSCA, promulgated at 40 CFR Part 761, apply to all persons who manufacture, process, distribute in commerce, use, or dispose of PCBs or PCB items. Substances that are regulated include, but are not limited to: dielectric fluids; solvents; oils; waste oils; heat transfer fluids; hydraulic fluids; paints or coatings; sludges; slurries; sediments; dredge spoils; soils; materials containing PCBs as a result of spills; and other chemical substances or combinations of substances, including impurities and byproducts and any byproduct, intermediate, or impurity manufactured at any point in a process. EPA regulates the TSCA requirements.

PCB remediation waste and PCB bulk product waste have not been identified during previous reconnaissance-level characterization efforts on above-slab building materials and items slated for demolition and disposal. Because data gaps have been identified, additional sampling is required to properly manage and dispose of the waste under TSCA. Except for transformers and capacitors, the final disposition of items will be based on the as-found concentrations. Where historic transformer records indicate PCB concentrations in dielectric fluids are greater than the as-found concentrations in the fluids, the transformer will be disposed based on the reported historic concentration. In accordance with 40 CFR 761.2(a)(4), capacitors that cannot be sampled and for which the age cannot be verified will be assumed to be manufactured before July 2, 1979 and contain total PCB concentrations greater than 500 milligram per kilogram (mg/kg). These capacitors will be disposed of in accordance with 40 CFR 761.60(b)(2)(iii). Additionally, per 40 CFR 761.2(a)(4), capacitors manufactured after July 2, 1979 will be assumed to be non-PCB; containing total PCB concentrations less than 50 mg/kg. PCB waste streams anticipated at Buildings 5 and 16/16a are listed in **Table 2**.

Materials at Building 5 have been documented to be radiologically contaminated and therefore will be designated as low-level radioactive waste. As such, if these materials also contain PCBs, they will be regulated for disposal in accordance with 40 CFR 761.50(b)(7). No building materials with PCB concentrations of 50 mg/kg or greater have been detected at Building 5, therefore they would not be classified as PCB/radioactive waste or PCB bulk product waste. If materials containing PCBs at 50 mg/kg or greater were identified, their disposal per 40 CFR 761.50(b)(7) is clarified in EPA's June 2014 Revisions to the PCB Q and A Manual as follows:

> "In accordance with §761.50(b)(7)(ii), any person disposing of PCB/radioactive waste must do so taking into account both its PCB concentration and its radioactive properties. If, taking into account only the properties of the PCB in the waste (and not the radioactive properties of the waste), the waste meets the requirements for disposal in a non-hazardous landfill (e.g., PCB/bulk product waste under Sec. 761.62(b)(1)), then the person may dispose of the PCB/radioactive waste, without regard to the PCB component of the waste, on the basis of its radioactive properties in accordance with all applicable requirements for the radioactive component of the waste. […] Federal, State or local regulations or permits may govern what type of waste can be disposed of in a radioactive waste landfill. Check with the landfill where you plan to dispose of the waste to make sure they are able to accept it. "

Table 2. PCB Waste Streams that May be Generated during Above-slab Demolition of Buildings 5, 16/16A

Category	Items	PCB Concentration		Designation
		Bulk (mg/kg)	Non-Porous Surface ($\mu g/100cm^2$)	
Electrical equipment	Transformers, capacitors	<50	≤10	Non-PCB Equipment
		≥50 and <500 (contaminating fluid)	>10 and <100	PCB-Contaminated Electrical Equipment
		≥500 (contaminated fluid)	≥100	PCB Transformer or Capacitor
Other Equipment	Vacuum pumps, Electromagnets, Switches (motor starters	<50	≤10	Non-PCB Equipment
		≥50 and <500 (contaminating fluid)	>10 and <100	PCB-Contaminated
		<2	Not applicable	Oil reclamation
		≥2 and <5	Not applicable	TSCA Oil reclamation
		≥5 and <50	Not applicable	California hazardous waste
Liquid–multi-phasic[1]	Sludge, oil-water mixture	<3 micrograms per liter	Not applicable	May be discharged to a treatment works or to navigable waters
		<200 micrograms per liter	Not applicable	Permitted for non-contact use in closed system
		≥ 50 ppm and < 500 milligrams per liter	Not applicable	PCB waste[2]
Cable	Cable insulation	<50	Not applicable	Excluded
		≥50	Not applicable	PCB Bulk Product
Pipes	Piping from vacuum, hydraulic, or heat exchange lines	<50	≤10	Non-PCB
		≥50	>10 and <100	PCB Remediation Waste
Lighting	PCB lighting ballasts	≥50	Not Applicable	PCB Bulk Product

1 For multi-phasic non-liquid/liquid or liquid/liquid mixtures, the phases shall be separated before chemical analysis. Following phase separation, the PCB
.

2 *Ibid*.

Category	Items	PCB Concentration		Designation
		Bulk (mg/kg)	Non-Porous Surface ($\mu g/100cm^2$)	
Building materials	Transite, caulking, insulation, wood, concrete, cement, plaster wallboard, ducting, rubber, asphalt, ceiling tile, roofing material, mastic, tape, adhesives, paper, Galbestos	<50	≤10	Excluded
		≥50	Not Applicable	PCB Bulk Product
Building materials or soils contaminated from spill or leak (porous)	Paint or coating on metal; corroded metal; fibrous glass or glass wool; unglazed ceramics; ceramics with porous glaze; porous building stone such as sandstone, travertine, limestone, or coral rock; low density plastics such as Styrofoam and low density polyethylene; coated (varnished or painted) or uncoated wood; painted or unpainted concrete or cement; plaster; plasterboard; wallboard; rubber; caulking; fiberboard; chipboard; asphalt; ceiling tile or tar paper containing PCBs	any concentration, assuming unknown source concentration and/or unknown release date		PCB Remediation Waste
Any of the above	Any of the above items PCBs	≥5 milligrams per liter leachate (STLC) or ≥50 milligrams per kilogram (TTLC)		California Hazardous Waste
Low-level radioactive waste	Any of the above wastes that are also considered LLRW	See above to determine if a particular waste is PCB or Non-PCB		If regulated for PCB content, then PCB/radioactive waste

Notes:

$\mu g/100cm^2$ micrograms per 100 square centimeters

mg/kg milligrams per kilogram

PCB polychlorinated biphenyl

3 BACKGROUND

3.1 Site Description

The area specific to the Project is approximately one acre in size. Buildings 5 and 16/16A were among the first to be constructed at LBNL in the 1940s. They are part of a cluster of one- to two-story low-rise buildings located at the center of LBNL and are constructed of wood or steel frames, with concrete block, corrugated metal, and/or Transite siding.

The Old Town buildings were used primarily as research laboratories or secondary support facilities related to the 184-inch cyclotron, including craft and maintenance shops, storage facilities, and offices. More recently, a number of the buildings were used to support the Advanced Light Source operations (Weiss, 2010).

3.1.1 Building 5

Building 5, known as the "chemistry annex", was built in 1947 and was designed for high-level radioactive chemistry work. The current building layout is provided in *Appendix A-1*.

3.1.2 Buildings 16/16A

Building 16 was constructed between 1943 and 1948, originally to house the XC Calutron magnet, a device used for enriching uranium. The current structure is a result of additions and/or modifications constructed as recently as the 1980s. The current building layout is provided in *Appendix A-2*.

3.2 Previous Investigations

Previous investigations and relevant reports prepared for the Old Town area of LBNL indicate there are no above-grade building materials or equipment in Buildings 5 and 16/16A with PCBs at concentrations at or above 50 mg/kg. The previous investigations and sampling activities are described in the following reports:

- *Draft Final RCRA Facility Assessment at the Lawrence Berkley Laboratory* (LBNL Environmental Restoration Program, 1992)
- *Draft Final RCRA Facility Investigation Report* (LBNL Environmental Restoration Program, 2000)
- *Summary of Radionuclide Investigations for Lawrence Berkeley National Laboratory* (LBNL Environmental Restoration Program, 2003)
- *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory* (LBNL Environmental Restoration Program, 2009)
- *Reconnaissance-Level Characterization Report for Buildings 5, 14, 25A, 40, 41, 44, 44A, 44B, 52, and 52A at the Lawrence Berkeley National Laboratory*, *Berkeley California* (Weiss Associates, 2010)
- *Waste Management Plan for Phase One of Old Town Demolition* (LBNL Environment, Waste & Radiation Protection Department, 2014)

- *Non-Radiological Reconnaissance Level Characterization Report University of California, Lawrence Berkeley National Laboratory Buildings 5, 16, 16A and Miscellaneous Equipment, One Cyclotron Road, Berkeley, California* (Northgate Environmental Management, Inc., 2014)

- *Guidance for Sampling and Analysis for Polychlorinated Biphenyls in Above-Slab Building Materials and Fixed Equipment in Buildings 4, 16, and 16A for the Lawrence Berkeley National Laboratory, Berkeley, California* (Weiss Associates, 2015)

Information and data from these reports will be used during the final building inspections to evaluate current site conditions and determine PCB data gaps.

3.2.1 Building 5

Table 3 provides a summary of the potential PCB-containing materials and items for disposal from Building 5 during this Project. The table also contains sampling information for items that were previously characterized and the data gaps to be addressed. The complete listing of PCB results is provided in *Appendix A-1.*

Based on the highest PCB result from building materials and items sampled to date, PCB concentrations in building materials and equipment at Building 5 are below 50 mg/kg. In addition, there is no evidence to suggest there has been a release of PCB containing liquids that would create PCB remediation waste in the above-grade building materials or equipment.

3.2.2 Building 16/16A

Tables 4 and **5** provide summaries of the potential PCB-containing materials and items for disposal from Buildings 16 and 16A during this Project. These tables also contain sampling information for items that were previously characterized and the data gaps to be addressed. The complete listing of PCB results is provided in *Appendix A-2.* Based on the highest PCB result from building materials and items sampled to date, PCB concentrations in building materials and equipment sampled at Buildings 16 and 16A are below 50 mg/kg for solid samples and 10 milligrams per 100 square centimeters (µg/100 cm^2) for wipe samples. In addition, there is no evidence to suggest there has been a release of PCB-containing liquids that would create a PCB remediation waste in the above-grade building materials.

Table 3. Building 5 PCB Summary and Planned Sample Collection Quantities

Matrix/Material Analyzed or Considered	Previous Sample Quantity	Highest Result	Received PCB Spill?	PCBs Less Than 50 mg/kg	Quantity of Samples to Collect
Sediment	1	0.52 mg/kg	No	Yes	1 sample from each pit outside of Room 150A if sufficient sediment is found for sampling. Sediment found in pits and sumps inside the Building 5 foundation have been previously sampled for PCBs.
Heating, ventilation, and air conditioning ducts	0	Not tested	No	Unknown	1 wipe sample at the duct outlet in each room.
Exterior paint	0	Not tested	No	Unknown	1 sample of each paint color.
Interior paint	3	19.9 mg/kg	No	Yes	1 sample of other paint colors not already tested.
Window caulk	1	0.042 mg/kg	No	Yes	1 sample of each distinct caulk types.
Substrate to which the sampled caulk adhered	0	Not tested	No	Unknown	1 sample of the substrate to which the sampled caulk (see row above) adhered. Hold and analyze if caulk result is ≥ 50 mg/kg.
Transite siding material	0	Not tested	No	Unknown	3 samples of each type of Transite material observed.
Roofing Material	0	Not tested	No	unknown	3 samples per roof type of undocumented age or pre-1980 roofing material, including roofing that may be covered with newer roofing.
Oil in all equipment not previously sampled	1	2 mg/kg	No	Unknown	1 sample of oil from each reservoir or wipe sample if dry. Sample capacitors if a port can be located.
Vacuum pump piping	0	Subject to final inventory	No	Unknown	1 sample of fluids in each discrete pipe. If dry 1 wipe sample every 100 linear feet or other representative location for each discrete pipe system.
Oil coolant piping	0	Subject to final inventory	No	Unknown	1 sample of coolant from each system or, if dry, 1 wipe sample every 100 linear feet.
Insulation material on copper cable	0	Not tested	No	Unknown	Up to 4 4-point composites; one composite for each type of insulation.
Mastic	0	Not tested	No	Unknown	Collect one sample from each type encountered.
Fluorescent lighting ballast	15 inspected	No ballast found	No	NA	1 sample of each stained ceiling tile.
Tape	0	Not present	NA	NA	1 sample from each type encountered.

Matrix/Material Analyzed or Considered	Previous Sample Quantity	Highest Result	Received PCB Spill?	PCBs Less Than 50 mg/kg	Quantity of Samples to Collect
Varnishes/waxes	0	Not present	NA	NA	
Adhesives	0	Not present	NA	NA	
Paper	0	Not present	NA	NA	
Galbestos	0	Not present	NA	NA	
Felt or fabric insulation	0	Not present	NA	NA	

Notes:
mg/kg milligrams per kilogram
NA not applicable
PCB polychlorinated biphenyl

Table 4. Building 16 PCB Summary and Planned Sample Collection Quantities

Matrix/Material Analyzed or Considered	Previous Sample Quantity	Highest Result	Received PCB Spill?	PCBs Less Than 50 mg/kg	Quantity of Samples to Collect
Heating, ventilation, and air conditioning ducts	0	Not tested	No	Unknown	1 wipe sample at the duct outlet in each room.
Exterior paint	1	0.2 mg/kg	No	Yes	1 sample of each paint color.
Interior paint	0	Not tested	No	Unknown	1 sample of other paint colors not already tested.
Window/siding exterior caulking	4	0.67 mg/kg	No	Yes	1 sample of each distinct caulk types.
Window/siding interior caulk	6	0.32 mg/kg	No	Yes	1 sample of each distinct caulk types.
Substrate to which the sampled caulk adhered	0	Not tested	No	Unknown	1 sample of the substrate to which the sampled caulk (see row above) adhered. Hold and analyze if caulk result is ≥ 50 mg/kg.
Transite siding material	0	Not tested	No	Unknown	3 samples of each type of Transite material observed.
Roofing Material	0	Not tested	No	Unknown	3 samples per roof type of undocumented age or pre-1980 roofing, including roofing that may be covered with newer roofing.
Oil in all equipment not previously sampled	11	31 mg/kg	No	No	1 sample of oil from each reservoir or wipe sample if dry. Sample capacitors if a port can be located.

Matrix/Material Analyzed or Considered	Previous Sample Quantity	Highest Result	Received PCB Spill?	PCBs Less Than 50 mg/kg	Quantity of Samples to Collect
Vacuum pump piping	0	Subject to final inventory	No	Unknown	1 sample of fluids in each discrete pipe. If dry 1 wipe sample every 100 linear feet.
Oil coolant piping	0	Subject to final inventory	No	Unknown	1 sample of coolant from each or, if dry, 1 wipe sample every 100 linear feet.
Insulation material on copper cable	0	Not tested	No	Unknown	Up to 4 4-point composites, one composite for each type of insulation.
Mastic	0	Not tested	No	Unknown	Collect 1 sample from each type encountered.
Fluorescent lighting ballast	9 inspected	No ballast found	No	NA	1 sample of each stained ceiling tile in areas of the building. constructed before 1980
Tape	0	Not present	NA	NA	Black tape is present on piping associated with the Horton Sphere vacuum system (overhead) and with the magnet/diffusion pump in the northern part of B16 (Room 137, NE corner); 1 sample of each type of tape will be collected. 1 sample from each type encountered.
Varnishes/waxes	0	Not present	NA	NA	
Adhesives	0	Not present	NA	NA	
Paper	0	Not present	NA	NA	
Galbestos	0	Not present	NA	NA	
Felt or fabric insulation	0	Not present	NA	NA	

Notes: mg/kg milligrams per kilogram
NA not applicable
PCB polychlorinated biphenyl

Table 5. Building 16A PCB Summary and Planned Sample Collection Quantities

Matrix/Material Analyzed or Considered	Number of Existing Samples	Highest Result	Received PCB Spill?	PCBs Less Than 50 mg/kg	Quantity of Samples to Collect
Exterior paint scrapings	0	Not tested	No	Unknown	1 sample of each paint color.
Interior paint scrapings	0	Not tested	No	Unknown	1 sample of each paint color.
Window (on door)/siding caulking	0	Not tested	No	Unknown	1 sample of distinct caulk types.
Acoustic insulation	0	Not tested	No	Unknown	1 sample of each distinct insulation type.
Roofing material	0	Not tested	No	Unknown	3 samples per roof type of undocumented or pre-1980 roofing, including roofing that may be covered with newer roofing.
Fluorescent lighting ballast	0	Not tested	Unknown	Unknown	1 sample of each stained ceiling tile.
Tape	0	Not present	NA	NA	1 sample from each type encountered.
Varnishes/waxes	0	Not present	NA	NA	
Mastic	0	Not present	NA	NA	
Adhesives	0	Not present	NA	NA	
Paper	0	Not present	NA	NA	
Galbestos	0	Not present	NA	NA	
Felt or fabric insulation	0	Not present	NA	NA	

Notes: mg/kg milligrams per kilogram
NA not applicable
PCB polychlorinated biphenyl

4 PROJECT OBJECTIVES

4.1 Project Objectives and Problem Definition

Supplemental sampling of select building materials and equipment is required to fill data gaps from previous characterization efforts to determine if EPA-regulated PCB bulk product waste or remediation waste is present in Buildings 5 and 16/16A. The data will also be used to confirm waste disposal profiles for the various waste streams. This SAP has been prepared to address sampling and analysis of PCB data gaps to assure that all materials and equipment are properly profiled prior to initiating above-grade building demolition and disposal activities.

4.2 Data Quality Objectives

Data quality objectives (DQOs) for this Project are provided in the seven-step process described below.

Step 1—State the Problem. Data gaps exist in characterization of building materials and equipment including fluids in Buildings 5 and 16/16A for PCB content that prevent the proper designation for disposal of the materials and equipment. Complete maintenance records are not available for all equipment (transformers and capacitors), necessitating that disposal decisions be based on the as-found concentrations of oil contained in the equipment.

Additional data are required to characterize building materials and equipment, including fluids found in equipment for disposal per the designations listed in Table 2 and to provide the scope of worker safety procedures required during demolition. The data are also required to determine if any of the building materials, equipment, and fluids in Buildings 16/16A may be recycled. No building materials, equipment, and fluids in Building 5 will be recycled.

Step 2—Identify the Goal of the Study. The goal of the sampling is to obtain sufficient data regarding the PCB content of building materials and equipment in Buildings 5 and 16/16A to properly characterize the materials in conformance with regulatory requirements summarized in Table 2.

Step 3—Identify Information Inputs. Data from prior reconnaissance-level characterizations of Buildings 5, 16/16A, which includes results of inspections of fixed equipment and light fixtures, inventories of equipment that contained oil, and results of PCB sampling and analysis of selected building materials, oils and equipment surfaces will be used as inputs (Appendix A) along with PCB results obtained as a result of implementation of this SAP in determining if the above-slab building materials and equipment contain PCBs at concentrations rendering the materials and/or equipment bulk product waste or PCB remediation waste.

Available records for transformers will be reviewed and historic dielectric fluid concentrations or current concentrations, whichever are higher, will be used to appropriately characterize for final disposition.

Step 4—Define the Boundaries of the Study. The spatial boundaries of the Project include the building materials above the slab and equipment in Buildings 5 and 16/16A. The sampling must be completed prior to building demolition, and is planned to be conducted in June and July 2015.

Step 5—Develop the Analytical Approach. Prior to collecting samples, a thorough inspection of building materials and equipment in Buildings 5 and 16/16A will be completed and an inventory of materials and equipment that may have contained PCBs will be generated. The inventory will be compared to previous characterization reports to identify which materials and/or equipment have not been tested and therefore require sampling. The constituents of concern are PCBs; in addition to total PCBs, the following Aroclors will be reported for each sample:

- Aroclor 1016
- Aroclor 1221
- Aroclor 1232
- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260
- Aroclor 1268

The total PCB result, calculated as a sum of the individual Aroclors, will be compared to the applicable thresholds listed in Table 2. For building materials containing PCBs due to a spill or release, the results will be compared to the project action level of 1 mg/kg (the presumptive site cleanup level) or 10 µg/100 cm^2 for wipe samples collected from non-porous surfaces; building materials, equipment, and items with total PCB concentrations equal to or greater than these levels will managed as PCB remediation waste. The total PCB result, calculated as a sum of the individual Aroclors, from oil, hydraulic fluid, and coolant samples will be used to determine the appropriate final disposition such as reclamation or incineration.

Except for transformers and capacitors, the final disposition of items will be based on the as-found concentrations. Where historical transformer records indicate PCB concentrations in dielectric fluids are greater than the as-found concentrations in the fluids, the transformer will be managed and disposed of based on the reported historical concentration. In accordance with 40 CFR 761.2(a)(4), capacitors that cannot be sampled and the age of which cannot be verified will be assumed to be manufactured before July 2, 1979 and contain total PCB concentrations greater than 500 milligram per kilogram (mg/kg). These capacitors will be disposed in accordance with 40 CFR 761.60(b)(2)(iii). Additionally, per 40 CFR 761.2(a)(4), capacitors manufactured after July 2, 1979 will be assumed to be non-PCB; containing total PCB concentrations less than 50 mg/kg.

Step 6—Specify Performance or Acceptance Criteria. Data gaps identified in prior characterization reports will be addressed to the extent required to meet the goal stated in Step 2 above. The extent of existing data gaps regarding equipment characterization is uncertain and will be addressed by reviewing previously collected sample data and development of an inventory by visual inspection to identify equipment, items, and fluids that have not been sampled.

Data collected for this study will be acceptable if collected in conformance with applicable requirements of 40 CFR 761 and the data acceptability standards of the disposal or recycling facilities to which waste/material from Buildings 5, 16/16A is to be sent. No building materials, equipment or liquids from Building 5 will be recycled. Data from previous characterization used to define data gaps, shall meet minimum quality requirements stated herein. Existing data will be accepted if collected and analyzed according to the requirements of 40 CFR 761. If modifications to the collection or analysis procedures described in this SAP are necessary, these changes will be evaluated for their impact on resulting data usability. Data adequacy and limitations shall be documented in the sampling and analysis report.

Step 7—Develop the Plan for Obtaining Data. A systematic inspection using the compiled inventory listing and building layout figures provided in Appendix A will be performed in each building. Sampling will be conducted for data gaps identified in building materials, equipment, and items. Sample preparation and analysis will be performed using the following promulgated methods provided in the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1996):

Sample preparation:

- EPA Method 3580A—Waste Dilution (oil/hydraulic fluids/coolants)
- EPA Method 3540C—Soxhlet Extraction (solid matrices including sediment, building materials, insulation, wipes, etc.)
- EPA Method 3665A—Cleanup of extracts with sulfuric acid
- EPA Method 3660B—Sulfur cleanup with copper option

Sample analysis:

- Polychlorinated biphenyls—EPA Method 8082A

4.3 Data Quality Indicators (DQIs)

The purpose of quality assurance (QA)/quality control (QC) procedures is to produce data of known and expected quality by satisfying certain DQIs relative to precision, accuracy, representativeness, comparability, and completeness. The performance criteria for laboratory analysis of PCBs are found in the EPA Region 9 DQI table for Organochlorine Pesticides and Polychlorinated Biphenyls (EPA, 1999).

Indicators of data quality are summarized in **Table 6** and described in the following sections.

Table 6. Data Quality Indicators

Matrix	Sample Preparation Method	Analysis Method	Analytical Instrumentation	Method Reporting Limit	Precision	Accuracy
Solid samples (Sediment, Paint, Adhesive, Sealant, Bulk Materials and Porous Items)	EPA Method 3540C	EPA Method 8082A	Gas Chromatography with Electron Capture Detectors	0.010 to 0.020 mg/kg	±30% RPD	40-150%
Oil/Hydraulic Fluid	EPA Method 3500C			0.1 to 0.2 mg/kg		
Non-Porous Items (Wipes)	EPA Method 3540C			0.5 to 1.0 µg/100 cm^2		70-150%

Notes:

%	percent
µg/100 cm^2	micrograms per 100 square centimeters
EPA	US Environmental Protection Agency
mg/kg	milligrams per kilogram
RPD	relative percent difference

4.3.1 Precision

Precision is the degree to which the analytical measurement is reproducible (i.e. that there is agreement between replicate measurements made under similar conditions for the same property). This is a measure of random error and can result from problems with sampling procedures, preservation, storage, shipment, preparation or analysis. Reproducibility among duplicate samples provides a determination of precision, which can be expressed as the relative percent difference in the amount of detected compounds between the original and duplicate samples. Relative percent difference (RPD) is quantified by the following equation:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \text{x100}$$

where:

RPD = Relative percent difference
C1 = Larger of the two observed values
C2 = Smaller of the two observed values

Precision will be evaluated using laboratory control sample and laboratory control duplicate results.

4.3.2 Accuracy

Accuracy is the evaluation of how close the analytical measurement is to the true value. Accuracy is a combination of random error (precision) and systematic error (bias). Accuracy for laboratory analytes is determined by comparing measured concentrations in a sample matrix against the measured concentration in a matrix spiked with a known amount. The formula for determining accuracy is:

$$\text{Percent Recovery (\%)} = \frac{(B - A) \text{ x } 100}{T}$$

where:

B = measured concentration of spiked samples
A = measured concentration of unspiked samples
T = true spiked concentration

Accuracy will be evaluated based on the percent recovery results for laboratory control samples and laboratory control duplicates. Accuracy will also be evaluated based on the recovery for surrogate spike standards.

4.3.3 Representativeness

Representativeness is a qualitative term describing the degree to which sample data typifies the characteristic of interest at the point of interest accurately and precisely. Representativeness of data from field sites is a function of the sampling process design and the sampling procedures, which are designed to optimize the potential for obtaining samples that reflect the true state of the environment while maintaining practicability. Sampling methods are described in *Section 7*.

4.3.4 Comparability

Comparability is a qualitative term to describe the ability and appropriateness of taking two or more data sets to make collective conclusions. Issues to be considered include variables that could affect the descriptive value of the data for specific parameters at specific times using specific methods.

Considerations include:

- Variables of interest included
- Common units used
- Similarity of methods and QA
- Time frames
- Equipment used

4.4 Data Review

Level 3 data packages are required for all PCB results. All analytical data generated by the laboratory will be reviewed prior to reporting to assure their validity. This internal laboratory data review process will consist of data reduction, several levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms, or logbooks, that will be signed and dated by the reviewer. Any analytical issues will be documented in the data package narrative.

All data will be reviewed by a qualified DMS associate to ensure that sample collection and analyses conform to the relevant performance criteria. This review will include, but not be limited to sample preparation and analysis procedures, compositing procedures, chain-of-custody, holding time, method reporting and detection limits, surrogate standard recoveries, and instrument calibration. A data usability summary will be prepared to document reviewed data.

4.5 Data Management

Hardcopy Deliverables—All raw data and documentation, including (but not limited to) logbooks, data sheets, electronic files, final reports, *etc.*, will be maintained by the laboratory for at least seven years. All data packages data will be Level 3.

Electronic Deliverables—The electronic data deliverable (EDD) will be in the specific file format required for upload by LBNL database personnel. The laboratory will certify that the EDD and the hard copy reports are identical. One significant figure will be used for PCB results that are less than ten, and two significant figures will be used for PCB results that are greater than ten. A complete listing of the data from the LBNL database will be compared to the hardcopy data following data entry.

Hardcopy deliverables, data packages on the Adobe Acrobat format and EDDs will be catalogued and kept on file at the project site. Hardcopy and EDD deliverables will be transmitted to LBNL.

5 SAMPLING RATIONALE

This SAP has been prepared to address sampling and analysis of PCB data gaps to assure that all materials and equipment are properly profiled prior to initiating above-grade building demolition and disposal activities. The following sections describe the procedures for data gaps sampling.

5.1 Preliminary Inspection, Inventory and Sampling

In order to identify data gaps, a systematic inspection of the building materials, equipment and items will be performed and compared to the previously compiled inventory listing in *Appendix A.* This comparison will be used to determine materials and items that must be sampled. A list of materials and items that require sampling will be developed.

Samples will be collected from any building materials, such as caulking, paint, or other structural items not previously sampled. In accordance with industry standards at least one sample from each discrete type of building material will be sampled. If it appears that the materials may have been installed at different times, one sample from each installation will be sampled. If the building material extends over a large area, up to three samples will be samples as summarized in **Tables 3, 4,** and **5**.

Previously sampled equipment will be clearly marked. Oil/hydraulic fluids, coolant, or other liquids in unsampled equipment will be collected. If the unsampled equipment does not contain any liquids, a wipe sample will be collected. Wipe samples will be collected on the accessible interior surfaces of any piping suspected to contain PCBs, vacuum or heat exchange lines, and chambers that would be removed as part of the building demolition.

5.2 Material Discovery

If during the demolition process, a type of material is encountered that had not been identified during the inspection and inventory such as paper insulation behind wall board, then the material will be sampled as described in Section 5.1. As shown in **Tables 3**, 4, and **5** one sample from each type of material encountered will be collected for PCB analysis.

5.3 Records Management

All records created during inspections, inventory or sampling will be kept in the DMS project file for a minimum of 10 years per DMS record keeping practice. The results and conclusions of such sampling will be summarized in a brief technical letter or memorandum to be submitted to the LBNL for their use and records. These documents will include copies of field observation forms, and photographs.

6 REQUEST FOR ANALYSES

6.1 Analytical Laboratory

Analytical services will be performed by a laboratory be accredited under the State of California Department of Health Services Environmental Laboratory Accreditation Program and the Department of Defense Environmental Laboratory Accreditation Program. Laboratories selected for the project will be capable of providing the required turnaround time and data deliverables required in this SAP. Quality assurance personnel for the laboratory will be designated in each laboratory's Quality Assessment Manual. The analytical laboratory will designate a project manager for this project.

The laboratory will receive a copy of the final SAP including any revisions and amendments. At the laboratory, the project manager is responsible for its implementation.

6.2 Analytical Methods

Sample preparation and analysis will be performed using the following promulgated methods provided in the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 1996):

Sample preparation:

- EPA Method 3580A—Waste Dilution (oil/hydraulic fluids/coolants)
- EPA Method 3540C—Soxhlet Extraction (solid matrices including sediment, building materials, insulation, wipes, etc.)

- EPA Method 3665A—Cleanup of extracts with sulfuric acid
- EPA Method 3660B—Sulfur cleanup with copper option

Sample analysis:

- Polychlorinated biphenyls—EPA Method 8082A

7 FIELD METHODS AND PROCEDURES

The following types of samples may be collected during the deactivation, demolition, and disposal of building materials and equipment from Buildings 5, 16/16A:

- Sediment samples
- Paint chip samples from wall, caulking, and caulk substrate
- Transite and roofing material paint chip samples
- Oil/hydraulic fluid and coolant liquid samples
- Wipe samples
- Cable insulation samples
- Bulk material samples such as tape

The following supplies will be required for sample collection:

- Pre-cleaned containers and labels
- Paint scrapers and steel blades
- Chain-of-Custody (COC) Forms
- Disposable sampling gloves
- Safety glasses and other appropriate personal protective equipment
- Paper towels
- Field log book
- Permanent marker, wax pencils, and pens
- Sample packaging and shipping supplies
- Bagged ice and coolers
- Camera

7.1 Sediment Sampling

Sediment samples will be collected as follows:

- Don disposable gloves, safety glasses and other personal protective equipment.
- Using a disposable trowel scoop the sediment into a 16-ounce jar.
- Place a sample label on all containers, put the sample containers in a resealable bag, and place in cooler containing ice.
- Document the sample location and depth in the field logbook and enter the samples on the COC form (**Figure 4**).
- Replace gloves before collecting the next sample.

Figure 4. Example Chain-of-Custody Form

Chain-of-Custody Form

Project Number:					Project Name: OTD Phase 1	No. of Containers	Request for Analysis						Chain-of-Custody No.:
Sampler's *(Signature)*													Page _ of _
Field Sample ID	Date	Time	Comp.	Grab	Matrix								Additional Requirements
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)							Date and Time:
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)							Date and Time:
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)							Date and Time:
Notes: Data package: Level III Turnaround time:													For Laboratory Use Only

7.2 Paint Chip Sampling

Paint chip samples will be collected from areas with different color paints. Paint chip samples will be collected as follows:

1. Organize the sampling supplies in a clean area in the vicinity of the sampling point.
2. Wear disposable gloves, safety glasses, and other appropriate personal protective equipment while sampling.
3. Identify the area to be sampled and wipe it clean of dust with a paper towel.
4. Scrape the area with a new or decontaminated paint scraper or blade and collect paint chip samples into a sample container. Paint chip samples shall not contain any medium from which they are collected. Collect sufficient volume to generously cover the bottom of the 4-oz sampling jar (1 to 2 grams).
5. Seal the container with the lid, label it, and place it in a resealing bag inside a cooler with ice.
6. Mark the sampled equipment with a sample ID number and photograph the sampling location.
7. Change gloves, decontaminate blade with a paper towel moistened with hexane, and repeat steps 3 through 6 for additional samples.
8. Complete sampling records in the field log book and fill out the COC Form (**Figure 4**).
9. Pack the samples for shipment by courier or by overnight delivery service.
10. Ship the samples to the laboratory as soon as possible and by the fastest available delivery service.

7.3 Wipe Samples

Wipe samples will be used to evaluate residual PCB contamination on equipment and on piping left-in-place. Wipe samples will be collected on the accessible interior surfaces of any piping suspected to contain PCBs, vacuum or heat exchange lines, and chambers that would be removed as part of the building demolition. Wipe samples will be collected in accordance with 40 CFR 761.123 standard wipe sampling procedure enclosed in *Appendix B*.

Wipe samples from pipes will be collected at a frequency of one sample for every 100 linear feet of pipe. An environmental professional will determine the representative sample locations. The samples will be collected using a standard wipe sampling procedure as defined in §761.123 (*Appendix B*). To allow comparison of the sample data to the threshold of 10 $\mu g/100cm^2$, a surface sample from a minimum surface area of 100 cm^2 at each sampling location will be collected. To collect a sample from an area of 100 cm^2, the length of pipe listed in **Table 7** will be wiped.

Small diameter pipes (<2 inches) will be cut at both ends to an appropriate length for purposes of sampling the pipe. If necessary, a stainless steel rod will be used to push the wipe through the length of the pipe specified in **Table 7**. If the wipe is too large to be pushed through a small diameter pipe, the wipe will be cut in half. Both sections of the wipe will be pushed through the pipe.

To avoid any potential loss of PCBs, pipes to be sampled will be cut using a saw; not a torch. If a torch or other high temperature heat source is required to cut the pipes, the pipe will be sampled a minimum of 15 cm from the cut.

Table 7. Conversion Measurements for Pipeline Wipe Sampling

Inner Pipe Diameter (inches)	Inner Pipe Circumference (inches)	Length of Pipe to Sample (inches)	Area Sampled ($inches^2$)	Area Sampled ($centimeters^2$)
8	25.1	1	25.1	161.9
6	18.8	1.5	28.2	181.9
4	12.6	2	25.2	162.6
2	6.3	4	25.2	162.6
1	3.1	6	18.6	120.0
0.75	2.4	7	16.8	108.4

7.4 Oil Samples

Oil, hydraulic fluids and coolants in fixed equipment will be collected using bailers, pipettes, or syringes as appropriate. For samples from equipment with a drain valve or a collection port, the valve or port will be flushed prior to sample collection by opening the valve and allowing oil to momentarily run into a waste container before directing the stream into an open sample container. If multiphase liquids or non-aqueous materials are present, samples of each phase and material shall be collected.

Based on samples collected in 2014, diffusion pump oil may be too viscous to flow at room temperature. If diffusion pumps are sampled, the oil reservoir will be preheated using a heat gun until a sufficient sample volume is collected for analysis.

7.5 Solid Samples

Solid materials including caulking, Transite, roofing materials, and cable insulation will be collected as described below.

The following supplies will be required for collection of solid samples:

- Nitrile gloves
- Bolt cutters, shears or loppers or a hack saw
- Indelible marker or equivalent
- Resealing plastic bags, gallon size
- Pre-cleaned sample jars
- Spray paint
- Camera

The following sampling procedure will be employed:

1. Don a new pair of nitrile gloves.
2. For cable insulation sampling, in the *Technical Guidance for Determining the Presence of Polychlorinated Biphenyls (PCBs) at Regulated Concentrations on Vessels (Ships) to be Reflagged,* EPA recommends that a cross-section of the cable be cut by the sampling crew and the sample be sent in its entirety to the laboratory for separation and analysis. The laboratory will separate and remove all metal materials from the sample. All of the remaining non-metal portions of the sample will be homogenized into a single sample, and a weight-proportional composite will be prepared, extracted, and analyzed. A 5-inch length of cable will be cut using bolt cutters or a hack saw and the sample placed in a resealing plastic bag. The laboratory will be instructed to do all separation of the cable components.
3. Other solid samples will be collected by cutting, chipping or breaking the material and placing it in a clean sample container. A minimum of 5 grams will be collected for each sample.
4. Using an indelible marker, label the plastic bag/sample jar with the date and time of sample collection, sample identification number, collector's initials, and requested analysis.
5. Follow sample handling and the COC procedures.
6. Decontaminate bolt cutters or other reusable tools that were used for sample collection.
7. Photo-document the sample location.
8. Enter sampler's name, sample location, date and time of sample collection, sample identification number and photo number into field notebook.

7.6 Decontamination Procedure

All non-disposable equipment including the stainless steel rod used for small diameter pipe wipe sampling that comes into contact with potentially contaminated materials will be decontaminated. Decontamination will occur prior to and after each use of a piece of non-disposable equipment. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Sampling equipment decontamination will be performed in accordance with 40 CFR § 761.79 (c)(2) by swabbing surfaces with a solvent. Solvent, such as hexane, will be provided by the laboratory in a squeeze bottle. A paper towel moistened with hexane will be used for cleaning equipment surfaces that came into contact with potential PCB-containing material. The towels that are not expected to be contaminated with PCBs will be disposed of as trash together with used personal protective equipment. In Building 5, because of the potential for radioactive contamination all sampling equipment will be left in the building to be disposed with the demolition waste.

7.7 Investigation Derived Waste

Disposable equipment intended for one time use will not be decontaminated but will be placed in double lined plastic trash bags with sample gloves and other personal protective equipment for appropriate disposal following use. For materials used in Building 5, materials will be left in the building to be disposed as low level radioactive waste with the rest of the demolition waste.

8 SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME

The containers provided by the laboratory will be pre-cleaned by the manufacturer according to the EPA requirements. Sample temperature requirements will include storage and transportation at ≤6 Celsius. **Table 8** the preservation and holding times for PCB samples.

Table 8. Analytical Methods, Containers, Preservation, and Holding Time Requirements

Analytical Parameter	Analytical Method Number	Sample Containers	Preservation Requirements	Holding Times
PCBs	EPA Method 8082A	4-ounce jar	Cool to ≤ 6°Celsius	None for extraction; 40 days for analysis

Notes:
EPA US Environmental Protection Agency
PCB polychlorinated biphenyl

9 SAMPLE DOCUMENTATION AND SHIPMENT

9.1 Field Notes

Field documentation will include, at a minimum, a Field Logbook, buildings floor plans, and preprinted COC forms (**Figure 4**).

9.1.1 Field Logbooks

A Field Logbook with consecutively numbered pages will be assigned to this project. All entries will be recorded in indelible ink. At the end of each workday, the responsible sampler will cross out, sign, and date any unused portions of the logbook page last used. If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used. At a minimum, the Field Logbook will contain the following information:

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample
- Type of sampling equipment used
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Shipping arrangements (overnight air bill number)
- Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with contractor or federal agency personnel
- Deviations from sampling plans, site safety plans, and/or SOPs
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

9.1.2 Building Floor Plans

Building floor plans included in *Appendix A* and/or other site drawings as appropriate, are invaluable for establishing and recording the location of sample collection, or making notations for field observations. During the inspection process, floor plans will be used to identify previous sample locations and areas for sampling to address data gaps.

9.1.3 Photographs

Photographs will be taken at areas of interest and sample locations. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in the field photography log:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph

9.2 Sample Numbering and Labeling

Samples will be uniquely designated using a numbering system that identifies a sampling point and a sample. The numbering system will be as follows: building number, sample type (P for paint, C for caulking materials, O for oil/hydraulic fluid, C for coolants, W for wipe samples, and B for bulk material samples), and a consecutive sample number for the entire project. Examples of the numbering system are provided below:

- B16-P-YY where B-16 indicates Building 16, P stands for paint and YY is the consecutive sample number for the entire project.

A Sample Tracking Log will be maintained by the sampling personnel to track all collected samples.

Sample labels will be affixed to each sample container; non-waterproof labels will be covered with clear tape prior to sampling. Sample labels may be preprinted or prepared in the field. The following information will be recorded on the sample label:

- Project name
- Sample identification number
- Analysis to be performed
- Sampler's initials
- Sample collection date (month/day/year)

- Time of start of the sampling (24-hour clock)

9.3 Sample Custody

Sampling personnel will complete the COC form prior to transferring samples to the laboratory either by courier service or by overnight delivery service. A sample is under custody, if one or more of the following criteria are met:

- It is in the sampler's possession
- It is in the sampler's view after being in possession
- It is in a designated secure area

In addition to providing a custody exchange record for the samples, the COC form serves as a formal request for sample analyses. **Figure 4** includes an example of a COC form. At a minimum, each sample, the required analyses, sample collection date/time, and the individuals or organizations performing the sample collection, shipment, and receipt will be listed on the COC. Sample custody is the responsibility of the field crew from the time of sample collection until the samples are accepted by the laboratory courier service for delivery to the laboratory, or until the samples are accepted for shipment by a commercial courier. Thereafter, the laboratory performing the analysis will maintain custody.

The COC form will be the controlling document to assure that sample custody is maintained. Each time the sample custody is transferred to a different organization, the former custodian will sign the COC on the "Relinquished By" line, and the new custodian will sign the COC on the "Received By" line. The date, time and company affiliation will accompany each signature. The laboratory will immediately notify project personnel if the event the COC is broken. A decision will be made as to the fate of the sample(s) in question on a case-by-case basis. The sample(s) will either be processed "as-is" with custody failure noted along with the analytical data or rejected with resampling scheduled, if necessary. Any non-conformance associated with the samples will be noted on the appropriate certificate or analysis or in a case narrative.

The COC forms will be completed, signed, and distributed as follows:

- One copy retained by the sample coordinator
- The original sent to the analytical laboratory with the sample shipment

After the laboratory receives the samples, the laboratory sample custodian will inventory each shipment before signing for it and note on the Cooler Receipt Form any discrepancy in the number of samples, temperature of the cooler or broken samples. The laboratory will immediately notify project personnel of any problems identified with the shipped samples in order to determine the appropriate course of action.

9.4 Sample Packaging and Shipment

Samples to be shipped by commercial courier will be packed in sample coolers. A temperature blank will be placed in every cooler. All sample containers will be protected with bubble wrap. Ice, double-bagged in resealing bags, will be added to the cooler in sufficient quantity to keep the samples at $\leq$6 degrees Celsius for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

The COC form will be sealed in a plastic bag, and the bag will then be taped to the inside of the sample cooler lid. If several sample coolers are shipped, all of the COC forms will be enclosed in one cooler and the total number of coolers indicated in the COC form. The cooler will be taped shut with strapping tape. The samples will be shipped to the analytical laboratory by overnight delivery service. A copy of the courier shipping company waybill and copies of the COC forms will be retained for project records. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, sample containers in resealing bags will be placed in coolers with ice. A temperature blank will be placed in every cooler. The COC form will be completed and signed by the laboratory courier.

10 QUALITY CONTROL

QC procedures are established to ensure the representativeness and integrity of the samples that are collected, as well as the integrity and accuracy of the analytical process.

10.1 Field Quality Control Samples

All of the materials that are the subject of this SAP are being evaluated to determine the appropriate disposal pathway. Due to the nature of this program, no field quality control samples will be required. Specifically, field duplicates of wipe samples will not be collected because a second wipe sample from the same location will not provide representative results of the sample location. Other matrices to be samples are homogenous in nature including building materials and fluids found in equipment. It is more advantageous to collected additional samples of these items as described in this SAP for overall representativeness of each type of material encountered.

10.2 Laboratory Quality Control Checks

The recovery of known additions is a part of laboratory analytical protocols. The use of additives at known concentrations allows detection of matrix interferences and estimating the impact of these interferences when present. It also allows evaluation of the efficiency of extraction procedures and overall accuracy of analysis. The following laboratory internal QC checks will be included as applicable and appropriate per the analytical method:

- Laboratory control sample (LCS)
- Laboratory control duplicate (LCD)
- Surrogate standards
- Method and instrument blanks

All decisions related to data quality will be made based on laboratory QC samples described in the following sections.

10.2.1 Laboratory Control Samples

Laboratory control samples are matrix-equivalent QC check samples (such as analyte-free sand) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for LCS/LCD preparation is of a source different from the stock that was used to prepare calibration standards.

Analytical accuracy will be represented by the recovery of the spiked compound in the LCS/LCD. As a general rule, the recovery of most compounds spiked into samples is expected to fall within a range of 40 to 150 percent. The laboratory will have statistically-based control limits for recovery for each method and matrix.

Analytical precision will be evaluated based on the RPD of the LCS/LCD pair. The laboratory will have statistically-based control limits for RPD established for PCB analysis of solid and wipe samples.

10.2.2 Surrogate Standards

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements:

- Are not the target analytes
- Do not interfere with the determination of target analytes
- Are not naturally occurring, yet are chemically similar to the target analytes
- Are compounds exhibiting similar response to target analytes

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, re-extraction and reanalysis may be performed.

Analytical accuracy will be also evaluated based on the surrogate standard recovery. The laboratory will have statistically-based control limits for RPD established for each method of analysis and sample matrix. The surrogate standard control limits typically range from 40 to 150 percent for PCB analysis.

10.2.3 Method Blanks

A method blank is used to monitor the laboratory preparation and analysis process for interferences and contamination from glassware, reagents, sample handling, and from the general laboratory environment. A method blank is carried through the entire sample preparation and analysis process, and is included with each batch of samples.

10.2.4 Reporting Limits

The laboratory will determine the detection limits for each Aroclor and matrix by using the procedure described in 40 CFR Part 136, Appendix B or another scientifically valid and documented procedure. The detection limit is defined as the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99 percent level of confidence.

The limit of detection (LOD) is the smallest amount or concentration that must be present in a sample in order to be detected at a 99 percent confidence level. The LOD is typically two to four times the detection limit. The limit of quantitation (LOQ) is the lowest concentration of a substance that produces quantitative result within specified limit of precision and accuracy; usually set at or above the concentration of the lowest calibration standard.

Once the LOQs have been established, laboratories routinely use them as reporting limits in the analysis of interference-free, undiluted samples. The LOQs, however, are highly matrix-dependent and their values increase with sample dilution. Higher reporting limits are expected for samples with matrix interferences such as paint, oil, and hydraulic fluids. The LOQs provided by the laboratory will be reviewed to determine whether they are sufficiently low to support project decisions.

11 FIELD VARIANCES

This SAP provides the basis for sampling activities to be performed in order to address PCB data gaps. Field conditions at the time of sampling may dictate that the actual samples be collected from a matrix, using techniques not described in this SAP, or otherwise not in conformance with the approach described. Any potential deviations from this SAP will be performed in coordination with the appropriate LBNL representative(s).

12 FIELD HEALTH AND SAFETY PROCEDURES

All activities performed in support of this SAP will be conducted in accordance with the *DMS Site-Specific Health and Safety Plan* (DMS, 2015).

13 REFERENCES

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Appendix A. Summary of Existing Data

Appendix A-1. Summary of Building 5 Materials Characterization Data

Summary of PCB Concentrations in Building 5 Structural Elements

Building	Sample ID	Sample Description	Total PCBs, mg/kg
B5	B5CK01	Window sill caulking, Room 150 northeast	0.42
B5	B5PC01	Wall paint, Room 150 northeast	19.9
B5	B5PC02	Wall paint, Room 112 east	5.2
B5	B5PC03	Wall paint, Room 136 southeast	2.3
B5	B5SC01	Concrete core, Room 150A southeast	<0.0061
B5	B5SC02	Concrete core, Room 150 east	<0.0061
B5	B5SC03	Concrete core, Room 150A west	0.0068
B5	B5SC04	Concrete core, Room 150A southwest	<0.0061
B5	B5SC05	Concrete core, Room 150	<0.0061
B5	B5SC06	Concrete core, Room 100 east	<0.0061
B5	B5SC07	Concrete core, Room 100 northwest	<0.0061
B5	B5SC08	Concrete core, Room 100 center	<0.0061
B5	B5SC09	Concrete core, Room 100 south	<0.0061
B5	B5SC15	Concrete wall chips, Room 112 east	0.104
B5	B5SC16	Concrete wall chips, Room 112 southeast	0.102
B5	B5SC20	Concrete, Room 117	<0.0061
B5	B5SC21	Concrete core, Room 105 east	<0.0061
B5	B5SC23	Concrete core, Room 105 southeast	<0.0061
B5	B5SC24	Concrete core, Room 105	<0.0061
B5	B5SC25	Concrete core, Room 105 northeast	<0.0061
B5	B5SC26	Concrete core, Room 105 northwest	<0.0061
B5	B5SE04	Pit sediment, Room 102 central	0.52

From Reconnaissance-Level Characterization Report for Buildings 5, 14, 25A, 40, 41, 44A; 44B, 52, and 52A at the Lawrence Berkeley National Laboratory, Berkeley, California, Weiss Associates, December 2010.

TABLE 4c
Analytical Results for Polychlorinated Biphenyls in Liquids, Building 5

Sample Identification	Sample Date	Sample Location	Aroclor1016	Aroclor1221	Aroclor1232	Aroclor1242	Aroclor1248	Aroclor1254	Aroclor1260	PCBs, total
Liquid Samples (Results Reported in mg/kg)										
B5-E33-LI-01	12/18/2013	Oil within equipment 33	<2	<2	<2	<2	<2	<2	<2	<2
STLC (mg/L)			--	--	--	--	--	--	--	5
TTLC (mg/kg)			--	--	--	--	--	--	--	50
TCLP (mg/L)			--	--	--	--	--	--	--	--

Notes:

TTLC and STLC values are from California Code of Regulations, Title 22, Chapter 11, Article 3, Section 66261.24.
TCLP values are from Resource Conservation and Recovery Act (40 CFR Part 261).

Abbreviations:

mg/L	Milligrams per liter
mg/kg	Milligrams per kilogram
STLC	Soluble Threshold Limit Concentration
TTLC	Total Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
--	Not Analyzed or Not Established

TABLE 4e
Fluorescent Lighting Ballast Inspection for Suspect Polychlorinated Biphenyls, Building 5

Room Number	Light Description	Ballast Manufacturer	PCB Status
Hallway Near Room 123	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Hallway Near Room 118	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 135	Silver Housing Lights	Electronic Ballast Tech, Inc.	No PCBs
Room 122	Dual Lamp Overhead with White Latch	All-Brite Lite, Inc.	No PCBs
Room 122	Dual Lamp Overhead with Ballast Above Light	Electronic Ballast Tech, Inc.	No PCBs
Room 122A	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Hallway Outside Room 112	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 112 at Entry	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 112 at Middle	Dual Lamp Overhead with Ballast Above Light	Electronic Ballast Tech, Inc.	No PCBs
Room 112 at End	Dual Lamp Overhead with Silver Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 112 Near Room 116	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 105	8' Light Overhead with White Latch	Ballast Tech, Inc.	No PCBs
Room 105	4' Light Overhead with Silver Latch	Sylvania, Quick Tronic	No PCBs
Room 101	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 150	Modern Light Dual Ballast	Advance	No PCBs

Abbreviations:
PCBs Polychlorinated Biphenyls

TABLE 4f
Summary of Fixed Equipment Inspection, Building 5

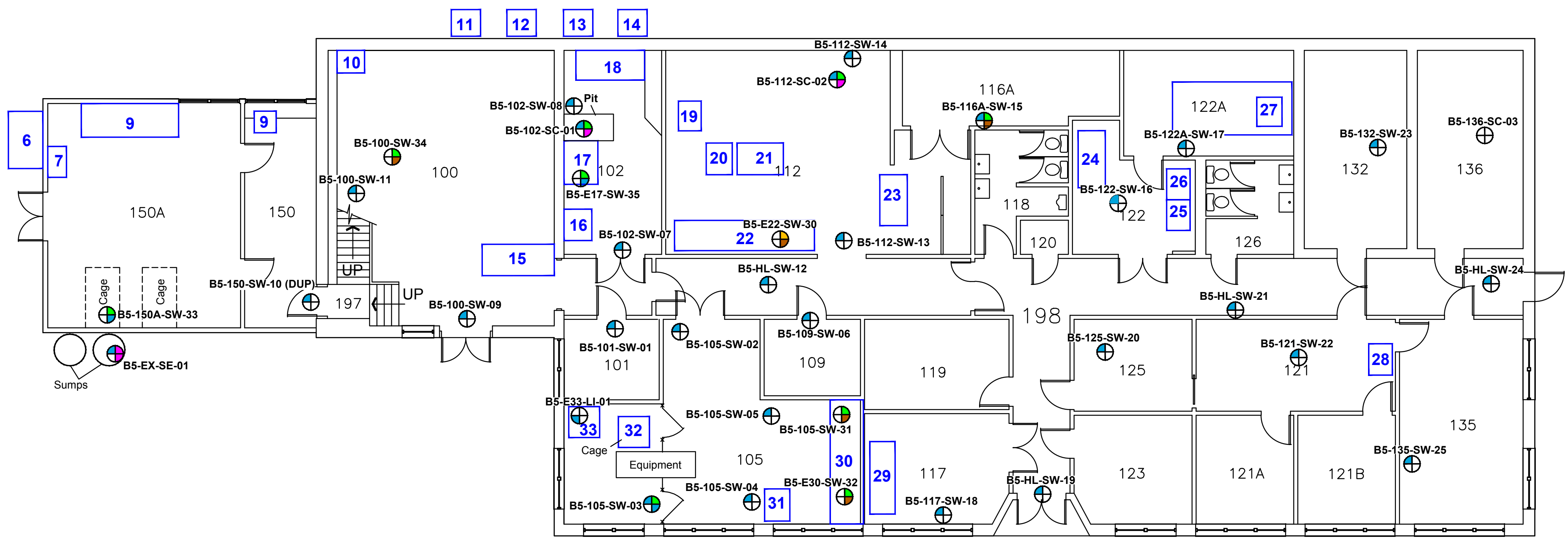
Non-DOE #	Official Name	Building	Room	Sample Collected?	Contains Regulated Metals (i.e., Lead, Silver)[1]	Contains Oil[1]	Contains PCB Containing Fluids [1]	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)[1]	Contains Elemental Mercury[1]	Contains Refrigerants [1]	Berylium Components or Contamination [1]	Asbestos Containing Components [1]	Disposal Recommendations
B5_eq01	Vault (Below Ground)	5	Outside 150A	N	N	N	N	N	N	N	N	N	Recycle
B5_eq02	Holding Tanks (Below Ground)	5	Outside 150A	Y-SE	N	N	N	N	N	N	N	N	Remove Excess Material; Recycle
B5_eq03	Holding Tanks (Below Ground)	5	Outside 150A	N	N	N	N	N	N	N	N	N	Recycle
B5_eq04	Capacitor Bank	5	Outside 150	N	N	N	N	Y	N	N	N	N	Recycle
B5_eq05a	NIM Cabinet	5	150	The equipment has been or will be moved to another building.									
B5_eq05b	NIM Cabinet	5	150	The equipment has been or will be moved to another building.									
B5_eq06	HVAC Equipment and Ducts; AC 2-05, AH-1, CP-1	5	Outside 150	N	N	N	N	N	N	N	N	N	Recycle
B5_eq07	HVAC Duct	5	150	N	N	N	N	N	N	N	N	N	Recycle
B5_eq08	Benches and Shelves	5	150	The equipment has been or will be moved to another building.									
B5_eq09	Glove Box	5	150A	N	N	N	N	N	N	N	N	N	Recycle
B5_eq10	Bench and Wall Cabinets	5	100	N	N	N	N	N	N	N	N	N	Recycle
B5_eq11	Vacuum Pump	5	Outside 100	N	N	N	N	N	N	N	N	N	Recycle
B5_eq12	Vacuum Pump	5	Outside 100	N	N	N	N	N	N	N	N	N	Recycle
B5_eq13	Fan and Exhaust Stack	5	Outside 100	N	N	N	N	N	N	N	N	N	Recycle
B5_eq14	Vacuum Pump	5	Outside 100	N	N	N	N	N	N	N	N	N	Recycle
B5_eq15	NIM Cabinets and Bench	5	100	The equipment has been or will be moved to another building.									
B5_eq16	NIM Cabinet	5	102	N	N	N	N	Y	N	N	N	N	Recycle
B5_eq17	Turbo Pump_Test Stand #8_B5_eq17	5	102	N	N	N	N	N	N	N	N	N	Recycle
B5_eq18	Bench	5	102	The equipment has been or will be moved to another building.									
B5_eq19	Hazardous Gas Cabinet & Vent	5	112	N	N	N	N	Y	N	N	N	N	See Equipment Label for Disposal
B5_eq20	NIM Cabinet	5	112	The equipment has been or will be moved to another building.									
B5_eq21	Test Stand #7	5	112	The equipment has been or will be moved to another building.									
B5_eq22	Base Cabinets, Bench & Sink	5	112	Y-SW	N	N	N	N	N	N	N	N	Recycle
B5_eq23	NIM Cabinets	5	112	N	N	N	N	Y	N	N	N	N	Recycle
B5_eq24	AC Compressor (Retired)	5	122	N	N	N	N	N	N	N	N	N	Recycle
B5_eq25	Regulator A	5	122	N	N	N	N	Y	N	N	N	N	Recycle
B5_eq26	Regulators B&C	5	122	N	N	N	N	Y	N	N	N	N	Recycle
B5_eq27	Blowers, Equipment & Water Heater	5	122A	N	N	N	N	N	N	N	N	N	Recycle
B5_eq28	Kitchen Cabinets & Counter	5	121	N	N	N	N	N	N	N	N	N	Recycle
B5_eq29	Wall Cabinets	5	117	N	N	N	N	N	N	N	N	N	Recycle
B5_eq30	Sink, Bench & Cabinets	5	105	Y-SW	N	N	N	N	N	N	N	N	Recycle
B5_eq31	NIM Cabinet	5	105	The equipment has been or will be moved to another building.									
B5_eq32	NIM Cabinet	5	105	The equipment has been or will be moved to another building.									
B5_eq33	Power Supply	5	105	Y-LI	N	Y	<2	N		N	N	N	Drain Oil; Recycle
B5_eq34	TS-#5	5	105	The equipment has been or will be moved to another building.									

TABLE 4f
Summary of Fixed Equipment Inspection, Building 5

Non-DOE #	Official Name	Building	Room	Sample Collected?	Contains Regulated Metals (i.e., Lead, Silver)[1]	Contains Oil[1]	Contains PCB Containing Fluids [1]	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)[1]	Contains Elemental Mercury[1]	Contains Refrigerants [1]	Berylium Components or Contamination [1]	Asbestos Containing Components [1]	Disposal Recommendations
B5_eq35	Built-in Wall Cabinet Above	5	105	The equipment has been or will be moved to another building.									
6084528	NIKON Comparator (B5_eq36)	5	150A	The equipment has been or will be moved to another building.									
B5_eq37	Sink in Utility Closet	5	120	The equipment has been or will be moved to another building.									
B5_eq38	Overhead Crane on 2nd Fl. To Remain	5	197	N	N	N	N	N	N	N	N	N	Recycle

Note:
[1] If a sample was not collected, a determination was made through visual inspection.

Abbreviations:
PCB Polychlorinated biphenyls
N No
Y Yes
SE Sediment sample
SW Surface Wipe Sample
LI Liquid Sample for PCBs in oil



LEGEND:

51 Fixed Equipment

0130 Room Number

B5-105-SW-03 ⊕ Sample Location

CONTAMINANTS INVESTIGATED

Be, Pb, PCBs, Other Metals

ABBREVIATIONS:

Be	Beryllium
LI	Liquid Sample
Pb	Lead
PCBs	Polychlorinated Biphenyls
SC	Concrete Sample
SE	Sediment Sample
STLC	Soluble Toxicity Limit Concentration
SW	Wipe Sample
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration

CHARACTERIZATION RESULTS

- Not Analyzed
- No Detection
- Detected below TTLC: 10 times the STLC, and 20 times the TCLP for solid matrices, STLC/TCLP for aqueous samples, or wipe concentration threshold
- Detected but no published threshold (TTLC for solid matrices, STLC/TCLP for aqueous samples, or wipe concentration threshold)
- Detected above 10 times the STLC or 20 times the TCLP for solid matrices (does not apply to wipe samples)
- Detected above the wipe concentration threshold
- Detected above the TTLC for solid samples or the STLC/TCLP for aqueous samples

NOTES:

1. Metals analyzed at noted locations include California Administrative Manual (CAM) 17 metals, Hexavalent chromium, or a selected subset.
2. See Reconnaissance Level Characterization Report, Northgate 2014, for additional details regarding sample results.

0 5 10

Scale (Feet)

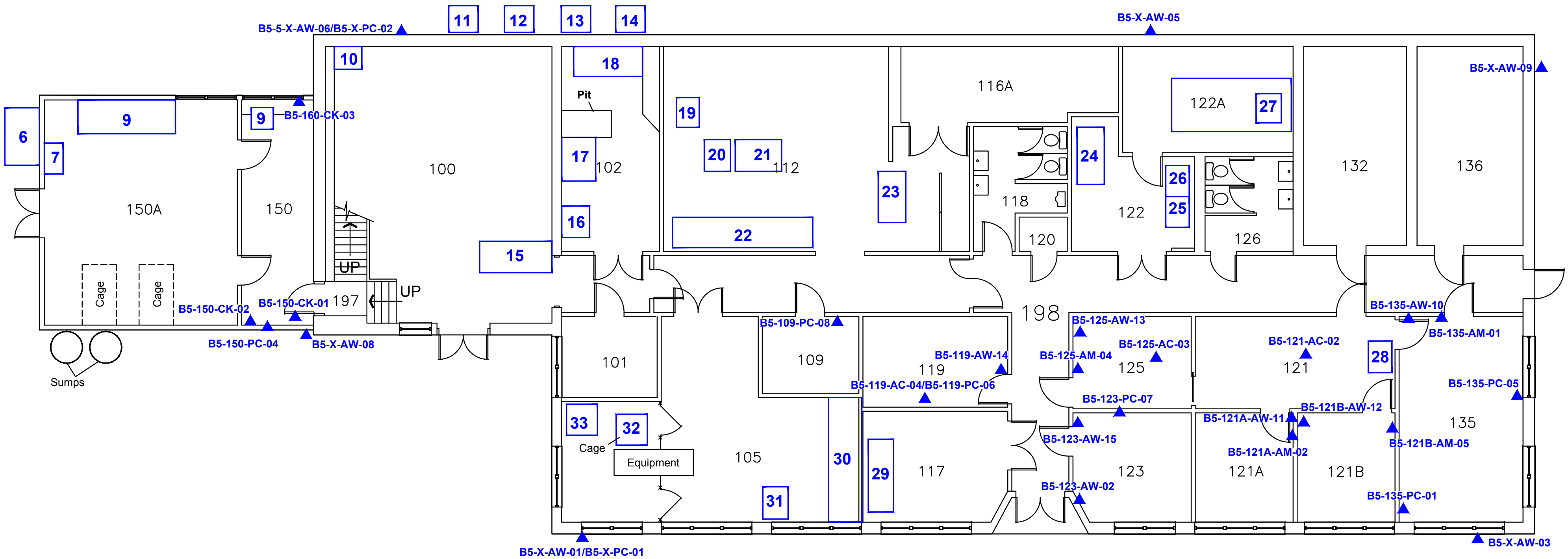
FIGURE 2a

Surface Wipe and Bulk Sample Locations, Building 5, Floor 1

One Cyclotron Road, Berkeley, California

northgate environmental management, inc.

Project No. 1281.01



LEGEND:

51	Fixed Equipment
0130	Room Number
B5-110-AC-02 ▲	Sample Location

ABBREVIATIONS:

AC	Asbestos Ceiling
AM	Asbestos Miscellaneous
AW	Asbestos Wall
CK	Caulking
PC	Paint Chip

NOTES:

1. See Reconnaissance Level Characterization Report, Northgate 2014, for sample results

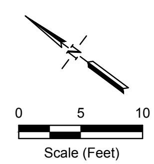
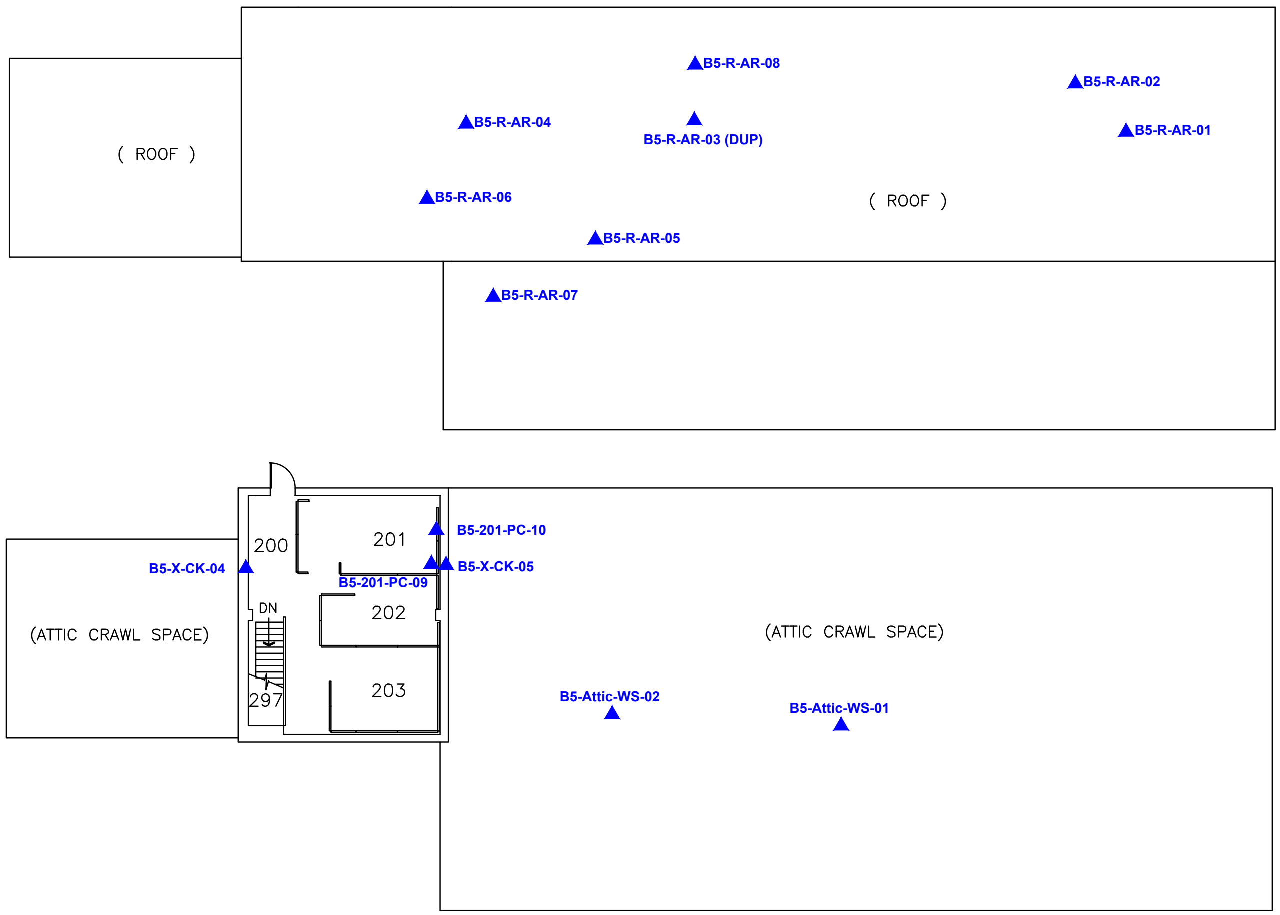


FIGURE 2b
Asbestos and Paint Sample Locations, Building 5, Floor 1

One Cyclotron Road,
Berkeley, California

northgate
environmental management, inc.

Project No. 1281.01



LEGEND:

200 Room Number

B5-Attic-WS-02 ▲ Sample Location

ABBREVIATIONS:

AR Asbestos Roofing
CK Caulking
PC Paint Chip
WS Wood Sample

NOTES:

1. See Reconnaissance Level Characterization Report, Northgate 2014, for sample results

N

0 7.5 15

Scale (Feet)

FIGURE 2c
Asbestos, Paint and Bulk Sample Location, Building 5, Floor 2 and Attic

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01

G:\Projects\Temp\1281 LBNL\Figures\Figure 2bc-3cde- Bldg 5-16 - Asbestos-Paint_Washer Sample Locations_v2.dwg Layout: F2c_BLDG5_FL2 User: mbechtel Feb 05, 2014 - 3:11pm

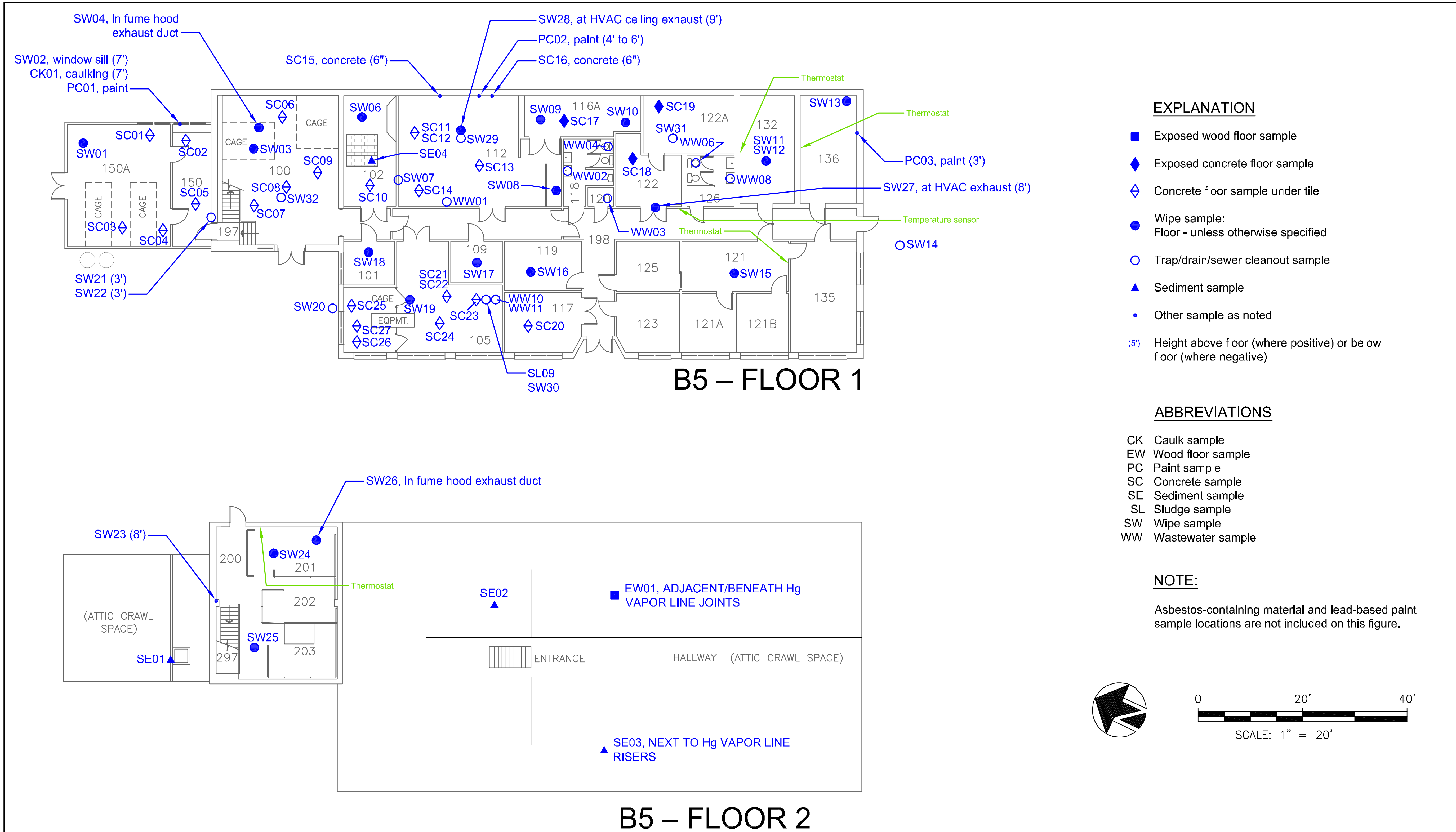


Figure 6-7. Non-Radiological Sampling Locations – Building 5

Appendix A-2. Summary of Building 16/16A Materials Characterization Data

Summary of PCB Concentrations in Equipment Oil and Wipes, Buildings 16/16A

Non-DOE #	Official Name	Building	Room	Sample Collected	Contains Regulated Metals (i.e., Lead, Silver)1	Contains Oil	Oil Containing PCB	Total PCBs in oil, mg/kg	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)1	Contains Elemental Mercury	Contains Refrigerants	Berylium Components or Contamination	Asbestos Containing Components	Wipe sample, µg/100 cm^2	Equipment Disposal Recommendations
B16_eq01	Liquid Nitrogen Tank	16	Outside of 101	N	N	N	N		N	N	Nitrogen	N	N		Contains liquid nitrogen - dispose accordingly
B16_eq02	Liquid Nitrogen Controller	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq03	Gas Stands	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq04	PP201 Power Supply	16	Outside of 101	N	Y	N	N		Y	N	N	N	N		Recycle
B16_eq05	Induction Voltage Regulator	16	Outside of 101	N	Y	N	N		Y	N	N	N	N		Recycle
B16_eq06	Induction Voltage Regulator	16	Outside of 101	N	Y	N	N		Y	N	N	N	N		Recycle
B16_eq07	Coils in Cage	16	Outside of 101	N	N	N	N		N	N	N	N	N		Recycle
B16_eq08	Power Supply	16	Outside of 101	Y - LI	N	Y	Y	31	Y	N	N	N	N		Drain oil and dispose as California hazardous waste
B16_eq09	Power Supply	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq10	Power Supply	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq11	Power Supply & Coil Racks	16	Outside of 101	Y - LI	N	Y	Y	8.9	Y	N	N	N	N		Drain oil and dispose as California hazardous waste
B16_eq12	Power Supply	16	Outside of 101	N	N	Y	No PCBs Label	Sample oil	Y	N	N	N	N		
B16_eq13	Power Supply	16	Outside of 101	N	N	Y	No PCBs Label	Sample oil	Y	N	N	N	N		
B16_eq14	Power Supply	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq15	Fan and Exhaust Stack	16	Outside of 101	N	N	N	N		N	N	N	N	N		Recycle
B16_eq16	Capacitor Bank	16	Outside of 101	N	N	N	N		N	N	N	N	N		Recycle
B16_eq17	Power Controller	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq18	Sandblaster	16	Outside of 101	N	N	N	N		N	N	N	N	N		Recycle
B16_eq19	Power Controller	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq20	Power Controller	16	Outside of 101	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq21	Horton Sphere	16	Roof/101	N	N	N	N		N	N	N	N	N		Recycle
B+A24:O2416_eq22	Diffusion Pump (Ceiling)	16	101	Y - LI	N	Y	Y	2.8	N	N	N	N	N		Drain oi for reclamation or burning for energy recovery
B16_eq23	Diffusion Pump (Ceiling)	16	101	Y - LI	N	Y	N	<2	N	N	N	N	Y (Insulation)		Drain and recycle oil; remove asbestos
B16_eq24	Rooftop ByroPump & Equipment	16	Roof	N	N	N	N		N	N	N	N	N		Recycle
B16_eq25	Roughing Pump	16	Outside of 101	N1	N	Y	N	Sample oil	N	N	N	N	N		Recycle
B16_eq26	Chemical Locker	16	Outside of 108	Y -SW	N	N	N		N	N	N	N	N		Recycle
B16_eq27	Power Supply\NIM	16	108	The equipment has been or will be moved to another building.											
B16_eq28a	Wood Bench & Cabinets	16	110	N	N	N	N		N	N	N	N	N		Recycle
B16_eq28a	Wood Shelves	16	110	Y -SW	N	N	N		N	N	N	N	N		Recycle
B16_eq29	Former Drum Storage Pad	16	Outside of 138	N	N	N	N		N	N	N	N	N		Recycle
B16_eq30	Soldering Station	16	138	Y-SW	N	N	N		N	N	N	N	Y (Transite)		Remove asbestos; Recycle
B16_eq31	Sink	16	138	Y-SE	N	N	N		N	N	N	N	N		Separate p-trap sludge; Recycle
B16_eq32	Wood Cabinets	16	140	Y-SW	N	N	N		N	N	N	N	N		Recycle
B16_eq33	Granite Slab	16	140	N	N	N	N		N	N	N	N	N		Recycle
B16_eq33A	HVAC Unit	16	140	N	N	N	N		N	N	N	N	N		Recycle
B16_eq34	Fume Hood	16	138B	Y -SW	NV	N	N		N	N	N	N	N		Recycle
B16_eq35	Wood Cabinets	16	138	N	N	N	N		N	N	N	N	N		Recycle
B16_eq36	Wood Cabinets	16	137	N	N	N	N		N	N	N	N	N		Recycle
B16_eq37	Wood Cabinets-Benches	16	138	N	N	N	N		N	N	N	N	N		Recycle
B16_eq38	TS14 & Diffusion Pump	16	137	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq39	Power Supply	16	137	N	N	N	N		Y	N	N	N	N		Recycle
B16A_eq40	Power Supply/NIM	16	137	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq41	Capacitor Bank	16	137A	N	N	N	N		Y	N	N	N	N		Recycle

Summary of PCB Concentrations in Equipment Oil and Wipes, Buildings 16/16A

Non-DOE #	Official Name	Building	Room	Sample Collected	Contains Regulated Metals (i.e., Lead, Silver)1	Contains Oil	Oil Containing PCB	Total PCBs in oil, mg/kg	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)1	Contains Elemental Mercury	Contains Refrigerants	Berylium Components or Contamination	Asbestos Containing Components	Wipe sample, $\mu g/100\ cm^2$	Equipment Disposal Recommendations
B16A_eq42	Induction Voltage Regulator (908 Can)	16A	--	Y-SW	N	N	N		Y	N	N	N	N	5.4	Recycle
B16A_eq43	Induction Voltage Regulator (914 Can)	16A	--	N	N	N	N		Y	N	N	N	N		Recycle
B+A48:O4816A_eq43 A	Induction Regulator _B16A	16A	--	Y-LI	N	Y	Y	3	Y	N	N	N	N	<0.5	Drain oi for reclamation or burning for energy recovery
B16A_eq44	Controller cabinet (902)	16A	--	N	N	N	N		N	N	N	N	N		Recycle
B16A_eq45	Controller Cabinet (901)	16A	--	N	N	N	N		N	N	N	N	N		Recycle
B16_eq46	Roughing Pump_B16_eq46	16	137A	Y-LI,SW	N	Y	N	<2	N	N	N	N	N	<0.5	Drain and recycle oil
B16_eq47	Stokes Vacuum Pump	16	137A	2 Y-A	N	Unknown	Unknown		N	N	N	N	N		Check for oil; Recycle
B16_eq48	Stokes Microvac Pump	16	137A	2 N	N	Unknown	Unknown		N	N	N	N	N		Check for oil; Recycle
B16_eq49	Transformer	16	137	Y-SW2	Y	Unknown	Unknown		N	N	N	N	N	1.6	Check for oil; Recycle
B16_eq50	Wood Cabinets	16	137	N	N	N	N		N	N	N	N	N		Recycle
B16_eq51	Pumps & Equipment	16	125	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq52	Capacitor Bank	16	125	Y-LI	N	Y	N	<2	Y	N	N	N	N		Drain and recycle oil
B16_eq53	Test Stand 11 - Shroud, Columns and Coil	16	125	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq54	Power Supply	16	125	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq55	Controller	16	125	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq56	Control Station	16	109	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq57	Controller	16	109	N	N	N	N		Y	N	N	N	N		Recycle
B16_eq58	Bio-Station (No Biohazard)	16	105C	Y-SW	N	N	N		N	N	N	N	N		Recycle
B16_eq58A	Test Stand Misc.	16	105C	The equipment has been or will be moved to another building.											
B16_eq59A	Roughing Pump	16	138B	Y-LI	N	Y	N	<2	N	N	N	N	N		Drain and recycle oil
B16_eq59B	Roughing Pump	16	138B	Y-A,LI	N	Y	N	<2	N	N	N	N	Y (Gasket)		Remove Asbestos (Gasket); Drain and recycle oil
B16_eq60	Pulse Power Transformer	16	125	Y-LI	N	Y	N	<2	N	N	N	N	N		Drain and recycle oil
B16_eq61	Test Stand#12 &3 NIMs	16	105A	The equipment has been or will be moved to another building.											
B16_eq100	Green Pot	16	Exterior	Y-SE 2	N	Unknown	Unknown	Unknown	N	N	N	N	N		Remove sediment; Recycle

Yellow highlight: oil charaterized

Blue highlight: oil to sample and characterize if present in equipment.

From Non-Radiological Reconnaissance Level Characterization Report, University of California Lawrence Berkeley National Laboratory, Buildings 5, 16, 16A and Miscellaneous Equipment, One Cyclotron Road, Berkeley, California, Northgate Environmental Management, Inc., June 2014.

TABLE 5c
Analytical Results for Polychlorinated Biphenyls in Liquids, Building 16/16A

Sample Identification	Sample Date	Sample Location	Analyte (mg/kg)		
			Aroclor1254	Aroclor1260	PCBs, total
Liquid Samples					
B16-E8-LI-01	12/9/2013	Oil from equipment 8	<2	31	31
B16-E8-LI-01-DUP	12/9/2013	Oil from equipment 8	<2	27	27
B16-E11-LI-02	12/10/2013	Oil from equipment 11	8.9	<2	8.9
B16-E46-LI-03	12/11/2013	Oil from equipment 46	<2	<2	<2
B16-E43A-LI-04	12/12/2013	Oil from equipment 43A	<2	3	3
B16-E59B-LI-05	12/13/2013	Oil from equipment 59B	<2	<2	<2
B16-E59A-LI-06	12/14/2013	Oil from equipment 59A	<2	<2	<2
B16-E52-LI-07	12/15/2013	Oil from equipment 52	<2	<2	<2
B16-E60-LI-08	12/16/2013	Oil from equipment 60	<2	<2	<2
B16-E22-LI-09	12/18/2013	Oil from equipment 22	2.8	<2	2.8
B16-E23-LI-10	12/18/2013	Oil from equipment 23	<2	<2	<2
Sediment Samples					
B16-E48-SE-06	12/9/2013	Sediment sample from equipment 48	<1	<1	<1
Caulking and Paint Chip Samples					
B16-X-PC-15	11/18/2013	Exterior Paint Chip	0.2	0.064	0.26
B16-138A-CK-01	11/18/2013	Caulking in Room 138A	0.32	<0.1	0.32
B16-130-CK-02	11/18/2013	Caulking in Room 130	<1	<1	<1
B16-110-CK-03	11/18/2013	Caulking in Room 110	0.086	0.076	0.29
B16-110-CK-04	11/18/2013	Caulking in Room 110	<0.05	<0.05	0.052
B16-108-CK-05	11/18/2013	Caulking in Room 108	0.19	<0.05	0.19
B16-X-CK-06	11/18/2013	Caulking from building exterior	<0.1	<0.1	<0.1
B16-X-CK-07	11/18/2013	Caulking from building exterior	0.67	<0.1	0.67
B16-X-CK-08	11/18/2013	Caulking from building exterior	0.17	<0.1	0.17
B16-140-CK-09	11/18/2013	Caulking in Room 140	<0.05	<0.05	<0.05
B16-X-CK-10	11/18/2013	Caulking from building exterior	<0.5	<0.5	<0.5
B16-X-CK-10-DUP	11/18/2013	Duplicate sample	<0.5	<0.5	<0.5
STLC (mg/L)			--	--	5
TTLC (mg/kg)			--	--	50
TCLP (mg/L)			--	--	--

Notes:
TTLC and STLC values are from California Code of Regulations, Title 22, Chapter 11, Article 3, Section 66261.24.
TCLP values are from Resource Conservation and Recovery Act (40 CFR Part 261).
Concentrations of PCBs not detected are not displayed in the table.

Abbreviations:

mg/L	Milligrams per liter
mg/kg	Milligrams per kilogram
STLC	Soluble Threshold Limit Concentration
TTLC	Total Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
--	Not Analyzed or Not Established

TABLE 5d
Analytical Results for Beryllium, Lead, Mercury, pH, and Polychlorinated Biphenyls in Surface Wipes, Building 16/16A

Sample Identification	Sample Date	Sample Location	Analyte (µg/100 cm^2)			Analyte (pH units)	Analyte (µg/100 cm^2)		
			Beryllium	Lead	Mercury	pH	Aroclor1254	Aroclor1260	PCBs, total
Building 16									
B16-138-SW-1	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-2	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-3	12/4/2013	Entrance to Room 138B	<0.05	--	--	--	--	--	--
B16-138-SW-4	12/4/2013	Entrance to Room 140	<0.05	--	--	--	--	--	--
B16-138-SW-5	12/4/2013	Floor beneath former machinery	<0.05	--	--	--	--	--	--
B16-138-SW-6	12/4/2013	Floor beneath former machinery	<0.05	--	--	--	--	--	--
B16-138-SW-7	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-8	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-9	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-10	12/4/2013	Floor in room 138	<0.05	20	0.0235	--	--	--	--
B16-138-SW-10-DUP	12/4/2013	Floor in room 138	<0.05	8	0.021	--	--	--	--
B16-138-SW-11	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-12	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-13	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-14	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-15	12/4/2013	Floor in room 138	<0.05	**41.5**	0.0255	--	--	--	--
B16-138-SW-16	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-17	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-18	12/4/2013	Floor in room 138	<0.05	--	--	--	--	--	--
B16-138-SW-19	12/4/2013	Exit to Room 125	<0.05	--	--	--	--	--	--
B16-138-SW-20	12/4/2013	Exit to Room 125	<0.05	--	--	--	--	--	--
B16-138-SW-20-DUP	12/4/2013	Exit to Room 125	<0.05	--	--	--	--	--	--
B16-140-SW-21	12/4/2013	Exit to outside	<0.05	--	--	--	--	--	--
B16-140-SW-22	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-23	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-24	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-25	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-26	12/4/2013	Entrance to Room 138	<0.05	--	--	--	--	--	--
B16-140-SW-27	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-28	12/4/2013	Exit to outside	<0.05	--	--	--	--	--	--
B16-140-SW-29	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-30	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-30-DUP	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-31	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-32	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-33	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-140-SW-34	12/4/2013	Floor in Room 140	<0.05	--	--	--	--	--	--
B16-138B-SW-35	12/5/2013	Entrance to Room 138	<0.05	--	--	--	--	--	--
B16-138B-SW-36	12/5/2013	On shelving of E34	<0.05	--	--	--	--	--	--

TABLE 5d
Analytical Results for Beryllium, Lead, Mercury, pH, and Polychlorinated Biphenyls in Surface Wipes, Building 16/16A

Sample Identification	Sample Date	Sample Location	Analyte (µg/100 cm^2)			Analyte (pH units)	Analyte (µg/100 cm^2)		
			Beryllium	Lead	Mercury	pH	Aroclor1254	Aroclor1260	PCBs, total
B16-138B-SW-37	12/5/2013	Floor of Room 138B	<0.05	--	--	--	--	--	--
B16-138-SW-38	12/5/2013	Stained Wall in Room 138	<0.05	16	0.15	--	--	--	--
B16-138-SW-39	12/5/2013	On light fixture of Room 138	<0.05	**120**	0.23 J	--	--	--	--
B16-137-SW-40	12/5/2013	Exit to Room 125	<0.05	--	--	--	--	--	--
B16-137-SW-40-DUP	12/5/2013	Exit to Room 125	<0.05	--	--	--	--	--	--
B16-137-SW-41	12/5/2013	Floor of Room 137	<0.05	--	--	--	--	--	--
B16-137-SW-42	12/5/2013	Floor of Room 137	<0.05	--	--	--	--	--	--
B16-137-SW-43	12/5/2013	Floor of Room 137	<0.05	--	--	--	--	--	--
B16-137-SW-44	12/5/2013	Floor of Room 137	<0.05	--	--	--	--	--	--
B16-137-SW-45	12/5/2013	Entrance to Room 137A	<0.05	--	--	--	--	--	--
B16-137-SW-46	12/5/2013	Floor of Room 137	<0.05	--	--	--	--	--	--
B16-137A-SW-47	12/5/2013	Entrance to Room 137	<0.05	--	--	--	--	--	--
B16-137A-SW-48	12/5/2013	Floor of Room 137A	<0.05	--	--	--	--	--	--
B16-137A-SW-49	12/5/2013	On ledge in Room 137A	<0.05	--	--	--	--	--	--
B16-138A-SW-50	12/5/2013	Floor in Room 138A	<0.05	--	--	--	--	--	--
B16-138A-SW-50-DUP	12/5/2013	Floor in Room 138A	<0.05	--	--	--	--	--	--
B16-125-SW-51	12/5/2013	On legde in Room 125	<0.05	--	--	--	--	--	--
B16-125-SW-52	12/5/2013	Exit to outside in Room 125	<0.05	--	--	--	--	--	--
B16-125-SW-53	12/5/2013	Floor near trench in Room 125	**0.19**	--	--	--	--	--	--
B16-125-SW-54	12/5/2013	On E60 in Room 125	<0.05	--	--	--	--	--	--
B16-125-SW-55	12/5/2013	At exit of Building between Rooms 130 and 128	<0.05	--	--	--	--	--	--
B16-130-SW-56	12/5/2013	At entrance of Room 130	<0.05	--	--	--	--	--	--
B16-124-SW-57	12/5/2013	Floor in Room 124	<0.05	--	--	--	--	--	--
B16-110-SW-58	12/5/2013	On Bench in Room 110	<0.05	--	--	--	--	--	--
B16-108-SW-59	12/5/2013	At doorway in Room 108	<0.05	--	--	--	--	--	--
B16-HL-SW-60	12/5/2013	Floor in Hallway	<0.05	--	--	--	--	--	--
B16-HL-SW-60-DUP	12/5/2013	Floor in Hallway	<0.05	--	--	--	--	--	--
B16-HL-SW-61	12/5/2013	Floor in Hallway	<0.05	--	--	--	--	--	--
B16-101-SW-62	12/5/2013	At Exit to Building	<0.05	--	--	--	--	--	--
B16-101-SW-63	12/5/2013	Floor of Room 101	<0.05	--	--	--	--	--	--
B16-105-SW-64	12/5/2013	At exit of Room 105	<0.05	--	--	--	--	--	--
B16-105A-SW-65	12/5/2013	Floor of Room 105A	<0.05	--	--	--	--	--	--
B16-105C-SW-66	12/5/2013	Floor of Room 105C	<0.05	--	--	--	--	--	--
B16-109-SW-67	12/5/2013	At Stairway to perkins plaza	<0.05	--	--	--	--	--	--
B16-DG-SW-68	12/5/2013	In dungeon	<0.05	**450**	0.17	--	--	--	--
B16-PP-SW-69	12/5/2013	At entrance to perkins plaza	<0.05	--	--	--	--	--	--
B16-PP-SW-70	12/5/2013	At entrance to perkins plaza	<0.05	--	--	--	--	--	--
B16-PP-SW-70-DUP	12/5/2013	At entrance to perkins plaza	<0.05	--	--	--	--	--	--
B16-E46-SW-71	12/9/2013	On staining observed at equipment 46	--	--	--	--	<0.5	<0.5	<0.5
B16-E43A-SW-72	12/9/2013	On staining observed at equipment 43A	--	--	--	--	<0.5	<0.5	<0.5

TABLE 5d
Analytical Results for Beryllium, Lead, Mercury, pH, and Polychlorinated Biphenyls in Surface Wipes, Building 16/16A

Sample Identification	Sample Date	Sample Location	Analyte (µg/100 cm^2)			Analyte (pH units)	Analyte (µg/100 cm^2)		
			Beryllium	Lead	Mercury	pH	Aroclor1254	Aroclor1260	PCBs, total
B16-A-SW-73	12/9/2013	On staining observed in Building 16A	--	--	--	--	<0.5	0.88	0.88
B16-A-SW-74	12/9/2013	Floor of Building 16A	<0.05	--	--	--			
B16-E42-SW-75	12/9/2013	On staining observed at equipment 42	--	--	--	--	2.0	3.3	5.4
B16-E58-SW-76	12/9/2013	Within Fume Hood of E58	--	14.5	0.065	--	--	--	--
B16-105C-SW-77	12/9/2013	On Vent of Room 105C	--	22	0.105	--	--	--	--
B16-138-SW-78	12/9/2013	On Equipment 30 in Room 138	--	**245**	0.0295	--	--	--	--
B16-E34-SW-79	12/9/2013	On Vent of eqipment 34	--	**800**	1.3	5.05	--	--	--
B16-E32-SW-80	12/9/2013	On eqipment 32	--	5	<0.013	--	--	--	--
B16-E32-SW-80-DUP	12/9/2013	On eqipment 32	--	4.85	<0.013	--	--	--	--
B16-E49-SW-81	12/9/2013	On staining observed at equipment 49	--	--	--	--	0.62	1.0	1.6
B16-E26-SW-82	12/9/2013	In Cabinet of eqipment 26	--	**55**	0.145	--	--	--	--
B16-CR-SW-83	12/9/2013	On Crane Rail	<0.05	14	0.32	--	--	--	--
B16-E23-SW-84	12/9/2013	On Diffusion Pump	--	6	0.029	--	--	--	--
Background Samples									
B4-HL-SW-26	12/6/2013	At the entrance to Building 4	<0.05	--	--	--	--	--	--
B7-HL-SW-27	12/6/2013	At the entrance to Building 7	<0.05	--	--	--	--	--	--
EX-SW-28	12/6/2013	Adjacent to the north of Building 7	<0.05	--	--	--	--	--	--
EX-SW-29	12/6/2013	Ajacent to the south of Building 14	<0.05	--	--	--	--	--	--
CFR Threshold for Health and Safety			0.2 [1]	27 [2]	--	< 2.0 or > 12.0	--	--	10 [3]

Notes:
Bold indicates detection above CFR Threshold for Health and Safety
[1] The threshold for beryllium in wipe samples is based on the Chronic Beryllium Disease Prevention Program, Title 10, CFR, Part 850
[2] The threshold for lead in wipe samples is based on Title 40, CFR, Part 745; converted from 250 µg/ft^2 to 27 µg/100 cm^2.
[3] The threshold for total PCBs in wipe samples is based on Title 40, CFR, Part 761.
PCB speciations not detected above detection limits are not displayed in the table.

Abbreviations:

µg/100 cm^2	Micrograms per 100 square centimeters
CCR	California Code of Regulations
PCBs	Polychlorinated Biphenyls
--	Not Analyzed or Not Established
J	Indicates an estimated value

TABLE 5e
Fluorescent Lighting Ballast Inspection for Suspect Polychlorinated Biphenyls, Building 16/16A

Room Number	Light Description	Ballast Manufacturer	PCB Status
Room 109	Dual Lamp Overhead with White Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 109	Dual Lamp Overhead with Silver Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 105D	Modern Dual Lamp Overhead Light	TCC, Inc.	No PCBs
Room 110	Dual Lamp Overhead	Electronic Ballast Tech, Inc.	No PCBs
Room 110	Desk Task Lamp with a Hand-turn Latch	Electronic Ballast Tech, Inc.	No PCBs
Room 105	Dual Lamp Overhead with a Silver Latch	Sylvania, Inc.	No PCBs
Room 140	Dual Lamp Overhead	Electronic Ballast Tech, Inc.	No PCBs
Room 138	Solder Station Task Lamp	Motorola, Inc.	No PCBs
Room 125	Desk Lamp Task-Light	Advance, Inc.	No PCBs

Abbreviation:
PCBs Polychlorinated Biphenyls

TABLE 5f
Summary of Fixed Equipment Inspection, Building 16/16A

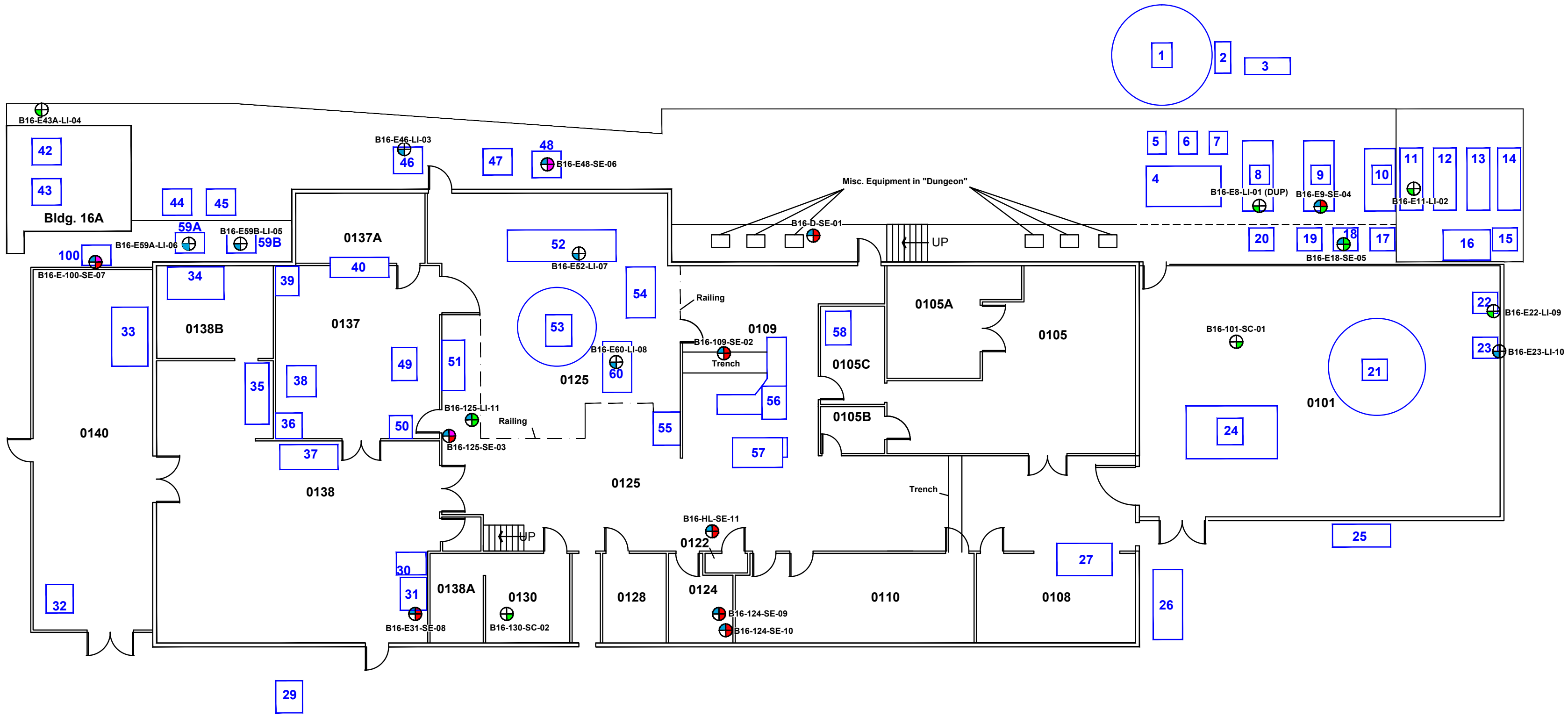
Non-DOE #	Official Name	Building	Room	Sample Collected?	Contains Regulated Metals (i.e., Lead, Silver)[1]	Contains Oil[1]	Contains PCB Containing Fluids [1]	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)[1]	Contains Elemental Mercury[1]	Contains Refrigerants[1]	Berylium Components or Contamination[1]	Asbestos Containing Components[1]	Disposal Recommendations
B16_eq01	Liquid Nitrogen Tank	16	Outside of 101	N	N	N	N	N	N	Nitrogen	N	N	Contains liquid nitrogen - dispose accordingly
B16_eq02	Liquid Nitrogen Controller	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq03	Gas Stands	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq04	PP201 Power Supply	16	Outside of 101	N	Y	N	N	Y	N	N	N	N	Recycle
B16_eq05	Induction Voltage Regulator	16	Outside of 101	N	Y	N	N	Y	N	N	N	N	Recycle
B16_eq06	Induction Voltage Regulator	16	Outside of 101	N	Y	N	N	Y	N	N	N	N	Recycle
B16_eq07	Coils in Cage	16	Outside of 101	N	N	N	N	N	N	N	N	N	Recycle
B16_eq08	Power Supply	16	Outside of 101	Y - LI	N	Y	N	Y	N	N	N	N	Drain oil; Recycle
B16_eq09	Power Supply	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Drain oil; Recycle
B16_eq10	Power Supply	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Drain oil; Recycle
B16_eq11	Power Supply & Coil Racks	16	Outside of 101	Y - LI	N	Y	N	Y	N	N	N	N	Drain oil; Recycle
B16_eq12	Power Supply	16	Outside of 101	N	N	Y	No PCBs' Label	Y	N	N	N	N	Drain oil; Recycle
B16_eq13	Power Supply	16	Outside of 101	N	N	Y	No PCBs' Label	Y	N	N	N	N	Drain oil; Recycle
B16_eq14	Power Supply	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq15	Fan and Exhaust Stack	16	Outside of 101	N	N	N	N	N	N	N	N	N	Recycle
B16_eq16	Capacitor Bank	16	Outside of 101	N	N	N	N	N	N	N	N	N	Recycle
B16_eq17	Power Controller	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq18	Sandblaster	16	Outside of 101	N	N	N	N	N	N	N	N	N	Recycle
B16_eq19	Power Controller	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq20	Power Controller	16	Outside of 101	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq21	Horton Sphere	16	Roof/101	N	N	N	N	N	N	N	N	N	Recycle
B16_eq22	Diffusion Pump (Ceiling)	16	101	Y - LI	N	Y	N	N	N	N	N	N	Drain oil; Recycle
B16_eq23	Diffusion Pump (Ceiling)	16	101	Y - LI	N	Y	N	N	N	N	N	Y (Insulation)	Drain oil; Remove asbestos; Recycle
B16_eq24	Rooftop ByroPump & Equipment	16	Roof	N	N	N	N	N	N	N	N	N	Recycle
B16_eq25	Roughing Pump	16	Outside of 101	N[1]	N	Y	N	N	N	N	N	N	Recycle
B16_eq26	Chemical Locker	16	Outside of 108	Y -SW	N	N	N	N	N	N	N	N	Recycle
B16_eq27	Power Supply\NIM	16	108	The equipment has been or will be moved to another building.									
B16_eq28a	Wood Bench & Cabinets	16	110	N	N	N	N	N	N	N	N	N	Recycle
B16_eq28a	Wood Shelves	16	110	Y -SW	N	N	N	N	N	N	N	N	Recycle
B16_eq29	Former Drum Storage Pad	16	Outside of 138	N	N	N	N	N	N	N	N	N	Recycle
B16_eq30	Soldering Station	16	138	Y-SW	N	N	N	N	N	N	N	Y (Transite)	Remove asbestos; Recycle
B16_eq31	Sink	16	138	Y-SE	N	N	N	N	N	N	N	N	Separate p-trap sludge; Recycle
B16_eq32	Wood Cabinets	16	140	Y-SW	N	N	N	N	N	N	N	N	Recycle
B16_eq33	Granite Slab	16	140	N	N	N	N	N	N	N	N	N	Recycle
B16_eq33A	HVAC Unit	16	140	N	N	N	N	N	N	N	N	N	Recycle
B16_eq34	Fume Hood	16	138B	Y -SW	NV	N	N	N	N	N	N	N	Recycle
B16_eq35	Wood Cabinets	16	138	N	N	N	N	N	N	N	N	N	Recycle
B16_eq36	Wood Cabinets	16	137	N	N	N	N	N	N	N	N	N	Recycle
B16_eq37	Wood Cabinets-Benches	16	138	N	N	N	N	N	N	N	N	N	Recycle

TABLE 5f
Summary of Fixed Equipment Inspection, Building 16/16A

Non-DOE #	Official Name	Building	Room	Sample Collected?	Contains Regulated Metals (i.e., Lead, Silver)[1]	Contains Oil[1]	Contains PCB Containing Fluids [1]	Contains Circuit Boards or Other Regulated Electronic Components (CRTs)[1]	Contains Elemental Mercury[1]	Contains Refrigerants[1]	Berylium Components or Contamination[1]	Asbestos Containing Components[1]	Disposal Recommendations
B16_eq38	TS14 & Diffusion Pump	16	137	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq39	Power Supply	16	137	N	N	N	N	Y	N	N	N	N	Recycle
B16A_eq40	Power Supply/NIM	16	137	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq41	Capacitor Bank	16	137A	N	N	N	N	Y	N	N	N	N	Recycle
B16A_eq42	Induction Voltage Regulator (908 Can)	16A	--	Y-SW	N	N	N	Y	N	N	N	N	Recycle
B16A_eq43	Induction Voltage Regulator (914 Can)	16A	--	N	N	N	N	Y	N	N	N	N	Recycle
B16A_eq43A	Induction Regulator _B16A eq43A	16A	--	Y-LI	N	Y	N	Y	N	N	N	N	Drain oil; Recycle
B16A_eq44	Controller cabinet (902)	16A	--	N	N	N	N	N	N	N	N	N	Recycle
B16A_eq45	Controller Cabinet (901)	16A	--	N	N	N	N	N	N	N	N	N	Recycle
B16_eq46	Roughing Pump_B16_eq46	16	137A	Y-LI,SW	N	Y	N	N	N	N	N	N	Drain oil; Recycle
B16_eq47	Stokes Vacuum Pump	16	137A	Y-A[2]	N	UK	UK	N	N	N	N	N	Check for oil; Recycle
B16_eq48	Stokes Microvac Pump	16	137A	N[2]	N	UK	UK	N	N	N	N	N	Check for oil; Recycle
B16_eq49	Transformer	16	137	Y-SW[2]	Y	UK	UK	N	N	N	N	N	Check for oil; Recycle
B16_eq50	Wood Cabinets	16	137	N	N	N	N	N	N	N	N	N	Recycle
B16_eq51	Pumps & Equipment	16	125	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq52	Capacitor Bank	16	125	Y-LI	N	Y	N	Y	N	N	N	N	Drain oil; Recycle
B16_eq53	Test Stand 11 - Shroud, Columns and Coil	16	125	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq54	Power Supply	16	125	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq55	Controller	16	125	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq56	Control Station	16	109	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq57	Controller	16	109	N	N	N	N	Y	N	N	N	N	Recycle
B16_eq58	Bio-Station (No Biohazard)	16	105C	Y-SW	N	N	N	N	N	N	N	N	Recycle
B16_eq58A	Test Stand Misc.	16	105C	The equipment has been or will be moved to another building.									
B16_eq59A	Roughing Pump	16	138B	Y-LI	N	Y	N	N	N	N	N	N	Drain oil; Recycle
B16_eq59B	Roughing Pump	16	138B	Y-A,LI	N	Y	N	N	N	N	N	Y (Gasket)	Remove Asbestos (Gasket); Drain oil; Recycle
B16_eq60	Pulse Power Transformer	16	125	Y-LI	N	Y	N	N	N	N	N	N	Drain oil; Recycle
B16_eq61	Test Stand#12 &3 NIMs	16	105A	The equipment has been or will be moved to another building.									
B16_eq100	Green Pot	16	Exterior	Y-SE [2]	N	UK	UK	N	N	N	N	N	Remove sediment; Recycle

Notes:
[1] If a sample was not collected, a determination was made through visual inspectio
[2] A liquid oil sample could not be collected as oil was inaccessibl

Abbreviations:
- A Asbestos
- PCB Polychlorinated biphenyl
- N No
- Y Yes
- LI Liquid Sample for PCBs in oi
- SE Sediment sampl
- SW Surface Wipe Sampl
- UK Unknown
- -- Not Applicable



LEGEND:

51 Fixed Equipment

0130 Room Number

B16-124-SE-09 ⊕ Sample Location

CONTAMINANTS INVESTIGATED

Be, Pb, PCBs, Other Metals

ABBREVIATIONS:

Be	Beryllium
LI	Liquid Sample
Pb	Lead
PCBs	Polychlorinated Biphenyls
SC	Concrete Sample
SE	Sediment Sample
STLC	Soluble Toxicity Limit Concentration
SW	Wipe Sample
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration

CHARACTERIZATION RESULTS

- Not Analyzed
- No Detection
- Detected below TTLC: 10 times the STLC, and20 times the TCLP for solid matrices and STLC/TCLP for aqueous samples
- Detected but no published threshold (TTLC for solid matrices and STLC/TCLP for aqueous samples)
- Detected above 10 times the STLC or 20 times the TCLP for solid matrices
- Detected above the TTLC for solid samples or the STLC/TCLP for aqueous samples

NOTES:

1. Metals analyzed at noted locations include California Administrative Manual (CAM) 17 metals, Hexavalent chromium, or a selected subset.
2. See Reconnaissance Level Characterization Report, Northgate 2014, for additional details regarding sample results.

0 7.5 15

Scale (Feet)

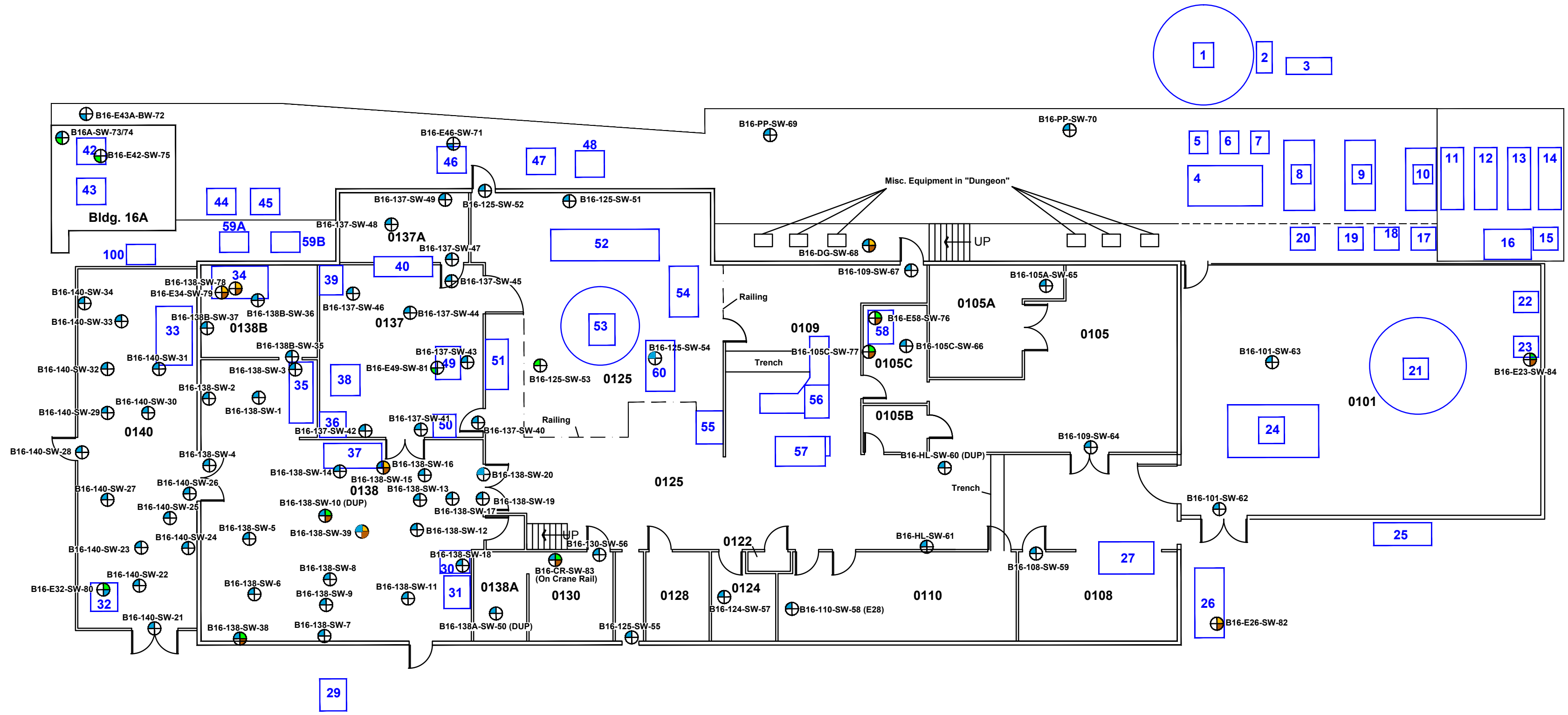
FIGURE 3a
Bulk Sample Locations, Building 16/16A

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01

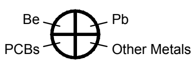
D:\Work\NGEM\1281\Figure 2a-3a-3b - Wipe-Bulk Sample Locations - Results os.dwg Layout: F3a_Bulk_BLDG16_FL1 User: oleg Feb 06, 2014 - 1:45pm



LEGEND:

51	Fixed Equipment
0130	Room Number
B16-138-SW-11 ⊕	Sample Location

CONTAMINANTS INVESTIGATED



ABBREVIATIONS:

Be	Beryllium
LI	Liquid Sample
Pb	Lead
PCBs	Polychlorinated Biphenyls
SC	Concrete Sample
SE	Sediment Sample
STLC	Soluble Toxicity Limit Concentration
SW	Wipe Sample
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration

CHARACTERIZATION RESULTS

- Not Analyzed
- No Detection
- Detected below wipe concentration threshold
- Detected but no published wipe concentration threshold
- Detected above the wipe concentration threshold

NOTES:

1. Metals analyzed at noted locations include California Administrative Manual (CAM) 17 metals, Hexavalent chromium, or a selected subset.
2. See Reconnaissance Level Characterization Report, Northgate 2014, for additional details regarding sample results.

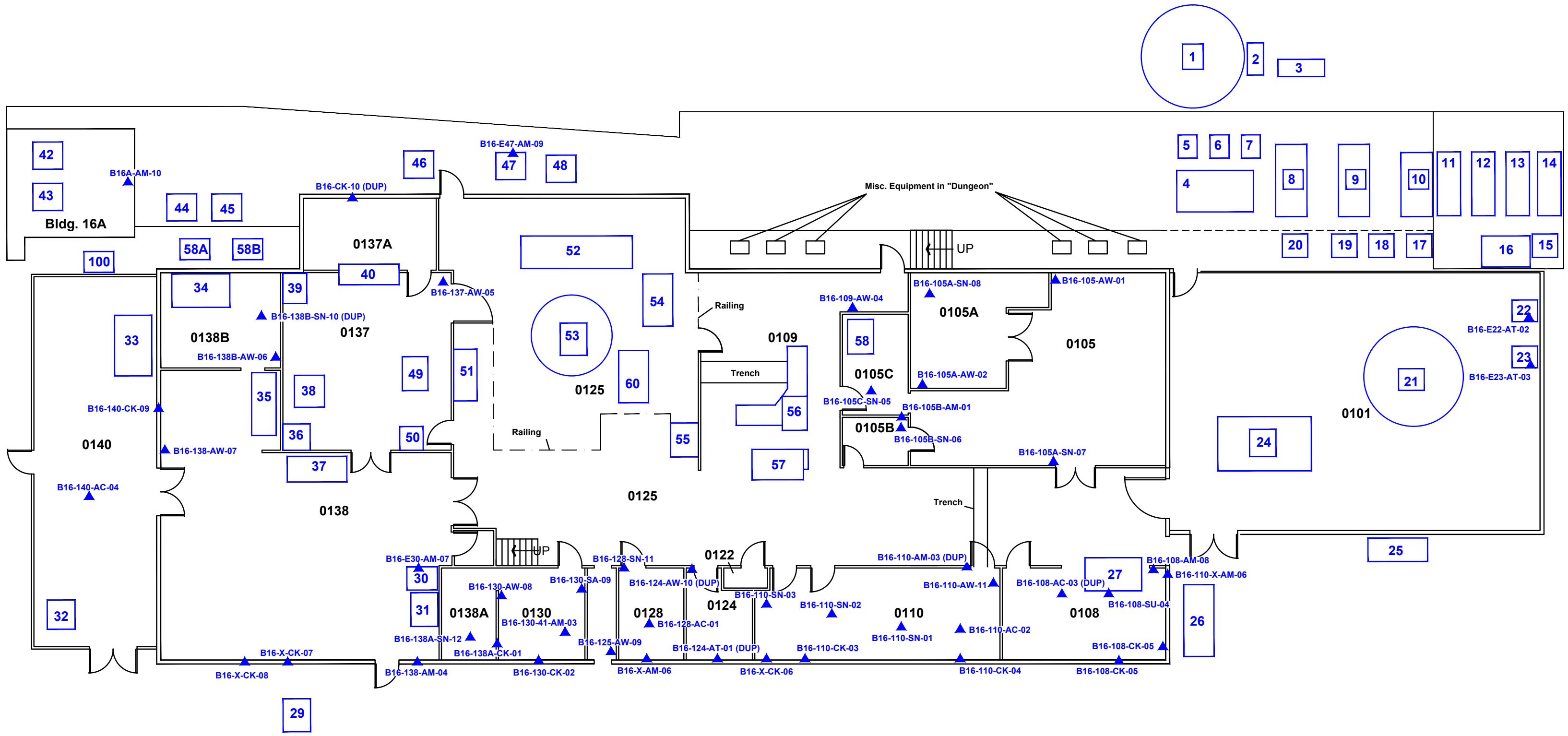
0 7.5 15
Scale (Feet)

FIGURE 3b
Wipe Sample Locations, Building 16/16A

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01



LEGEND:

51 Fixed Equipment

0130 Room Number

B16-110-AC-02 ▲ Sample Location

ABBREVIATIONS:

AC Asbestos Ceiling
AM Asbestos Miscellaneous
AT Asbestos Insulation
AW Asbestos Wall
CK Caulking
SN Mastic

NOTES:

1. See Reconnaissance Level Characterization Report, Northgate 2014, for sample results

0 7.5 15

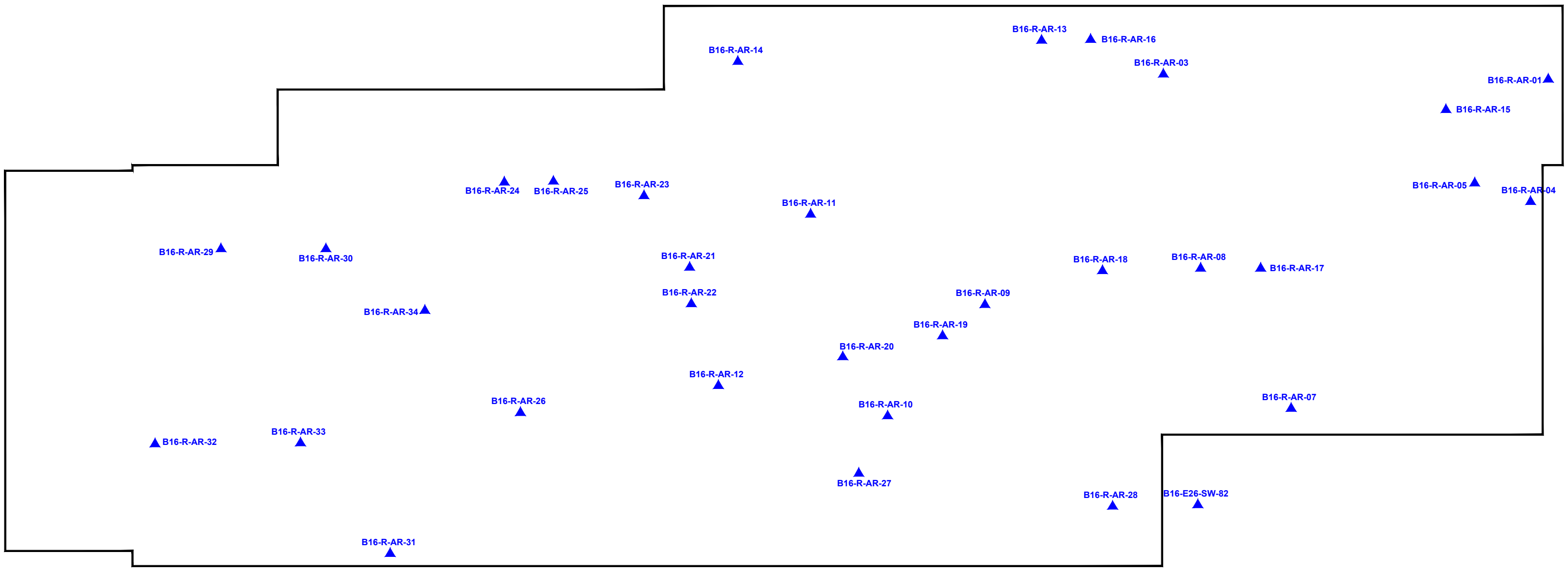
Scale (Feet)

FIGURE 3c
Asbestos Sample Locations, Building 16 and 16A

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01



LEGEND:

B16-R-AR-11 ▲ Sample Location

ABBREVIATIONS:

AR Asbestos Roofing

NOTES:

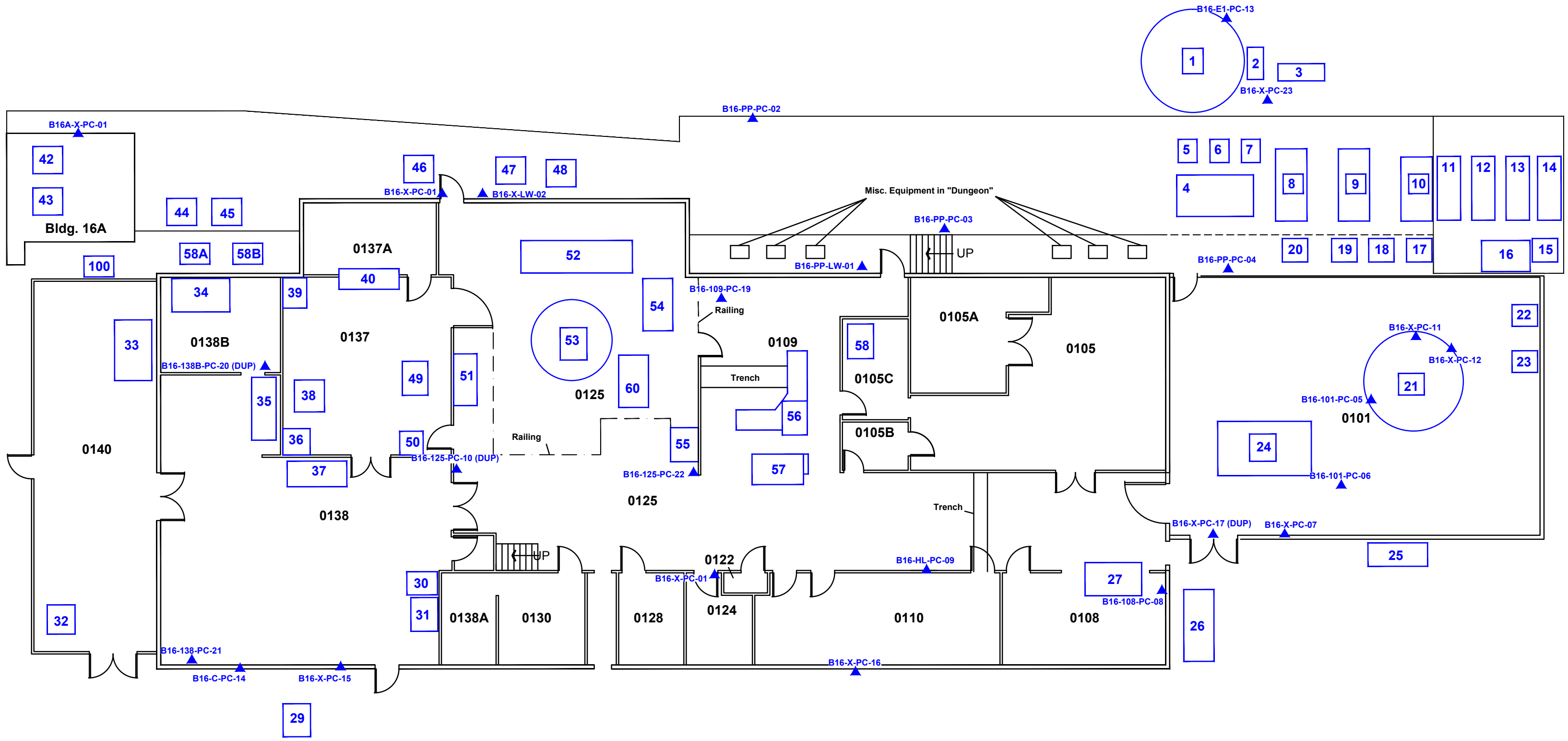
1. See Reconnaissance Level Characterization Report, Northgate 2014, for sample results

FIGURE 3d
Roof Sampling Locations, Building 16

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01



LEGEND:

51 Fixed Equipment

0130 Room Number

B16-HL-PC-09 ▲ Sample Location

ABBREVIATIONS:

PC	Paint Chips
LW	Lead Washer/Lead Caps covering Nuts and Washers

NOTES:

1. See Reconnaissance Level Characterization Report, Northgate 2014, for sample results.
2. All loose and flaky paint should be stabilized prior to demolition.

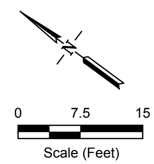


FIGURE 3e
Lead Paint and Lead Washers/Cap Sample Locations, Building 16 and 16A

One Cyclotron Road,
Berkeley, California

northgate environmental management, inc.

Project No. 1281.01

Appendix B. Wipe Sampling and Double Wash/Rinse Cleanup As Recommended by the Environmental Protection Agency PCB Spill Cleanup Policy

WIPE SAMPLING AND DOUBLE WASH/RINSE CLEANUP

AS RECOMMENDED BY

THE ENVIRONMENTAL PROTECTION AGENCY PCB SPILL CLEANUP POLICY

June 23, 1987

Revised and Clarified on April 18, 1991

Written By:

John H. Smith, Ph.D.
Chief, PCB Disposal Section
Chemical Regulation Branch
United States Environmental Protection Agency
Washington, D.C.

CONTENTS

I. WIPE SAMPLING ACCORDING TO THE PCB SPILL CLEANUP POLICY

Introduction:

This document was prepared following the publication of the PCB Spill Cleanup Policy in the Federal Register on April 2, 1987. The procedures were demonstrated by EPA PCB program technical staff at PCB Forum '87 and PCB Forum '88. These PCB forums were privately sponsored seminars discussing the requirements of the recently issued PCB Spill Cleanup Policy. The seminars were publicly announced and held in eight cities near the EPA Regional Offices.

The revisions and clarifications to the document include the addition of an Introduction heading, the addition of three paragraphs to the Background heading, and the amendment to item 4 in "An Example of a Wipe Sampling Procedure."

This document was revised and clarified because it did not clearly and completely state EPA's intentions in an area where details were essential, that is the original version of this document assumed that a gloved hand would apply the gauze with moderate pressure, but inadvertently this requirement was never explicitly stated in the example of the wipe sampling procedure. The gloved-hand application of the gauze might have been assumed since the gloves were to be discarded after each sample. The procedure clearly did not say to apply the gauze to the surface with forceps. The EPA demonstrations and discussions at the PCB Forums clearly emphasized the pressurized application of moistened cotton gauze to the surface with a gloved hand.

Background:

The PCB spill Cleanup Policy requires wipe sampling for the determination of surface levels of PCBs resulting from PCB spills onto hard, "smooth", surfaces such as metal, wood, concrete, plastic, and glass (see Tables 1 and 2). There are several activities surrounding a PCB spill cleanup where wipe sampling may be used: (a) site characterization; (b) interim evaluation of the progress of the cleanup; and (c) the final process to verify that the cleanup has met requirements of the PCB Spill Cleanup Policy.

Wipe sampling has a number of advantages. The most apparent advantage is that wipe sampling is probably the best way to determine smooth "impervious" surface concentrations. Wipe sampling is most effective in areas with relatively large, flat, easily accessible surfaces where an accidental and/or short time exposure to PCBs has occurred. The surfaces which are sampled by wipe sampling in many cases will have been (or will be) cleaned by wiping or wiping-related activities.

Wipe sampling is best used in conjunction with statistical random sampling and/or area sampling techniques. Reduction in sampling errors for all kinds of sampling procedures can be accomplished by statistical selection of the smaller sampling sites selected to represent a larger area. Non-sampling errors may be reduced by maintaining consistency within the sampling activities; use of comprehensive quality control procedures and samples; and wherever possible, establishing a reference point for comparison.

Unfortunately, wipe sampling is not quantitative because of the fairly large variability in several component parts of sampling and the relative inefficiency of extraction of the analyte of interest from the wipes. Wipe sampling evaluation study results are known to vary widely, for example, when the same sampling is done (1) by different samplers; (2) on similarly contaminated surfaces having different textures or porosities; (3) using no solvent or solvents having different polarities; and (4) using different kinds of wiping material such as filter paper or cotton gauze.

When a decision is made to use wipe sampling, (1) it should be assumed that the results are not always reproducible; (2) extra care should be used to minimize the variability and optimize quantitation; and (3) even if representative sampling is employed, wipe sampling results can indicate residual levels substantially below true surface levels. In developing the PCB Spill Cleanup Policy, EPA has considered the advantages and disadvantages of wipe sampling and accordingly has established allowable residual PCB levels as measured by wipe sampling.

Since the objective of surface sampling is to remove PCB liquids and particles, which may be adhering to the surface, from the surface an aggressive sampling procedure is necessary. The aggressive sampling is appropriate since often the surfaces being samples have been aggressively cleaned and may drive residual PCBs into the surface. For determining the PCB surface concentrations on smooth surfaces, EPA recommends wipe sampling using cotton gauze as the wipe medium and using a gloved or doubly gloved hand to apply the wipe to the surface. This procedure requires changing into new/clean gloves between samples. EPA recognizes that there may be some transport of PCBs from the gauze to the surface of the gloves. However, this potential loss is considered more acceptable than the problems from the disadvantages of other wipe sampling procedures.

Procedures employing filter paper and/or glass fiber pads and application of these pads to surfaces by swabbing, dipping, or brushing with a pair of forceps are unacceptable. EPA recognizes that this kind of wipe sampling technique may be widely applied to address other kinds of surface sampling objectives. However, to meet EPA's PCB surface sampling objectives, these procedures are less efficient and less effective than hand wiping with the more absorbent cotton gauze.

Any compositing of wipe samples or sampling of areas larger than 100 cm^2 may not address the intent of PCB Spill Cleanup Policy verification sampling.

Answers to Questions on Wipe Sampling Procedures:

Why is does it take so much care to wipe sample correctly?

There is a considerable variability possible among wipe sampling results due to (a) the sampling technique of the sampler and (b) the efficiencies of removing PCBs from several matrices and placing the PCBs into several other matrices. Therefore it is important to reduce this variability to the maximum extent possible, so that in the event of a verification analysis by quality control samplers or government enforcement inspectors, similar wipe sampling results will be obtained for a clean site.

Two factors increase the probability of reducing errors introduced by the sampler's technique: consistency and quality control. Consistency is aided by proper training, easily understood sampling procedures, immediate availability of proper supplies, and whenever possible, using the same sampler to do all sampling at a particular site. Quality control procedures provide reference points and comparisons for the field sample results. When the analytical results from quality control samples indicate potential sampling and analysis problems, there is often sufficient time to reexamine field results. Quality control sampling can reduce or eliminate additional sampling and analysis start up and/or additional cleanup costs.

The reproducibility and efficiency of transferring residual PCBs from one place to another require that such residual PCBs must have a much greater affinity to partition, in one or more steps, from the place of origin to the ultimate destination. For all transfer steps, PCBs must exhibit a much greater propensity to be in the destination medium than in the medium of origin. There are several transfer steps in the process which starts from the removal of PCBs from the surface sampled and ends with the production of a PCB surface concentration by way of instrumental analysis.

The first of these transfer steps is removing residual PCBs from the surface to be sampled and transferring them into the sampling medium*. Gauze pads are sturdier, allow better surface to surface contact, and absorb more solvent (and more PCBs) than filter paper. Therefore, gauze pads are the absorbent/sampling medium of choice. Since PCBs are very soluble in organic solvents, organic solvent is used to moisten the gauze pads to ease the transport of PCBs from the sampled surface into the sampling media. Once the areas of where the spill occurred have been sampled (after cleanup) and the residual PCBs have been transported to the moistened gauze, then the gauze is air dried and stored/shipped for chemical analysis. The gauze is dried so as to facilitate transfer by organic solvent from the gauze to another medium during the laboratory extraction step.

In the extraction step the PCBs must be isolated from the gauze in a form amenable to the chemical analysis methods to be used. The PCBs now in the gauze are usually extracted into a solvent by repeated rinsing with and subsequent collection of organic solvent. The extraction solvent is removed from the PCBs by evaporation of the solvent prior to chemical analysis. The more volatile organic solvent evaporates and leaves the less volatile PCBs in a more concentrated solution for further treatment or instrumental analysis.

What is the best way to wipe sample for PCBs on smooth surfaces?

There are several steps in a wipe sampling procedure. The first step is to prepare the sampler for the sampling activity. The sampler may have to be advised of (through a briefing or a refresher course), or trained in, the objectives of the sampling program and the procedures to be used to accomplish those objectives.

Once advised of the objectives and sampling procedures, the sampler must either prepare or obtain the sampling plan and sampling materials. The sampler must know the exact sampling sites or know the exact procedure for selecting those sites. The sampling supplies must be sufficient in quantity and quality for all normally expected occurrences. Provisions should be also made for quality assurance samples, chain of custody forms, and shipping materials for storage.

* When PCB-contaminated office paper has been solvent rinsed, then wipe sampled and bulk sampled, some recent chemical analysis results indicate that the PCB concentration in the surface wipes is not the same as the concentration in the bulk samples. PCB levels in uncontaminated paper were used as a control. The difference in PCB levels in the wipe samples and bulk samples may

be explained by PCB migration into the paper either during cleanup to remove PCBs or during the wipe sampling step.

An important series of quality assurance measures taken before on-site sampling occurs may save considerable expense from collecting contaminated or unusable wipe samples. Sampler training can include practice sampling of surfaces spiked with PCB surrogate compounds, such as tri- and tetrachlorobenzenes to sharpen skills (a) in wiping thoroughly and consistently, and (b) avoiding cross contamination. In addition, before field sampling is conducted, method blanks can be used to verify that sampling equipment supplies and procedures do not introduce PCBs or analytical interferences to the wipe samples. Complete supplies for sampling should be cleaned, a fraction of the supplies sampled individually or through method blanks, and, if clean, the supplies should be protected against contamination or destruction while being transported to the sampling site and while at the sampling site before actual sampling occurs.

The sampler arrives at a sampling site and determines the exact location where the 100 square centimeter (cm^2) sample will be taken. The sample location may be marked or framed by a template. The sampler must be conscious of possibility of cross contamination during all stages of the sampling activity. All surfaces should be wiped with as uniform a pressure as possible. It is important to use the appropriate pressure to thoroughly wipe materials off the surface. Wiping proceeds from left to right in rows from the top to the bottom of the framed sampling area. The sampling area is wiped again with the same uniform pressure in columns from the top to the bottom from the left side to the right side of the entire framed area. It is not critical whether wiping starts at the top left or with rows first and then columns. The objective is to systematically, thoroughly, and consistently wipe the entire framed area twice, each time from a different direction and orientation.

Once the area has been wiped, the sampling gauze is allowed to air dry and is replaced in the sample vial. The sample vial is then labelled, the chain of custody filled out, and the sample prepared/stored for shipping.

Table 1

SUMMARY OF CLEANUP LEVELS BASED ON THE EPA PCB SPILL CLEANUP POLICY

Requirements for Cleanup of Low-Concentration Spills Which Involve Less Than One Pound PCBs by Weight (Less Than 270 Gallons of Untested Mineral Oil [Containing Less Than 500 ppm PCBs])

Solid Surfaces (except for all indoor, residential surfaces other than vault areas)	Double washed/rinsed
All Indoor, Residential Surfaces Other Than Vault Areas	10 micrograms per 100 cm^2 by standard commercial wipe tests
Soil	Remove visible traces of the spill and soil within a one foot buffer of the visible traces

Table 2

SUMMARY OF CLEANUP LEVELS
BASED ON THE EPA PCB SPILL CLEANUP POLICY

Requirements for Cleanup of
High-Concentration Spills and Low-Concentration Spills
Involving One Pound or More PCBs by Weight
(270 Gallons or More of Untested Mineral Oil
[Containing Less Than 500 ppm PCBs])

Residential/Commercial/Rural

Indoor (except vaults), and Outdoor High Contact	10 micrograms per 100 cm^2
Indoor Vaults	10 micrograms per 100 cm^2
Outdoor Low Contact	10 micrograms per 100 cm^2
Porous Surface Option	100 micrograms per 100 cm^2 plus encapsulation
Soil	10 ppm Plus a 10 Inch Cap

Restricted Access (Non-Sub-Station)

High Contact Surfaces	10 micrograms per 100 cm^2
Low Contact Indoor Surfaces	10 micrograms per 100 cm^2
Porous Surface Option	100 micrograms per 100 cm^2 Plus Encapsulation
Outdoor Low Contact Surfaces	100 micrograms per 100 cm^2
Soil	25 ppm

Outdoor Electrical Substations

Surfaces	100 micrograms per 100 cm^2

Soil	25 ppm or 50 ppm with Notice

Additional Wipe Sampling Information
(Contents)

An Example of a List of Wipe Sampling Supplies

Copy of Sampling Procedures and Study Objectives

Pen (Indelible Ink)

Pre-numbered Sample Labels

Tape to Cover Labels

Chain of Custody Forms

Screw Top Vials with Teflon Lined Caps
These Vials Contain Pre-Cleaned 3" x 3" Surgical Gauze Pads

Teflon Squirt Bottle for Applying Solvent to Wipes and Washing

Solvent, preferably in a bottle with a volumetric delivery top

Graduated cylinder, when not using a volumetric delivery top

Disposable Gloves

Metal Ruler

Sampling Template

Forceps for Removing (Replacing) Gauze from (into) Vials

Disposable Wipes (for cleaning ruler)

Garbage Bags/Containers (for disposal of gloves and solid waste)

Funnel

Five Gallon Solvent Can for Disposal of Rinse Solvent

Shipping/Storage Containers for Samples

Sampling Site Description Forms with Optional Instant Print Camera

An Example of Sample Site Preparations

At each sample site location:

- Mark the exact sample site with the template or a ruler

- If the site is not easily marked with a template or ruler (an irregular non-planar surface), write a detailed description of the area sampled. A instant print photograph with the ruler included (for scale) is a very valuable descriptor.

- Prepare all necessary forms and sampling logs for entry of the sampling time, date, location, and other information describing the sampling at that particular site.

- Prepare all sampling equipment for sampling the site.

An Example of a Wipe Sampling Procedure

Assume that the exact sampling site has been marked.

1. With gloved hands, remove the cap from the sampling vial.

2. With the forceps, remove the gauze from the sampling vial.

3. From a solvent bottle, use the volumetric delivery device or fill a graduated cylinder with 5 milliliters of solvent to the gauze.

4. Immediately begin applying the gauze using a gloved hand and, applying pressure, wipe the marked area completely twice, from left to right and then from top to bottom.

5. Let the gauze air dry.

6. Fold the dry gauze (sampled side inward) and return it to the sample vial.

7. Cap the sample vial.

8. Remove and discard the gloves.

9. Label the vial and fill out sampling details on the sampling forms.

10. Fill out chain of custody forms and prepare the sample for storage and shipping.

A Detailed Description of Quality Controls for Wipe Sampling Activities

Several kinds of quality control (QC) samples should be used. Each kind of sample provides an indication of the reliability of a part of the sampling and analysis process.

It is better not to identify QC samples as such when submitting the QC samples to the analytical laboratory. It is best to randomly number all samples when submitting them to the analytical laboratory. The chemical analysis laboratory does not need to know sample descriptions except for matrix type or in the event of the presence of an unusually high concentration in the wipe. Specific identification of the QC samples will not be necessary since the concentration range in these samples should be in the normal operating range of the analytical instruments.

Vials refer to the glass vials containing sampling gauze.

1. Field Blanks - at least 5% of the total samples include at least two samples each from the following:

    a. Ship unopened vials back for analysis.

    b. With gloved hands, remove the cap from a sample vial for the estimated time (record this time) of normal wipe sampling, allow the gauze to air dry without applying it to any surface, and proceed with step 7 in the wipe sampling procedure.

    c. Use the wipe sampling procedures to wipe some areas/surfaces near the sampling site but which are not expected to be contaminated.

2. Duplicates - at least 5% of total samples including at a minimum the designated samples from both the following groups:

    a. Double wipe at least two sample sites, label which was the first wipe and which was the second wipe for each of the two sites, for each kind of surface sampled.

    b. For at least two sample sites for each kind of surface sampled, wipe two adjacent identical or nearly identical areas. Clearly identify the samples as being adjacent to one another in the sample description forms.

A Detailed Description of Quality Controls for Wipe Sampling Activities (Continued)

3. Field Spikes - at least 5% of total samples including at a minimum the designated samples from each of the following groups for each kind of surface sampled. Clearly describe these samples on the sample description forms.

   a. For two vials or more, remove each gauze and moisten as for sampling and spike each wet gauze with ten micrograms each of the kind of PCBs which was spilled, wipe a contaminated surface adjacent to a sampled surface as in 2b (above), let the gauze air dry, replace the gauze, and proceed with step 7 in the wipe sampling procedure.

   b. For a second pair of vials or more, remove each gauze and moisten as for sampling, wipe a contaminated surface adjacent to a sampled surface as in 2b (above), after wipe sampling (but before air drying) spike each wet gauze with ten micrograms each of the kind of PCBs which was spilled, let the gauze air dry, replace the gauze in the vials, and proceed with step 7 in the wipe sampling procedure.

   c. For a third pair of vials or more, spike sampling surfaces adjacent to another sampled surface as in 2b (above) with ten micrograms each of the kind of PCBs which was spilled and allow to air dry; remove each gauze and moisten as for sampling; wipe the surface; let the gauze air dry, replace the gauze in the vials; and proceed with step 7 in the wipe sampling procedure.

Wipe Sampling Quality Control Samples (Summary)

1. Field Blanks - At least two samples from each category

    a. For each spill site prepare the following blanks:

        i. Unopened sampling vials containing gauze

        ii. Remove gauze but do not use to wipe

    b. For each kind of surface, wipe an uncontaminated 100 cm^2 surface with a gauze as a blank surface

2. Duplicate Samples - At least 5% of total samples

    a. For each kind of surface at each spill site:

        i. Double wipe at least two sample sites

        ii. Side by side wipe at least two sample sites

3. Spiked Samples - At least 5% of total samples

    a. Wipe no less than two samples each for each kind of surface at each spill site. All are side by side paired samples. One sample for each pair is untreated, for the other sample:

        i. Spike gauze with 10 micrograms of PCBs, then wipe the 100 cm^2 area

        ii. Wipe the 100 cm^2 area first, then spike gauze with 10 micrograms of PCBs

        iii. Spike the 100 cm^2 site with 10 micrograms of PCBs, then wipe

An Example of Quality Assurance Procedures Useful When Conducting Wipe Sampling Activities

1. Designate a person, not the sampler or chemical analyst, who is responsible for quality assurance and quality control including: training, preparation of sampling supplies, wipe sampling, sample preparation/extraction, chemical analysis, analytical data reduction, reporting of the sampling results, and conclusions drawn from the results.

2. Document the objectives of the wipe sampling and subsequent chemical analysis. Include performance requirements such as number of samples required, precision, accuracy, measurable deliverables, and schedules.

3. Develop a quality assurance plan which includes: the objectives; quality assurance/quality control procedures, audits, and schedules; persons responsible for all aspects of the sampling and chemical analysis efforts; references to all safety, training, sampling, and chemical analysis procedures; and corrective actions (including approximate times before corrective actions will occur) to be taken in the event that documented procedures cannot be or have not been followed.

4. Verify that staff doing sampling are the designated staff or suitably trained and informed replacements for the designated staff.

5. Verify that the sampling equipment and the sample gauze/vials are not going to introduce contamination into the samples.

6. Verify that sufficient quality control samples are taken and taken properly, that sampling objectives are met, and that chain of custody procedures are being followed.

7. Verify that sample extraction and chemical analysis occurs according to documented procedures. Assure that suitable and sufficient analytical quality control samples and reference standards are analyzed.

8. Verify that analytical data calculations are properly generated and the data are correctly associated with the proper samples.

9. Assure that conclusions based on the chemical analysis of the samples are in keeping with the sampling procedures and sample site locations.

10. Document quality assurance activities including: who did it, what was done, when it was done, where was it done, and why was it

done. Document and justify any deviations from documented procedures and policies.

An Example of Procedures to Use When Cleaning Wipe Sampling Equipment

1. Using clean (or cleaned) disposable equipment is overall probably more cost-effective than cleaning and verifying that cleaned sampling equipment is free from PCBs. The second choice is not cleaning any equipment on or near the sampling site, but to have sufficient recleaned sampling equipment to completely sample a site. The least favorable situation is to clean sampling equipment for reuse at the same sampling site. If cleaning must be done at or near the sampling site, clean the sampling equipment as far from the actual site of cleanup/contaminations as possible.

2. Try to have sufficient clean materials on-site to completely sample a site (plus at least ten percent surplus for unforeseen accidents and blunders) so as not to have to clean any sampling equipment.

3. Use cleaning procedures which have been verified as effective previously. Good cleaning includes:

Washing with soapy water
Rinsing thoroughly with water
Rinsing three times thoroughly with distilled water
Rinsing with PCB-free organic solvent
Air drying for non-glass
Drying in a muffle furnace at 350°C for glass
Verification sampling and analysis of cleaned equipment
Protective packaging for shipment to the sampling site

4. The same kind of verification procedures should be used for new equipment as is used for equipment which has been cleaned:

a. Selecting a statistical sample from the equipment. For lots having large numbers of units (such as sample bottles), a 5% or less proportion of the units may be sufficient. For equipment which comes in direct contact with contaminated surfaces (such as templates) a 10% sample may be more appropriate unless historical data have verified that a smaller proportion is sufficient.

b. Rinsing "clean", dry equipment with the same amount of organic solvent as is used in the sampling procedure or more than sufficient solvent to completely cover and rinse off all contact (with the wipe sample, sampler, or the surface) surfaces of equipment. The rinseate is collected and treated as an extract from a sample gauze pad.

c. The presence of detectable levels of PCBs indicate that contamination is present and that the lot from which the verification sample(s) came must be either recleaned and reverified or disposed of appropriately.

II. DESCRIPTION OF DOUBLE WASH/RINSE

Introduction

The PCB Spill Cleanup Policy requires that low concentration spills of small amounts of PCBs on surfaces are to be removed by a double wash/rinse procedure. The objectives of the double wash/rinse are (1) to recognize the lesser hazard resulting from these small quantity spills and from the cleanup of such spills, and (2) to remove the easily removable PCB material thoroughly and quickly. It is also important not to redistribute PCBs or leave pieces of cleanup materials as a result of the cleanup procedure.

General Requirements for All Double Wash/Rinse Surfaces

For spills where there is still visible PCB-containing liquid present on the surface to be cleaned up, the double wash/rinse procedure first requires a pre-cleaning step. This step includes thoroughly wiping/mopping up the entire surface with absorbent paper or cloth material, such that there are no longer visible signs of the liquid present on the surface.

The double wash/rinse procedure called for in the cleanup of surfaces contaminated by small spills includes the two washing steps and two rinsing steps. The two washing and rinsing steps are slightly different depending on: (a) whether a contaminated surface was relatively clean before the spill, or (b) whether a surface was coated/covered with some sort of absorbent material, such as dust, dirt, grime, or grease.

Minimization of residual PCBs following the double wash/rinse procedure is facilitated by the proper selection and use of cleanup equipment. Scrubbers and the absorbent pads used in the double wash/rinse procedure shall not be dissolved by solvents or cleaners used. Scrubbers and absorbent pads shall not contain greater than 2 parts per million (weight per weight) PCBs. Washing scrubbers and absorbent pads shall not be reused. Rinsing scrubbers and absorbent pads may be reused as washing scrubbers or absorbent pads if necessary, but this is not recommended. All double wash/rinse cleaning/absorbent materials must remain intact (i.e. do not shred, crumble, or leave visible fragments on the surface) after the double wash/rinse operation.

During the double wash/rinse process, all washing and rinsing liquids/solvents must be contained, captured, and properly disposed of in accordance with local, state, and Federal regulations. Following use in the double wash/rinse process, all double wash/rinse equipment and absorbent materials must also be disposed of in accordance with local state, and Federal regulations.

Summary of The Double Wash/Rinse Procedure

General

1. Use disposable cleaning materials which do not

   - dissolve or break apart
   - contain traces of PCBs.

2. Remove any visible PCB liquid before washing/rinsing.

3. Capture and contain washing/rinsing solutions.

4. Properly dispose of cleaning materials and solutions/liquids.

Specific

1. For surfaces not covered with dirt, dust, grime, grease or other potential absorbent of PCBs:

   WASH 1: Scrub with organic solvent and wipe up the solvent.

   RINSE 1: Wipe surface with moistened pad, wipe up with dry pad.

   WASH 2: Repeat WASH 1.

   RINSE 2: Repeat RINSE 1.

2. For surfaces covered with dirt, dust, grime, grease or other potential absorbent of PCBs:

   WASH 1: Scrub with detergent and water, dry.

   RINSE 1: Rinse with water, wipe with wet adsorbent pad, dry.

   WASH 2: Scrub with organic solvent and wipe up the solvent.

   RINSE 2: Wipe surface with moistened pad, wipe up with dry pad.

Detailed Requirements for the Double Wash/Rinse

1. Specific requirements for surfaces that do not appear dusty or grimy before a spill, such as glass, automobile surfaces, newly poured concrete, and desk tops:

WASH 1.

If there is no visible liquid or after having removed the visible liquid, cover the entire surface with organic solvent in which PCBs are soluble to at least 5% by weight. Contain and collect any runoff solvent for disposal. Scrub rough surfaces with a scrub brush or disposable scrubbing pad. Add solvent such that the surface is always very wet for one minute per square foot. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.

RINSE 1.

Wipe the surface with an absorbent pad soaked with the same organic solvent with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Immediately wipe/sop up the solvent on the surface with a dry absorbent.

WASH 2.

Repeat WASH 1.

RINSE 2.

Repeat RINSE 1.

Detailed Requirements for the Double Wash/Rinse (Continued)

2. Specific requirements for dirty, dusty, grimy, or greasy surfaces or surfaces having surface coverings of some other kind of sorbant materials (where the spill probably largely sorbed onto the materials on the surface):

WASH 1.

If there is no visible liquid or after having removed the visible liquid, cover the entire surface with concentrated or industrial strength detergent or non-ionic surfactant solution. Contain and collect all cleaning solutions for proper disposal. Scrub rough surfaces with a scrub brush or scrubbing pad, adding cleaning solution such that the surface is always very wet, for one minute per square foot. Wipe smooth surfaces with a cleaning solution-soaked disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Mop up or absorb the residual cleaner solution and suds with an absorbent pad until the surface appears dry. This cleaning should remove any residual dirt, dust, grime, or other sorbant materials left on the surface following step one (above).

RINSE 1.

Rinse off the wash solution with one gallon of water per square foot and capture the rinse water. Mop up the wet surface until the surface appears dry.

WASH 2.

Next, cover the entire dry surface with organic solvent in which PCBs are soluble to at least 5% by weight. Scrub rough surfaces with a scrub brush or scrubbing pad adding solvent such that the surface is always very wet for one minute per square foot. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.

RINSE 2.

Wipe the surface with an absorbent pad soaked with the same organic solvent as in RINSE 1 (above) and immediately wipe up the solvent on the surface with a dry absorbent.