DRAFT

Field Sampling and Chemical Analysis Plan for the PCBs in Caulk Project (Taking Action for Clean Water Bay Area TMDL Implementation)

Subcontract for SWRCB Agreement No. 09-305-550-1 with
Association of Bay Area Governments

Prepared by
Susan Klosterhaus and Lester McKee
San Francisco Estuary Institute

July 2010

San Francisco Estuary Institute
7770 Pardee Lane, 2nd Floor
Oakland, CA 94621

Table of Contents

1. Project Management

1.1 Project Background

Elevated polychlorinated biphenyl (PCB) levels threaten the heath of people and wildlife consuming fish from San Francisco Bay (RWQCB, 2008). A Total Maximum Daily Load (TMDL) to address PCB impairment of all segments of San Francisco Bay was adopted by the San Francisco Bay Regional Water Quality Control Board in February 2008. The San Francisco Bay PCBs TMDL Project Report (RWQCB 2004) found that urban runoff was one of the major sources of PCB loads to the Bay and concluded that controlling sources of PCBs to urban runoff was one of two top priorities for TMDL implementation. Based on this recommendation, the Clean Estuary Partnership (CEP) evaluated available data on sources of PCBs in urban runoff and recommended approaches for addressing two potentially significant sources, past PCBs releases that have contaminated soil and sediments and PCB-containing historic building materials, specifically uncontained materials like sealants, caulking and paint (LWA et al. 2006). When the building materials fail or buildings are remodeled, residues can be transported away from the building during rainstorms, through landscape irrigation overflows, or by pavement washing (forecourts and footpaths surrounding the buildings) and find their way into the stormwater drainage system. In addition, when buildings are demolished, PCBs may be released onto the ground and can be washed off into stormwater drains by rainfall. While these are logical pathways, we lack data to determine which buildings have PCBs at levels that may be concerning, the magnitude of losses to stormwater, or how PCBs in buildings could be better managed.

A survey of 1,348 buildings in Switzerland constructed between 1950 and 1980 found that almost half of the buildings contained PCBs, almost 10% of the buildings contained sealants with PCB concentrations exceeding 10% by weight, and the total PCBs reservoir in Switzerland was an estimated 50-150 metric tons (Kohler et al. 2005). Less rigorous studies have been conducted in Boston (Herrick et al. 2004) and Toronto (Melymuk et al. 2008) with similar findings; however no such evaluation is known for California. A Swedish study also found that significant quantities of PCBs were released into soil and water runoff during building remodeling (Astebro et al. 2000). Both the Swiss and Swedish governments have developed active programs to manage PCB-containing building materials in response to public health concerns, which relate to both direct exposures and the adverse effect of PCBs on Europe’s fisheries.

In 2007 the California State Water Resources Control Board awarded the Association of Bay Area Governments (ABAG) a grant that includes several tasks for implementation of Bay Area Total Maximum Daily Loads (TMDLs). The project was halted under the state bond freeze in December 2008 and restarted under the American Recovery and Reinvestment Act of 2009 (ARRA) through the State Revolving Fund in August of 2009. One of the tasks in the master grant is the PCBs in Caulk Project (referred to herein as the Project), which includes characterizing the use of PCBs in historic building materials in the San Francisco Bay Area. The San Francisco Estuary Institute (SFEI) is the subcontractor for Task 7.5.2.2 of SWRCB Agreement No. 09-305-550-01. This Field Sampling and Chemical Analysis Plan (SAP) outlines procedures to be followed by project personnel to insure usability and representativeness of data collected through the Project implementation. The SAP will be submitted to the State Water Resources Control Board (SWRCB) as part of the work to complete Task 7.5.2.2 of the master agreement, and under Task 1 of SFEI's subcontract under that agreement, which has a term of January 27, 2010 through December 1, 2011.

1.2 Project Description

The objective of this element of the PCBs in Caulk Project is to obtain Bay Area-specific estimates on PCB loadings to urban runoff from historic building materials. While many structures were historically built with a variety of materials known to contain PCBs, including caulking/sealants, grouts, paints, and flame retardant coatings of acoustic ceiling tiles, the focus of this Project is caulking/sealants that were used between rigid components of buildings and other structures. The results from implementing this SAP will inform the development of BMPs for the handling of PCB-contaminated caulking. This SAP contains information on the data-collection phase of the Project, which will obtain Bay Area-specific information on the presence of PCBs in sealants used in historic buildings and other structures.

In collaboration with Bay Area Stormwater Management Agencies Association (BASMAA), the San Francisco Bay Regional Water Quality Control Board (Water Board), and local municipalities, the San Francisco Estuary Institute (SFEI) will test or sample structures that have the potential to contain PCBs in their exterior sealants or caulking (herein referred to as only 'sealants'). Other members of the Project team will identify buildings and secure permission to test a minimum of ten Bay Area structures. Structures to be tested or sampled will be identified based on structure type, year of construction, and whether or not the sealants have been replaced or renovated since the original date of construction. Based on the results of this identification process, and in cooperation with structure owners, this SAP will be implemented to obtain Bay Area-specific information on the PCB content of sealants. As appropriate, data generated from the sampling phase will be used to support BMP development and implementation. All testing and sampling conducted during the above-mentioned activities will be in compliance with this SAP.

It is likely that sealant testing in participating buildings or structures will occur through the use of a portable X-ray fluorescence (XRF) detector to estimate PCB concentrations. If permission is granted, physical sealant samples will be collected from structures and sent to a qualified analytical laboratory for confirmation of PCB content according to the Project Quality Assurance Project Plan (QAPP).

1.3 Project Organization and Responsibilities

The project will make use of the cooperative efforts of several parties involved in the design and implementation of the various components of the project. The main roles and responsibilities are defined below.

1.3.1. SWRCB Project Manager (Kari Holmes, California State Water Resources Control Board)

The SWRCB Project Manager oversees performance of the project agreement and monitors progress of the project. Technical review will be delegated to Jan O'Hara at the San Francisco Bay Regional Water Quality Control Board.

1.3.2 Project Manager (Athena Honore, ABAG/SFEP)

The Project Manager will be responsible for ensuring that all work performed through the Project is consistent with the project proposal and objectives, and for oversight of all efforts associated with the project. Additionally, the Project Manager will act as the liaison between the Contractor and the SWRCB Project Manager.

1.3.3 Contractor (SFEI)

The Contractor will be responsible for all efforts associated with the data collection phase, including SAP and QAPP development, data and sample collection, data management and interpretation, and reporting. The Contractor is also responsible for oversight of the subcontractor performing the laboratory analysis.

1.3.4 Contractor Project Manager (Susan Klosterhaus, SFEI)

The Contractor Project Manager will be responsible for ensuring that testing and sampling personnel adhere to the provisions of the QAPP and SAP. The Contractor Project Manager is also responsible for custody of any samples collected until receipt by the analytical laboratory.

1.3.5 Data Manager (Don Yee or Jay Davis, SFEI)

The Data Manager will be responsible for receipt and review of all project related documentation and reporting associated with laboratory PCB analysis. The Data Manager will serve as the project quality assurance officer and will be responsible for verifying compliance of all analytical data with the requirements established by the Project QAPP before its use for interpretive purposes.

1.3.6 Project Chemist (Francois Rodigari, East Bay Municipal Utility District)

The Project Chemist at the selected analytical laboratory will be responsible for ensuring that the laboratory's quality assurance program and standard operating procedures are consistent with the Project QAPP, and that laboratory analyses meet all applicable requirements or explain any deviations. The Project Chemist will also be responsible for coordinating with the Data Manager and Project Manager as required for the project. All laboratory analyses will be performed by the East Bay Municipal Utility District, Oakland, CA.

1.3.7 Other Collaborators (Bay Area Stormwater Management Agencies Association, SF Bay Regional Water Quality Control Board)

Bay Area Stormwater Management Agencies Association (BASMAA) and Water Board staff will be involved in the design and implementation of the Project. BASMAA and the Water

Board will coordinate their involvement through the Project Manager, and will be given the opportunity to review and comment on all relevant project documents, including, but not limited to, the project QAPP, SAP, and draft and final reports. BASMAA will serve as liaison between the municipalities and the Project Manager by providing summary information about the project and its objectives to the municipalities that may wish to participate in the project. BASMAA will also attempt to identify structures that meet the structure criteria within each municipality that may be available for testing and/or sampling and will attempt to secure permission from structure owners for testing or sampling.

2. Information Sources

2.1 Prior Investigations of PCBs in Sealants

A technical memorandum prepared for the Project summarized the available information on the use of PCBs in building materials (Moran et al. 2007). Based on information from these assessments, the memorandum made a number of recommendations for the Project, including the following:

- The project should focus on (1) caulking and sealants and (2) paints and coatings, with the caulking and sealants being the higher priority building material of the two.
- A combination of field screening with XRF and confirmation sampling with PCB measurements by an analytical laboratory (using gas chromatography-mass spectrometry or GC-MS) should be used in the investigation of PCB content in the building materials.
- The Project should initially focus its efforts on exterior caulking and sealants used in concrete and masonry structures constructed or substantially remodeled between 1957 and 1977. Testing and sampling should be designed to confirm and narrow the construction date range to ensure that the BMPs developed at a later stage in the Project target the appropriate structure types.

2.2 Use of portable X-Ray Fluorescence (XRF) to Estimate PCB Concentrations in Sealants

A pilot study was conducted in 2009 to determine if a portable XRF analyzer, which estimates the elemental composition of a substance (e.g. chlorine or Cl, not PCBs specifically) can be used as a screening tool to estimate PCB concentrations in sealants. In this study, 20 sealant samples were obtained from buildings predicted to have measurable concentrations of PCBs and analyzed for Cl content using XRF and a suite of PCB congeners using gas-chromatography-mass spectrometry (GC-MS). The results indicated that portable XRF may be most useful for ruling out sealants that do not contain high concentrations of PCBs (≥1%). When XRF did not detect Cl (detection limit average ~0.1%), PCBs were present at concentrations less than than ~0.1% in the sealants. However, in general, the pilot study results suggested that use of portable XRF alone is not a good indicator of PCB content due to a high rate of ‘false positives’. That is, when XRF detected elevated Cl (~>0.1%), PCBs were present in only ~20% of the samples (i.e. 20% specificity), indicating the presence of other chlorinated compounds in the sealant samples. When PCBs were present, the relationship between XRF measured Cl and GC-MS measured

PCBs was sufficient such that an adjustment factor could be applied to the XRF Cl data to provide a good estimate of PCB content.

In February and March 2010, a preliminary field survey of ~25 Bay Area structures was conducted in which portable XRF was used to screen intact sealants for Cl content. Cl was detected in eight out of the ten structures surveyed that were thought to have been constructed during the time period when PCBs were commonly added to structural sealants; confirmation of construction dates and the status of sealant renovation was not readily available, however. Cl was also detected in at least one location on all three structures known to have been constructed in the 1990s and 2000s and in three out of five structures with unknown construction dates. These results suggest that chlorinated compounds are prevalent in sealants used in Bay Area building structures that were constructed not only during the time period of known PCB use, but also those constructed over the last thirty years, following the PCB ban in the late 1970s.

In addition to the potential high rate of 'false positives', 'false negatives' are also a concern with the use of portable XRF in this application. In the preliminary field survey conducted in 2010, method detection limits (MDLs) for Cl fluctuated between 728 and 12,795 ppm (0.07 to 1.3%), with a mean MDL of 4095 ppm (~0.4%). The cause of the MDL variability is unknown but is thought to be the result of interference with other elements present in the sample and/or matrix effects. In this context, 'false negatives' may occur when PCBs are present at a concentration below the elevated MDL for Cl (~1%) but above the average MDL (~0.4%). Use of a more sensitive portable XRF instrument would likely reduce the average MDL for Cl to 200 ppm, though it is uncertain at this time whether this instrument will be available for use in this Project.

3. Sample Types and Other Data Collection

3.1 Sampling Design

Preliminary information suggests that the primary use of XRF in this Project will be to rule out sealants that do not contain PCBs in concentrations ≥1% (see section 2.2). XRF may therefore be used to rule out structures from which samples will not be collected for analysis of PCBs by GC-MS.

Exterior sealants from a minimum of ten Bay Area structures will be tested for Cl using a portable XRF analyzer. The number of structures and sites selected is based on the requirement in section C.12.b in the Municipal Regional Stormwater NPDES Permit, which this project seeks to implement. Other members of the Project team, in collaboration with SFEI, will identify structures for testing using the criteria outlined in the technical memo (Moran et al. 2007) and secure permission to test them. If permission is granted, physical sealant samples will also be obtained from structures and sent to a qualified laboratory for PCB analysis according to the Project QAPP. Project budget constraints and the number of structures for which permission to sample is received determine the number of structures to be sampled during the Project.

Testing and sampling will focus on structures constructed between 1957 and 1977, the era when structures are most likely to contain PCB in their sealants (Moran et al. 2007) and, to the extent feasible and supporting data are available, on sealants used on structure exteriors and those that have not been renovated or remodeled since construction. Structures may include, but are not limited to, transportation infrastructure (e.g. roads, bridges, sidewalks) and/or privately- or publicly-owned buildings. An estimate of the volume and surface area of the sealant on the exterior of each structure will also be determined to estimate the total mass of PCBs in the structure's sealants. This information, along with other site characteristics such as imperviousness, slope, and flow paths to the stormwater system, will be used to estimate potential PCB loadings from structural sealants to urban stormwater runoff.

3.2 Portable X-Ray Fluorescence (XRF) Data

A portable XRF analyzer will be used to estimate the concentration of Cl and other trace elements in sealants on each structure selected for inclusion in the Project. Sealants used around windows, at building/walkway interfaces, and in expansion joints between two abutting pieces of concrete will be targeted since sealants in these locations are most likely to contain PCBs (Moran et al. 2007). A preliminary validation study (section 2) indicated that XRF may be a useful screening tool for PCBs in sealants because it detected Cl when PCBs were present at percent levels in sealants and did not detect Cl when PCBs were less than than ~0.1%. XRF analysis can be conducted on either intact sealant or a sealant sample removed from the structure. However, analysis of a sample removed from the structure may be more reliable due to the difficulty of accessing intact sealants with the XRF (i.e. sealant location often prevents flush contact of XRF with the sealant) and the potential for analytical interference due to the presence of unknown materials behind the sealant (e.g. if the sealant thickness is less than the X-ray penetration depth, the presence of mortar or other material behind the sealant may affect the analysis); the extent to which these situations influence the analysis is unknown. In addition to Cl, other elemental data will be collected for possible determination of an elemental 'fingerprint' for PCBs using portable XRF. The pilot study conducted in 2009 (section 2.2) suggested, however, that the existence of a fingerprint is unlikely.

3.3 Sealants

If permission is granted, sealant samples for PCB analysis using GC-MS will be collected from one or more locations on the structure. Collection of one sealant sample per sealant type on each structure is desirable to fully characterize the PCB content in the structure's sealants. Sampling location(s) and procedures for replacement of the sealant will be conducted with concurrence from the municipality or structure owner. Alternatively, sealant samples may be obtained from structures via 'blind' sampling (i.e. not collected by SFEI). This may involve anonymously transmitting the sealant samples and the corresponding structure information (i.e. structure age and other characteristics but not geographical location) to SFEI.

Budget limitations may prevent the analysis of all sealant samples collected. If necessary, the Project team will select a sub-set of samples for PCB analysis using GC-MS once all samples have been collected.

3.4 QC Blanks (Field Blanks)

Collection of sealant field blank samples has been deemed unnecessary due to the difficulty in collection and interpretation of representative blank samples and the use of precautions that minimize contamination of the samples. Additionally, PCBs have been reported to be present in percent concentrations when used in sealants; therefore any low level contamination (at ppb or even ppm level) due to sampling equipment and procedures is not expected to affect data quality because it would be many orders of magnitude lower than the concentrations deemed to be a positive PCB signal.

3.5 QC Samples (Field Duplicates)

Assessment of within-structure variability of PCB concentrations in sealants is not a primary objective of the Project, therefore field duplicate samples will not be collected. Due to budget limitations, GC-MS analysis of only one sealant sample per sealant type on each structure will maximize the number of Bay Area structures and structure types that may be analyzed in the Project. The selected laboratory will conduct a number of quality assurance analyses (see Project QAPP), including a limited number of sample duplicates, to evaluate laboratory and method performance as well as variability of PCB content within a sample.

4. Field Documentation

Proper documentation of testing and sampling locations and methods is important to interpretation of project results. Data documentation at each location will include information recorded on field data sheets and photographic documentation. If permission is granted to collect physical samples of sealants, information will also be recorded on sample labels.

4.1 Field Data Sheets

A field data sheet will be completed for each structure tested ('Structure Information' form) and each sealant type screened on each structure ('Sealant Information' form; see forms in the Appendix). The 'Structure Information' form will include the type of structure (e.g. commercial building, school, etc.), County in which the structure is located, and the date of construction, if known. The 'Sealant Information' form will include the location/function of the sealant on the structure (e.g. around window or between concrete blocks), whether or not the sealant has been renovated since construction, physical characteristics of the sealant (i.e., level of deterioration, color), as well as all XRF tests for chlorine conducted on the sealant. If physical samples of sealant are collected, the sample ID and post-collection XRF chlorine tests will also be recorded on the 'Sealant Information' form. All information will be recorded in permanent ink. Any changes made to the recorded information will be made using single strike-through and will be initialed and dated by the person making the change.

4.2 Photographic Documentation

A photograph of each type of sealant tested or sampled on each structure will be taken. Photographs of the testing and sample collection process may also be taken. Care will be taken to avoid capturing information in the photo that could be used to identify the structure location; only close-up photos that record the physical appearance/condition of the material and the material function (e.g. sealing cement blocks in a walkway or joining cement blocks in a building) are necessary. The photo number will be recorded on each corresponding testing or sample collection data sheet. All photographs will be stored on the SFEI file server for the project duration.

4.3 Sample Identification

Sealant samples will be assigned unique sample identification codes to provide a method for tracking each sample, and codes will be recorded on sample labels (Appendix). Each sample will be identified by a unique code that indicates the sampling date, structure ID, and sample number. The following is an example of the sample identification code for the samples:

100504-03-1

where: 100504 indicates the sampling date, May 4, 2010;
03 indicates structure #3, which will start at '1' and increase by one in chronological order of sampling;
1 indicates the sample number, which will start at '1' and increase by one consecutively with each sample collected on each structure.

5. Testing and Sampling Procedures

The following section describes the field testing and sampling techniques that will be used in the Project. Procedures for testing sealants using portable X-Ray fluorescence (XRF) and collecting sealant samples are not standardized and minimal detail on sealant sample collection is available in peer-reviewed publications. Sealant sampling procedures were therefore developed in consultation with the XRF company representative and researchers with experience using the XRF on sealants and plastics. Professional judgment was used to develop sealant sample collection methods.

5.1 Sealant Testing and Sampling Procedures

Once a structure has been identified as meeting the selection criteria and permission is granted to perform the testing or collection of sealant samples, an on-site survey of the structure will be used to identify sealants and sealant locations on the structure to be tested or sampled. It is expected that sealants from a number of different locations on each structure may be tested; however, inconspicuous locations on the structure will be targeted for any physical sealant sampling.

5.1.1 Sealant Testing Using Portable X-Ray Fluorescence (XRF)

A portable XRF analyzer (Innov-X Systems, Woburn, MA) will be used as a screening tool to estimate the concentration of chlorine (Cl) and other elements in sealants in many locations on each structure. The analyzer will also be calibrated for Cl using plastic pellet European reference materials (EC680 and EC681) upon first use. The XRF analyzer will be ‘standardized’ using procedures recommended by the Innov-X representative each time the instrument is turned on and prior to any sealant monitoring. A 30 second measurement in soil/light element analytical program (LEAP) mode will be used. Field personnel will wipe the sealant surface to be sampled with a laboratory tissue to remove any debris that may potentially interfere with the XRF analysis. At least one XRF reading will be collected from each type of sealant present on the structure (e.g., window sealant, joint between concrete blocks, and joint between concrete at base of building and surrounding concrete surface). If Cl is detected, a minimum of two additional readings will be conducted at the same location on the structure to determine analytical variability and at other locations on the structure to determine variability in Cl concentration within sealant type on each structure. The XRF analyzer will record the estimated concentration of a variety of elements in the sealant and the Cl concentration will be recorded on field datasheets. XRF analysis will also be conducted on any sealant samples following their collection from the structure.

5.1.2 Sealant Sampling for Laboratory Analysis

Where permission is granted to collect sealant samples, selection of the appropriate samples to collect will be made at the time of sampling by the Project Manager in consultation with the structure owner. Following XRF analysis on the intact material, a one inch strip (or ~10 g) of the sealant sample will be removed from the structure using a utility knife with a solvent-rinsed, stainless-steel blade. Field personnel will wear Nitrile gloves during sample collection to prevent sample contamination. The sample will be placed on a clean surface, where it will undergo a second XRF analysis. The sample will then be placed in a labeled, laboratory-cleaned glass jar. The samples will be kept in a chilled cooler until returned to SFEI, where the samples will be refrigerated pending delivery under chain-of-custody (COC) to the analytical laboratory. The procedure for replacement of the sealant will be coordinated with each municipality or structure owner.

5.2 Decontamination Procedures

5.2.1 Initial Equipment Cleaning

The sampling equipment that is pre-cleaned includes:

- Glass sample jars
- Utility knife, extra blades
- Stainless-steel spatulas, forceps

Prior to sealant sampling, all equipment will be thoroughly cleaned. Glass sample containers will be factory pre-cleaned (Quality Certified™, ESS Vial, Oakland, CA) and delivered to SFEI at least one week prior to the start of sample collection. Sample containers will be pre-labeled and kept in their original boxes, which will be transported in coolers. Utility knife blades, spatulas, and forceps will be pre-cleaned with Alconox, Liquinox, or similar detergent, and then rinsed with deionized water and methanol. The cleaned equipment will then be wrapped in methanol-rinsed aluminum foil and stored in clean Ziploc bags until used in the field.

5.2.2 Field Cleaning Protocol

Between each use the utility knife blade, spatulas, and forceps will be rinsed with methanol and then deionized water, and inspected to ensure all visible sign of the previous sample have been removed. The clean utility knife, extra blades, spatulas, and forceps will be kept in methanol-rinsed aluminum foil and stored in clean Ziploc bags when not in use.

5.3 Collection of Samples for Archiving

Archive samples will not be collected for this project. The sample size collected will be enough to support additional analyses if QAQC issues arise. Once quality assurance is certified by the QA officer, the laboratory will be instructed to dispose of any leftover sample materials.

6. Sample Handling Procedures

The following protocols were developed to maximize the likelihood that collected samples are representative of the structural sealant's current condition.

6.1 Sample Containers

Where permission is granted, a minimum of one sealant sample will be collected at each structure location. The sealant sample will be transferred into appropriate factory pre-cleaned containers using pre-cleaned forceps.

6.2 Sample Preservation and Storage

At the conclusion of sample processing at each site, all sample containers will be placed in the original container shipping box in a chilled cooler. At the conclusion of each sampling day, all samples will be refrigerated until delivery to the analytical laboratory.

6.3 Sample Custody and Shipment

At appropriate intervals or following the conclusion of sample collection for the Project, samples will be hand-delivered to the analytical laboratory with itemized chain-of-custody (COC) forms. Sufficient sampling information will be recorded in the field that allows tracking sample shipments from field to laboratory and from laboratory through data processing. All samples will be delivered in accordance with laboratory procedures. The following instructions are the most stringent requirements associated with analytical laboratories used for the Regional Monitoring Program for Water Quality in San Francisco Estuary (RMP):

Personnel delivering the samples should ensure COCs (example in Appendix) are filled out completely and legibly and that:

- All samples in shipment are represented on the COC
- All samples on the COC are included in the shipment

- Information on the COC and sample container label (e.g., sample ID, collection date, collection time, analysis) are in agreement
- The COC lists the appropriate project ID and Data Manager
- The COCs are signed by the responsible party

Glass jars holding sealant samples will be transported in the factory provided box. Glass jars will be cushioned to avoid damaging the containers while in transit. The shipping personnel will notify the laboratory in advance of sample delivery. The Project Manager will follow up with the laboratory to verify the shipment was received.

6.4 Laboratory Chain of Custody Procedures

Sample custody transfers to the analytical laboratory at the time of receipt. Upon receipt of the samples, the laboratory sample custodian should first verify sample integrity. Verification should include:

- Presence of custody seal
- Samples at appropriate temperature
- Chain of custody forms in agreement with samples
- Sample containers intact
- Samples labeled appropriately

Any questions on shipments should be brought to the attention of the Project Manager for resolution. Custody procedures followed by the laboratory should then follow laboratory standard operating procedures.

7. Investigation Derived Waste

7.1 Sampling Residuals

Upon completion of the project, the analytical laboratory will dispose of sampling residuals containing $\geq$50 ppm PCBs following the procedures outlined by the Toxic Substances Control Act (TSCA) for bulk product waste. The disposal of PCB bulk product waste is regulated under 40 CFR § 761.62 of TSCA. Under this provision, PCB bulk product waste must be disposed of in one of two ways: disposal in a permitted solid waste landfill or via a risk-based disposal approval process.

7.2 Personal Protective Equipment

At the conclusion of sampling efforts, field sampling personnel will collect any protective equipment used in the sampling process for appropriate disposal.

7.3 Decontamination Waste

Waste water and methanol produced in the decontamination of the field equipment process will be collected and removed by sampling personnel for proper disposal. No waste water or methanol will be left on-site at the conclusion of sampling.

8. Quality Control for Field Operations

Field personnel will strictly adhere to the Project protocols to ensure the collection of representative, uncontaminated samples. The most important aspects of quality control associated with sample collection are as follows:

- Field personnel will be thoroughly trained in the proper use of sample collection equipment and will be able to distinguish acceptable versus unacceptable samples in accordance with pre-established criteria.
- Field personnel will be thoroughly trained to recognize and avoid potential sources of sample contamination (e.g., uncleaned knife).
- Containers and tools that come in direct contact with the sample will be made of non-contaminating materials (e.g., glass, stainless-steel) and will be thoroughly cleaned between samples.
- Sample containers will be pre-cleaned and of the recommended type
- Field personnel will wear Nitrile gloves and safety eyeglasses when collecting physical sealant samples and cleaning sample collection equipment.

9. Laboratory Analysis

9.1 Laboratory Analytical Methods

Though every effort will be made to collect only those samples which will be analyzed for PCBs, a potential outcome of the project is that, due to budget constraints, not all of the samples collected will be analyzed by the laboratory. The number and types of structures that will be available for collection of sealant samples are not currently known and it is anticipated that not all of the municipalities and/or structure owners may have the opportunity to respond to the request for permission to collect samples prior to the initiation of field sampling. Sampling may therefore occur on an opportunistic basis, potentially resulting in a number of samples that cannot be analyzed for PCBs due to budget constraints (i.e. 'oversampling'). Samples that represent sealants from a variety of structure types and construction years will be selected for PCB analysis, consistent with project goals.

The samples will be analyzed for PCBs using a modified EPA 8270 protocol (semi-volatile organic compounds by gas chromatography-mass spectrometry). Hold times will follow EPA method 1668 (i.e. one year to extract and one year for extracts if samples and extracts are stored at -10 °C). Samples will be stored in 60 ml or 125 ml wide mouth glass jars until analysis. The minimum sample size is 10 g dry weight. PCB analytical results will be reported as IUPAC congeners. The congener list will include:

- the 40 congeners routinely monitored by the RMP (PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203),
- PCB 11, a non-Aroclor congener commonly detected in wastewater effluent and environmental samples (Rodenburg et al. 2010),
- the coplanar PCBs 77, 126, and 169, 'dioxin-like' congeners which contribute substantially to the dioxin toxic equivalents observed in San Francisco Bay sport fish.

9.2 Sample Tracking

Sufficient sampling information must be recorded in the field that allows tracking sample shipments from field to laboratory and from laboratory through data processing.

9.3 Data Reporting Requirements

As previously indicated, laboratory personnel will verify that the measurement process was "in control" (i.e., all specified data quality criteria were met or acceptable deviations explained) for each batch of samples before proceeding with the analysis of a subsequent batch. In addition, the laboratory will establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data. Only data that have met data quality criteria, or data that have acceptable deviations explained, will be submitted by the laboratory. When QA requirements have not been met, the samples will be re-analyzed when possible. Only the results of the re-analysis will be submitted, provided they are acceptable.

10. Refinements to the Planned Monitoring

Additional details regarding the planned monitoring will be developed in the future when further information becomes available on realistic sampling sites and scenarios. This will include estimating the numbers of samples anticipated to be sent to a laboratory for PCB analysis during both the characterization and implementation trial phases of the project and associated budget projections (e.g., numbers of samples and associated costs).

The overall objective of the monitoring is to obtain Bay Area-specific information on the presence of PCBs in sealants used in historic buildings and other structures and thereby inform development and testing of BMPs to properly identify, handle and dispose of these materials during renovation and demolition projects. Ancillary objectives may be articulated as further information becomes available, such as developing a relationship between XRF field screening and laboratory analysis results.

11. References

Astebro, A. et al. 2000. Emissions during replacement of PCB containing sealants – a case study. Organohalogen Compounds 46: 248-251.

Herrick, R.F. et al. 2004. An unrecognized source of PCB contamination in schools and other buildings. Environ Health Perspectives 112:1051-1053.

Kohler, M. et al. 2005. Joint sealants: an overlooked diffuse source of polychlorinated biphenyls in buildings. Environ Sci Technol 39: 1967-1973.

Larry Walker Associates et al. 2006. PCB TMDL Implementation Plan Development. Prepared for CEP. Final Draft.

Melymuk, L. et al. 2008. Continuing sources of PCBs: the significance of building sealants. Poster presentation a the International Symposium on Halogenated Persistent Organic Pollutants, Birmingham, UK.

Moran, K. et al. 2007. Memorandum regarding 'First Phase Support Information for PCB Portion of Taking Action for Clean Water Grant'. July 16 2007.

Rodenburg, L, et al. 2010. Evidence for Unique and Ubiquitous Environmental Sources of 3,3′-Dichlorobiphenyl (PCB 11). Environ Sci Technol 44: 2816–2821.

San Francisco Bay Regional Quality Control Board (RWQCB). 2004. PCBs in San Francisco Bay, TMDL Project Report, January 8.

San Francisco Bay Regional Quality Control Board (RWQCB). 2008. Total Maximum Daily Load for PCBs in San Francisco Bay: Final Staff Report for Proposed Basin Plan Amendment. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf

12. Appendix

Examples of field documentation associated with the Structural PCBs Project. Examples of the following are shown:

- Structure Information form
- Sealant Information form
- Chain of Custody (COC) form

Structural PCBs Project — Structure Information Form

Structure ID# _______________

Sampling Date ______________

Year of construction (Estimate if date cannot be provided: pre-1950, 1950-59; 1960-69; 1970-79; post-1979)____

Construction type:

☐ Light wood-frame residential and commercial building smaller than or equal to 5,000 square feet (W1)

☐ Light wood-frame building larger than 5,000 square feet (W2)

☐ Steel moment-resisting frame building (S1)

☐ Braced steel frame building (S2)

☐ Light metal building (S3)

☐ Steel frame building with cast-in-place concrete shear walls (S4)

☐ Steel frame building with unreinforced masonry infill walls (S5)

☐ Concrete moment-resisting frame building (C1)

☐ Concrete shear-wall building (C2)

☐ Concrete frame building with unreinforced masonry infill walls (C3)

☐ Tilt-up building (PC1)

☐ Precast concrete frame building (PC2)

☐ Reinforced masonry building with flexible floor and roof diaphragms (RM1)

☐ Reinforced masonry building with rigid floor and roof diaphragms (RM2)

☐ Unreinforced masonry bearing-wall building (URM)

☐ Other ____

Total # of sealant types/locations screened on the structure ___________________________

Total # of sealant samples collected from structure __________________________________

Notes:

Structural PCBs Project — Sealant Information Form

Structure ID# _______________

Sampling Date __________

Sealant function/location on structure:

____ Around window

____ Around doorway

____ Between concrete blocks and base of structure

____ Between concrete blocks on structure wall

____ Other ____

Has the sealant been replaced since the structure construction date?

____Yes ____ No ____ Unknown If yes, what year? _____________________

What is the physical condition of the sealant?

____ Good (not cracked or deteriorating)

____ Fair (some cracking/deterioration)

____ Poor (very deteriorated, noticeably falling apart)

What color is the sealant?

White ____ Light grey ____ Dark grey _____ Black _____ Brown _____

Other, please specify ____

XRF tests on intact sealant

% Cl __________________ XRF ID# _____________ Photo#___________

% Cl __________________ XRF ID# _____________ Photo#___________

% Cl __________________ XRF ID# _____________ Photo#___________

Sealant volume estimate on the structure

Height of sealant strip ____

Number of stories on the structure (i.e., structure height) ________________________________

Approximate dimensions of structure (i.e. length, width) ________________________________

If applicable, number of doors and/or windows on the structure ___________________________

Was a physical sealant sample collected from this location on the structure?

Yes ____ No ____

Sealant sample ID# ____

XRF tests on sealant (post collection from structure)

% Cl ___________________ XRF ID# ______________ Photo#__________________________

% Cl ___________________ XRF ID# ______________ Photo#__________________________

% Cl ___________________ XRF ID# ______________ Photo#__________________________

<<Where sealant sample collections are possible, there will be a 'Sealant Information' form completed for each type of sealant on the structure, in addition to the 'Structure Information' form.>>

Results to:

CHAIN OF CUSTODY RECORD

Page of

San Francisco Estuary Institute
7770 Pardee Lane
Oakland, CA, 94621-1424
Phone: 510-746-7334 Fax: 510-746-7300

Bill to:

Shipped to:

Sampled by [Print Name(s)] / Affiliation

Sampler(s) Signature(s)

Preservatives (see codes)

Analyses Requested

Project Name:

Sample ID No.	Sampled Date	Sampled Time	Grab or Composite	Matrix (see codes)	Number/Size/Type of Containers										Remarks

← Total Number of Containers

Shipment Method

Out: / / Via:

Additional Comments:

Relinquished by / Affiliation	Date	Time	Accepted by / Affiliation	Date	Time

Cooler No.(s) / Temperature(s) (C)°

MATRIX CODES: F = Freshwater S = Saline SE = Sediment SW = Surface Water PW = Porewater B = Blanks T= Toxicity O = Other (specify)

PRESERVATIVE CODES: H = Hydrochloric acid + ice I = Ice only N = Nitric acid + ice S = Sulfuric acid + ice O = Other (specify)