US Army Corps of Engineers

U. S. Army Corps of Engineers Kansas City District

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CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

OPERABLE UNIT 1: VICINITY PROPERTY PHASE 2 SAMPLING

FINAL QUALITY ASSURANCE PROJECT PLAN

MARCH 2008 (Original)
SEPTEMBER 2011 (Revision 02 for Phase 2)

Prepared By:

The Louis Berger Group, Inc.

And

ARCADIS-US/Malcolm Pirnie, Inc.

298929

FINAL Quality Assurance Project Plan Cornell-Dubilier Electronics Superfund Site Operable Unit 1: Vicinity Property Sampling – Phase 2

Prepared by:

The Louis Berger Group, Inc. and ARCADIS-US/Malcolm Pirnie

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APPENDIX

Appendix A Cornell-Dubilier OU-1 Field Sampling Plan
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ACRONYMS

ARAR	Applicable, Relevant, and Appropriate Requirement
ASB	Analytical Services Branch
ASTM	ASTM International. ASTM is a non-profit standards organization formerly called the American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
CDE	Cornell-Dubilier Electronics
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHSM	Corporate Health and Safety Manager
CLP	Contract Laboratory Program
COC	Chain of Custody
CRQL	Contract Required Quantitation Limit
DESA	Division of Environmental Science and Assessment
D	Replicate
DOT	Department of Transportation
DPM	Deputy Project Manager
DQA	Data Quality Audit
DQCR	Daily Quality Control Report
DQI	Data Quality Indicator
DQO	Data Quality Objectives
ECD	Electronic Capture Detector
EDD	Electronic Data Deliverable
FORMS II Lite	Field Operations Records Management System II Lite
FSP	Field Sampling Plan
FTL	Field Team Leader
GC	Gas Chromatography
GC-ECD	Gas Chromatography-Electron Capture Detector
HASP	Health and Safety Plan
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NELAP	National Environmental Laboratory Accreditation Program
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
OSHA	Occupational Safety and Health Administration
OU	Operable Unit

OU-1	Operable Unit 1
PA	Performance Audit
PE	Performance Evaluation
PCB	Polychlorinated Biphenyl
PCIH	Project Certified Industrial Hygienist
PE	Performance Evaluation
PID	Photoionization Detector
PO	Project Officer
PM	Project Manager
ppb	parts per billion (equivalent to ug/kg)
ppm	parts per million (equivalent to mg/kg)
PQOs	Project Quality Objectives
PSO	Project Safety Officer
PT	Performance Testing
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
R	Recovery
RDCSCC	Residential Direct Contact Soil Cleanup Criterion
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
RSCC	Regional Sample Control Center
SA	Spike added to spiking matrix
SDG	Sample Delivery Group
SMO	Sample Management Officer
SOP	Standard Operating Procedure
SOW	Statement of Work
SR	Spike result
SSR	Spike sample result
TAT	Turnaround Time
TBC	To Be Considered
TCL	Target Compound List
TD	Technical Director
TSA	Technical Systems Audit

µg /kg	microgram per kilogram
µg/100cm^2	microgram per 100 square centimeters
UFP	Uniform Federal Policy
USACE-KCD	United States Army Corps of Engineers-Kansas City District
USEPA	United States Environmental Protection Agency

INTRODUCTION

This Quality Assurance Project Plan (QAPP) is intended to integrate the technical and quality control aspects of Phase 2 of soil and interior dust sampling and analysis planned for 2011 at Operable Unit 1 (OU-1) of the Cornell-Dubilier Electronics (CDE) Superfund Site. The information in this QAPP is supplemented by detailed information in the Field Sampling Plan (FSP). This QAPP details the planning processes for collecting data and describes the implementation of the quality assurance (QA) and quality control (QC) activities developed for this program. The purpose of this QAPP is to generate project data that are technically valid and legally defensible. The QAPP consists of four main components:

- Project Management;
- Measurement and Data Acquisition;
- Assessment and Oversight; and
- Data Validation and Usability.

The above components will incorporate QA/QC requirements cited within the following documents:

- US Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans, USEPA QA/R-5, March 2001.
- Guidance on Systematic Planning using the Data Quality Objectives Process (QA/G-4), February 2006.
- Uniform Federal Policy for Quality Assurance Project Plans, Final Version March 2005

Project Background

The former CDE facility is located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey. The former CDE facility, also known as the Hamilton Industrial Park, consists of approximately 26 acres. The northwest portion of the property is comprised of approximately 45 percent of the total land area and was the developed portion of the property, containing a system of catch basins to channel stormwater flow, paved roadways, and paved lots where the Site buildings (now demolished) previously stood before OU-2 remedial activities began.

CDE manufactured electronic components including, in particular, capacitors from 1936 to 1962. Polychlorinated biphenyls (PCBs) and chlorinated organic solvents were used in the

manufacturing process. It is believed that CDE disposed of PCB-contaminated materials and other hazardous substances directly on the facility soils. These activities evidently led to widespread chemical contamination at the former CDE facility, as well as migration of contaminants to areas nearby. Elevated levels of volatile organic chemicals (VOCs), PCBs, and other contaminants have been reported in soils at the former CDE facility, in soils at adjacent properties (residential, commercial, and municipal), in groundwater beneath the former CDE facility, and in the surface water and sediments of Bound Brook.

In 2000, the USEPA initiated the remedial investigation (RI) and collected soil samples from OU-1 properties. Analytical results from this investigation revealed additional properties with PCB contamination in soil, and indicated the need for more extensive sampling. The USEPA evaluated data obtained during sampling conducted in 1997 and 1998 in conjunction with the RI findings, and in June 2003 proposed a comprehensive remedy for OU-1. On September 30, 2003, the USEPA signed a Record of Decision (ROD) to address the contaminated soils at the OU-1 properties. The soils cleanup level established by the USEPA in the ROD is 1.0 ppm for total PCBs. The State of New Jersey concurred with the Selected Remedy in the ROD, but at that time had a lower Residential Direct Contact Soil Cleanup Criterion (RDCSCC) for PCBs of 0.49 ppm. Because, at the time, this was not a promulgated standard, it was not an Applicable, Relevant and Appropriate Requirement (ARAR), but rather a "To Be Considered" (TBC) criteria.

The major components of the Selected Remedy described in the ROD include:

- Excavation of an estimated 2,100 cubic yards of contaminated soil from approximately 16 properties, backfilling with clean fill, and property restoration as necessary.
- Transport of the contaminated soil off-site for disposal, with treatment as necessary.
- Interior dust remediation where PCB-contaminated dust is encountered.
- Where necessary, temporary relocation of residents during the interior remediation.

The USEPA has previously conducted Phase 1 soil and interior dust sampling at OU-1 properties. The soil and interior dust sampling and analysis program described in this QAPP is similar to the Phase 1 sampling program conducted by Malcolm Pirnie, Inc. in 2008 described in the *Final Quality Assurance Project Plan Cornell-Dubilier Electronics Superfund Site Operable Unit 1: Vicinity Property Pre-Remedial Design Samples*, March 2008. The results of the Phase 1

sampling program were summarized in the *Final Data Characterization Report for OU1 Soil and Interior Dust Sampling Operable Unit 01 Cornell-Dubilier Electronics Superfund Site*, January 2009.

The objectives for this Phase 2 study of the OU-1 vicinity properties are as follows:

- To characterize Total PCB concentrations (as PCB Aroclors) in the soils on selected vicinity properties.
- To characterize Total PCB concentrations (as PCB Aroclors) along selected right of way (ROW) areas.
- To characterize Total PCB contamination (as PCB Aroclors) in the interior dust collected within selected vicinity properties.
- To characterize Total PCB concentrations (as PCB Aroclors) in the interior dust collected within properties that were previously remediated (*i.e.*, confirmatory dust sampling)

QAPP Worksheet #1
(UFP-QAPP Section 2.1)
Title and Approval Page

Site Name/Project Name: Cornell-Dubilier Electronics Superfund Site Operable Unit 1
Site Location: South Plainfield, New Jersey

Document Title: Cornell-Dubilier Electronics Superfund Site QAPP (OU-1)

Lead Organization: USEPA Region 2

Preparer's Name and Organizational Affiliation: James McCann of ARCADIS-U.S-/Malcolm Pirnie, Inc., and Erika Zamek of the Louis Berger Group

Preparer's Address, Telephone Number, and E-mail Address:
James McCann, ARCADIS-U.S-/Malcolm Pirnie, 17-17 Route 206 North, Fair Lawn, NJ 07410, Phone 201-398-4310, e-mail: james.mccann@arcadis-us.com
Erika Zamek, Louis Berger Group, 565 Taxter Rd., Suite 510, Elmsford, NY 10523, Phone 914-798-3722, e-mail: ezamek@louisberger.com
Preparation Date (Day/Month/Year): 9/13/2011

Investigative Organization's Project Manager/Date: _____
Signature
Printed Name/Organization: Edward Dudek, P.E., The Louis Berger Group, Inc.

Investigative Organization's Project QA Officer/Date: James McCann
Signature
Printed Name/Organization: James McCann, ARCADIS-US-/Malcolm Pirnie, Inc

Lead Organization's Project Manager/Date: _____
Signature
Printed Name/Organization: Diego Garcia, USEPA Region 2 Project Manager

Approval Signatures/Date: _____ 03 Jan 2011
Signature
Printed Name/Title: Kenneth Maas, USACE-KCD Project Manager

Approval Authority: US Army Corps of Engineers, Kansas City (USACE-KCD)

Document Title	Approval Date
The Louis Berger Group, Inc. and Malcolm Pirnie, Inc., 2009. Final Quality Assurance Project Plan, Cornell-Dubilier Electronics Superfind Site, South Plainfield, NJ, Operable Unit 4: Bound Brook. (This document describes the requirements for characterizing the nature and extent of hazardous consituents in the sediments of and of Bound Brook, which flows adjacent to the former CDE Facility [OU 2]).	July 2010
Sevenson Environmentaal Services, Inc., Quality Assurance Project Plan - Revision 3, Cornell-Dubilier Electronics Superfund Site Operable Unit 2- Soil Remediation, South Planfield, New Jersey	April 2009
Malcolm Pirnie, Inc. 2009,Quality Assurance Project Plan, Cornell-Dubilier Electronics Superfund Site, South Plainfield, NJ, Operable Unit 2 Soil Remedation Split Sample Program	August 2009

6. Organizational Partners (stakeholders) and connection with Lead Organization:
   The primary project organizational partners include representatives from USEPA Region 2, USACE-KCD, New Jersey Department of Environmental Conservation (NJDEP), and The Louis Berger Group, Inc. (Louis Berger). USEPA Region 2 and USACE-KCD will provide project and contract management guidance to Louis Berger. Louis Berger will be the primary consultant and will be responsible for developing and implementing the investigation and will provide project management for other subcontractors. ARCADIS-US-Malcolm Pirnie, Inc. will work as a subconsultant to Louis Berger to assist in the preparation of the project documents and the sampling and analysis program activities.

7. Data users: USEPA Region 2, the NJDEP, and Louis Berger.

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:

QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Worksheet # or Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Scoping Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	9 plus meeting minutes Data Needs Table in Attachment 1.2 10 and Attachment 1.1 Introduction and 13 See Field Sampling Plan Figure 1 for maps.
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 –See Attachment 1.1 for Data Quality Objectives (DQOs) 12

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Worksheet # or Related Documents
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	14 15 16
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.3 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.4 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/Standard Operating Procedure (SOP) Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	17 See FSP Section 5 18 and FSP Section 5 19 20 See FSP Attachments 1-4 and 6. 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	23 24 25

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Worksheet # or Related Documents
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	26 Attachment 2 SOP No. 1 27 and Attachments 3 and USEPA Forms II Lite software User's Guide or Scribe User Manual
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	29 30
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	31 Attachment 5 SOP No. 6 32
4.2 QA Management Reports	- QA Management Reports Table	33
4.3 Final Project Report		

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Worksheet # or Related Documents
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	34 35 36 37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining		36

QAPP Worksheet #3
(UFP-QAPP Manual Section 2.3.1)

The following persons will receive a hardcopy of the approved QAPP, subsequent QAPP revisions, addenda, and amendments:

Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Diego Garcia	USEPA Project Manager	USEPA Region 2	212-637-4947	212-637-4393	Garcia.diego@epamail.epa.gov	MP-CDS-2011-01
Amy Darpinian	USACE Project Chemist	USACE-KCD	816-389-3897	816-389-3897	Amy.F.Darpinian@usace.army.mil	MP-CDS -2011-02
Chris Purkiss	Field Team Leader	The Louis Berger Group, Inc.	973-407-1685	973-267-6468	cpurkiss@louisberger.com	MP-CDS-2011-04

Electronic copies of the QAPP and related project documents will also be made available to the personnel named in the organization chart given in Worksheet 5, Figure 1 and other personnel who will be assigned to work on the project. Those named above will be responsible for distributing the QAPP and related documents to others in their organization.

QAPP Worksheet #4
(UFP-QAPP Manual Section 2.3.2)

Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described. Ask each organization to forward signed sheets to the central project file.

Project Personnel Sign-Off Sheet

Organization: USEPA Region 2

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Diego Garcia	Project Manager –USEPA Region 2	212-637-4947		

QAPP Worksheet #4
(UFP-QAPP Manual Section 2.3.2)

Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described. Ask each organization to forward signed sheets to the central project file.

Project Personnel Sign-Off Sheet

Organization: USACE-KCD

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Kenneth Maas	Project Manager – USACE-KCD	816-389-3709	K Maas	14 Nov 2011
Amy Darpinian	Project Chemist – USACE-KCD	816-389-3897	Amy Darpinian	14 Nov 2011

QAPP Worksheet #4
(UFP-QAPP Manual Section 2.3.2)

Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described. Ask each organization to forward signed sheets to the central project file.

Project Personnel Sign-Off Sheet

Organization: The Louis Berger Group, Inc. and ARCADIS-US/Malcolm Pirnie

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Edward Dudek, PE	Project Manager	914-798-3711		9/13/11
Erika Zamek	Deputy Project Manager	914-798-3722		9/13/11
James McCann	Project Quality Officer	201-398-4310		9/13/11
Chris Purkiss	Field Team Leader	973-407-1685		
TBD	Sample Management Officer			
TBD	Field Team Members		Project field team members, when assigned, will be required to sign that they have read applicable sections of the QAPP.	Field team members must read applicable sections of the QAPP and SOPs prior to participating in the project.

QAPP Worksheet #5

(UFP-QAPP Manual Section 2.4.1)

Project Organizational Chart

The Organization Chart, provided as Figure 1, the description of project organization and the roles of the team members are summarized below:

Project/Task Organization Overview

The project management team will consist of representatives from USEPA Region 2, USACE-KCD, and Louis Berger. USEPA Region 2 and USACE-KCD will provide technical direction to the project and contract management guidance to Louis Berger. NJDEP will provide USEPA with State approval during the planning and investigation. Louis Berger will be the primary contractor, will be responsible for developing and implementing the investigation, and will provide project management for the other subcontractors. ARCADIS-US/Malcolm Pirnie will assist with the preparation of the project documents and the performance of sampling activities as a subconsultant to Louis Berger.

Cornell-Dubilier Team Members

This section contains a description of the project organizational structure. Diego Garcia is the USEPA Project Manager with responsibility for the CDE Superfund Site. Kenneth Maas is the USACE-KCD Project Manager. Louis Berger will be the primary contractor, and will be responsible for developing and implementing the investigation, and conduct project management for other subcontractors. Additional project team members will include personnel from ARCADIS-US/Malcolm Pirnie who are subcontracted to Louis Berger.

Quality Consultants – The Quality Consultants are responsible for providing guidance on technical matters and reviews of all major technical documents relating to the project, but are not involved with the development of the work products.

Project Manager – The Project Manager (PM) will be the primary point of contact with the USACE. The PM may delegate authority

to expedite and facilitate the implementation of the project plan. The PM is responsible for:

- Coordination with the USACE.
- Budget control.
- Subcontractor performance.
- Project coordination to implement Work Plans.
- Allocation of staffing and resources to implement the QA/QC program and the Site Safety and Health Plan (SSHP).
- Review of engineering and interim reports.

Deputy Project Manager – The Deputy Project Manager (DPM) reports directly to, and works with, the Project Manager. The DPM is responsible for assisting the Project Manager, as needed, with project related issues. Two DPMs are currently assisting the PM in the management of the OU1: one DPM from Louis Berger, and one from ARCADIS-Malcolm Pirnie. The Louis Berger and ARCADIS-Malcolm Pirnie DPMs work together to assist the PM through coordination of resources from both Louis Berger and ARCADIS-Malcolm Pirnie to achieve the assigned tasks.

Project Quality Consultant – The Project Quality Consultant is responsible for independent review of project quality. The Project Quality Consultant makes an integral contribution to the project success by performing technical reviews throughout all project phases and offering technical guidance.

Corporate Health and Safety Manager –The Louis Berger CHSM serves as the administrator of Louis Berger's Corporate Health and Safety program. They are responsible for:

- Proper training for field personnel and confirming that ARCADIS-Malcolm Pirnie personnel have received the proper training.
- Medical clearance of field personnel and confirming that ARCADIS-Malcolm Pirnie personnel have received the

necessary medical clearance.

- Field personnel having adequate experience with personal protective equipment and confirming that ARCADIS-Malcolm Pirnie personnel have adequate experience with personal protective equipment.
- Providing guidance on data interpretation.
- Determining levels of worker protection.

Project Certified Industrial Hygienist – The Louis Berger Project Certified Industrial Hygienist (PCIH) is responsible for development, implementation and review of the Site Safety and Health Plan. The Louis Berger PCIH functions as a liaison with the USACE, the Occupational Safety and Health Administration (OSHA), and other agencies on health and safety issues.

Project Quality Control Officer – The Project QC Officer is responsible for project specific supervision and monitoring of the QA program and reports to the Project Manager. Additional responsibilities include:

- Ensuring that field personnel are familiar with and adhere to proper sampling procedures, field measurement techniques, sample identification, and chain-of-custody procedures.
- Coordinating with the analytical laboratory for the receipt of samples, the reporting of analytical results, and recommending corrective actions to correct deficiencies in the analytical protocol or sampling.
- Preparing QA reports to management.

Project Safety Officer – The Project Safety Officer (PSO) is knowledgeable in safety and worker protection techniques as they relate to the project. Responsibilities include monitoring daily compliance of site work to the SSHP, having the ability and authority to make needed changes or additions to the SSHP and providing technical assistance to the Project Manager on problems relating to work site safety.

The PSO is responsible for the development and set-up of emergency procedures and personnel decontamination procedures. The PSO or designee will complete a daily diary of activities with health and safety relevance. If unsafe work conditions are encountered, the PSO is authorized to stop work. Resolution of all on-Site health and safety problems will be coordinated through the Project Manager with assistance from the PCIH.

Field Team Leader – The Field Team Leader will serve as the on-Site contact person for the field investigations and activities. The Field Team Leader will be responsible for the logistics of the field activities. The Field Team Leader will:

- Supervise environmental sample collection in accordance with approved planning documents.
- Inspect and replace equipment.
- Prepare interim field reports.
- Prepare samples for shipment.
- Coordinate field activities.
- Schedule sampling and other field activities.

Field Personnel – All field personnel are required to become thoroughly familiar with the FSP, QAPP, and the SSHP, and to follow the guidelines outlined in them. Field personnel will implement the plans and contribute any appropriate suggestions and assist in discovering or correcting non-conforming working procedures.

Data Validator (to be assigned if necessary) – For this project we anticipate that the majority of the data validation will be performed by the USEPA, since the analytical data will generated by the USEPA's Division of Environmental Assessment (DESA) laboratory or USEPA Contract Laboratory Program laboratories. Qualified data validation specialists will also be available from Louis Berger and will be assigned as required to validate any non-CLP data from a subcontract laboratory.

Subcontractor Team Members

Subcontractors may be utilized for performance of specific work activities associated with the CDE Superfund Site field investigations. The following is a list of possible services to be subcontracted for the Site:

Laboratory (to be determined) - It is anticipated that the DESA laboratory or a CLP laboratory will perform the required chemical analyses on the soils; however, a subcontract laboratory may be required as an alternate laboratory to perform analysis for PCBs in the dust samples. A back-up subcontract laboratory has not been chosen for the soil analyses at this time; however, NEA has been selected as a backup subcontract laboratory for the dust sample analyses. Standard Operating Procedures (SOPs) for NEA are included in this QAPP, accordingly.

QAPP Worksheet #6

(UFP-QAPP Manual Section 2.4.2)

Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Approval of Amendments to the QAPP	ARCADIS-US/Malcolm Pirnie	Project Quality Officer (Jim McCann or designee)	201-398-4310	Obtain initial approval from the Investigative Organization PM and submit documented amendments within 10 working days to USACE-KCD/USEPA for approval.
Document and Records Control	The Louis Berger Group, Inc.	Deputy Project Manager (Erika Zamek or designee)	914-798-3722	Project Document Preparation and distribution. Document and records control posting procedure implemented within 5 working days of receipt by Louis Berger.
Stop Work and Initiation of Corrective action	The Louis Berger Group, Inc.	Project Manager or Deputy Project Manager (Ed Dudek, or Erika Zamek, or designees)	E. Dudek: 914-798-3711 E. Zamek: 914-798-3722	The PM communicates within 24 hours of stop work to the project organization by phone, with confirming e-mail.
Real time modification, notifications and approval	ARCADIS-US/Malcolm Pirnie	Project Quality Officer (Jim McCann or designee) with PM/DPM approval.	201-398-4310	Real time modification to the project will require the approval of the Project Quality Officer and PM or DPM (or designees) and will be documented using the Field Modifications Form in Attachment 4 within 5 working days.
Reporting of serious issues	The Louis Berger Group, Inc.	Project Manager or Deputy Project Manager (Ed Dudek, E. Zamek, or designees)	E. Dudek: 914-798-3711 E. Zamek: 914-798-3722	Report any serious issues to the USEPA and USACE-KCD and other concerned parties by e-mail or memo.
Meeting Minutes	The Louis Berger Group, Inc.	Deputy Project Manager (Erika Zamek or designee)	914-798-3722	Post approved meeting minutes or distribute by e-mail within 5 working days of meeting.
Corrective action, audit finding	ARCADIS-US/Malcolm Pirnie	Project Quality Officer (James McCann or designee)	201-398-4310	Problems or negative audit findings are reported to the PM or DPM by e-mail within 3 days.

QAPP Worksheet #7
(UFP-QAPP Manual Section 2.4.3)

Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Diego Garcia	USEPA Project Manager	USEPA Region 2	Remedial Project Manager	N/A
Kenneth Maas	USACE-KCD Project Manager	USACE KCD	Project Manager	Professional Engineer
Carlton Bergman	NJDEP Project Manager	NJ DEP Division of Remedial Management and Response	Project Manager	N/A
Edward Dudek, PE	Senior Program Manager	The Louis Berger Group, Inc.	Investigative Organization Project Manager	Professional Engineer (NY), ME Civil Engineering, BE Civil Engineering
Erika Zamek	Senior Geologist	The Louis Berger Group, Inc.	Deputy Project Manager	BS Biology, MS Geology
Ben Girard		ARCADIS-Malcolm Pirnie	Deputy Project Manager	
James McCann	Project Chemist	ARCADIS-US/Malcolm Pirnie	Project Quality Officer	MA/BS in Chemistry, 40+ years of experience in analytical chemistry, environmental testing, and quality assurance

Note: Resumes of project team members can be obtained by contacting the Louis Berger PM or designee.

QAPP Worksheet #8
(UFP-QAPP Manual Section 2.4.4)

Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Field Team and on-Site personnel	Safety and OSHA HAZWOPER training and medical monitoring as specified in the SSHP	The Louis Berger Group, Inc.	Training dates kept in company/project training records	All field team members working on Site.	All Louis Berger and subcontractor personnel working on Site	Project Files
Sample Management and Creation of sample chain of custody (COC) records	Forms II Lite Software Training or alternately training in Scribe software http://www.ertsupport.org/downloads.htm)	USEPA on-line training	Training dates kept in company/project training records	Sample Management Officer or designee assigned to log samples into Forms II Lite or Scribe	Staff preparing COC forms.	Project Files
Dust Sample Collection	Training in the use of the vacuum equipment for collection of dust samples per SOP 4 in FSP Attachment 2	Louis-Berger Group and ARCADIS-US/Malcolm Pirnie	Training dates kept in the project records	Field personnel responsible for collecting dust samples	Louis-Berger Group and ARCADIS-US/Malcolm Pirnie personnel	Project Files

Note: Training Records will be kept in the project files.

QAPP Worksheet #9
(UFP-QAPP Manual Section 2.5.1)

Project team meetings and conference calls among internal staff and also with the USACE and USEPA project managers were held to plan Phase 2 sampling. Project planning was initiated in February 2011 and continued through July 2011.

These sessions included weekly conference calls internal to the investigative team to review/plan the project and discuss any open issues. In addition, biweekly conference calls have been held with USACE, USEPA and The Louis Berger Group/ARCADIS-US/Malcolm Pirnie team representatives to discuss the project objective and status. Visits to the CDE Superfund OU-1 Site were, and continue to be, made by team members as necessary to evaluate conditions and gather information needed to develop project plans and identify sampling locations.

Biweekly Project Team Conference Call Participants:

Project Scoping Session Participants Sheet

Project Name: Cornell-Dubilier Superfund Site OU-1 **Projected Date(s) of Sampling: Spring/Summer 2011** **Project Manager:** Edward Dudek, PE	**Site Name:** Cornell-Dubilier Electronics Superfund Site Operable Unit 1 **Site Location:** 333 Hamilton Boulevard, South Plainfield, New Jersey

Date of Sessions: February through April 2011
Scoping Session Purpose: Review the status of project plans.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Kenneth Maas	Project Manager	USACE-KCD	816-389-3709	Kenneth.E.Maas@usace.army.mil	USACE-KCD Project Manager
Diego Garcia	USEPA Project Manager	USEPA Region 2	212-637-4947	Garcia.diego@epamail.epa.gov	USEPA Project Manager
Edward Dudek, PE	Senior Program Manager	The Louis Berger Group, Inc.	914-798-3711	edudek@louisberger.com	Project Manager
Erika Zamek	Senior Geologist	The Louis Berger Group, Inc.	914-798-3722	ezamek@louisberger.com	Deputy Project Manager
Ben Girard		ARCADIS-Malcolm Pirnie	716-667-6645	Ben.Girard@arcadis-us.com	Deputy Project Manager

Other team members from the investigative team and representatives of the USACE and USEPA participated as necessary in the bi-weekly planning calls.

Comments, decisions, and action items produced by biweekly sessions were, and continue to be, documented in meeting minutes. Meeting minutes are developed and stored in the project files by Louis Berger. The Louis Berger PM distributes meeting minutes to team members via e-mail.

Weekly Internal Conference Call Team Participants: Project Scoping Session Participants Sheet

Project Name: Cornell-Dubilier Superfund Site OU-1 **Projected Date(s) of Sampling:** Spring/Summer 2011 **Project Manager:** Edward Dudek, PE	**Site Name:** Cornell-Dubilier Electronics Superfund Site Operable Unit 1 **Site Location:** 333 Hamilton Boulevard, South Plainfield, New Jersey

Date of Session: Weekly sessions starting February 2011..
Scoping Session Purpose: Project planning, discussion and resolution of issues, assignment of tasks, and definition of the path forward.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Edward Dudek, PE	Senior Program Manager	The Louis Berger Group,	914-798-3711	edudek@louisberger.com	Project Manager
Erika Zamek	Senior Geologist	The Louis Berger Group	914-798-3722	ezamek@louisberger.com	Deputy Project Manager
James McCann	Project Chemist	ARCADIS-US/Malcolm Pirnie	201-398-4310	james.mccann@arcadis-us.com	Project Quality Assurance Officer

Other members of the investigative team participated as necessary in the weekly project planning/status calls.

Comments/Decisions: The data needs for the project were developed based on information provided during communications with the USEPA and USACE-KCD.

Consensus Decisions: The team recommended that consideration be given to using a subcontract lab for the PCB dust analyses due to the low detection limits, anticipated limited sample volume and the non-routine nature of the sample preparation steps.

Action Items: It was decided that a Request for Proposal would be prepared for a subcontract lab for the dust analyses. Erika Zamek was assigned to prepare the Draft FSP, QCP, and SSHP, while Jim McCann was assigned to prepare the draft QAPP. The results of that procurement are included in this QAPP as alternate SOPs.

QAPP Worksheet #10
(UFP-QAPP Manual Section 2.5.2)

Problem Definition

The former CDE facility, located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey, operated from 1936 to 1962 manufacturing electronic components including, in particular, capacitors. PCBs and chlorinated organic solvents were used in the manufacturing process. These activities led to widespread chemical contamination at the facility, as well as migration of contaminants to nearby areas. PCBs have been detected in groundwater, soils and in recently demolished building interiors at the industrial park; at adjacent residential, commercial, and municipal properties; and in surface water and sediments of Bound Brook. The USEPA divided the Site into separate operable units for remediation design. The focus of this QAPP is OU-1, which consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility with soils and/or interior dust potentially contaminated with PCBs. In 2000, the USEPA initiated the RI and collected soil samples from OU-1 properties. Analytical results from this investigation revealed additional properties with PCB contamination in soil at unacceptable levels, and indicated the need for more extensive sampling. The USEPA evaluated data obtained during sampling conducted in 1997 and 1998 in conjunction with the RI findings, and in June 2003 proposed a comprehensive remedy for OU-1. On September 30, 2003, the USEPA signed a ROD to address the contaminated soils and interior dust at the OU-1 properties. The soils cleanup level established by the USEPA in the ROD is 1.0 ppm for total PCBs. The State of New Jersey concurred with the Selected Remedy in the ROD, but had a lower RDSCC criterion for PCBs of 0.49 ppm. Based on the data collected at that time, the USEPA believed that by meeting the 1.0 ppm goal for this action, the Selected Remedy may also achieve the State's RDSCC. Per the ROD, if the selected remedy did not achieve the RDSCC at some properties, the State could elect to pursue additional soil removal or may require that additional restrictions be placed on properties to prevent future direct contact with soils.

Note: For further discussion see the DQOs, which are given in Attachment 1.1. A site map is available in the Field Sampling Plan (FSP) as Figure 1.

QAPP Worksheet #11
(UFP-QAPP Manual Section 2.6.1)

Project Quality Objectives /Systematic Planning Process Statements

Who will use the data?
USEPA Region 2, the USACE, the NJDEP, and Louis Berger's remediation design team.

What will the data be used for?

- To compare the Total PCB concentration (as PCB Aroclors) in the soils on properties located in the vicinity of the former CDE facility to the USEPA remediation goal of 1.0 ppm.
- To compare the Total PCB concentration (as PCB Aroclors) in the interior dust collected within dwellings located on properties in the vicinity of the CDE facility to the USEPA remediation goal of 1.0 ppm.
- To compare the Total PCB concentration (as PCB Aroclors) in ROW soils collected in the vicinity of the former CDE facility to the USEPA remediation goal of 1.0 ppm.
- To compare the Total PCB concentration (as PCB Aroclors) in dust samples collected at previously-cleaned dwellings located on properties in the vicinity of the CDE facility (*i.e.,* confirmatory dust samples) to the USEPA remediation goal of 1.0 ppm.
- The data collected during this investigation may be used to estimate quantities of soil to be remediated during future design phases.

What types of data are needed?

Analytical data needs include analyses for PCBs as Aroclors in surface soils, sub-surface soils and interior dust samples. (See Attachment 1.2).

How "good" do the data need to be in order to support the environmental decision?

The data must be technically defensible and of sufficient quality to support the project DQOs, which are described in Attachment 1.1. See Worksheet 15, Reference and Evaluation Table, which summarizes the analytical parameters and the associated project action levels and project quantitation limits.

How much data are needed?

Samples will include soils and interior settled dust collected for PCB analyses. The number of samples to be collected at each sampling location is described in the FSP Section 5 given in Appendix A and on the maps in Appendix B.

Where, when, and how should the data be collected/generated? Phase 2 soil and interior dust samples will be collected in the Spring of 2011 per the FSP and project schedule. The samples collected will be submitted to the USEPA Region 2 DESA laboratory, USEPA CLP laboratories, and/or subcontract laboratories for analyses.
Who will collect and generate the data? Louis Berger field personnel will collect the soil samples, and ARCADIS-US/Malcolm Pirnie employees will collect the residential dust samples. The samples will be analyzed for chemical parameters by USEPA Region 2 DESA laboratory, USEPA CLP laboratories, and/or subcontract laboratories.
How will the data be reported? The data will be reported by the USEPA-assigned lab or the subcontract laboratory to Louis Berger, according to the requirements in Worksheet 29. The electronic data deliverable will be in the USEPA Region 2 format. http://www.epa.gov/Region2/superfund/medd.htm
How will the data be archived? Electronic data will be archived in the project database to be maintained by Louis Berger. Hard copies of laboratory reports will also be kept in the Louis Berger project files. Data will be transferred to the USACE upon completion of the project. Retrieval of data by others will be at the discretion of the USACE and the USEPA. The length of time that records will be archived will be at the discretion of the USACE and USEPA.

QAPP Worksheet #12-1
(UFP-QAPP Manual Section 2.6.2)
Analytical Parameters:

Measurement Performance Criteria Table

Matrix	Soil[1]
Analytical Group	PCB Aroclors
Concentration Level	Low

Sampling Procedure	**Analytical Method/SOP**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria** [2]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
See SOPs attached to the Field Sampling Plan and referenced in Worksheet 23	USEPA-CLP SOW SOM01.2	Sensitivity and Accuracy	Less than CRQLs	Equipment and or Field Blanks[3]	S & A
		Precision	RPD > 35% for duplicate values greater than or equal to 5 times the CRQL	Field Duplicates [3]	S & A
		Accuracy	Per SOM01.2, Difference ±15% or less	Calibration Verification	A
		Accuracy	Per SOM01.2, Recovery 50-150%	Surrogates	A
		Sensitivity	Less than CRQLs	Method and instrument Blanks	A
		Accuracy	Aroclor 1016 Recovery 50-150% Aroclor 1260 Recovery 50-150%	Laboratory Control Samples	A
		Accuracy /Precision	Recovery for Aroclor 1016 29-135%, RPD 0-15%; Recovery for Aroclor 1260 29-136%,RPD 0-20% per SOM01.2	Matrix Spike (MS)/Matrix Spike Duplicates (MSD)[3]	A
		Accuracy	Per SOM01.2 within Retention window on both columns and based upon Calibration Factors	Confirmation	A
		Sensitivity	Low enough to support the QLs	Method Detection Limits (MDLs)	A
		Completeness	>90% soil collection, >90% laboratory analysis	Data completeness check	S & A

1 If necessary also applicable to dust samples, if they are analyzed by an assigned USEPA CLP laboratory.
2 The assigned laboratory must perform and meet the measurement performance criteria that assess the analytical Data Quality Indicators (DQIs) specified in USEPA CLP SOW SOM01.2.
3 Field duplicates and MS/MSD samples will not be performed on interior dust samples, since there will not be sufficient sample mass available.

QAPP Worksheet #12-2
(UFP-QAPP Manual Section 2.6.2)
Analytical Parameters:

Measurement Performance Criteria Table

Matrix	Dust[1]
Analytical Group	PCB Aroclors
Concentration Level	Low

Sampling Procedure	**Analytical Method/SOP**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria** [2]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
See SOPs attached to the Field Sampling Plan and referenced in Worksheet 23	SW-846-8082/SOP NEA148_06 or assigned lab SOP	Sensitivity	Less than QLs	Equipment and or Field Blank[3]	S & A
		Precision	RPD less than or equal to 30%	Duplicates [4]	S & A
		Accuracy	+/- 15% of true value	Continuous Calibration Check	A
		Accuracy	60-140% recovery or per lab SOP	Surrogates	A
		Accuracy	60-140% recovery, RPD <30% or per lab SOP	Laboratory Control Samples	A
		Accuracy	Sample results on two columns < 25%	Confirmation on second column	A
		Sensitivity	Less than the RL for any PCB Aroclor	Method Blanks	A
		Completeness	> 90% dust collection, >90% laboratory analysis	Data Completeness Check	S & A

1 May also be applicable to soil samples, if analysis by a subcontract lab is assigned instead of a CLP lab or the DESA lab.
2 The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical data.
3 For dust sampling aqueous equipment blanks will not be collected. Instead the filters used to collect the samples will be proofed and a PCB free solid supplied may be vacuumed as a field blank to simulate dust.
4 Field duplicates and MS/MSD samples are not required for interior dust samples, since there will not be sufficient sample mass available. Lab duplicates may be analyzed as a measure of precision, if sufficient sample is available.
5 The assigned laboratory must meet the measurement performance criteria that assess the DQIs in USEPA SW846 method 8082.

Precision, Accuracy (or Bias), Representativeness, Completeness, and Comparability

To measure and control the quality of analyses, certain QA parameters are defined and utilized in data analysis activities. These parameters are defined below. The QA/QC required for the parameters to be analyzed under the USEPA CLP is contained in the USEPA CLP SOW. If non-CLP labs perform these analyses, they would also be required to meet these QA/QC criteria. Detailed information on CLP methods and QA/QC criteria can be found in the USEPA CLP SOW, on the USEPA CLP website at http://www.epa.gov/superfund/programs/clp/.

Precision

Precision measures the reproducibility of data or measurements under specific conditions. Precision is a quantitative measure of the variability of a group of data compared to their average value. Duplicate precision is stated in terms of relative percent difference (RPD) or absolute difference between two measurements. Measurement of precision is dependent upon sampling technique and analytical method. Field duplicate and laboratory duplicate samples will be used to measure precision for project soil samples. Both sampling and analysis will be as consistent as possible. For a pair of measurements, RPD (or absolute difference) will be calculated to assess precision, as presented below:

$$RPD(\%) = \frac{|D_1 - D_2|}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

where: D_1 and D_2 = the two replicate values.

RPD will meet USEPA CLP SOW requirements, where applicable, or the QA requirements listed in the applicable laboratory standard operating procedures.

Accuracy/Bias

Accuracy measures the bias in a measurement system. Sources of error include the sampling process, field contamination, preservation, handling, shipping, sample matrix, sample preparation, and analysis technique. Analytical accuracy will be assessed through surrogate spike, matrix spike, laboratory control and/or quality check samples, where applicable. In general, accuracy is measured in terms of percent recovery (%R):

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

where: SSR = spike sample result
SR = sample result
SA = spike added to spiking matrix

Refer to the CLP SOW for the laboratory analytical method accuracy requirements.

Representativeness

Representativeness expresses the degree to which data accurately and precisely reflect a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design and implementation of the sampling program and proper laboratory protocol. The sampling design created for this project was designed to provide data representative of Site conditions. During the development of the sampling design, consideration was given to the past history of contamination in the study area, existing analytical data, physical setting, and processes. Representativeness will be satisfied by determining that the FSP is followed; proper sampling techniques, preservation, and handling are used; proper analytical procedures are followed; and holding times for the samples are not exceeded in the laboratory.

Completeness

Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories used for this project will provide data that meet the QC acceptance criteria for 90 percent, or more, of all samples analyzed. Following the completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{COMPLETENESS (\%)} = \frac{\text{number of usable data}}{\text{number of samples collected for each parameter analyzed}} \times 100$$

The data validation process will be used to determine the quality and quantity of usable analytical data generated.

The completeness acceptance criterion for samples collected in the field will be 90 percent of the quantity of samples planned for collection as described in the FSP. Corrective action may be implemented to re-collect samples where necessary and possible (*e.g.*, modifying a planned sample location, sample jars broken during shipment). Laboratory notification sample receipt and conditions will be used to determine, as soon as possible, whether any problems during sample shipment would necessitate recollection of samples.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are expected to provide comparable data to existing datasets for the CDE Site. The procedures proposed for both soil and settled dust sample collection are similar to those previously conducted by the USEPA. The procedures used will be USEPA-promulgated methodologies or ASTM Standard Test Methods, which are well recognized and commonly used for environmental and geotechnical investigations.

Desired Method Sensitivity

Depending upon the use of the data (see Attachment 1.2 for data needs and data use) and the type of test parameter, specific Quantitation Limits (QLs) will be required. Worksheet 15 lists the required QLs or USEPA CLP contract required QLs (CRQLs), as specified for the definitive chemical parameters required for this project. These are well below the project action levels, which are also listed or referenced. For PCBs, which are the contaminants being measured at the Site, the USEPA remediation goal is for the Site is 1 mg/kg as outlined in the ROD. The method selected for the determination of PCBs in the soils is based upon USEPA CLP SOW SOM01.2, with CRQLs well below the USEPA action levels. Since dust sample size will be limited and will require special handling, the dust samples may be analyzed for PCBs by a subcontract laboratory employing method SW-846-8082. Use of a subcontract laboratory will only be performed at the USACE's discretion.

QAPP Worksheet #13
(UFP-QAPP Manual Section 2.7)

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Sampling Trip Report	Residential Soil Sampling Trip Report Cornell-Dubilier Electronics, South Plainfield, NJ, November 4, 1997	Roy F. Weston, Inc. Federal Programs Division Site 201 1090 King Georges Post Road Edison, New Jersey 08837-3703 Residential soil sampling.	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.
Historical Data	Final Report Vacuum Dust Sampling Cornell Dubilier Electronics, South Plainfield, NJ, February 1998	Roy F. Weston, Inc. PCB data on interior dust samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Data	Final Report Vacuum Dust Sampling Cornell-Dubilier Electronics, South Plainfield, NJ, July 1998	Roy F. Weston, Inc. PCB data on vacuum interior dust samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.
Historical Data	Final Report Vacuum, Wipe, and Soil Sampling Cornell-Dubilier Electronics, South Plainfield, NJ, December 1998	Roy F. Weston, Inc. PCB data on vacuum interior dust, wipe and soil samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Data	Tier I Residential Sampling and Analysis Summary Report – Cornell-Dubilier Electronics, June 25, 1998	Roy F. Weston, Inc. PCB data on soil samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.
Historical Data	Tier II Residential Sampling and Analysis Summary Report – Cornell Dubilier Electronics, July 2, 1998	Roy F. Weston, Inc. PCB data on soil samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Data	Tier III Residential/Neighborhood Sampling and Analysis Summary Report – Cornell-Dubilier Electronics, July 10, 1998	Roy F. Weston, Inc. PCB data on soil samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.
Historical Data	Tier I Residential Sampling and Analysis Summary Report – Cornell-Dubilier Electronics, February 16, 1999	Roy F. Weston, Inc. PCB data on soil samples	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Historical Data	Final Investigation Report For Operable Unit 1 (OU-1) Off-Site Soils For Cornell-Dubilier Electronics Superfund Site, South Plainfield, Middlesex County, New Jersey, August 2001	Foster Wheeler Environmental Corporation soils PCB data on OU-1 properties.	To determine the extent of PCB contamination on the properties and to evaluate remediation actions for the Site.	The historical data are considered to be valid and have been accepted by the USEPA.
Record of Decision (ROD)	USEPA, Region II, Record of Decision, Cornell-Dubilier Electronics Superfund Site, Middlesex County, New Jersey. September 2003.	USEPA Region 2	Background information used in planning the current project.	The historical data are considered to be valid and have been accepted by the USEPA.
Historical Data	Draft Removal Action Report, Cornell-Dubilier Electronic Superfund Site, June 2007	Cape Environmental, Exton, PA Chemistry data on soil removed from OU-1 properties.	Background information used in planning the current project.	The historical data are considered to be valid and have been accepted by the USEPA.

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Data for Phase 1 sampling conducted by Malcolm Pirnie, Inc.	Final Data Characterization Report for OU1 Soil and Interior Dust Sampling, January 2009	Malcolm Pirnie Inc. PCB data on soil samples and interior dust samples	To determine if PCB contamination was present at concentrations above the ROD criteria in the soil and dust samples at the Phase 1 properties	The historical data are considered to be valid and have been accepted by the USEPA.

1. Existing data is discussed in more detail in the FSP Section 1.4.

2. Existing studies, particularly for dust collection, were carefully considered during development of the current dust sampling methods.

QAPP Worksheet #14
(UFP-QAPP Manual Section 2.8.1)

Summary of Project Tasks

Sampling Tasks:

- To compare detected Total PCB concentrations (as PCB Aroclors) in soil samples on properties located in the vicinity of the former CDE facility to the USEPA remediation goal for the OU-1 soils of 1.0 ppm. The soil sampling methods are discussed in FSP Attachment 1: SOP No. 2. A total of 15 samples (10 from the 0 to 6-inch horizon and five from the 24 to 30-inch horizon) will be collected from each property.
- To compare detected Total PCB concentrations (as PCB Aroclors) in soil samples collected from ROW areas located in the vicinity of the former CDE facility to the USEPA remediation goal for OU-1 soils of 1.0 ppm. The soil sampling methods are discussed in FSP Attachment 1: SOP No. 2. ROW samples will be collected along road-spanning transects placed 50 feet apart. Up to four samples will be collected from each transect, depending on the width of the area containing material that can be sampled. Soil will be obtained from the 0-6 inch horizon.
- To compare detected Total PCB concentrations (as PCB Aroclors) in samples of the interior dust collected within dwellings on properties located in the vicinity of the former CDE facility to the USEPA remediation goal for the OU-1 of 1.0 ppm. The interior settled dust sampling methods are discussed in FSP Attachment 2 – SOP No. 3. A total of two samples (one from highly-trafficked areas and one from the bedroom spaces) will be collected at each property.

The data needs associated with these tasks are summarized in Attachment 1.2.

Analysis Tasks: The analytical tasks are as follows:

Laboratory analyses will be performed on soil and dust samples for PCB Aroclors. The testing methodologies are described in Worksheets 19 and 23.

Quality Control Tasks: The analytical and testing laboratories will be required to analyze QC samples listed in the USEPA CLP SOW SOM01.2 and the other documents and procedures given in Worksheet 28.

Secondary Data: Historical data available in the USEPA ROD and prior studies will be used for remediation design. See Worksheet 13.

Data Management Tasks: Data, field notes, and analytical information will be placed in an electronic database which will be maintained in the Louis Berger office in Elmsford, NY. If at the time of sampling the assigned CLP or DESA lab are prepared to provide data in the Region 2 Electronic Data Deliverable (EDD) format, they will be required to do so. All electronic data will be backed up. Hardcopies of data will also be stored in project files. See Worksheet 29 for discussion of data management..
Documentation and Records: Hardcopy data (field notebooks, photos, hardcopies of Chain of Custody forms, Airbills, etc.) will be taken to the Louis Berger office in Elmsford, NY and stored in the project files.
Assessment/Audit Tasks: SOPs will be reviewed prior to the performance of tasks. Technical System Audits will be performed per SOP No. 3 in Attachment 5 (see Worksheet 31.)
Data Review Tasks: Verification of sampling and laboratory data will be conducted. Laboratory data produced by USEPA CLP labs will be validated by the USEPA. Any non-CLP chemical data that is generated will be validated by subcontract data validators against the criteria in the applicable analytical SOPs (see Worksheets 23, 28, 35 and 36) .

QAPP Worksheet #15
(UFP-QAPP Manual Section 2.8.1)

Reference Limits and Evaluation Table

Matrix: Solid[7]

Analytical Group: PCBs by CLP SOW SOM01.2

Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ug/kg)	Project Quantitation Limit (ug/kg)[2]	Analytical Method		Achievable Laboratory Limits (Based upon USEPA CLP CRQLs	
				MDLs	QLs	MDLs	CRQLs(ug/kg)[6,7]
Aroclor 1016	12674-11-2	Note 1	33	Note 3	33	Note 5	33
Aroclor 1221	11104-28-2	Note 1	33	Note 3	33	Note 5	33
Aroclor 1232	11141-16-5	Note 1	33	Note 3	33	Note 5	33
Aroclor 1242	53469-21-9	Note 1	33	Note 3	33	Note 5	33
Aroclor 1248	12672-29-6	Note 1	33	Note 3	33	Note 5	33
Aroclor 1254	11097-69-1	Note 1	33	Note 3	33	Note 5	33
Aroclor 1260	11096-82-5	Note 1	33	Note 3	33	Note 5	33
Aroclor 1262	37324-23-5	Note 1	33	Note 3	33	Note 5	33
Aroclor 1268	11100-14-4	Note 1	33	Note 3	33	Note 5	33
Total PCB (Sum of all Aroclors)		1,000 (USEPA ROD criteria)[1]					

1. The USEPA soil cleanup criterion for total PCBs given in the ROD is 1.0 ppm (or 1,000 ug/kg). The USEPA CLP CRQLs are also sufficiently sensitive to compare the data to the lower ROD-specified New Jersey RDCSCC of 0.49 ppm.
2. The project quantitation limits for soils are based upon USEPA CLP CRQLs for soil given in CLP SOW SOM01.2.
3. The MDLs should meet the criteria given in USEPA CLP SOW SOM01.2.
4. The method QLs must be equivalent to or lower than the CRQLs given in USEPA CLP SOW SOM01.2.
5. The assigned laboratory must have determined MDLs annually, meeting the requirements in USEPA CLP SOW SOM01.2.
6. The achievable Laboratory Limits as listed are based upon CLP CRQLs for soil samples. The actual achievable QLs based upon the assigned laboratory MDL studies should be equivalent or lower. To achieve the detection limits, at least 10 grams of sample should be collected.
7. Soils samples will include soils and possibly interior dust, if a CLP lab is assigned to analyze the samples.

QAPP Worksheet #15 (continued)
(UFP-QAPP Manual Section 2.8.1)

Reference Limits and Evaluation Table

Matrix: Dust

Analytical Group: PCBs by WS846-8082

Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ug/kg)	Project Quantitation Limit (ug/kg)	Analytical Method		Achievable Laboratory Limits (Based upon NEA QLs)	
				MDLs (ug/kg)	QLs(ug/kg)[2]	MDLs (ug/kg)	QLs (ug/kg)[3]
Aroclor 1016	12674-11-2	Note 1	20	NA	NA	10	20
Aroclor 1221	11104-28-2	Note 1	20	NA	NA	10	20
Aroclor 1232	11141-16-5	Note 1	20	NA	NA	10	20
Aroclor 1242	53469-21-9	Note 1	20	NA	NA	10	20
Aroclor 1248	12672-29-6	Note 1	20	NA	NA	10	20
Aroclor 1254	11097-69-1	Note 1	20	NA	NA	10	20
Aroclor 1260	11096-82-5	Note 1	20	NA	NA	10	20
Aroclor 1262	37324-23-5	Note 1	20	NA	NA	10	20
Aroclor 1268	11100-14-4	Note 1	20	NA	NA	10	20
Total PCB (Sum of all Aroclors)		1,000 (USEPA ROD criteria)[1]					

1. The USEPA soil cleanup criterion for total PCBs given in the ROD is 1.0 ppm (or 1,000 ug/kg) will also be used as the action level for dust. The USEPA CLP CRQLs are also sufficiently sensitive to compare data to the New Jersey RDCSCC of 0.49 ppm, a value lower than the ROD-specified 1.0 mg/kg..
2. The achievable Laboratory Limits as listed are based upon NEA148_SOP for PCB by 8082 based upon a 5 gram sample and a 5 mL final sample extract volume. The actual achievable QLs may differ dependent upon the mass of the settled dust collected. For dust samples sized from 0.5 to 1.0 grams, the lab will use a final extract volume of 2 mL.
3. Dust is assumed to be dry and sample size will be limited, therefore the data on dust samples will not be corrected for moisture content.

QAPP Worksheet #16
(UFP-QAPP Manual Section 2.8.2)

Project Schedule Timeline Table

Activities	Organization	Dates		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Development of the Sampling Rationale, FSP and associated sampling SOPs	Louis Berger	March 2011	May 2011	Final FSP	May 2011
Select a subcontract lab as a potential alternative for dust analysis	Louis Berger	March 2011	May 2011	Lab selected for draft QAPP	May 2011
Preparation of the QAPP, and the testing QA requirements	Louis Berger and ARCADIS-US/Malcolm Pirnie	March 2011	May 2011	Final QAPP	May 2011
Preparation of SSHP	Louis Berger	March 2011	April 2011	Final SSHP	May 2011
Submit DESA/CLP request forms for soils to Adly Michael	Louis Berger	Spring 2011	Spring 2011	Submitted forms	Three weeks before sampling begins
Collection of Soil Samples and Submission for Analysis	Louis Berger	May -June 2011	2011	Samples collected per Final FSP	2011
Collection of Interior Dust Samples and Submission for Analysis	Louis Berger and ARCADIS-US/Malcolm Pirnie	May -June 2011	2011	Samples collected per Final FSP	2011
Submit Trip COC Reports	Louis Berger	Date of sample collection	2011	Included with samples	Days when samples are collected
Laboratory Analyses – USEPA-CLP or DESA assigned	Laboratories assigned by USEPA-CLP or DESA	2011 after samples are collected	Analyses should be completed within 21 days of receipt of samples.	Validated data provided to LBG	42 days after sample collection
Laboratory Analyses – Subcontract Laboratory	Subcontract Laboratory	2011 after samples are collected	Analyses should be completed within contract-specified time period	Unvalidated data provided to LBG for validation prior to final deliverable due date	Within the contract-specified time period for analysis and validation,

Project Schedule Timeline Table

Activities	Organization	Dates		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Validation, Review and Verification of Data - USEPA-CLP or DESA assigned	USEPA Region 2 or Louis Berger and ARCADIS-US/Malcolm Pirnie	Summer 2011	Validation should be completed within 21 days after the laboratory provides the data packages.	Full laboratory narrative, including but not limited to Form1s, narrative, QC summary, and results in USEPA MEDD format.	21 days after all the lab data packages are available
Validation, Review and Verification of Data - Subcontract Laboratory	USEPA Region 2 or Louis Berger and ARCADIS-US/Malcolm Pirnie or selected subcontractor	Summer 2011	Validation should be complete within the contract-specified timeframe	Full laboratory narrative, including but not limited to Form1s, narrative, QC summary, and results in USEPA MEDD format.	Within the contract-specified time period for analysis and validation,

Note: A more detailed project schedule is maintained by the USACE and Louis Berger Project Manager. An up-to-date copy of the Project Schedule will be available to the project team members.

QAPP Worksheet #17
(UFP-QAPP Section 3.1.1)

Sampling Design and Rationale

It is anticipated that surface and subsurface soil samples will be collected from up to 30 individual properties identified by Louis Berger and the USEPA as requiring additional sampling to determine if the total PCBs in soils exceed the USEPA clean-up criterion selected in the ROD of 1 ppm. Sampling will commence upon receiving copies of access agreements from the USEPA. The soil samples will be collected with a hand auger and will be taken at two discrete depth intervals. Surface soil samples will be collected at 0-6 inches, and subsurface soil samples at 24-30 inches. The 24-30 inch interval may be changed to 18-24 inches if field conditions do not allow deeper samples to be collected. This shallower depth will only be sampled after two unsuccessful attempts at collecting samples at the specified 24-30 inch depth interval. The subsurface samples will be collected from the same locations as the surface samples, as determined in the field. Sampling locations will be determined in the field through coordination with the USACE and USEPA Region 2 during a site reconnaissance visit conducted by the USEPA Remedial Project Manager and Louis Berger staff prior to the sample collection effort. Property layout, available sampling material (*i.e.,* grassy surfaces), and site usage will all be considered for selecting surface and subsurface sample locations. An attempt will also be made to distribute the sampling locations to provide maximum coverage across the available sampling area. Upon completion of sampling at a property, all soil sampling locations will be located by a NJ-licensed land surveyor. Initially 10 surface samples and five subsurface samples are expected to be collected per property. An example property map is shown on Figure 2. This map represents a property sampled during the Phase 1 program conducted in 2008.

Soil samples will be collected along public roadway ROW areas identified by Louis Berger and the USEPA to determine if the Total PCBs in soils exceed the USEPA clean-up criterion selected in the ROD of 1.0 ppm. Samples will be collected with a hand auger from the 0-6 inch depth interval. Soil sampling will commence upon approval of the draft planning documents. It is anticipated that approximately 450 samples will be collected from ROW areas.

Interior dust samples will also be collected in homes at locations determined in conjunction with the USEPA. It is estimated that interior dust samples will be collected at the same (up to 30) individual properties at which soil samples are collected. Additionally, confirmatory interior dust samples will be collected at the seven properties at which dwelling interiors were cleaned by the USEPA in 2010. Specific locations within each dwelling at which confirmatory interior dust samples will be collected will coincide with the location(s) where interior dust samples were collected during previous sampling events, if practicable. Dust sample(s) will be collected at each property using a vacuum cleaner sampling device according to the procedures described in the interior dust sampling SOP 4 (see Attachment 2 of the FSP).

For a more complete description of the sampling design and rationale see FSP Section 5.0.

QAPP Worksheet #18
(UFP-QAPP Manual Section 3.1.1)

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
10 locations per property[1]	Soil (Surface)	0 to 6	PCBs	Low	10 samples per property (duplicates at 1 per 20)	Note 2,3	Determine if the soil exceeds the USEPA criterion of 1 ppm. See FSP Section 5.1.
5 locations per property[1]	Soil (Sub-surface)	24 to 30 (or 18-24 inches based on field conditions)	PCBs	Low	5 samples per property (duplicates at 1 per 20)	Note 2,3	Determine if the soil exceeds the USEPA criterion of 1 ppm. See FSP Section 5.1.
ROWs[2]	Soil (Surface)	0 to 6	PCBs	Low	Up to 4 samples per transect, transects spaced 50 feet on center	Note 2,3	Determine if the soil exceeds the USEPA criterion of 1 ppm. See FSP Section 5.1.
Approx. 2 samples of interior dust within each building[3]	Interior dust	NA	PCBs	Low	2 samples per property	Note 2,3	Determine if interior dust exceeds the USEPA clean up criterion of 1 ppm. See FSP Section 5.2.

1. The soil sample locations at each property will be selected in the field in conjunction with the USACE and USEPA. It is anticipated that 15 samples will be collected at each property: 10 from the 0 to 6 inch depth interval, and five from the 24 to 30 inch depth interval. The 15 samples will be collected from a total of 10 identifiable locations: five of the 10 locations will have only a 0 to 6 inch depth interval sample collected, and five of the 10 locations will have a 0 to 6 inch interval sample and a 24 to 30 inch depth interval sample. See FSP Section 5.0 for further details regarding selection of sample locations.
2. Right of Way (ROW) sampling is expected to be performed along transects across specific public roadways identified by Louis Berger and the USEPA. It is anticipated that two samples may be collected from each side of the roadway – one at the curb and

one at the furthest distance from the curb at the edge of the easement. Only one sample may be collected from a side if insufficient sampling area (*i.e.,* grass, soil) exists. Transects are expected to be spaced 50 feet apart.

3. It is anticipated that up to 30 individual properties identified by Louis Berger and the USEPA as requiring additional investigation will be sampled during the pre-remedial design sampling activities; however, the specific list of properties will be determined by the USEPA. It is anticipated that two interior dust samples will be collected from each property, one from highly-trafficked common areas in the residential living space and one from the bedroom spaces. See FSP Section 5.0 for further details regarding selection of sample locations.

4. See Worksheet 21 and Appendix A: FSP Attachments 1 and 2 for sampling SOPs.

QAPP Worksheet #19
(UFP-QAPP Manual Section 3.1.1)

Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume/Mass per Analysis	Containers[1] (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)[2]
Soils	PCBs	Low	USEPA-CLP SOM01.2	At least 30 g; see SOM01.2	8 oz. Glass, Amber Jar	Cool to 4 +/- 2 °C or	14 days to extraction, 40 days to analysis or applicable CLP requirements
Interior dust (Screened by lab through No. 100 mesh sieve)	PCBs	Low	SW846-8082 or USEPA-CLP SOM01.2	If possible collect at least 10 g, but if necessary the lab can analyze smaller dust sample volumes[3]	The vacuum filters should be placed in a clean 32 oz. Glass, Amber Jar or sealable plastic bag. [4]	Cool to 4 +/- 2 °C or	14 days to extraction, 40 days to analysis or applicable CLP requirements

1. The size and type of the sample container will depend upon the requirements of the assigned laboratory.
2. Requested laboratory turn-around times (TATs) for the non-CLP test methods for the majority of the requested analyses will be within 21 days of receipt of the sample. Quicker TATs may be requested for specific samples, as appropriate.
3. Ideal and necessary volumes assume the removal via sieving of solid, non-dust particulates (i.e., pebbles, wood fragments, etc.). It is anticipated that any soil clumps will be broken apart prior to the screening process.
4. To make sure that sufficient dust mass is available for PCB Aroclor analyses, multiple vacuum filters should be collected per individual sample and should be placed together in the jar or sealed plastic bag. The field crew should record the weight of each filter before and after sample collection to determine the cumulative amount of dust that has been collected for analysis.

QAPP Worksheet #20

(UFP-QAPP Manual Section 3.1.1)

The following table summarizes by matrix, analytical group, and concentration level the number of field QC samples that will be collected and sent to the laboratory.

Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	Approximate No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS	No. of Field Blanks	No. of Equip. Blanks [4]	No. of PT Samples	Approximate Total No. of Samples to Lab
Soil	PCBs	Low	USEPA-CLP SOM01.2	900	1 per 20	Note 3	0	At least one per week	Note 5	1100
Interior dust	PCBs	Low	SW-846-8082/NEA148_SOP or USEPA-CLP SOM01.2	74	0	0	(Note 4)	0	Note 5	140

1. Field duplicates for soil samples will be taken from the same boring and depth.
2. Field duplicates for dust will be co-located samples collected from an adjacent area of similar size.
3. A separate soil and/or sample container is not required for matrix spikes, since the lab will take QA samples for soil and from the sample container.
4. Aqueous equipment blanks will be not be collected during the interior dust sample collection. Instead, the samples of the vacuum filters to be employed for collecting the dust samples will be proofed by the lab. If a subcontract lab analyzes the samples, field blanks may also be collected by vacuuming a PCB free solid material supplied by the lab.
5. Performance Testing (PT) samples are performed quarterly by CLP laboratories per USEPA-CLP SOW requirements.

QAPP Worksheet #21
(UFP-QAPP Manual Section 3.1.2)

Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work?	Comments
SOP 1	Procedure to Conduct Sample Management for CLP and Non-CLP Samples, April 2011, Revision No. 2	ARCADIS-US/Malcolm Pirnie/	Notebook, personal computer, safety glasses, gloves, sample coolers, ice, sample labels etc.	No	QAPP Attachment 2
SOP 2	Procedure for Shallow Subsurface Soil Sample Collection and Processing, September 2007, Revision No. 0	Malcolm Pirnie	Hand auger and sampling/processing equipment, sample jars etc.	No	FSP Attachment 1
SOP 3	Procedure for Collecting Interior Dust, April 201, Revision 2	ARCADIS-US/Malcolm Pirnie	Vacuum cleaner, clean accessories, vacuum cleaner bags or collection filters, ice, coolers, etc.	No	FSP Attachment 2
SOP 4	Procedure for Conducting Decontamination of Soil Sampling Equipment, September 2007, Revision No. 1	Malcolm Pirnie	Distilled water, solvents, etc.	No	FSP Attachment 3
SOP 5	Procedure to Conduct Collection of Equipment Blanks, April 2011, Revision 1	ARCADIS-US/Malcolm Pirnie	Sample processing equipment, sample bottles, preservation ice, coolers, etc.	No	QAPP Attachment 6
SOP 6	Procedure to Conduct a Technical System Audit (TSA)	Malcolm Pirnie	Copies of relevant project documentation (e.g., FSP, QAPP, and memos, correspondence, or addenda pertaining to field activities), TSA audit checklist, and digital camera.	No	QAPP Attachment 5
SOP 7	Procedure for Calibration, Operation and Maintenance of the Photo Ionization Detector (PID), March 2006, Revision No. 0	Malcolm Pirnie	PID instruments	No	FSP Attachment 4

Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work?	Comments
OSWER 9240.0-47 USEPA540-R-09-03	Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-47, USEPA540-R-09-03, January 2011	USEPA	Notebook, personal computer, safety glasses, gloves, sample coolers, ice, sample labels and other materials described in the document.	No	To be used by the field team as a guide for collecting and preparing CLP samples. Referenced in SOPs 1
Form II Lite User's Guide or Scribe User's Guide	Forms II Lite, Version 5.1 User's Guide, Version 5.1 or For Scribe see http://www.ertsupport.org/downloads.htm	USEPA	Personal computer, printer, Forms II Lite or Scribe software, etc.	No	Either Forms II Lite or Scribe is required for creating COC forms for USEPA-CLP samples.
SOP No. HW-32	Standard Operating Procedure For Implementing The National Strategy For Procuring Analytical Services for All OSWER Programs (Superfund, RCRA, Brownfields), Revision 5, March 17, 2005	USEPA Region 2	SOP No. HW-32 attachments	No	

QAPP Worksheet #22
(UFP-QAPP Manual Section 3.1.2.4)

Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Vacuum cleaner (Omega or equivalent alternative) used to collect interior dust samples	None required.	Per the vacuum manual.	None required.	Decontaminate per FSP, SOP 4.	Decontaminate/ change vacuum accessories before each sample is collected.	None required	Decontaminate per FSP SOP 4.	Field Team Leader	See FSP Attachment 2, SOP 4.
Photoionization Detector (PID)	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	See FSP Attachment 4, SOP 7	Field Team Leader	FSP Attachment 4, SOP 7

QAPP Worksheet #23
(UFP-QAPP Manual Section 3.2.1)

Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work
SOM01.2	USEPA Multi-Media, Multi-Concentration, Organic Analytical Service for Superfund (SOM01.2), May 2005 or lastest revision [1,3]	Definitive	PCBs	GC-ECD	Assigned CLP Lab or the Region 2 DESA lab	No
NEA148_07/EPA 8082	Determination of Polychlorinated Biphenyl (PCB) Aroclors, Revision 07, 3-11-11 EPA SW846 Method 8082	Definitive	PCBs	GC-ECD	NEA Inc, Division of Pace Analytical Services	Yes[2]

Note 1: If a subcontract lab is employed instead of DESA or an assigned CLP lab, PCB Aroclors may be analyzedd by USEPA Method SW-846-8082; however the lab must achieve the project-required QLs.

Note 2: In the case of dust samples the laboratory will also be required to process the sample by passing the dust through a No. 100 mesh sieve screen.

Note 3: If the DESA lab chooses to perform the analyses they will follow their own SOPs.

QAPP Worksheet #24
(UFP-QAPP Manual Section 3.2.2)

Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gas Chromatograph with Electron Capture Detector (GC-ECD)	Initial and continuing calibration per USEPA CLP SOW SOM01.2 and or SW846-8082/NEA148_07	See USEPA CLP SOW or SW846-8082 /NEA148_07	See USEPA CLP SOW or SW846-8082 /NEA148_07	Calibrate per SOM01.2 and SW846-8082/NEA148_07 prior to analyses reanalyze samples as necessary	Assigned Lab personnel	SOM01.2 and SW846-8082/NEA148_07

QAPP Worksheet #25
(UFP-QAPP Manual Section 3.2.3)

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC-ECD	Per instrument manual and USEPA CLP SOM01.2 or SW846-8082/NEA148_07 [a,b]	See USEPA CLP SOM01.2 or SW846-8082/NEA148_07	See USEPA CLP SOM01.2 or SW846-8082/NEA148_07	See USEPA or SW846-8082CLP SOM01.2/NEA148_07	See USEPA CLP SOM01.2 or SW846-8082/NEA148_07	See USEPA CLP SOM01.2 or SW846-808/NEA148_072	Assigned lab personnel	See USEPA CLP SOM01.2 or SW846-8082/NEA148_07

a. The maintenance of the analytical instruments including the testing activity, inspection activity, frequency, acceptance criteria, responsible person and SOP reference must be documented in the Laboratory's Quality Control Manual. It is anticipated that the samples will be analyzed through the USEPA CLP program, which has developed detailed Statements of Work referenced in Worksheet #23. There is also possibility that some of the analyses will be assigned by USEPA Region 2 for analysis by the USEPA Region 2 DESA Lab. If the DESA lab or a contract lab performs analyses, the associated instrumentation must be maintained according to their SOPs and Laboratory Quality Manual.
b. Spare parts and maintenance of laboratory analytical instrumentation are the responsibility of the assigned laboratory.

QAPP Worksheet #26
(UFP-QAPP Manual Appendix A)

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): The Field Team, supervised by the Field Team Leader, will collect the samples.
Sample Packaging (Personnel/Organization): The Field Team
Coordination of Shipment (Personnel/Organization): The Sample Management Officer
Type of Shipment/Carrier: Federal Express for Overnight Delivery or courier to the laboratory
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Assigned USEPA CLP laboratory, the USEPA Region 2 DESA laboratory or subcontract lab personnel
Sample Custody and Storage (Personnel/Organization): Assigned USEPA CLP laboratory, the USEPA Region 2 DESA laboratory or subcontract lab personnel
Sample Preparation (Personnel/Organization): Assigned USEPA CLP laboratory, the USEPA Region 2 DESA laboratory or subcontract lab personnel
Sample Determinative Analysis (Personnel/Organization): Assigned USEPA CLP laboratory, the USEPA Region 2 DESA laboratory or subcontract lab personnel
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples will not be stored in the field, but will be shipped within 24 hours of collection. If due to an emergency they are stored in the field, they will be kept in a cooler or transferred to a refrigerator kept at 4 degrees C (+/- 2 degrees C) or frozen (-10 degrees C).
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extraction and digestion will be conducted according to the USEPA-CLP SOWs and the requirements given in Worksheet 19, or EPA SW846 8082.
Biological Sample Storage (No. of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: Assigned USEPA DESA or CLP Lab or Subcontract Lab Sample Custodians
Number of Days from Analysis: At least 60 days

Sample Handling System

Sample handling and custody procedures ensure the timely, correct, and complete analysis of each sample for all parameters requested. A sample is considered to be in someone's custody if it:

- Is in his/her possession.
- Is in his/her view, after being in his/her possession.
- Is in his/her possession and has been placed in a secure location.
- Is in a designated secure area.

Sample custody documentation provides a written record of sample collection and analysis. The sample custody procedures provide for specific identification of samples associated with an exact location, the recording of pertinent information associated with the sample, including time of sample collection and any preservation techniques, and a Chain of Custody (COC) record which serves as physical evidence of sample custody. Custody procedures will be similar to the procedures outlined at www.environmental.usace.army.mil/guide_chem.htm and the USEPA's Contract Laboratory Program Guidance for Field Samplers (USEPA, 2007). The COC documentation system provides the means to individually identify, track, and monitor each sample from the time of collection through final data reporting. Sample custody procedures are developed in three areas: sample collection, laboratory analysis, and final evidence files, which are described below. See Attachment 9 for a copy of SOP No. HW-32, Implementing the National Strategy for Procuring Analytical Services for All OSWER Programs. It includes the Region 2 requirements for obtaining analytical services for Superfund projects and outlines the arrangements that must be made through the Region 2 Regional Sample Control Coordinator (RSCC) and gives example forms that must be submitted.

Field Sample Handling and Custody

Field records provide a means of recording information for each field activity performed at the Site. COC procedures document

pertinent sampling data and all transfers of custody until the samples reach the analytical laboratory. The sample packaging and shipment procedures summarized below will ensure that the samples arrive at the laboratory with the COC intact. Refer to SOP No. 1 in Attachment 2 for sample management information. Worksheet 19 lists the specific sample preservation requirements for each test method.

Field Procedures

The general responsibilities of the field team are listed below:

- The field sampler is personally responsible for the care and custody of the samples until they are transferred to the Sample Management Officer (SMO) or until they are properly dispatched. As few people as possible should handle the samples.

- The Field Team Leader, or designee, is responsible for entering the proper information in the field logbook, including all pertinent information such as sample identification number, date and time of sample collection, type of analysis, and description of sample location. The information entered into the field logbook will be used to generate a COC.

- All sample containers will be labeled with the project identification, sample number, matrix, type of analysis required, and preservation requirements.

- The samples will be properly preserved, bagged, and packed into coolers. The original COC form will be placed into the lead cooler and will be shipped to the laboratory.

- The SMO or designee will review all field activities to determine whether proper custody procedures were followed during the field work and if additional samples are required.

Field Records

The field logbook will provide the means of recording data collection activities. Entries will be described in as much detail as possible so that persons going to the Site can reconstruct a particular situation without reliance on memory. At the beginning of each day, the date, start time, weather, and names of all sampling team members present will be entered. The names of visitors to the Site and the purpose of their visit will also be recorded. All field measurements, as well as the instrument(s), will be noted.

Samples will be collected following the sampling procedures documented in the FSP Section 5.0. Observations such as sampling conditions or any problems will also be recorded. Sample identification numbers will be assigned at the time the data are entered in the logbook. Field duplicate samples for soil samples, which will receive a unique sample identification number, are "blind" to the laboratory and will be identified under the sample description so that they can be associated with their respective samples by project staff. Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples for soils will not be noted in the logbook or COC forms as they will be collected after homogenization of the soil samples in the analytical laboratory. MS/MSD samples will not be collected for interior dust samples, as sufficient dust mass will not be available.

Sample Identification System

All samples collected from the Site must be identified with a sample label in addition to an entry on a COC record. Indelible ink will be used to complete sample labels and handwritten COC records. COCs for all CLP samples must be generated using Forms II Lite or Scribe software. In addition, each soil sample shall be identified by a unique sample number assigned by the field team as described in the Section 6.3.1 of the FSP. The unique sample number will include a sequential sample number, the property ID, type of property, and the type of sample and the depth of the sample if it is a soil sample. See the following example of the proposed sample number nomenclature: CDE-OU1-SB-205-01S.

Sample Labels/Tags

Sample labels will require the field team to complete the following information for each sample container:

1. Sample Number.
2. In the case of CLP samples, the label must also list the CLP Number and the CLP Case Number.
3. Sample Matrix.
4. Parameters to be analyzed.
5. Date of Collection.
6. Time of Collection.
7. Preservation Technique Employed (if applicable).
8. Sampler's Name.

QAPP Worksheet #27
(UFP-QAPP Manual Section 3.3.3)

Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Samples will be collected per the procedures described in the FSP Section 5.0 (given in Appendix A). The field sample custody procedures including sample packing, shipment, and delivery requirements are discussed in the text in Worksheets 17 and 26. Also refer to SOP No. 1 in Attachment 2 and the CLP Guidance for Field Samplers in Attachment 11 for sample management information.
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Each laboratory will have a sample custodian who accepts custody of the samples and verifies that the information on the sample labels matches the information on the COC. The sample custodian will document any discrepancies and will sign and date all appropriate receiving documents. The sample custodian will also document the condition of the samples upon receipt at the laboratory. The laboratory sample custody procedures ware discussed further in the following text.
Sample Identification Procedures: The sample identification scheme that will be employed is described in the Section 6.3.1 of FSP in Appendix A. Sample labeling procedures are discussed in the text in Worksheet 26.
Chain-of-Custody (COC) Procedures: A COC record will accompany the samples from the time of sampling through all transfers of custody. Example COC forms are presented in Attachments 3.1 and 3.2. The COC procedures are detailed in the following text and in SOP No. 1 in Attachment 2, and for CLP samples, in the CLP Guidance for Field Samplers .

Sample Custody Requirements:

Chain of Custody Procedure

When samples are being submitted to an USEPA-CLP laboratory, the COC must be generated using FORMS II Lite or Scribe software. Each CLP sample will have a CLP number assigned in addition to the field sample identification number. The following information is typically recorded on manual COC forms. All COC forms must be signed in ink:

- Project name and/or project number.
- Signature of SMO or designee.
- Sampling station number.

- Date and time of collection.
- Grab or composite sample designation.
- Sample matrix.
- Sampling location description.
- Field identification number.
- Analyses required.
- Preservation technique.
- Signatures and dates for transfers of custody.
- Air express/shipper's bill of lading identification numbers.

The COC form serves as an official communication to the laboratory detailing the particular analyses required for each sample. The COC record will accompany the samples from the time of sampling through all transfers of custody. It will be kept on file at the laboratory where samples are analyzed and archived. Three copies of the COC form are created; one copy is retained by the Field Team Leader and two are sent to the laboratory. An electronic copy of each COC should be also made and kept in the project directory. The SMO or designee completes a COC record to accompany each shipment from the field to the laboratory. In the case of CLP samples a copy of the COC must be sent to the USEPA CLP Region 2 coordinator.

The completed COC is put in a zip-lock bag and taped to the inside cover of the sample shipping container. If there is more than one container in a shipment, copies of the COC form will be placed in each container. Each container is then sealed with custody seals and custody is transferred to the laboratory.

Transfer of Custody and Shipment

The custody of samples must be maintained from the time of sampling through shipment and relinquishment to the laboratory.

Instructions for transferring custody are given below:

- All samples are accompanied by a COC. When transferring custody of samples, the individuals relinquishing and receiving will sign, date, and note the time on the COC. This form documents sample custody transfer from the SMO or designee, through the shipper, to the analytical laboratory. Since a common carrier will usually not accept responsibility for handling COC forms, the name of the carrier is entered under "Received by," the bill-of-lading number is recorded in the comments section, and the COC form is placed in a zip-lock plastic bag and taped to the inside lid of the lead shipping cooler. Copies of the COC form will be placed in each additional cooler in a shipment.

- Samples will be packaged for shipment and either picked up at the Site by the laboratory or dispatched to the appropriate laboratory via overnight delivery service. SOP No. 1 in Attachment 2 contains the proper sample packaging techniques. A separate COC record must accompany each shipment. Shipping containers will be sealed for shipment to the laboratory. Two custody seals will be applied to each cooler to document that the container was properly sealed and to determine if the container was tampered with during shipment. The custody seals will be placed on the coolers in such a manner that the custody seal would be broken if the cooler were opened (*i.e.*, diagonally opposite corners of the cooler lid).

- The original COC (and a copy for CLP laboratories) will accompany the shipment. A copy will be retained by the Field Team Leader.

- If the samples are sent by common carrier or air freight, proper documentation must be maintained. For example, the bill of lading must be retained by the Field Team Leader.

Laboratory Custody Procedures

The laboratory custody procedures will be equivalent to those described in the latest edition of the CLP SOW. The following will be addressed in the laboratory custody SOPs:

- A designated sample custodian accepts custody of the samples and verifies that the information on the sample labels matches the information on the COC. The sample custodian will document any discrepancies and will sign and date all appropriate receiving documents. The sample custodian will also document the condition of the samples upon receipt at the laboratory. The CLP laboratories will send a copy of the sample receipt checklist to USEPA's RSCC, while the subcontract laboratories will complete the form and return it electronically.

- Once the samples have been accepted by the laboratory, checked and logged in, they must be maintained in accordance with laboratory custody and security requirements.

- To ensure traceability of samples while in the possession of the laboratory, a method for sample identification that has been documented in a laboratory SOP will be used to assign sample numbers.

- The following stages of analysis must be documented by the laboratory:
    - Sample Extraction/Preparation.
    - Sample Analysis.
    - Data Reduction.
    - Data Reporting.

- Laboratory personnel are responsible for the custody of samples until they are returned to the sample custodian.

- When sample analyses and QA checks have been completed in the laboratory, the used portion of the sample must be stored or disposed of in accordance with the protocols specified in the CLP SOW or the subcontract agreement. Identifying labels, data sheets, COCs, and laboratory records will be retained until analyses and QA checks are completed in accordance with the protocols specified in the CLP SOW or the subcontract agreement.

Final Evidence Files

This is the final phase of sample custody. The COC records and sample analysis request form copies are archived in their respective project files. Laboratory custody forms, sample preparation and analysis logbooks, and data packages will become part of the laboratory final evidence file. Other relevant documentation including records, reports, and correspondence, logs, pictures, and data review reports will be archived by The Louis Berger Group.

Sample Holding Times

Information on sample holding times and required preservation for each test method are provided in Worksheet 19.

Sample Packaging and Shipping Requirements

Custody of samples must be maintained through the shipment of samples to the selected laboratory. All samples will be packaged and shipped at the end of each day unless other arrangements are made with the laboratory. See SOP 1 in Attachment 2 for a description of the Sample Management and Custody Procedures, as well as sample packing. Also refer to the USEPA CLP Guidance for Field Samplers for more details regarding shipment of CLP samples.

QAPP Worksheet #28-1
(UFP-QAPP Manual Section 3.4)

QC Samples Table

Matrix	Solids
Analytical Group	PCBs
Concentration Level	Low
Sampling SOP	See FSP, SOPs 2 and 3
Analytical Method/ SOP Reference	SOM01.2
Sampler's Name	Field Team
Field Sampling Organization	Louis Berger Group
Analytical Organization	Assigned USEPA CLP Lab
No. of Sample Locations	See Worksheet 20 and FSP

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits[1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment and/or Field Blanks	At least one equipment blank a week for soils. For dust, the filters will be proofed at least once during the program. .	FSP and QAPP	Investigate source of contamination	Field Team Leader	Sensitivity/Accuracy	< QL
Field Duplicates	1 per 20 field samples \for soils. None for dust.	FSP and QAPP	If the results exceed limits for the field replicate, this will be addressed by the Data Reviewer	Field Team Leader and or Laboratory	Precision	RPD 35% for duplicate values greater than or equal to 5 times the CRQL
Calibration Verification	Every 12 hours	Per SOM01.2	Recalibrate and reanalyze samples	Assigned lab	Accuracy	Difference ±15% or less
Surrogatess	Per SOM01.2	Per SOM01.2 Recovery 50-150%	Recalibrate and reanalyze samples	Assigned lab	Accuracy	50-150%

QC Samples Table

Matrix	Solids
Analytical Group	PCBs
Concentration Level	Low
Sampling SOP	See FSP, SOPs 2 and 3
Analytical Method/ SOP Reference	SOM01.2
Sampler's Name	Field Team
Field Sampling Organization	Louis Berger Group
Analytical Organization	Assigned USEPA CLP Lab
No. of Sample Locations	See Worksheet 20 and FSP

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits[1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicates (MS/MSD) [2]	Each group of field samples in an SDG, or each SDG, whichever is most frequent per SOM01.2	Per SOM01.2 Exhibit D, Section 12.0	Investigate and reanalyze the samples, record in case narrative	Assigned lab	Accuracy/ Precision	Recovery for Aroclor 1016 29-135%, RPD 0-15% Recovery for Aroclor 1260 29-136%, RPD 0-20%
Laboratory Control Samples (LCS)	Once every 20 samples of the sample matrix in an SDG	Per SOM01.1/1.2, Exhibit D, Section 12.0	Check calculation. It maybe necessary to re-calibrate to meet acceptance criteria	Assigned lab	Accuracy	Aroclor 1016 Recovery 50-150% Aroclor 1260 Recovery 50-150%
Confirmatory Analysis	Every sample	Per SOM01.1/1.2	Investigate and correct problem- Re-analyze samples	Assigned lab	Accuracy	Within Retention Windows on both columns and based upon calibration factors
Method Blank	Each group of 20 samples or less of the same matrix	Per SOM01.1/1.2, Exhibit D, Section 12.0 , Less than CRQLs	Correct problem and reanalyze blank	Assigned lab	Sensitivity	Less than CRQLs
Instrument Blank	Every 12 hours on each GC column used for analysis	Per SOM01.1/1.2, Exhibit D, Section 12.0 , Less than CRQLs	An acceptable instrument blank must be run before collecting or accepting data	Assigned lab	Sensitivity	Less than CRQLs

QC Samples Table

Matrix	Solids
Analytical Group	PCBs
Concentration Level	Low
Sampling SOP	See FSP, SOPs 2 and 3
Analytical Method/ SOP Reference	SOM01.2
Sampler's Name	Field Team
Field Sampling Organization	Louis Berger Group
Analytical Organization	Assigned USEPA CLP Lab
No. of Sample Locations	See Worksheet 20 and FSP

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits[1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Detection Limits	Annually	Per SOM01.1/1.2, Exhibit D, Section 12.0	Correct the problem and determine method detection limits per SOM01.2 before analyzing samples	Assigned lab	Sensitivity	Low enough to support CRQLs

1. The assigned laboratory also must perform all the QA/QC sample analyses and meet all the measurement performance criteria that assess the analytical DQIs specified in USEPA CLP SOW SOM01.2, such as laboratory duplicates and matrix spike duplicates for precision, matrix spikes, laboratory control standards for accuracy, and blanks and method detection limits for sensitivity. The lab personnel must follow all the corrective actions required by the USEPA CLP SOW.
2. If dust samples are analyzed by CLP SOM01.2, the lab will not be able to analyze field duplicate or MD/MSD samples, since insufficient sample mass will be available.

QAPP Worksheet #28-2
(UFP-QAPP Manual Section 3.4)

QC Samples Table

Matrix	Dust
Analytical Group	PCBs
Concentration Level	Low
Sampling SOP	See FSP, SOPs 2 and 3
Analytical Method/ SOP Reference	SW846-8082/SOP NEA148-07
Sampler's Name	Field Team
Field Sampling Organization	Louis Berger and ARCADIS-US/ Malcolm Pirnie
Analytical Organization	Assigned USEPA CLP Lab
No. of Sample Locations	See Worksheet 20 and FSP

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blanks (proof filters)	At least once	FSP and QAPP	Investigate source of contamination.	Field Team Leader	Sensitivity/Accuracy	< QL
Lab Duplicates	None for dust.	Per NEA148-07, RPD less than or equal to 30%	Investigate and correct. Reanalyze the samples.	Assigned lab	Precision	RPD less than or equal to 30%
Continuous Calibration Check	Every sample	+/- 15% or less of true value	Investigate and correct. Reanalyze the samples.	Assigned Lab	Accuracy	+/- 15% or less of true value
Surrogate	Every Sample	Per NEA148-07, 60-140% recovery	Investigate and correct. Reanalyze the samples.	Assigned lab	Accuracy	60-140% recovery
Laboratory Control Samples (LCS)	Once every 20 samples of the sample matrix in a SDG	Per NEA148-07, 60-140% recovery,	Check calculation. It may be necessary to re-calibrate to meet acceptance criteria.	Assigned lab	Accuracy	60-140% recovery, RPD < 30%, or per lab SOP
Confirmation on second column	Every sample	Per NEA148-07	Investigate and correct, Reanalyze the samples	Assigned lab	Accuracy/Bias/ Precision	Sample results on two columns <25%

QC Samples Table

Matrix	Dust
Analytical Group	PCBs
Concentration Level	Low
Sampling SOP	See FSP, SOPs 2 and 3
Analytical Method/ SOP Reference	SW846-8082/SOP NEA148-07
Sampler's Name	Field Team
Field Sampling Organization	Louis Berger and ARCADIS-US/ Malcolm Pirnie
Analytical Organization	Assigned USEPA CLP Lab
No. of Sample Locations	See Worksheet 20 and FSP

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	Each group of 20 samples or less of the same matrix	Per NEA148-07, Less than RL	Correct problem and reanalyze blank	Assigned lab	Sensitivity	Less than RL
Method Detection Limits	Annually	Per NEA148-07, Low enough to support the RLs	Determine before analyzing samples	Assigned lab	Sensitivity	Low enough to support the RLs

1. The assigned laboratory also must perform all the QA/QC sample analyses and meet all the measurement performance criteria that assess the applicable DQIs specified in lab SOP per 8082.
2. The lab will not perform field duplicate or MD/MSD sample analyses on dust samples, since insufficient sample volume will be available.

QAPP Worksheet #29

(UFP-QAPP Manual Section 3.5.1)

This section identifies the documents and records that will be generated for all aspects of the project including, but not limited to, sample collection and field measurement, on-Site and off-Site analysis, and data assessment.

Project Documents and Records Table

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Notes and/or data sheets	NOT APPLICABLE	Analytical Data Deliverables (CLP and non-CLP)	Field Sampling Audit Check List	NONE
Air bills		Trip Reports submitted to USEPA Region 2	Analytical and Testing Sample Data Packages (CLP and non-CLP)	
Chain of custody forms		ANSET Reports submitted to USEPA Region 2	QA Review sheets	
USACE-KCD Daily Quality Control Summary			Draft and Final Data Summary Reports	
			Trip Reports submitted to USEPA Region 2	
			ANSET Reports submitted to USEPA Region 2	
			Data Validation Reports (non-CLP)	
			Record of collected samples, analyses requested, and program cost	

Data Management

This section describes the project data management process, tracing the path of the data from their generation to their final use or storage. All project data and information must be documented in a format useable to the project personnel.

Project Document Control System

Project documents will be controlled by the Louis Berger Project Manager and the Deputy Project Manager, who will maintain and distribute the hardcopies and electronic copies of the project documents, including any amendments. Electronic copies of project information will be maintained in the project directory on the server at the Louis Berger Elmsford, NY office, which is backed up at least once per day.

Data Recording

Data for this project will be collected by handwritten entries and will be recorded into field logbooks or on forms. Forms II Lite or Scribe software will be the primary tool used to generate COC records and sample labels, or possibly COCs and labels will be created manually. Forms II Lite and Scribe software have been designed to meet USEPA requirements. The Louis Berger IT department will provide a laptop computer properly configured to meet the minimum requirements outlined in the Forms II Lite or Scribe Users Manuals. Computer-generated data associated with laboratory analyses will be managed under the control of the assigned USEPA-CLP or sub-contract laboratory's laboratory information management system (LIMS). Requirements for the LIMS software can be found in the individual laboratories' QA documentation.

Types of Project Documentation and Records

1. Sample Collection and Field Measurement Records include items such as:
    a. Field data collection or sampling data sheets or field notes.
    b. COC records.
    c. Air bills.
    d. Communications logs, records or copies of pertinent e-mails.
    e. Corrective action reports and results.
    f. Documentation of field modifications.
    g. Field instrument records.

h. Drilling logs.

2. Analytical Records include items such as:
   a. COC records.
   b. Sample receipt records.
   c. Records of sample preparation and analysis.
   d. Instrument calibration records.
   e. Raw data files.
   f. Electronic Data Deliverables (See http://www.epa.gov/region02/superfund/medd.htm for a description of the EPA Region 2 Electronic Deliverable that subcontract laboratories will be requested to provide). If at the time of the sampling and analysis, the assigned USEPA CLP or the DESA laboratory are prepared to provide data in the Region 2 format, they will be requested to do so.)
   g. Analytical Results and supporting data.
   h. Sample Data Packages.
3. Project Data Assessment Records such as:
   a. Technical System Field Audits.
   b. Data Validation Reports.

Data Quality Assurance Checks

Louis Berger will monitor the progress of sample collection to verify that samples are collected as planned. The progress of sample collection and processing will be monitored through documentation of the samples collected each day and submission of that documentation in the form of USACE Data Quality Control Summary Reports (DQCR) to the Deputy Project Manager and to the USACE (See Attachment 8).

The contracted laboratory (either CLP or non-CLP) will have a formal in-house QA Plan to which it adheres and performs as part of daily operations. Data generation processes will be reviewed and modified to meet objectives, if necessary. A formalized data generation procedure will be utilized. Each analyst must have previously demonstrated, through the laboratory QA program, his or her

ability to generate acceptable results within the requirements of the each method.

Laboratory Data Transmittal

Laboratory data are managed by the laboratory's LIMS system, beginning with sample check-in on the sample receiving data terminal. For non-CLP laboratories, full laboratory data reports will be delivered to Louis Berger within 21 days of the laboratory's receipt of each SDG, and will include electronic data deliverables (EDDs). In addition, Region 2 requires that non-CLP laboratories adhere to the Analytical Services Tracking System (ANSETS) reporting requirements, which utilize the ANSETS Data Requirement form. Detailed instructions and procedures can be obtained by contacting the USEPA Region 2 Regional Sample Control Coordinator, Mr. Adly Michael at 732-906-6161 or Michael.adly@epa.gov. For CLP laboratories, third-party validated laboratory results will be received by Louis Berger through the USEPA RSCC, and will include EDDs.

Data Storage and Retrieval

Paper copies of the forms, electronic copies of files, and the photographic log will be transmitted regularly to the Louis Berger PM or designee. The completed forms and notebooks will be stored in the custody of the PM or DPM for the duration of the project. The full laboratory data reports submitted to Louis Berger will be stored in the custody of the Project Quality Manager. The Laboratory will maintain copies of documents and backups of all data associated with the analyses of samples. Raw data and electronic media of all field samples, including QC samples and blanks, will be archived from the date of generation and will be kept by the laboratory per the requirements of USEPA-CLP. Hard copies of project files will be archived off-site at a secure facility and retained until the end of the contract; project closeout will be conducted in accordance with USEPA Close-out Guidelines. Data will be transferred to the USACE upon completion of the project. Retrieval of data by others will be at the discretion of the USACE and the USEPA. The length of time that records will be archived will be at the discretion of the USACE and USEPA.

Each laboratory shall archive, electronically, the sample analyses and submit the electronic data files along with the data deliverable package. In addition, each laboratory must submit instrument manufacturer, method files and ID file information. Louis Berger must receive this information in the event a lab on this project closes or updates hardware/software.

QAPP Worksheet #30
(UFP-QAPP Manual Section 3.5.2.3)

Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number[1]
Soil [2]	PCBs	Low	Up to 30 properties and ROW areas identified by Louis Berger and the USEPA will be sampled. Approximately 10 surface soils and 5 subsurface soil samples will be collected at each property, and up to 4 samples per ROW transect (spaced 50 feet apart). See FSP in Appendix A for more details.	SOM01.2	21 days	The USEPA Region II DESA Laboratory, and or an assigned USEPA CLP Laboratory. Contacts regarding the USEPA CLP Laboratories are: Adly Michael of USEPA Region 2 Edison, NJ at 732-321-6161 or Jennifer Feranda of USEPA Region 2 Edison, NJ at 732-321-6687	A backup lab has not been assigned at this time.

Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number[1]
Interior Dust	PCBs	Low	Up to 30 previously unsampled dwellings on properties identified by Louis Berger and the USEPA will be sampled, along with seven dwellings cleaned by USEPA in 2010. Approximately two dust samples will be collected at each property. See FSP in Appendix A for more details.	SW846-8082/NEA 148_07 after sieving of interior dust through ASTM D 422, No. 100 sieve	21 days	NEA Inc. Division of Pace Analytical Services, Inc. 2190 Technology Drive Schenectady, NY 12308 Contact: Ann Casey	A backup lab has not been assigned at this time.

1. A backup subcontractor laboratory may be selected at a future date pending procurement by Malcolm Pirnie and approval by the USACE.
2. We anticipate that an assigned CLP lab will analyze the soils and that a subcontract lab will likely analyze the dust samples.

QAPP Worksheet #31
(UFP-QAPP Manual Section 4.1.1)

Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
QC Reports of any non-conformance	Daily as required	Int.	Louis Berger	Field Team Members	Project Quality Officer (ARCADIS-US/Malcolm Pirnie)	Louis Berger PM or designees	Project Quality Officer ARCADIS-US/Malcolm Pirnie
Field Safety Audit	Initially within the first week of field work and then at least quarterly if necessary	Int.	Louis Berger	Louis Berger Project Safety Officer	Louis Berger PM	Louis Berger PM or designees	Project Safety Officer (Louis Berger)
Technical System Internal Audit	Initially within the first week and then at least quarterly if necessary	Int.	ARCADIS-US/Malcolm Pirnie	Project Quality Officer (ARCADIS-US/Malcolm Pirnie) or designee	Louis Berger PM	PM, FTL or designees	Project Quality Officer (ARCADIS-US/Malcolm Pirnie)

QAPP Worksheet #32
(UFP-QAPP Manual Section 4.1.2)

Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Non-Conformance	See below	Louis Berger PM and the Project Quality Officer (ARCADIS-US/Malcolm Pirnie)	As soon as possible	Complete non-conformance form	Louis Berger PM	As soon as possible
Technical System Field Audits (TSAs)	See Technical Systems Audit report SOP 6 in Attachment 5	Louis Berger PM	Within week	See below section on Field Corrective Actions	Field Team Leader and PM (Louis Berger)	Within week
Internal Laboratory Audits (This does not apply if the USEPA Region 2 DESA or a USEPA CLP Lab are assigned to perform the analyses)	Per Laboratory Quality Manual	Laboratory Management or designee	Annually	Per Laboratory Quality Manual	Assigned Subcontract Laboratory Personnel	Per Laboratory Quality Manual

Non-Conformance/QC Reporting

A non-conformance is defined as an identified or suspected deficiency or discrepancy with regard to implementation of an approved document (*e.g.*, improper sampling procedures, improper instrument calibration, calculation, computer program); or an item where the

quality of the end product itself or subsequent activities using the document or item would be affected by the deficiency; or an activity that is not conducted in accordance with the established plans or procedures.

Any staff member engaged in project work that discovers or suspects a non-conformance is responsible for initiating a non-conformance report to the Project QC Officer. The Project QC Officer will evaluate each non-conformance report and the Project QC Officer will provide a disposition which describes the actions to be taken. An example Non-Conformance/QC report form is included in the Field Sampling Plan, Appendix A.

The PM will verify that no further project work dependent on the nonconforming item or activity is performed until approval is obtained and the non-conformance is properly addressed. If the non-conformance is related to material, the PM shall be responsible for marking or identifying, with the non-conformance report number, the nonconforming item (if practical) and indicating that it is nonconforming and is not to be used.

A copy of each non-conformance report will be included in the project file. Copies of all non-conformances shall be maintained by the Project QC Officer.

Assessment and Oversight

This element addresses assessment of the effectiveness of the project implementation and associated QA/QC activities.

Assessment and Response Actions

To monitor the capability and performance of the FSP activities, several types of audits will be performed. These audits will be conducted by the PQO or designee. Performance audits (PAs) of laboratories are conducted to measure the accuracy of the measurement systems. Data Quality Audits (DQAs) are conducted to determine if the data generated by the sampling and analysis satisfy the DQOs.

Technical System Audits (TSAs)

Field audits will be conducted on an ongoing basis during the project as field data are generated, reduced, and analyzed. Numerical manipulations, including manual calculations, will be documented. Records of numerical analyses will be legible, of reproduction-quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator. System audits of Site activities will be accomplished by an inspection of field Site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a TSA:

- Whether procedures and analyses are conducted according to procedures outlined in the FSP.
- Whether proper sample documentation is being recorded.
- If the working order of field instruments and equipment is being properly checked and recorded.
- The level of QC conducted per each field team.
- Decontamination procedures, where applicable.
- Sample packaging and shipment.

TSAs are conducted for each field team at the beginning of each field sampling task to determine if the system is capable of producing data that meet the DQOs. As long as the field team(s) demonstrate proficiency in the sampling procedures being audited, a follow-up audit will not be required. However, if the audit indicates the need for corrective action, a second TSA will be required. Following the initial audit, TSAs will be conducted on the following schedule:

- Whenever key personnel leave the project or new key personnel are added to the project.
- Whenever a significant amount of time (more than 6 months) has elapsed between TSAs for a particular field task.

Any minor deficiencies that are noted during the TSA will be corrected in the field as they occur. If major deficiencies are noted (*i.e.*, those that cannot be immediately corrected in the field), a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem. A Stop-Work Order may be issued by the Project QC Officer, following notification to the PM. The conditions and the need for a Stop-Work Order will be documented in sufficient detail to permit evaluation of the deficiency and determination of

proper corrective action(s). Pertinent communications with the Project QC Officer, Field Team Leader, DPM, and PM that pertain to an evaluation of the problem along with potential solutions and their implementation will be attached to the Stop-Work Order. In order for work to resume following a Stop-Work Order, the Louis Berger PM and Project QC Officer must rescind it in writing. The Project QC Officer is responsible for tracking non-conforming conditions, evaluating the effectiveness of corrective measures, and assuring that the necessary steps have been taken to prevent recurrence of the original problem.

Regardless of whether major, minor, or no deficiencies were noted during the audit, a written report of the TSA will be prepared by the Project QC Officer and submitted to Louis Berger, USEPA, and USACE PMs, as well as the Field Team Leader and the field team. This report will identify any deficiencies found and will outline the corrective actions that were recommended/implemented to address them. A copy of SOP No. 3 on conducting a TSA and an example of an audit form are found in Attachment 5. Note that the audit form contained in the SOP is for example purposes only; the Project QC Officer will tailor this form for each type of activity audited. Periodically during the audit, it may be determined that the Site program should be modified to increase data quality or efficiency. These modifications will be documented by the Louis Berger PM or Project QC Officer in a Field Modification Form. An example of this form can be found in Attachment 4.

Field Corrective Actions

At the end of each sampling day, the sampling team is to report any problems requiring corrective action that were encountered during the day. Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness, or comparability are not met, or when procedural practices or other conditions are not acceptable. A report is to be filed that documents the problems encountered and the corrective action implemented. A Stop-Work Order may be issued by the Project QC Officer, following notification to the PM, if corrective action does not adequately address a problem, or if no resolution can be reached.

Performance Audits

A performance audit (PA) consists of sending a laboratory a performance evaluation (PE) sample for analysis. The PE sample is a sample of known concentration [established by an independent party such as the National Institute of Standards and Technology (NIST)] that is analyzed by the laboratory, and the analytical results are compared with the certified concentration. The results provide a measure of laboratory performance that is used along with other QA criteria to monitor laboratory capability. USEPA-CLP laboratories are required to perform quarterly analysis of PE samples. At the current time, there are no plans to conduct any additional PA using PE samples. Therefore, all chemical subcontract laboratories performing chemical tests procured for this project must be NJDEP or federally-certified and are subject to the performance audits required by those programs.

Internal Laboratory Audits

As part of its QA program, the Laboratory Quality Assurance Manager (QAM) will conduct periodic checks and audits of the analytical systems to ensure that the systems are working properly and personnel are adhering to established procedures and documenting the required information. These checks and audits will also assist in determining or detecting where problems are occurring.

In addition to conducting internal reviews and audits, as part of its established QA program the laboratory is required to take part in regularly scheduled Performance Evaluations and laboratory audits from State and Federal agencies for applicable tests. Each laboratory selected to support this program must maintain current NJDEP or Federal certifications, as appropriate. **This does not apply if the USEPA Region 2 DESA or a USEPA CLP Lab is assigned to perform the analyses. Louis Berger will only perform audits of commercial subcontract laboratories.**

Laboratory Corrective Actions

If a particular laboratory analysis is deemed "out of control," corrective action will be taken by the laboratory to maintain continued data quality. Each laboratory must adhere to their in-house corrective action policy. The coordinator of the laboratory's analytical section will be responsible for initiating laboratory corrective action when necessary.

Data Quality Audits (DQAs)

DQAs are conducted to determine if the data are adequate to support the DQOs and to determine the cause of deficiencies in the event that the data quality is not adequate. This audit is conducted by the Project QC Officer or his designee after the data have been fully validated. The Project QC Officer will first determine to what extent the data can be used to support the decision making process. If the data are deficient, the Project QC Officer will identify the cause of the deficiency and will determine what modifications need to be made (*e.g.*, request that the laboratory analyze a larger volume sample or employ an alternate or modified method to lower the RLs so that subsequent data are acceptable.)

QAPP Worksheet #33
(UFP-QAPP Manual Section 4.2)

QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Progress Reports	Monthly	End of each following month	Louis Berger PM or Deputy PM	USEPA and USACE-KCD PMs
Daily Quality Control Report (DQCR) (See Attachment 8)	Daily during field work	End of each week of field work	Louis Berger Field Team Leader	USACE-KCD Chemist
Technical System Field Audit	Initally within the first two weeks of field work and with follow up audits if significant deficiencies are found	Month after field work begins	Project QC Officer ARCADIS-US/Malcolm Pirnie or designee	USACE PM
Data Validation Report	After lab data is received	Within 21 days after receiving data	Data Validator	Project QC Officer and PM
Corrective Action Reports	When corrective action is required	When corrective action is implemented	Project Manager or designee	Project Team and PM(s)

The USACE PM will receive several types of management reports. These will include the results of any corrective action reports and data validation reports. In addition, the progress report will contain a section on quality control reports. Problems or issues that arise between regular reporting periods may be identified to program management at any time. Information included in the progress report will include the following:

- Results of Technical System field audits conducted during the period.
- An assessment of any problems with the measurement data, including accuracy, precision, completeness, representativeness, and comparability.
- A listing of the non-conformance reports, including Stop-Work Orders issued during the period, related corrective actions undertaken, and an assessment of the results of these actions.
- Identification of significant quality assurance problems and recommended solutions, as necessary.

QAPP Worksheet #34
(UFP-QAPP Manual Section 5.2.1)

This worksheet and text section describes the processes that will be followed to verify project data. Verification inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). Internal or external is in relation to the data generator.

Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain of custody (COC)	Form will be internally reviewed upon completion and verified against field logs and laboratory reports. Review will occur with the completetion of each report.	I	Louis Berger Group
Field report	Field reports will be verified with the field logbooks.	I	Louis Berger Group
Laboratory data packages	Laboratory data packages will be used to verify the reported results in the project report and against QAPP criteria.	I	Louis Berger Group

Data Verification

- The Field Team Leader or designee is required to review the logbook entries for errors or omissions. This information is transmitted to the Project QC Officer or designee for correction.

- In addition, the Project QC Officer or designee is responsible for reviewing field data for completeness and to verify that the field crew followed the QC requirements detailed in this QAPP (*e.g.*, the collection of QC samples at the required frequency, response checking the field instruments). If any problems with the information are found, the Project QC Officer or designee will document the problems.

- Once the Project QC Officer or designee reviews the field data, he/she signs the bottom of the logbook page as reviewed and approved.

QAPP Worksheet #35

(UFP-QAPP Manual Section 5.2.2)

This worksheet describes the processes that will be followed to validate project data. Validation inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). It describes how each item will be validated, when the activity will occur, what documentation is necessary and identifies the person responsible. It also differentiates between steps IIa and IIb of validation.

Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Methods	Records support implementation of SOP in QAPP.	J. McCann, ARCADIS-US/Malcolm Pirnie
IIa	Chain of Custody	Examine traceability of data from sample collection to generation of project report	J. McCann, ARCADIS-US/Malcolm Pirnie, or the assigned data reviewer (Based upon the USEPA-CLP Data Validation Reports for CLP data.)
IIb	Deviations from SOP and project documents.	Determine impacts of any deviation from method and the project plan.	Project Team led by Edward Dudek, PE, Louis Berger Group

QAPP Worksheet #36

(UFP-QAPP Manual Section 5.2.2)

This worksheet and text section identifies the matrices, analytical groups, and concentration levels that each entity performing validation will be responsible for, as well as criteria that will be used to validate those data.

Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)[1]
IIa/IIb	Solid (Soil and also dust if analyzed by CLP)	PCB Aroclors by SOM01.2	Low	USEPA National Functional Guidelines and Region 2 Validation Criteria	USEPA Data Validators assisted by subcontractors.
IIa/IIb	Solids (dust)	PCB Aroclors by 8082	Low	SW-8082 USEPA Region 2 Validation criterias and the QAPP acceptance limits	By experienced data validator (ARCADIS-US/Malcolm Pirnie)

1. We anticipate that the soil samples will be analyzed by a USEPA CLP laboratory or the USEPA Region 2 DESA laboratory. If the CLP or the DESA laboratory performs the analyses, the reported data will be considered valid. If analytical test data is produced by a subcontract laboratory, it will be reviewed by a qualified ARCADIS-US/Malcolm Pirnie data validator assigned through the Louis Berger Group.

USEPA DESA Laboratory Data

Data generated by the USEPA Region 2 DESA laboratory in Edison, NJ undergo an internal laboratory QA review and are considered USEPA-validated and useable as reported. No third party data validation will be performed on DESA-generated data.

USEPA CLP Data

Validation of USEPA CLP data will be accomplished by comparing the contents of the data packages and QA/QC results to the requirements contained in the applicable analytical methods (SOWs), laboratory SOPs, and validation guidelines. All data generated through the CLP will be validated by RSCC using the latest applicable USEPA Region 2 validation procedures in accordance to the following USEPA guidance documents or their most recent revisions:

- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, OPSWER 9240.1-46, USEPA-540-R-07-003, July 2007

- SOP NO. HW-37/Aroclor Validation of Data USEPA Contract Laboratory Program for Organic Analysis of Low/Medium Concentration of Aroclor Organic Compounds SOM01.1, Revision 0, April 2006.

Commercial Subcontractor Laboratory Data

Data generated by a commercial subcontractor laboratory will be validated by an ARCADIS-US/Malcolm Pirnie data reviewer or other qualified Louis Berger subcontractor. Parameters will be validated in accordance with the QC requirements of this QAPP, USEPA's National Functional Guidelines, the applicable Region 2 guidelines and the QAPP QA acceptance limits.

The validator will conduct a 100% validation of the first SDG received for each analytical parameter. This means that the validator will review the raw data and logbook sheets, and will recalculate at least 10 percent of the sample and QC sample results. If this validation indicates that the laboratory is producing acceptable data, the validation may be scaled back and subsequent data packages will have a less rigorous review. The validation will then be based on the information provided by the laboratory on their QC forms. If the laboratory QC on the report forms are within limits no further review will be conducted; however, if there are QA/QC aspects not meeting criteria, the validator may then review some or all of the full data package to determine the cause or data quality impact of the

non-compliance. In addition, at least one of every five data packages will be subject to a full review.

Once data validation is completed, a data validation report will be generated. The report will contain information regarding the parameters that are qualified, the reason for the qualification, and the direction of the bias (only for parameters qualified as estimated), where it can be determined. Based upon the quality assurance review of the analytical data, specific codes (data qualifiers or 'flags') will be placed next to results to provide an indication of the quantitative and qualitative reliability of the results. The data qualifier codes in the National Function Guidelines are proposed for this project. Qualifiers assigned by laboratories will be defined by each laboratory in their data package and will be superseded by the data validator's qualifiers.

Field Data Evaluation

Procedures to evaluate field data for this program include reviewing the data entered into the log books to check that errors have not been made. The field data to be documented includes data generated during measurement of field parameters, observations, results of any quality control sample analyses, and field instrument calibrations. This task will be the responsibility of a Louis Berger Data Reviewer with oversight by the Project QC Officer or designee.

QAPP Worksheet #37
(UFP-QAPP Manual Section 5.2.3)

This worksheet describes the procedures/methods/activities that will be used to determine whether data are of the right type, quality, and quantity to support environmental decision-making for the project.

Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: The USEPA will perform the validation of the USEPA-CLP laboratory data or the DESA laboratory analytical results. Data reported by assigned USEPA CLP laboratories will be validated by USEPA Region 2 validators and /or subcontract validators under contract to USEPA following Region 2 SOPs. DESA laboratory data undergoes an internal laboratory QA review and is considered to be validated by the USEPA. The Louis Berger or ARCADIS-US/Malcolm Pirnie data validator will validate the non-CLP chemical data in accordance with the protocols outlined on Worksheet 35. Data validation alone does not insure usability of the data. Other factors will be considered, including comparison of actual reporting limits achieved by the lab on the samples collected to the project action levels and data needs.
Describe the evaluative procedures used to assess overall measurement error associated with the project: As part of the data validation process, the validator identifies any qualifications, the bias (if known) of the data, applies qualifiers and comments on the usability of the data. Once the validation package is received from the validator it is reviewed by the Project Quality Officer or a designee. Any QA/QC problems with the validation will be discussed with the validator and laboratories. The data will be compared to the ROD total PCB action level of 1 ppm and the ROD-specified New Jersey RDCSCC of 0.49 ppm to characterize detected contamination in soils and settled dust.

Identify the personnel responsible for performing the usability assessment:

The usability of the data is the responsibility of the project team. The PM and Deputy PM will reconvene the project team after all data has been validated and reviewed. The data users performing the remediation design will participate in a usability assessment to determine if the data is sufficient to meet the data needs and the project DQOs, and will recommend if additional data is required. A data assessment report will be issued by the PM or his designee documenting the results of the usability assessment review performed by the project team. The report will be submitted to the USEPA and USAEC for their approval and regulatory review.

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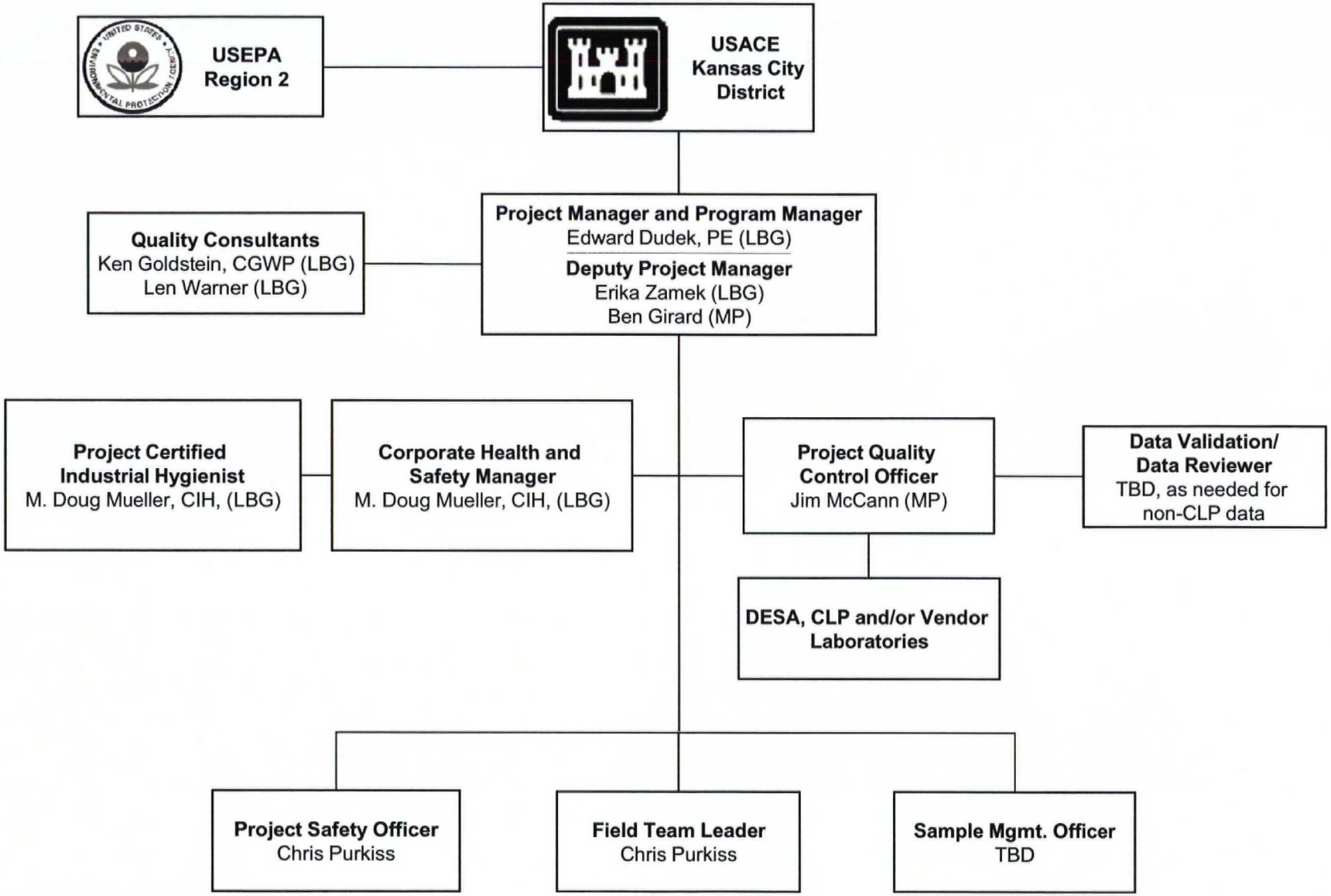
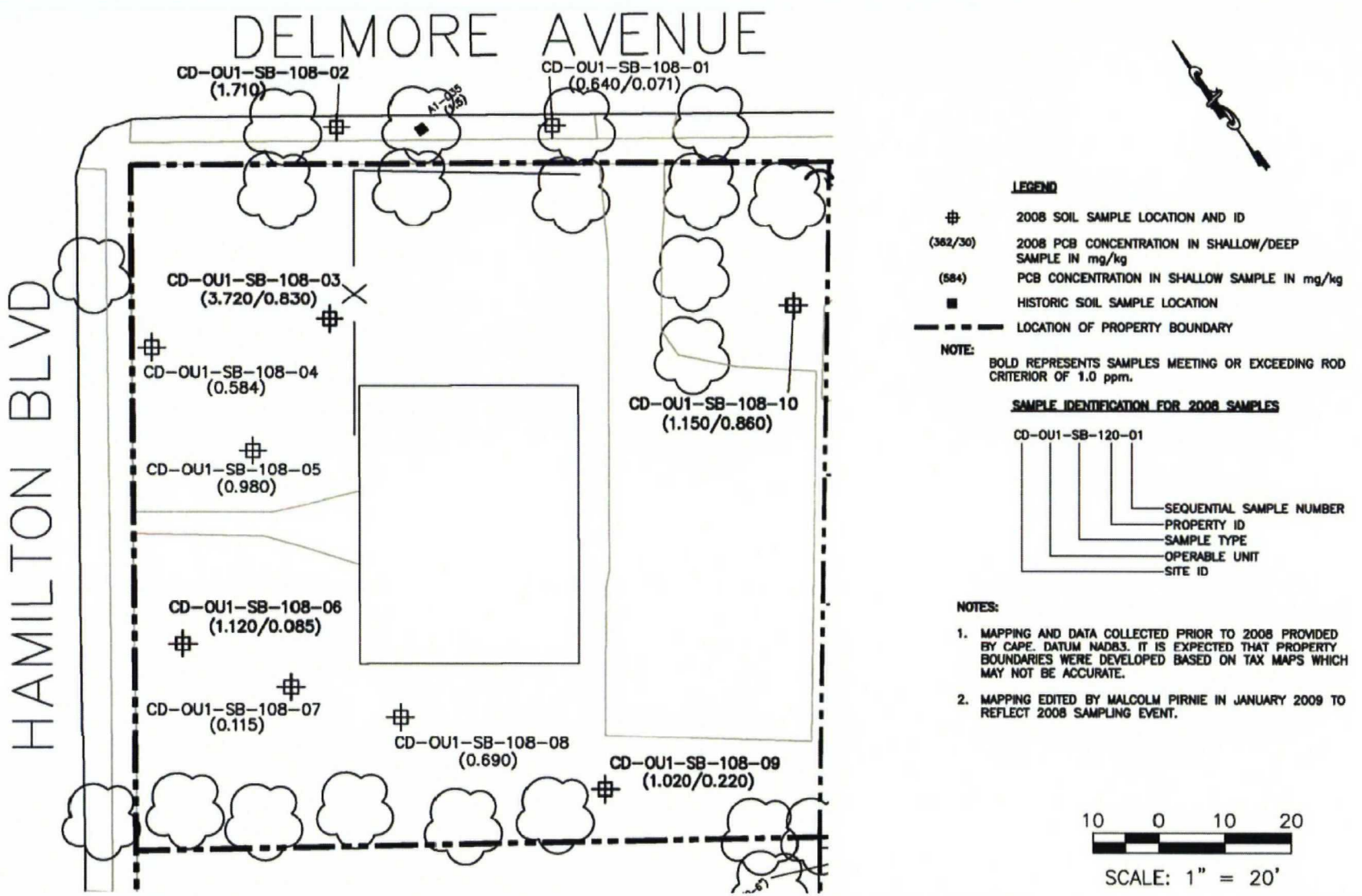
FIGURES



MALCOLM PIRNIE	Figure 1: Cornell-Dubilier Electronics Superfund Site OU1 Project Team Organization Chart	**September 2011**



Source: Figure 108, Final Data Characterization Report for OU1 Soil and Interior Dust Sampling, January 2009 (Malcolm Pirnie, 2009)

MALCOLM PIRNIE

Figure 2: Example Property Map Showing Sampling Points

September 2011

ATTACHMENT 1.1

Data Quality Objectives

DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is used to establish performance or acceptance criteria which serve as the basis for designing a plan for collecting data of the right type, quality, and quantity to support decisions. The approach to developing DQOs is an iterative one, designed to take decision makers through a strategic planning process that begins with setting broad project goals and continues through a number of refining steps aimed at generating environmental data that will be appropriate to making the decisions needed to reach the goals.

This document begins with a "project-level" statement of the DQOs that sets the framework for addressing the environmental problems of the study area. The project-level DQOs focus on the information that the decision-making team needs to carry out an integrated assessment that will produce data to be used for planning remedial actions at properties that are part of Operable Unit 1 (OU-1) of the Cornell-Dubilier Electronics (CDE) Superfund Site (the Site).

1.0 State the Problem

The CDE Superfund Site is located in South Plainfield, Middlesex County, New Jersey. The former CDE facility operated from 1936 to 1962, manufacturing electronic components including, in particular, capacitors. Polychlorinated biphenyls (PCBs) and chlorinated organic solvents were used in the manufacturing process. These activities led to widespread chemical contamination at the facility, as well as migration of contaminants to nearby areas. PCBs have been detected in ground water, soils, and in building interiors at the industrial park (now demolished); at adjacent residential, commercial, and municipal properties; and in the surface water and sediments of the Bound Brook. The United States Environmental Protection Agency (USEPA) divided the Site into four separate operable units. The focus of this project is OU-1, which consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility with soils and/or indoor dust potentially contaminated with PCBs.

- In 2000, the USEPA initiated the remedial investigation (RI) and collected soil samples from OU-1 properties and right of way (ROW) areas. Analytical results from this investigation revealed additional properties with PCB contamination in soil at unacceptable levels, and indicated the need for more extensive sampling. The USEPA evaluated data obtained during sampling conducted in 1997 and 1998 in conjunction with the RI findings, and in June 2003 proposed a comprehensive remedy for OU-1. On September 30, 2003, the USEPA signed a Record of Decision (ROD) to address the contaminated soils at the OU-1 properties. The soils cleanup level established by the USEPA in the ROD is 1.0 ppm for total PCBs. The State of New Jersey concurred with Selected Remedy in the ROD, but has defined a lower Residential Direct Contact Soil Cleanup Criterion (RDCSCC) for PCBs of 0.49 ppm. Based on the data collected at that time, the USEPA believed that in meeting the 1.0 ppm goal for this action, the Selected Remedy may also achieve the State's RDSCC. If the Selected Remedy does not achieve the RDSCC at some properties, the State may elect to pursue additional soil removal or may require that additional restrictions be placed on properties to prevent future direct contact with soils above 0.49 ppm.

The major components of the Selected Remedy described in the ROD include:

- Excavation of an estimated 2,100 cubic yards of contaminated soil from approximately 16 properties, backfilling with clean fill, and property restoration as necessary;
- Transport of the contaminated soil off-site for disposal, with treatment as necessary;
- Indoor dust remediation where PCB-contaminated dust is encountered; and,
- Where necessary, temporary relocation of residents during the indoor remediation.

Studies conducted by the USEPA prior to 2008 have identified four OU-1 properties requiring remedial action, and a study area of approximately 59 properties that require expanded soil and interior dust sampling to determine if additional remediation is required to meet the ROD cleanup goals. Remedial actions were completed on the four properties. This QAPP addresses Phase 2 sampling of those identified properties (Phase 1 was conducted in 2008).

The objectives for this study of the OU-1 properties are as follows:

- To characterize Total PCB contamination (as PCB Aroclors) in the soils on vicinity properties.
- To characterize Total PCB contamination (as PCB Aroclors) in vicinity ROW areas.
- To characterize the extent of Total PCB contamination (as PCB Aroclors) in the indoor dust collected within vicinity properties.
- To characterize the extent of Total PCB contamination (as PCB Aroclors) in indoor dust collected within vicinity properties that were cleaned during 2010.

The team which will implement this study and the team structure are presented on Figure 1 of the QAPP. To date, no formal conceptual site model exists for the site, but at this time it is suspected that fugitive dust emissions from the OU2 Site are responsible for contamination at the vicinity properties.

2.0 Identify the Goals of the Study

To meet the objectives, the following fundamental questions will need to be answered during the investigation:

Fundamental Questions	Alternative Actions
Do soils at individual properties in the vicinity of the former CDE facility contain PCBs above the USEPA action level of 1 ppm?	If soils contain PCBs above the action level, additional samples may be collected to delineate the full extent of the PCB contamination at the property.

	The property may also be remediated as appropriate. Action to be taken will be at the direction of the EPA. If soils do not contain PCBs above the action level no further action will be necessary.
Do indoor dust samples within individual properties in the vicinity of the former CDE facility contain PCBs above the USEPA action level of 1 ppm?	Properties with indoor dust containing PCBs above action levels will be remediated at the direction of EPA. If indoor dust does not contain PCBs above the action level, no further action will be necessary.
Do samples collected in the selected ROW areas in the vicinity of the former CDE facility contain PCBs above the USEPA action level of 1 ppm?	If soils contain PCBs above the action level, samples may be collected from individual properties adjacent to the ROW sample to determine if PCB contamination above the USEPA action level of 1 ppm is present. If soils do not contain PCBs above the action level no further action will be necessary.
Do confirmatory interior dust samples collected from properties in the vicinity of the former CDE facility that were cleaned in 2010 contain PCBs above the USEPA action level of 1 ppm?	Cleaned properties with confirmatory indoor dust containing PCBs above action levels will undergo additional cleaning at the direction of EPA. If indoor dust does not contain PCBs above the action level, no further action will be necessary.

The following decisions will need to be addressed:

- Determine which properties containing soil contaminated with PCBs above the USEPA action level will require additional sampling.
- Determine which properties associated with ROW soils contaminated with PCBs above the USEPA action level will require sampling.
- Determine which properties containing indoor dust contaminated with PCBs above the USEPA action level will require remediation.

3.0 Identify Information Inputs

The following inputs are required to answer the fundamental questions identified in Step 2 above:

- Gather any existing information from existing site maps and data files. The existing maps include soils data from past investigations conducted at OU-1

properties from June 1997 to May 1998, the RI in 2000, sampling by the remedial action contractor in 2006, and the Phase 1 soil data.

- Review existing PCB data for OU-1 properties.
- Review existing PCB data for OU-1 ROW areas.
- New data collection, with analysis to be performed on soil and interior dust samples. Total PCBs (as a sum of Aroclors) will be measured.
- The action level is established at 1.0 ppm in the ROD.
- Total PCBs will be measured in soil and interior dust extract using CLP or EPA Method 8082. The detection limit is well below the action level.

4.0 Define the Boundaries of the Study

The former CDE facility, also known as the Hamilton Industrial Park, is located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey. The former CDE facility consists of approximately 26 acres which contained buildings used by a variety of commercial and industrial tenants; the buildings were demolished by USEPA in 2008. The facility is bounded on the northeast by the Bound Brook and former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by the Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single-family residential properties; and on the northwest, across Hamilton Boulevard, by mixed residential and commercial properties.

The study being conducted focuses on the properties surrounding the former CDE facility. The physical boundaries of the of the investigation area have been defined by the USEPA as the entire area encompassing OU-1, which consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. The study area for OU1 vicinity properties is shown in Figure 2 of the FSP.

The following practical constraints and obstacles that may impede the sampling and interfere with the planned data collection:

- Delay of arrangements and permission to access the properties.
- Weather conditions at the site may prevent collection of samples as scheduled.
- Geological and physical conditions encountered at the sampling locations may interfere with the collection of a desired sample. If these conditions exist, it may be necessary adjusts the sampling schedule and possibly chose alternate sampling locations.
- Laboratory data may not meet the quality assurance criteria or reporting limit criteria and it may be necessary to re-sample locations.

5.0 Develop the Analytical Approach

The purpose of this step is to integrate the outputs from the previous steps into a statement that defines the conditions that would cause the decision maker to choose among alternative actions.

In order to evaluate the data obtained during this study, a population parameter that will be compared to the action level must be defined. Examples of this parameter include the mean of the population being analyzed, the median of the population being analyzed, or individual measurements. The USEPA will determine which population parameter will be compared to the action level.

The following primary decision rules will be used to answer the fundamental questions:

- If the soil on a property is found to contain Total PCB concentrations greater than 1.0 ppm, the contaminated soil will ultimately need to be excavated, backfilled with clean fill, and the property restored. The contaminated soil will then be transported to an off-site location for treatment and/or disposal as appropriate.

- If the soil in a ROW area is found to contain Total PCB concentrations greater than 1.0 ppm, the property(ies) adjacent to that ROW area will be sampled to determine if the property will require remediation.

- If the indoor dust within a property is found to contain Total PCB concentrations greater than 1.0 ppm, the property will require remediation (or additional cleaning, if previously remediated), and where necessary, the temporary relocation of residents during the indoor remedial activities.

6.0 Specify Performance or Acceptance Criteria

This step is to specify acceptable limits on decision errors which will be used by the decision maker to establish appropriate performance goals for limiting uncertainty in environmental data. These acceptable limits on decision errors allow decision makers to develop resource-effective sampling designs while limiting uncertainties in the collected data.

The USEPA has responsibility for data evaluation for remedial decision-making and will apply statistical tests as necessary to control decision errors.

There are two types of decision errors applicable to estimating the true value of a population:

1. Sampling design error, which occurs when the sampling design is unable to capture the complete state of natural variability over space and time; and

2. Measurement error, which refers to a combination of random and systematic errors, known as the total error and can be controlled by hypothesis testing; that is, selecting the null hypothesis (H_o) and the alternative hypothesis (H_a) and testing to reject or accept H_o. The null hypothesis is the baseline condition that is presumed to be true in the absence of strong evidence to the contrary.

The null hypothesis and alternative hypothesis are as follows:

H_o: Soils of the facility with data gaps do contain the contaminants of concern (COCs) at concentrations that exceed the action levels and will need to be remediated.

H_a: Soils of the facility with data gaps do not contain the COCs at concentrations that exceed the action levels and will not need to be remediated.

There are two types of decision errors:

1. The false rejection decision error (false positive), or Type I error, which occurs when the null hypothesis is rejected when it is true; and

2. The false acceptance decision error (false negative), or Type II error, which occurs when the null hypothesis is not rejected when it is false. In this case, the false rejection error concludes that the soil or indoor dust sample does not contain PCBs with concentrations that exceed the action level when the actual sample PCB concentration does exceed the action level.

The consequences of the false acceptance decision errors include the unnecessary expenditure of resources such as funding, personnel, and time. The consequences of the false rejection decision error are that the PCBs in the soils or indoor dust will not be remediated and will pose unacceptable risk to the environment or human health. Because of the possible severity of the false rejection decision error consequence, the false acceptance decision error is more tolerable than the false rejection decision error. The false acceptance decision error will occur when the analytical results are biased high, and the false rejection decision error will occur when the analytical results are biased low.

7.0 Develop the Plan for Obtaining Data

This step involves identifying the most resource-effective sampling and analysis design for generating data that are expected to satisfy project DQOs.

The consequence of the decision error will be balanced against the cost of limiting the possibility of these errors. These errors will be managed by the use of precise and accurate analytical methods, collection of duplicate samples, and use of accepted sampling techniques.

The approach to reducing the risk of error is to systematically perform soil and indoor dust sampling at each property following prescribed procedures. The sampling design will consist of selection of the properties within OU1 to sample based on previously collected curbside data and selection of representative sample locations at each property based on field observations and professional judgment. Louis Berger and the USEPA will be responsible for selecting the properties from which samples will be collected. A team of USEPA, USACE, and Louis Berger personnel will visit each selected property and map out individual soil sampling points based on yard size and shape. The size of the area sampled for indoor dust is driven by the volume required by the analytical laboratory and will be determined by the field team based on dust loading observed at the time of sample collection. The Field Sampling Plan, Appendix A to the QAAP, describes the sampling design that will be used to obtain the data in more detail.

To minimize unacceptable errors, laboratory analyses with a high degree of confidence and extensive quality assurance/quality control and documentation procedures will need to be utilized. Therefore, the USEPA Region II Division of Environmental Science and Assessment Laboratory or USEPA Contract Laboratory Program will be utilized whenever possible. If a non-USEPA sub-contract laboratory is utilized, it will be certified by the New Jersey Department of Environmental Protection and National Environmental Laboratory Accreditation Program. Analysis design will be performed by the analytical lab.

ATTACHMENT 1.2

Data Needs Table

DATA NEEDS TABLE

Data Need	Data User	Parameter	Method	QLs	Rationale for Analysis	Data Use
Surface soils	Remedial Design Team	PCB Aroclors	CLP SOM01.1 or SW846-8082	See Worksheet 15 for project QLs	Characterize the extent of Total PCB contamination above the USEPA action level in surface soils at properties in the vicinity of the CDE facility.	Determine whether or not additional samples and possible remediation will be needed.
Subsurface soils					Characterize the extent of Total PCB contamination above the USEPA action level in subsurface soils at properties in the vicinity of the CDE facility.	Determine whether or not additional samples and possible remediation will be needed.
Indoor dust					Characterize the extent of Total PCB contamination above the USEPA action level in indoor dust at properties in the vicinity of the CDE facility.	Determine whether or not remediation will be needed.

ATTACHMENT 2

SOP No. 1: Procedure to
Conduct Sample Management
for CLP and Non-CLP Samples

Procedure to Conduct Sample Management for CLP and non-CLP Samples

I. Introduction

This guideline is to provide reference information on sample management procedures.

II. Definitions

Contract Laboratory Program (CLP) – The U.S. Environmental Protection Agency (USEPA) CLP was developed to retain laboratory services that will ensure that all environmental samples collected under the Superfund Program will be analyzed in accordance with recognized USEPA laboratory methods and quality assurance/quality control (QA/QC) procedures. See http://www.epa.gov/superfund/programs/clp/ for detailed information on the CLP.

Target Compound List (TCL) – This is a list of organic compounds typically analyzed for by the CLP. The list is broken into three subdivisions: volatiles, semi-volatiles, and pesticides/polychlorinated biphenyls (PCBs).

Target Analyte List (TAL) – This is a list of inorganic parameters typically analyzed for by the CLP. Parameters on this list include heavy metals and cyanide.

Routine Analytical Services (RAS) – Laboratory analysis for parameters included on the TCL and/or the TAL in solid and aqueous samples.

Non-RAS – Laboratory analysis for substances or parameters not included on the TCL or the TAL. Also encompasses analysis of non-soil/sediment, non-aqueous matrices, and analysis of RAS compounds using non-RAS protocols.

Trip Blanks – Trip blanks are used to check for sample contamination originating from sample transport and shipping, as well as from site conditions. Trip blanks are necessary when aqueous environmental samples are collected for volatile organic analysis.

Rinsate Blanks – Rinsate blanks, also known as field blanks, are used to check the efficacy of sampling equipment decontamination procedures. Rinsate blanks are collected for each type of non-dedicated sampling equipment used onsite. Demonstrated analyte-free water is poured over the equipment, collected in containers, and analyzed for the analytes of concern.

Field Duplicate – Field duplicates are two separate samples collected from the same sampling location. Field duplicates are used to evaluate field sampling precision and are collected at a set frequency for each analyte group. For soils, a sample aliquot is homogenized and split into two sampling containers.

Matrix Spike/Matrix Spike Duplicates (MS/MSD) – MS/MSD analysis is the process by which standard mixes of various organic TCL compounds are added to field samples prior to extraction. The sample is then split into duplicates and analyzed. The analysis is used to

evaluate the matrix effect of the sample upon the analytical methodology. Triple volume of aqueous samples for MS/MSD analysis is collected in the field, at a frequency of at least 5 percent per matrix/concentration. No extra volume is required for the soil samples.

III. Guidelines

The use of sample management procedures during sample collection is intended to ensure that samples required during the site investigation are accounted for when the project is completed. The Sample Management Officer (SMO) is responsible for the implementation of sample management, and also for assuring that the proper QA/QC samples are collected. These goals can be achieved by adhering to the procedures and guidelines described in Sections IV, V, and VI below.

IV. Laboratory Coordination

Analysis of CLP Samples

For samples that will be analyzed through the CLP, a request must be made through the Regional Sample Control Center Coordinator (RSCC), prior to the initiation of sample collection activities, for assignment of a laboratory per USEPA Region 2 SOP No. HW-32: Standard Operating Procedure for Implementing the National Strategy for Procuring Analytical Services for All OSWER Programs, Revision 5, March 17, 2005. At this time, any requested modifications to the CLP SOWs must also be described [*e.g.*, lower detection limits, adding a parameter to the TCL or TAL list, requesting a quicker turnaround time (TAT)].

A description of how to request CLP services is included in the USEPA-issued Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-47, EPA 540-R-07-09, January 2011. This guidance document can be found online at the following URL: http://www.epa.gov/superfund/programs/clp/guidance.htm.

A request for CLP services generally includes the following steps:

1. Contact the RSCC well before the sampling event to discuss the CLP sample submission requirements. For USEPA Region 2, the RSCC is Adly Michael who can be contacted at 732-906-616187.

2. Fill out the RSCC request forms.

3. RSCC will contact the originator of the request with the Case Number and assigned laboratories. At times, the EPA Region 2 Division of Environmental Science and Assessment (DESA) Laboratory may choose to perform all or part of the analyses requested.

4. For a long-term project, weekly contact should be maintained with the RSCC.

For samples submitted to a CLP laboratory, either Forms II Lite or Scribe software must be used

by the samplers to record the sample information and to create CLP sample numbers and the required COC forms. Assistance with Forms II Lite can be obtained by calling the help desk at 703-818-4200 or by visiting the Forms II Lite web site at http://dyncsdao1.fedcsc.com/itg/forms2lite/. Scribe software can also be used for recording information on CLP samples. Per OSWER Directive No. 9200.1-103 issues November 1, 2010, Scribe will eventually replace Forms II Lite as the software for tracking CLP samples. Scribe software can be downloaded at http://www.ertsupport.org/scribe_home.htm. For technical questions about Scribe contact Joseph Schaefer at 732-906-6920.

Analysis of non-CLP Samples

Subcontractor laboratory(ies) will be procured for the project to conduct analysis of non-CLP parameters, as required. Weekly contact should be maintained with these laboratories to keep them informed of the status of the sampling program.

V. Preparation of Sample Containers

When CLP and/or DESA laboratory(ies) are used, certified clean sample containers must be purchased from an approved supplier. Copies of these certifications should be kept in the project files for future reference. When non-CLP laboratory (ies) are used, arrangements should be made with the subcontract laboratory to provide suitable, clean sample containers appropriate for each test.

It should be noted that non-CLP subcontract labs usually also provide coolers, but when samples are being sent to an assigned CLP lab or to the USEPA Region 2 DESA Laboratory, the samplers must make arrangements to obtain the coolers prior to the sampling event.

VI. QA/QC Samples

Rinsate Blanks

Rinsate blanks (or Equipment Blanks) are collected for each type of equipment used to collect samples at the frequency specified in the Quality Assurance Project Plan (QAPP). It is recommended that rinsates be collected at a minimum frequency of one per week and at a maximum frequency of one rinsate per location per day. Decontaminated equipment must be properly stored in an area and in a manner that will prevent cross contamination. The analyte-free water required for equipment decontamination and rinsate blank collection will be purchased from an approved supplier. If the samples are being analyzed by a subcontract lab reagent water should be obtained from the laboratory. Additional information on Rinsate Blanks is provided in SOP No. 5.

Where possible, composite rinsates will be collected from all equipment associated with a particular matrix for analysis of non-volatile parameters.

Rinsate blanks are collected using the following procedure:

1. Pour demonstrated analyte-free water over clean equipment.

2. Collect the water into sample containers.

3. Preserve, package, and ship to the analytical laboratory for analysis.

Field Duplicates

Samples for duplicate analysis are collected in the field for each matrix sampled, at the frequency described in QAPP. Sufficient quantity of matrix must be collected from the same sample location to fill a duplicate set of sample containers. The duplicate volume is shipped to the laboratory under a separate, "blind" sample ID (or CLP sample number).

For soil/sediment samples the volatile organic fraction is collected as co-located grab samples, while the non-volatile fraction is homogenized prior to collection. Due to the minimal sample mass obtained during dust sampling at OU1 conducted in 2008, no field duplicate samples will be obtained for interior dust during the 2011 investigation.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Matrix Spike/Matrix Duplicate (MS/MD)

MS/MSD analyses for organics are typically conducted for 1 in 20 environmental samples per concentration/matrix. Three times the total volume is necessary for collection of aqueous MS/MSD samples. No extra volume is required for the soil samples. MS/MSDs are noted as such on the chain of custody (COC).

VII. Sample Documentation, Packaging, and Shipping Procedures

One or more members of the field team should be designated as SMOs. The SMO will bear the ultimate responsibility for the documentation, packaging, and shipping of the samples. These procedures are outlined in the sections below.

Pre-Field Activities

If samples are being submitted to non-CLP labs, no special arrangements are required prior to the initiation of fieldwork. If samples are being submitted to CLP-assigned labs, the USEPA RSCC must be contacted for information regarding the following items prior to going out into the field:

- CLP Sample Numbers.
- SMO-assigned Case Numbers.
- Traffic Report/COC (TR/COC) Records.
- Chain-of-custody seals.

Refer to the USEPA CLP Guidance for Field Samplers, Chapter 2 for detailed instructions regarding pre-field activities. This document can be found in QAPP Attachment 11.

Documentation and Chain of Custody

For documentation purposes, the field team will enter information about each sample into the field logbook as they collect the sample. The information recorded should include but not be

limited to the following:

- The assigned sample number (sample ID).
- The CLP Number and Case Number (for CLP samples, only);.
- Method of sample collection.
- Sample date.
- Time of collection.
- Preservative(s) used.
- Analyses required.
- Sample type.
- Associated rinsate(s).
- Sampler's initials.

The same information should be included on the sample bottle label(s).

Once all of the samples have been collected, they should be grouped for shipment by receiving laboratory and the COC filled out. How the COC is set up and filled out varies between CLP and non-CLP laboratories:

- When samples are being shipped to a non-CLP laboratory, COC forms provided by the laboratory can be used.

- When samples are being shipped to a CLP-assigned laboratory, the COC and sample labels should be created and printed using the FORMS II Lite or Scribe software. The labels can be printed in the field using a laptop PC and printer. It is also possible to pre-print the labels using the FORMS II Lite or Scribe software prior to going to the field. Refer to the FORMS II Lite or the ERT User Manual For Scribe CLP Sampling for instructions on the use of the software. Scribe can also be used to create COCs for non-CLP samples. If circumstances require that handwritten sample labels must be used for CLP samples, follow the requirements in checklist Appendix E of the USEPA's CLP Guidance for Field Samplers.

Before placing a sample in a cooler, the sample label should be covered with clear tape. The sample labels should contain the following information:

- Company-designated sample number.

- For CLP samples only, the assigned CLP Sample Number and CLP Case Number must be recorded on each sample taken during a sampling event.

- The month, day, and year the sample was collected.

- The type of analysis requested.

- The type of preservation performed in the field.

CLP Documentation Requirements

A full description of the CLP documentation requirements are found in Sections 1.4 and 3.2 of USEPA's CLP Guidance for Field Samplers. Samplers must:

- Record the CLP Number and Case Number on each sample bottle.
- Complete the TR/COC Record using the Forms II Lite or Scribe software, making sure to indicate on the TR/COC Record if samples require the use of a Modified Analysis.
- Complete and attached sample labels.
- Complete and attach tags to meet Regional requirements.
- Complete and attach custody seals to meet Regional requirements.
- Complete field operations records, as necessary.

Contact the RSCC before the sampling event for information regarding the assigned CLP Sample Numbers, SMO-assigned Case Numbers, TR/COC Records and chain-of custody seals for sampling events. Under no circumstances should the site name appear on any documentation that is sent to the laboratory when shipping CLP samples.

Packaging and Shipping Samples

Below are guidelines for packaging and shipping samples. A checklist for packing CLP samples for shipment can also be found in Appendix E of the USEPA's CLP Guidance for Field Samplers.

1. Make sure the caps on the sample bottles are tightly sealed. Wipe down the outside of all of the sample bottles.
2. Preserve the samples according to requirements in the QAPP.
3. For CLP, apply one custody seal around the circumference of the container or over the cap and onto the sides of the container. The custody seal must applied to sample containers in such a manner as to reveal if the container was opened during transit.
4. Place containers in its individual zip-lock bag. Eliminate extra air space from the bag before sealing.
5. For CLP samples, place the associated sample tag into the zip-lock bag with the sample.
6. Prepare the shipping container (usually a cooler) so that no leakage can occur during shipping. Securely seal all valves using duct tape on both the inside and the outside of the cooler, and line with plastic or a larger garbage bag. Only coolers that conform

to the general design requirements in 49 CFR 173.410 should be used for shipment.

7. Put 1-2 inches of packing material in the bottom of the coolers, and then place the samples into the garbage bag in the cooler.

8. Surround the sample bottles with bags of ice (only the samples that need to be cooled – refer to the QAPP requirements for sample preservation). Prior to placement in the cooler, remove the ice from the original bag and re-pack into doubled zip lock bags. Use enough ice to ensure that the proper temperature (2-6°C) is maintained during transport. Place a temperature blank (40-mL vial filled with DI water and labeled as "temperature blank") into the cooler.

9. Place packing material over and around the sample bottles. Sufficient packing material must be used so the bottles will not move or break during transport.

10. Once the samples are packed, close and securely tie or tape the plastic or garbage bag.

11. Fill in the "relinquished by" and "received by" sections of the COC prior to shipment. The SMO should fill in the name of the commercial shipper (courier) and add the airbill number, if applicable, as the courier generally will not sign the COC.

12. Make enough copies of the COC form(s) to allow for placement of one set in each cooler that is not the lead cooler. Seal the original COC form in a ziplock bag and tape to the inside of the lead cooler, and seal one copy of the COC form(s) in a ziplock bag and place in each of the other cooler(s).

13. For CLP samples, retain one copy of the COC form for the SMO and one copy for transmission to the RSCC (send within 1 day). For non-CLP samples, retain one copy of the COC form for the SMO.

14. Close the cooler and seal with strapping tape. If visibly dirty, wipe down the outside of the cooler. Apply two signed and dated custody seals to the cooler diagonally across from each other where the cooler lid meets the cooler. Apply the custody seals in such a manner as to reveal if the cooler was opened during transit.

15. Place an address label on the outside of each cooler and cover with clear tape. If more than one cooler is being sent to one destination, label each cooler appropriately, *e.g.*, 1 of X, 2 of X, etc. Attach the airbill to one of the coolers. Generally, the samples are sent via overnight carrier for next day delivery. This should be confirmed with the Field Team Leader.

16. Notify the laboratory of the shipment before 9:00 a.m. on the day after shipping. For CLP samples, fill out the Sample Shipping Call-In Form. Call or fax the shipping information to RSCC by 9:00 am the following morning. For non-CLP samples, follow the notification system agreed to in the subcontract.

17. Instructions for shipping and packaging CLP samples can be found in the CLP Guidance for Field Samplers. Appendix E of the guidance contains sampling checklist which should be followed.

Note: Some samples have very short holding times. In some limited instances, the samples may need to be either hand delivered to a laboratory or picked up by the laboratory's courier service.

VIII. References

USEPA 2007, Introduction to the Analytical Services Branch (ABS) Contract Laboratory Program, EPA 540-R-07-02, OSWER 9240.0-42, January 2007

USEPA 2011. Contract Laboratory Program Guidance for Field Samplers, OSWER 9240.0-47, EPA 540-R-07-09, January 2011

FORMS II Lite, Version 5.1, User's Guide

ERT User Manual for Scribe CLP Sampling, June 11, 2010

ATTACHMENT 3.1

Example of CLP Chain of
Custody Form

Example CLP Chain of Custody Form

USEPA Contract Laboratory Program
Organic Traffic Report and Chain of Custody Record

Case No:
DAS No:
SDG No:

	Chain of Custody Record		For Lab Use Only
Date Shipped:		Sampler Signature:	
Carrier Name:	Relinquished by: (Date/Time)	Reveived by: (Date/Time)	
Airbill:	1.	1.	Lab Contract No:
Shipped to:	2.	2.	Unit Price:
	3.	3.	Transfer to:
	4.	4.	

CHAIN OF CUSTODY

Organic Sample No.	Matrix	Sampler	Conc/Type	Preservative	Location	Collection Date/Time	PCB Aroclors (SOM01.1)					Remarks	For Lab Use Only Sample Condition Upon Receipt
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													

Shipment for case complete (Y or N)?	Sample to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature upon receipt:	Chain of Custody Seal Number:	
Concentration: L = low, M = low/medium, H = High		Type/Designate: C = Composite, G = Grab		Custody Seal Intact?	Shipment Iced?

Note: Forms II Lite Software must be used to create COC for CLP samples.

ATTACHMENT 3.2

Example of Non-CLP Chain of Custody Form

EXAMPLE OF NON-CLP CHAIN OF CUSTODY FORM

Chain of Custody Record	TAT: PCB Aroclors: _____ Other: _____	**Case No:** _____ DAS No: _____ SDG No: _____

Date Shipped:	**Chain of Custody Record**	Sampler Signature:	**For Lab Use Only**
Carrier Name:	Relinquished by: (Date/Time)	Received by: (Date/Time)	
Airbill:	1.	1.	Lab Contract No:
Shipped to:	2.	2.	Unit Price:
	3.	3.	Transfer to:
	4.	4.	

CHAIN OF CUSTODY

Field Sample ID	Matrix	Sampler	Conc/Type	Preservative	Location	Collection Date/Time	PCB Aroclors in Soil	PCB Aroclors - Dust									Remarks	For Lab Use Only Sample Condition Upon Receipt
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		

Shipment for case complete (Y or N)?	Sample to be used for laboratory QC:	Additional Sampler Signature(s):		Cooler Temperature upon receipt:	Chain of Custody Seal Number:
Concentration: L = low, M = low/medium, H = High		Type/Designate: C = Composite, G = Grab			Custody Seal Intact? / Shipment Iced?

Forms II Lite Software should be used to create COC for samples submitted to CLP lab.

ATTACHMENT 4

Field Modification Form

FIELD MODIFICATION FORM
FOR
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE OU-1
The Louis Berger Group

Date:

Document:

Activity:

Requested Modification:

Rationale:

Attachments:

Project Manager: _____

Deputy Project Manager: _____

Project Quality Control Officer: _____

ATTACHMENT 5

SOP No. 6: Technical System Audit

Procedure to Conduct a Technical System Audit (TSA)

I. Introduction

This guideline is to provide information on TSAs to be conducted for the Cornell Dubilier Electronics Superfund Site.

II. Guidelines

The purpose of the TSA is to ensure that the sampling team adheres to the guidelines contained in the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). Prior to conducting the audit, a copy of the FSP and QAPP will be reviewed by the auditor Project Quality Control (QC) Officer or designee). During the TSA the sampling team's adherence to these guidelines will be verified and any deficiencies from the guidelines will be documented. The effect of the deficiencies will be noted, and any necessary corrective actions will be instituted.

Prior to conducting the audit, the auditor will contact the Deputy Project Manager (DPM) to discuss the audit. This will ensure that the sampling team is properly prepared for the sampling event.

A. Conducting the TSA

The following procedures will be used to conduct the TSA:

1) The auditor will bring the following equipment/documents into the field:

- Copy of the FSP and QAPP and any relevant memos, correspondence or addenda
- TSA audit checklist
- Digital camera

2) The following aspects of the sampling event will be audited:

- QA/QC samples
- Sampling methodologies
- Field documentation
- Sample management tasks
- Decontamination procedures

B. Corrective Action in the Field

Besides observing and reporting, the auditor is responsible for initiating steps for the start-up of corrective action procedures.

If the auditor witnesses discrepancies in the field between the FSP and QAPP and the performance of the sampling team, the auditor has several options available for corrective action. These options are dependent upon the type of deficiencies observed.

Deficiencies observed and the corrective action taken must be documented in the auditor's log book.

- Minor Deficiencies

  Minor deficiencies are problems where the impact, if any, to the data can be easily eliminated and the deficiency can be corrected or the procedure repeated to achieve the desired result. Minor deficiencies that are observed by the auditor will immediately be brought to the attention of the field team. The auditor and the field team will discuss the problem and agree upon what corrective action is necessary. This will allow for the deficiencies to be corrected immediately in the field.

- Major Deficiencies

  Major deficiencies are events or actions that substantially deviate from approved work plans, will result in increased project costs not previously approved, or will significantly impact the quality of the data.

  Upon witnessing a major deficiency, the auditor will temporarily stop all related site work and will inform the field team of the problem. The auditor and field team will discuss the deficiency as well as what steps are necessary for corrective action. If the deficiency can be corrected in the field, the auditor may allow work to resume as long as all necessary corrective actions are taken. Information regarding the nature of the deficiency as well as the corrective action(s) taken will immediately be transmitted to the USACE Project Manager (USACE PM), the Malcolm Pirnie Project Manager (PM), and the DPM.

If the deficiency cannot be corrected in the field, a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem. A written report of the major deficiencies will be prepared by the Project QC Officer and submitted to the USACE PM, the Malcolm Pirnie PM, and the DPM. The Stop-Work Order will remain in effect until the proper corrective action(s) can be implemented.

C. Preparation of a TSA Report

The TSA report provides a means of relaying the events of a sampling episode to key personnel. These events could possibly affect the sample integrity (QA/QC) and therefore, are important to the decisions made regarding analytical data. This report will identify any deficiencies found in the field and will outline the corrective actions that were recommended/implemented to address any minor deficiencies observed. The field audit report will also recommend appropriate corrective actions for any major deficiency noted. Follow-up reports describing completed corrective actions which addressed major deficiencies will be submitted by the Malcolm Pirnie PM to the USACE PM.

A quality control field audit report will usually contain the following information:

- Date and location of field audit
- Sample matrices witnessed
- Name of personnel conducting the sampling
- Summary of sample methodology
- Description of any infractions that occurred and the corrective actions taken
- Conclusions
- Recommendations
- Quality control field audit checklist

The following are examples of audit checklists:

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: _____

2. PROJECT ADDRESS: _____

_____

_____

3. INVESTIGATION _BUILDING MATERIALS _____ SOILS_____

_PRE-REMEDIAL ACTION OF VICINITY PROPERTY: _____

4. DATE(S) OF QC FIELD AUDIT _____

5. AUDITOR'S NAME _____PHONE_____

6. FACILITY CONTACT _____PHONE_____

7. CONTRACTOR CONTACT_____PHONE_____

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE

9. AUDITOR'S COMMENTS

_____

_____

_____

_____

10. WEATHER CONDITIONS

SUNNY ; PARTLY SUNNY ; PARTLY CLOUDY ; CLOUDY ; RAIN ; DRIZZLE ; SNOW ; SLEET

TEMPERATURE_____ WIND SPEED_____ WIND DIRECTION_____

QUALITY CONTROL FIELD AUDIT REPORT, Continued

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN

A B C D

LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER	_____	_____	_____	_____
DISSOLVED O_2 METER	_____	_____	_____	_____
PH METER	_____	_____	_____	_____
COMBUSTIBLE GAS INDICATOR (LEL/O_2)	_____	_____	_____	_____
FLAME IONIZATION DETECTOR (OVA)	_____	_____	_____	_____
PHOTOIONIZATION DETECTOR (HNU)	_____	_____	_____	_____
TOTAL GAS INDICATOR (CO, HS)	_____	_____	_____	_____
OTHER _____	_____	_____	_____	_____

OBSERVATIONS _____

_____

_____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS?

YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS?

YES NO N/A

15. WERE PHOTOGRAPHS TAKEN? YES NO

16. AUDITOR'S COMMENTS

_____

_____

_____

NON-AQUEOUS SAMPLE INFORMATION

1. NON-AQUEOUS MATRIX SAMPLED:

SOIL SEDIMENT SLUDGE CHEMICAL SOLIDS WASTE PILE

OTHER _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE - SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST FROM A DISCRETE LOCATION PRIOR TO HOMOGENIZATION?

YES NO N/A

4. WAS THE SAMPLE HOMOGENIZED PRIOR TO ACQUISITION INTO THE SAMPLE CONTAINERS? YESNO

5. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
SPOON/SPATULA	_____	_____	_____	_____
TROWEL/SCOOP	_____	_____	_____	_____
BUCKET AUGER	_____	_____	_____	_____
SPLIT SPOON	_____	_____	_____	_____
SHELBY TUBE	_____	_____	_____	_____
TRIER	_____	_____	_____	_____
PONAR DREDGE	_____	_____	_____	_____

6. WAS THE DRILL RIG, AUGER FLIGHTS, RODS, ETC. DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH SAMPLE LOCATION? YESNO N/A

IF NO, METHOD OF DECONTAMINATION _____

7. IF MUD ROTARY DRILLING WAS UTILIZED WHAT WAS THE SOURCE OF THE WATER? _____

8. WAS THE SAMPLING EQUIPMENT DEDICATED? YES_____ NO _____

9. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED? FIELD DECONTAMINATED?

10. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES?

YES NO IF NO, METHOD OF DECONTAMINATION: _____

11. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION? YES NO N/A

12. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION? YES NO N/A

13. AUDITOR'S COMMENTS

_____

_____

QA/QC INFORMATION

1. LABORATORY:

NAME _____ PHONE _____

CONTACT PERSON _____

CLP CLP CAPABLE CERTIFIED OTHER _____

2. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION

3. WHAT ORDER BY ANALYTICAL PARAMETER ARE SAMPLES COLLECTED: _____

_____

4. FIELD BLANKS: YES NO N/A FREQUENCY _____

METHOD: _____

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED? YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY _____

6. WHAT WAS THE SOURCE OF THE BLANK WATER? LABORATORY DEMONSTRATED ANALYTE-FREE
OTHER_____

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PRESERVED TO $4^{B}C$:	YES	NO	N/A

8. AUDITOR'S COMMENTS

_____

_____

_____

_____

ATTACHMENT 6

SOP No. 5: Procedure to
Conduct Collection of
Equipment Blanks

Procedure to Conduct Collection of Equipment Blanks

I. Introduction

This guideline provides procedures on the collection of equipment blanks associated with sample collection. Data from equipment blank analysis is considered during the subsequent validation, review, and interpretation of generated data.

II. Definition

Equipment blanks are often called rinse blanks or rinsate blanks. Equipment blanks are rinse water samples taken from clean sample containers and sampling equipment to determine if residual contaminants are present on the equipment prior to sampling. If contamination is present, the decontamination procedure or source of equipment must be modified to eliminate non-sample contamination. Frequency of equipment blanks will be based upon the requirements set forth in the QAPP, but typically should be collected at a rate of one per 20 environmental samples, at least one per week, or one per decontamination event, whichever is more frequent, but no more than one per day.

The following is the definition of equipment blank from the USEPA publication EPA-505-B-04-900A, Uniform Federal Policy for Quality Assurance Project Plans, March 2005:

Equipment blanks – A sample of water free of measurable contaminants poured over or through decontaminated field sampling equipment that is considered ready to collect or process an additional sample. The purpose of this blank is to assess the adequacy of the decontamination process.

III. Safety

Wear goggles and gloves when working with and collecting the blank rinse water samples. Also, conform to other safety and clean-hands practices, as appropriate. Perform the procedure with a helper if possible. Clean up all spilled water and sample preservatives immediately.

IV. Supplies

1. 1 Liter Sample bottles and labels
2. Sample preservative (Ice)
3. Plastic sheeting
4. Aluminum foil
5. Gloves
6. Goggles
7. Paper towels

V. Procedure

If the samples will not be going through the CLP Program for laboratory analysis, contact a subcontract commercial laboratory and inform them that you will be collecting equipment blanks and request sample bottles, preservatives, labels, and chain-of-custody forms. Also ask the

laboratory for specifics on the volume of water they require for each parameter and which parameters may be combined into the same sample bottle. If possible, have the laboratory supply the analyte-free water that will be used to collect the equipment blank.

If the samples will be going to a CLP laboratory, obtain the bottles and all necessary supplies, including analyte-free water, from the company equipment facility or supplier. The bottles need to be certified pre-cleaned. All preservation and holding time requirements as per aqueous (water) samples apply. See Table 1: below for the preservation and holding time requirements for the PCB equipment blanks. The following guidelines should be followed when collecting the soil sampling equipment blanks:

1. The equipment blank must be collected in a designated clean area of the site or field office. Spread out new plastic sheeting on a work surface, and have paper towels handy to wipe up accidental spills.

2. Label the capped sample bottles with an identification number that will later be used for cross-referencing with the associated environmental samples. All other label information will also need to be filled out prior to shipment to the laboratory. Place clear tape over the label to prevent the information on the label from being smeared if it should get wet. Record all information into the field logbook, consistent with regular sample collection procedures.

3. Put on gloves and goggles. Change gloves when handling different sets of decontaminated equipment.

4. If large stainless steel bowls will be used during soil sampling/processing activities and will require decontamination, use the decontaminated bowls to initially collect the rinsate water from the soil sampling equipment (*e.g.*, hand auger bucket). If the bowls are wrapped in aluminum foil, unwrap prior to use. Minimize the handling of decontaminated equipment to prevent the introduction of new contamination.

5. Unwrap all other equipment (trowels, spoons, auger heads, etc.) and place in the bowl. Larger equipment that does not fit in the bowl should be handled last. If large bowls will not be used during soil sampling/processing activities, consider utilization of other types of decontaminated equipment during the blank collection process that can hold water. Otherwise, the rinsate water will need to be captured directly into the sample bottles.

6. Pour analyte-free water slowly and liberally over the surfaces of the equipment that are expected to come into contact with sample material. Collect the analyte-free water in the laboratory jar after it has rinsed the sampling equipment.

7. Place sample bottles into zip-lock bags and then immediately into cooler(s) containing large amount of bagged ice. Cushion bottles to prevent breakage, but not with bags of ice. Ice will lose its cushioning abilities when melted.

8. If purchased 4-L analyte-free water was used and there is substantial remaining in an opened bottle, recap the bottle tightly and place a signed and dated custody seal over the cap and neck of the bottle. The bottle of water may be used for the next equipment blank collection, and can be stored until the vendor's expiration date on the bottle or one year from opening, whichever is sooner. When ready, pack and ship equipment blanks consistent with shipping procedures.

Table 1: Aqueous Sample Handling Requirements

Parameter	**Containers**	**Preservation**		**Maximum Holding Time From Collection to Analysis[1,2]**
		Temperature	**Other**	
PCB Aroclors	2 x 1-L Glass with Teflon lined caps	Cool 4°C ±2°C	Store in dark	7 days

1. Refer to the CLP SOW requirements or the applicable EPA method.

2. Contact EPA RSCC for samples going through the CLP Program. If a non-CLP is used they should be contacted regarding what sample volumes, preservatives, and type of sample bottles they recommend. Refer to the determinative method or laboratory for parameters not specified in the table above.

VI. Reference

SOP No. 5: Procedure To Conduct Collection of Equipment Blanks, Attachment 9, Cornell-Dubilier Electronics Superfund Site Soils OU-2 QAPP.

ATTACHMENT 7

Non-Conformance Report

CORNELL DUBILIER ELECTRONICS SUPERFUND SITE
NON-CONFORMANCE/QUALITY CONTROL REPORT

Date: _____

Organization Name: _____

Initiator's Name & Title: _____

Problem Description:

_____
_____
_____
_____
_____
_____
_____

Reported To: _____

_____

Corrective Action:

_____
_____
_____
_____
_____
_____
_____

Reviewed and Implemented by: _____

ATTACHMENT 8

Daily Quality Control Report

DAILY QUALITY CONTROL REPORT

Site: _____
Project No.: _____
Date: _____
Field Team: _____
_____

Weather (circle)

	Bright Sun	Clear	Overcast	Rain	T-Storm	Snow
Temp:	0 to 32	32 to 50	50 to 70	70 to 85	> 85	
Wind:	Still	Gusty	Moder.	High	Direction:	
Humidity:	Dry	Moder.	Humid			

Subcontractors and Equipment on Site: _____

Health and Safety Levels: (circle)

D	Mod. D	C	B	A

Summary of Health and Safety Activities: _____

Instrument Used: (circle)	PID	LEL	pH	Cond	Therm.	Turbidity	DO	ORP
Calibrated: (check)								

For actual calibration results, see field calibration forms.

Summary of Work Performed: _____

All samples were collected according to the procedures outlined in the planning documents?

Yes _____ No _____

Problems encountered/corrective actions taken: _____

Time Project Manager Contacted: _____

Problems encountered/corrective actions taken: _____

Name: _____ Signature: _____

ATTACHMENT 9

NEA Laboratory SOPs

(only to be utilized if CLP
cannot perform analyses)

STANDARD OPERATING PROCEDURE

EXTRACTION AND CLEANUP OF SOIL, SEDIMENT, AND SOLID SAMPLES BY SOXHLET EXTRACTION FOR POLYCHLORINATED BIPHENYL ANALYSIS

Reference Methods: EPA METHOD 3540C

LOCAL SOP NUMBER:	NE005_07
EFFECTIVE DATE:	03/28/2011
SUPERSEDES:	NE005_06
SOP TEMPLATE NUMBER:	SOT-ALL-Q-006-rev.03

APPROVALS

Dan Pfalzer Assistant General Manager	03/28/2011 Date
Christina L. Braidwood Quality Manager	03/28/2011 Date

PERIODIC REVIEW

SIGNATURES BELOW INDICATE NO CHANGES HAVE BEEN MADE SINCE PREVIOUS APPROVAL.

Signature	Title	Date
Signature	Title	Date
Signature	Title	Date

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PACE ANALYTICAL SERVICES, INC.
2190 TECHNOLOGY DRIVE
SCHENECTADY, NY 12308
(518) 346-4592

STANDARD OPERATING PROCEDURE

LABORATORY PROCEDURE NE005_07.DOC

REVISION 7 (03/28/2011)

1.0 IDENTIFICATION OF TEST METHOD

1.1 This is the Standard Operating Procedure for the extraction and cleanup of soil, sediment, and solid samples for Polychlorinated Biphenyl (PCB) analysis using the Soxhlet extraction technique by SW-846 Method 3540C for subsequent analysis by SW-846 Method 8082.

1.2 The purpose of this SOP is to provide the chemist with the procedures required to perform the extraction of PCBs, in soil/sediment/solid sample, using the soxhlet extraction technique and to perform the subsequent extract volume reduction and cleanup.

2.0 APPLICABLE MATRICES

2.1 This test method is appropriate for soil, sediment, and solid samples. Other extraction methods such as the sonication technique and automated solvent extraction may be used in place of the soxhlet extraction at the discretion of the supervising chemist and project requirements.

2.2 Time restraints (i.e. requested turn around time) may render this method inapplicable, as it requires 18 ± 2 hours of extraction reflux time.

2.3 Extract cleanup steps employed may vary from sample to sample and matrix to matrix. The chemist must have an understanding of the methods and requirements of USEPA-SW- 846A "Test Methods for Solid Wastes" Volume 1B: Lab Manual, 3rd edition. Methods 3540, 3500, 2500A. An approved instructor must also certify the chemist to perform the procedure.

3.0 DETECTION LIMIT

3.1 Please see determinative method (Lab SOP NE148) for details.

4.0 SCOPE AND APPLICATION

4.1 The following procedure is utilized by Pace Analytical, Inc. for the extraction and cleanup of PCBs from soil/sediment/solid samples using the soxhlet extraction method for analysis by SW-846 Method 8082.

5.0 SUMMARY OF TEST METHOD

5.1 Samples are initially dried utilizing sodium sulfate (soil/sediment) or 1:1 magnesium:sodium sulfate (biota samples).

5.2 The samples are then loaded into pre rinsed cellulose extraction thimbles. These loaded thimbles are then placed into soxhlet extractor apparatus where they are spiked and surrogated.

5.3 After an 18 ± 2 hour extraction the derived solvent is exchanged to pure hexane via a TurboVap evaporator system.

5.4 The extract is set to volume and put through a clean up. This cleanup is composed of several steps including acid, TBA, Florisil, and mercury.

5.5 The extract is then properly diluted and submitted for GC analysis.

6.0 DEFINITIONS

6.1 **Surrogate Standard Solution:** The chemical composition and chromatography of surrogates are similar to the analytes of interest. They are usually not found in environmental samples. These compounds are spiked into all samples, blanks, and matrix spike samples prior to extraction. Percent recoveries are calculated for each surrogate.

6.2 **Laboratory Method Blank:** A laboratory derived sample consisting of a sodium sulfate that is carried through all extraction and cleanup steps. The laboratory method blank is used to define the level of laboratory analyte background or other interferences that exist in the laboratory environment, the reagents, or extraction apparatus.

6.3 **Laboratory Control Spike (LCS):** Also known as the Quality Control (QC) Check Standard or Quality Control (QC) Check Sample. The LCS consists of sodium sulfate to which known quantities of the method analytes are added. The LCS is extracted and cleaned up exactly like a field sample, and its purpose is to determine whether the analysis is in control and whether the laboratory is capable of making accurate and precise measurements.

6.4 **Lab Control Standard Duplicate:** An exact copy of the Lab Control Standard to further assess analyte recovery efficiency.

6.5 **Matrix Spike (MS):** An aliquot of a field sample that is fortified with known quantities of the method analytes and is carried through all the extraction and cleanup steps. Its purpose is to assess the appropriateness of the method for the matrix by measuring the recovery of the method analytes.

6.6 **Sample Matrix Spike Duplicate (MSD):** An exact copy of the Matrix Spike. This is an aliquot of a field sample which is fortified with known quantities of the method analytes and is subject to the entire procedure. Its purpose is to assess the appropriateness of the method for the matrix by measuring the recovery of the method analytes.

6.7 **QC-Quality Control:** A set of measures for each sample within an analysis methodology to assure that the process is in control.

7.0 INTERFERENCES

7.1 Laboratory contamination can occur by the introduction of plasticizers (phthalate esters) into the samples through the use of certain plastics. Phthalate esters respond on electron capture detectors, usually as late eluting peaks, and can interfere in PCB quantification. Samples and extracts should not be exposed to plastics such as gloves, tubing, coating on clamps, and pipette bulbs, etc.

8.0 SAFETY

8.1 The chemist should have received in-house safety training and should know the location of first aid equipment and the emergency spill/clean-up equipment, before handling any apparatus or equipment. Safety glasses, a lab coat and gloves must be worn when handling glassware and samples. Polychlorinated biphenyls have been tentatively classified as known or suspected carcinogens. The chemist must review the Material Safety Data Sheets (MSDS) for PCBs and all reagents used in the procedure before handling them. All equipment and solvents should be handled within a lab fume hood.

9.0 EQUIPMENT AND SUPPLIES

9.1 **Water Cooled Condenser:** Pyrex 45/50 #3840-MCO.

9.2 **250mL Round Bottom Flask:** Pyrex #4100.

9.3 **Soxhlet Repetitive Flushing (reflux) Unit:** 45/50 Pyrex #3740-M.

9.4 **Heating Mantle**: Type "VF" laboratory heating mantle #HM0250VF1. (or equivalent)

9.5 **Heating Mantle Controller:** Glass-Col #PL3122 Minitwin (or equivalent) regulates temperature control of the mantle.

9.6 **Analytical Balance**: Mettler PL-303 used to determine sample mass. (or equivalent)

9.7 **Cellulose Extraction Thimble:** Contains sample during soxhlet extraction.

9.8 **TurboVap Evaporator:** Zymark #ZW640-3. (or equivalent)

9.9 **TurboVap Evaporator concentrator tubes:** Zymark 250mL, 0.5mL endpoint.

9.10 **Beakers:** Assorted Pyrex: 250mL, 600mL, and 1000mL, used for liquid containment and pipette storage.

9.11 **Vials:** glass, 40mL & 4 dram (with Polyseal cap) for sample extracts.

9.12 **Vial Rack:** Plastic rack used to hold vials, during all phases of the extract processing.

9.13 **Centrifuge:** International Equipment Co., Model CL. (or equivalent)

9.14 **Wrist Shaker:** Burrell wrist action shaker, Model 75 and 88. (or equivalent)

9.15 **Pipettes:** S/P Disposable Serological Borosilicate Pipettes.
- 9.15.1 **1mL** X 1/10
- 9.15.2 **5mL** X 1/10
- 9.15.3 **10mL** X 1/10
- 9.15.4 **Fisher Pasteur Borosilicate glass pipette** 9" #72050 (or equivalent)

9.16 **4oz. Jars:** Industrial Glassware

9.17 **Chiller:** Pump driven water circulating cooling system cool flow #75 NESLABS Instruments, Inc. (or equivalent).

10.0 REAGENTS AND STANDARDS

10.1 **Sodium Sulfate:** Anhydrous (12-60 Mesh). Used for the laboratory method blank and laboratory control spike.

10.2 **Boiling Chips:** Chemware PTFE Boiling Stones P#0919120 (or equivalent)

10.3 **Hexane:** High Purity Solvent Baxter (Burdick/Jackson) #UN1208. (or equivalent)

10.4 **Acetone:** High Purity Solvent Baxter (Burdick/Jackson) #UN1090. (or equivalent)

10.5 **1:1 Hexane/Acetone:** 50%/50% by volume solvent mixture prepared in the lab.

10.6 **Florisil:** deactivated, **SEE SUPERVISOR FOR THE APPROPRIATE FLORISIL DEACTIVATION CONCENTRATION TO BE USED.**

10.7 **TBA Reagent:** Tetrabutylammonium Hydrogen-Sulfite Reagent. (prepared in the laboratory as per NE283)

10.8 **Mercury:** Triple distilled Mercury Waste Solutions, Inc, (or equivalent)

10.9 **Sulfuric Acid:** Na_2SO_4 (concentrated) Mallinkrodt #2468 #UN1830. (or equivalent)

11.0 SAMPLE COLLECTION, PRESERVATION, SHIPMENT and STORAGE

11.1 Samples should be collected in 4oz. Teflon coated jars from the sampling site.

11.2 The samples must be chilled to 4 ± 2° C on the day of collection and maintained at that temperature until analysis. Field samples that will not be received at the laboratory on the day of collection must be packaged for shipment with sufficient ice to ensure that they will be at 4°C on arrival at the laboratory.

11.3 Solid samples have a hold time of 14 days from date of collection. They need to be extracted within this time.

11.4 The extracted solvents must be analyzed within 40 days of their extraction date.

12.0 QUALITY CONTROL

12.1 The extraction chemist should have completed an acceptable demonstration of precision and accuracy before performing the method without supervision. The addition of spiking material to a sample or blank must be witnessed by another extraction chemist and signed in LIMS. All surrogates and matrix spikes must meet acceptable QC limits

12.2 A method blank sample and lab control spike must be prepared per each extraction batch or 1 per 20 site samples whichever is more frequent. A matrix spike/lab duplicate should be prepared for every 20 site samples or as per client specified quality assurance project plan (QAPP). The spike default for LCS, MS is 1.0mL of A1242 @ 12.5ppm. Client and/or project specifications may dictate alternate amount or Aroclor.

12.3 PCB Surrogates TCMX and DCBP are added to each sample prior to extraction to measure extraction/cleanup efficiency. Default surrogate is: 0.5mL of 0.5ppm TCMX / 5.0ppm DCBP in hexane. Client and/or project specifications may dictate alternate amount.

13.0 CALIBRATION AND STANDARDIZATION

13.1 The analytical balance is calibrated daily to ensure accurate measurements are made when weighing out soil samples for extraction.

13.2 Please see determinative method (Lab SOP NE148) for details.

14.0 PROCEDURE

14.1 Sample Preparation

14.1.1 Throughout the entire process it should be noted that if the chemist encounters any problems or difficulties with any samples or steps involved, all work should **STOP!** Any problems should be brought to the attention of the supervisor and documented in the Laboratory Information Management System (LIMS).

14.1.2 Before any steps are taken, the chemist should first review the job sheet and verify the sample IDs on the bottle against the chain of custody. If there is a discrepancy on either the sample label or the chain of custody, this should be documented in LIMS and brought to the attention of the sample receiving supervisor.

14.1.3 If the sample is sediment and contains a water layer, decant and discard the layer as aqueous PCB waste. Mix the sample thoroughly in the sample jar. If there is not enough room to mix in the sample container, remove sample from container into a mixing tray using a metal spatula. Mix the sample thoroughly and discard any foreign objects such as sticks, rocks or leaves. Then place the sample back into the sample container before using. **Note** however that the sample may be composed entirely of rock, concrete or some other solid material in which case the entire sample is treated as the solid.

14.1.4 If the PCB concentration is to be determined on a dry weight basis, the percent total solid must be determined. Weigh approximately 5grams of the previously homogenized sample into a previously weighed, aluminum weighing pan. Record the weight of the pan and the weight of the pan with sample into LIMS. Place the sample in a drying oven at 100 to 110°C for at least 4 hours. Record the time placed in the oven and the oven temperature in LIMS. Remove the samples from the drying oven and allow to cool. Weigh the pan and sample.

Record the time out of the oven, the temperature of the oven at that time, and the final weight of pan with sample in LIMS. Dispose of the pan and dry sample appropriately.

Note: pushing the F12 button on the keyboard will automatically read in the weight from the scale and place it in the weight field in LIMS. All weights should be recorded in this manner.

14.1.5 Label a 4oz. jar for each sample. Rinse an extraction thimble for each sample with hexane and place in each labeled jar in a hood to dry. This will remove any extraneous material from the thimbles.

14.2 Sample Extraction

14.2.1 Weigh out approximately 10g of sample into a labeled 4oz. jar. Sodium sulfate is used as matrix for QC samples. Record the weight in LIMS.

14.2.2 Using a metal spatula, mix each sample with enough sodium sulfate to dry it. The sample should be free-flowing with no clumps. Load each sample and QC sample into its pre-rinsed and dried thimble. **Note:** Be careful not to add too much drying agent to the sample. If too much is added the sample may not fit completely in the thimble. In this case the sample will have to be split into two different thimble/soxhlet extractors.

14.2.3 Obtain enough 250mL round bottoms and soxhlets for each sample. Inspect the glassware for cracks or chips that will allow solvent to leak out. Add several boiling chips and 200mL of 1:1 Hexane:Acetone to each round bottom. Place a soxhlet extractor on top of the round bottom and label each round bottom with a sample number. Record the round bottom and soxhlet used for each sample in LIMS.

14.2.4 Using tweezers, place the loaded thimble into the corresponding soxhlet extractor. Rinse the tweezers with hexane between each sample.

14.2.5 Add surrogate to all samples and spike to the appropriate QC samples. The surrogate and spike should be added directly to the sample in the thimble.

14.2.6 Using hexane, rinse the inside and the outer connecting joint of the condenser units to be used. Turn on the chiller units that will be used to cool the condensers.

14.2.7 Place the soxhlet extractors into heating mantles and attach the condensers. Turn on the corresponding control units to a setting of 5.5. Double check the soxhlet and round bottoms at this time for cracks or chips.

14.2.8 Once the solvent begins to boil, a flushing action of 4-6 flushes per hour should be reached. Allow the extraction to proceed for 18hours ± 2 hours (usually overnight).

14.2.9 After the extraction time has finished, turn off the heating mantles and allow the samples to cool to room temperature. Rinse the inside of the condenser with several pipette volumes of hexane. Disengage the soxhlet extractor from the condenser, rinse the connecting joint into the soxhlet, and remove to a fume hood.

14.2.10 Tip the extractor to flush the solvent remaining in the soxhlet into the round bottom. Using a pair of long-handled tweezers, pull the thimble to the top of the soxhlet and allow them to drip-dry by balancing them on the edge of the soxhlet. Rinse tweezers between each sample. Once the thimbles are dry, remove them to a sheet of aluminum foil in the hood for total evaporation. When completely dry, fold them in the foil and dispose of them

14.2.11 Rinse the soxhlet with several pipette volumes of hexane and tip to drain into the round bottom.

14.2.12 Rinse the soxhlet with several pipette volumes of Hexane and tip again to drain into the round bottom. Set the soxhlet aside at this time.

14.2.13 Procure the same number of Turbo Tubes as there are samples. Pre-rinse turbo tubes with hexane and allow to dry. Using an individual Turbo Tube stand, label a TurboTube with the corresponding sample ID number and place in the holder.

14.2.14 Add a suitable amount of Sodium Sulfate to round bottom flask and swirl around to remove any residual water. Pour, decanting off the sodium sulfate, the contents of the round bottom into the TurboTube, using a pipette and Hexane to rinse the last drops out of the mouth of the round bottom. Rinse the round bottom with several pipette volumes of Hexane, swirl gently, and decant into same TurboTube. Repeat this step twice for same sample then repeat all preceding steps for all other samples.

14.2.15 All glassware must be rinsed with technical grade (tech)-Acetone or a "for rinsing-only" labeled solvent, and dried in the hood before other cleaning steps.

NOTE: ALL SAMPLE CONTAINERS ARE TO BE RETURNED TO THE APPROPRIATE REFRIDGERATOR. ALL EMPTY SAMPLE CONTAINERS ARE TO BE RETURNED TO CUSTODY FOR DISPOSAL.

14.3 Solvent Reduction: TurboVap Evaporator System

14.3.1 The TurboVap evaporator system is used in place of the Kuderna Danish (KD)-concentrator apparatus. The TurboVap uses a heated water bath and positive pressure nitrogen flow/vortex action. The unit maintains a slight equilibrium imbalance between the liquid and gaseous phase of the solvent extract, which allows fractional reduction of the solvents without loss of higher boiling point analytes.

14.3.2 Turn the unit on and allow it to heat up to 40 ± 2°C..

14.3.3 As a precaution the TurboVap system regulators should be checked to assure that no residual gas pressure remains within the system and that gas pressure regulators is off before placing samples in the apparatus. Residual gas pressure may cause splashing and cross contamination of samples. To bleed the system of residual gas pressure place an empty TurboTube into the water bath and close the lid. Make sure that the nitrogen gas pressure regulator is turned off. Bleed any residual gas until the regulator output pressure gauge reads "0" psi.

14.3.4 Rinse each tip and wipe down all surfaces of the TurboVap with solvent. Close the lid and turn the pressure up to blow the lines clean. Turn off the pressure and bleed the system of any residual gas.

14.3.5 Place the TurboTubes containing the samples into the TurboVap and close the lid. Begin slowly turning the pressure regulator on. Keep the gas pressure very low, until the solvent level is decreased, to avoid splashing. Increase the gas pressure as the sample reduces maintaining uniform flow throughout the reduction.

14.3.6 The process for solvent (Hexane/Acetone) reduction takes approximately 30-45 minutes. Do not leave the unit unattended as extracts may be blown to dryness and PCB loss may occur.

14.3.7 Concentrate to approximately 50mL. Remove the samples from the TurboVap, and fill each TurboTube with hexane up to the 200mL mark for solvent exchange. Immediately notify a supervisor if an extract is blown to dryness.

14.3.8 Concentrate the solvent to approximately 10.0mL. Remove the samples from the TurboVap and place in the rack.

NOTE: Not all samples will evaporate at the same rate; sample extracts containing large amounts of petroleum or other non-volatile liquids may stop reducing before the 10.0mL point is achieved. Samples which stop reducing should be removed as soon as possible.

14.3.9 Quantitatively transfer the sample extract with a Pasteur pipette into an appropriate volumetric flask (25mL is the default set volume for solid extracts). Rinse the TurboTube with 3 Pasteur pipettes of Hexane, and then transfer the Hexane rinse to the volumetric. Repeat the Hexane rinse two more times for a total of three Hexane rinses of the TurboTube. After the sample has been transferred, rinse the Pasteur pipette with 0.5mL of Hexane into the volumetric flask. Add Hexane to bring the solvent level up to exactly the meniscus mark on the volumetric. Stopper and invert the volumetric flask to mix. Decant the contents into a pre-labeled 40mL vial.

14.3.10 All used glassware must be rinsed with tech-Acetone or a "For Rinsing-Only" labeled solvent and dried in the fume hood before being washed.

14.4 Sample Extract Cleanup

14.4.1 Most extracts of environmental samples that are to be analyzed for PCBs by gas chromatography with electron capture detection contain co-extracted xenobiotics and other interfering substances which must be removed before accurate chromatographic analysis can be performed.

14.4.2 Not all clean-up procedures need to be performed on every sample and several are sample matrix specific. The experience of the analyst combined with the sampling site history should guide the selection of which clean-up procedures are necessary. The sample preparation chemist records the sequence and number of repeats of cleanup steps performed. Sample extract cleanups are performed on set volume extracts. The default set volume is 25mL for soil/sediment/solid samples.

14.4.3 **Cleanup procedure will be done in the following order unless otherwise noted: Sulfuric Acid Wash, TBA/Hg Shake , then Florisil Slurry.**

14.4.4 Sulfuric Acid Wash

14.4.4.1 The concentrated sulfuric acid treatment removes hydrocarbons and other organic compounds that are co-extracted with the PCB residues.

14.4.4.2 Add 5.0 mL concentrated H_2S0_4 and shake for 30 seconds by hand then centrifuge for approximately 2 minutes. Transfer the hexane (upper) layer to a labeled 40 mL vial.

14.4.4.3 Repeat 14.4.4.1 if the sample extract appears to be heavily loaded (opaque) with colored material. Two to three acid washes may be required. **Note:** All colored material may not be removed from the extract.

14.4.5 Elemental Sulfur Clean-up

14.4.5.1 Elemental sulfur is soluble in the extract solvents used for sediment and soil samples. It is commonly found in sediment/soil samples, decaying organic material and some industrial wastes. Large amounts of sulfur can cause the electron capture detector (ECD) to signal saturate for long periods during the elution envelope of PCBs. Even small amounts of sulfur can interfere with PCB measurement as a co-eluting chromatographic peak.

14.4.5.2 Two techniques exist for the elimination of elemental sulfur in PCB extracts. Mercuric precipitation (Mercury Shake) and the Tetrabutylammonium (TBA) sulfite procedure. Tetrabutylammonium sulfite causes the least amount of degradation of a broad range of pesticides and organics compounds, while mercury may degrade

organophosphorus and some organochlorine pesticides. The TBA procedure also has a higher capacity for samples containing high concentrations of elemental sulfur.

14.4.6 Removal of Sulfur Using Mercury

Note: ***Mercury is a highly toxic metal. All operations involving mercury should be performed within a hood. Prior to using mercury, the chemist should become acquainted with proper handling and emergency spill/clean-up procedures associated with this metal and must have reviewed the material safety data sheet MSDS.***

14.4.6.1 Add 1-3 drops of mercury to the sample extracts, cap, and place on the wrist shaker for 30 minutes. The sulfur is converted to mercuric sulfide and precipitates out of the sample extract. A black precipitate may beseen in sample extracts containing elemental sulfur.

14.4.6.2 Transfer the sample extract to a new 40 mL vial.

14.4.6.3 The precipitated sulfur can be removed from the extract by performing a sulfuric acid clean-up or Florisil slurry (discussed in 14.4.3 and 14.4.8).

14.4.7 Removal of Sulfur using TBA Sulfite

14.4.7.1 The TBA procedure removes elemental sulfur by conversion to the thiosulfate ion, which is water soluble.

14.4.7.2 Add 2.0mL TBA Sulfite Reagent, 1.0 mL 2-propanol, and approximately 0.65g of sodium sulfite crystals to the extract and shake for at least 5 minutes on the wrist shaker and observe. An excess of sodium sulfite must remain in the sample extract during the procedure. If the sodium sulfite crystals are entirely consumed add one or two more aliquots (approximately 0.65g) to the extract and observe.

14.4.7.3 Place the samples on the wrist shaker for 45 minutes observing at 15 minute intervals to make sure that the sodium sulfite is not consumed. Add 5mL's of organic free water and shake for an additional15 minutes.

14.4.7.4 Place the samples into the centrifuge and spin for approximately 2 minutes on setting #4.

14.4.7.5 Transfer the Hexane layer to a new 40mL vial and cap.

14.4.8 Florisil Adsorption (Slurry)

14.4.8.1 The Florisil slurry removes co-extracted polar compounds, residual water, and residual acid and is recommended as the final cleanup step

before the extract is submitted for GC analysis.

14.4.8.2 Add approximately 3 grams of tested and approved 10% deactivated Florisil® to each vial containing the sample extract.

14.4.8.3 Vigorously shake the vial for approximately 1 min by hand or on the wrist shaker. Swirl to get any Florisil off the walls of the vial, and then allow to settle.

14.4.8.4 Transfer the hexane layer to a clean 40mL vial.

14.5 Extract Screening and Dilution:

14.5.1 PCB extracts are generally screened by GC to determine the approximate concentration before final analysis. Prior site history and client supplied estimates of sample concentration may be used to determine what, if any, extract dilution is necessary. Extracts of unknown concentration are generally screened at a 10 to 100 fold dilution.

14.5.2 The supervising chemist is responsible for determining initial screening dilutions. Extract dilutions are prepared by transferring an aliquot of the original sample extract into a vial containing the correct amount of "make up" volume of hexane. Dilutions must be recorded in LIMS.

14.5.3 Perform the dilution using appropriate class "A" disposable volumetric pipettes to transfer the extract and to add the make-up volume of Hexane. Make sure that the vial is properly labeled. Cap and invert the vial at least three times to thoroughly mix the extract with the solvent.

14.5.4 Transfer 1mL of the extract to a labeled 1.5mL GC autosampler vial. Record the sample data in LIMS and submit with the sample extracts to the GC analyst.

15.0 CALCULATIONS

15.1 Calculate the **Percent Solids** (see section 14 for procedure) by:

$$\frac{\{(\text{wt. of pan + dried sample}) - (\text{wt.of pan})\}}{(\text{wt. of wet sample})} \times 100$$

16.0 METHOD PERFORMANCE

16.1 Please see determinative method (SOP NE148) for details

17.0 POLLUTION PREVENTION

17.1 Please see SOP NEA168 for details.

18.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES

18.1 Please see determinative method (SOP NE148) for details.

19.0 CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

19.1 Please see determinative method (SOP NE148) for details.

20.0 CONTINGINCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

20.1 Please see determinative method (SOP NE148) for details.

21.0 WASTE MANAGEMENT

21.1 Please see SOPs: NE054, NE083, and NE089.

22.0 REFERENCES

22.1 U.S. EPA SW-846 "Test Methods for Evaluating Solid Waste; Volume 1B Laboratory Manual Physical/Chemical Methods", Office of Solid Waste and Emergency Response, Third Edition, Final Update III, December 1996.

22.2 "Guide to Environmental Analytical Methods", Third Edition, Genium Publishing Corporation, 1996.

23.0 TABLES, DIAGRAMS, FLOWCHARTS and VALIDATION DATA

23.1 Appendix A: Soxhlet Extraction for Caulk and Clean-up Procedures

23.2 Appendix B: Outline of PCBs in Soil/Sediment for Soxhlet Extraction

Appendix A: Soxhlet Extraction for Caulk and Clean-up Procedures

1.0 Soxhlet Extraction

1.1 Caulking material itself is made of several different polymer components, many of which can interfere with the extraction and detection of PCBs.

1.2 Perform Pace Analytical's normal extraction by Soxhlet 3540 NE SOP 005. The Soxhlet extraction SOP should be followed with these modifications:

1.2.1 Since Caulking can be highly contaminated with PCB Aroclors and have several polymer/oils that interfere with the extraction/cleanup and analysis sample size should be 1-2grams. All caulk work should be performed in the designated high level hood to reduce the risk of contamination to other samples due to their potential to be extremely high level.

1.2.2 Weigh out the caulk sample (Warning caulk may also contain Lead and or Asbestos) if possible cut the caulk into small pieces and mix with Na_2SO_4. For dry and brittle caulk carefully mix.

1.2.3 Transfer the sample to a pre-rinsed thimble and top with Na_2SO_4.

1.2.4 Aroclor 1254 is the Aroclor of choice for lab control spikes.

1.3 Concentrate to approximately 10mL and set to 25mL with a volumetric. Transfer to a 40mL vial for clean up steps.

2.0 Caulk Sample Clean-up

2.1 Proceed with clean-up steps as with any other sample. Some samples may require a Florisil column to clean them up. Each sample should be evaluated on an individual basis.

2.2 **Florisil Clean-up Columns**

2.2.1 See SOP269 for 4% deactivated Florisil preparation.

2.2.2 Rinse a 1cm x 15cm chromatography column with course glass frit and stopcock with acetone three times and then hexane three times using a Teflon squirt bottle. Let the columns dry in the chemical fume hood.

2.2.3 Weigh out into a tared aluminum-weighing pan, 8 grams of 4% deactivated Florisil. Pour the Florisil into column and gently tap on the sides and on the clamp with a rubber bulb to pack the Florisil for uniformity and to eliminate channeling.

2.2.4 Top off the Florisil with 2g of sodium sulfate. Gently tap the column on the sides and on the clamp with a rubber bulb to pack the sodium sulfate.

2.2.5 Using a pipette, quantitatively transfer 5mL of the sample to the column.

2.2.6 Elute the column with 50mL of hexane. (DO NOT let the Column go dry).

2.2.7 Collect the amount of Hexane listed on the calibrated Florisil jar (normally 40mL) into an ASE vial.

2.2.8 Using the blow down apparatus, concentrate samples down to approximately 2.5mL.

2.2.9 Transfer sample to a 5mL volumetric flasks and set to volume. (If 5mL of the 25x extract was put through the column, the last step should be to set the extract to 5mL. The sample will still be a 25x).

Appendix B

Outline for PCBs IN SOIL/SEDIMENT
For Soxhlet Extraction

1. PREPARE SAMPLE FOR PREPARATION
2. RINSE EXTRACTION THIMBLES
3. WEIGH SAMPLE AND RECORD WEIGHT
4. DRY SAMPLES
5. ADD SAMPLE TO THIMBLES
6. SET UP SOXHLET EXTRACTOR APPARATUS
7. ADD SURROGATES AND/OR MATRIX SPIKE
8. EXTRACT SAMPLE FOR APPROXIMATELY 18 HOURS
9. BREAKDOWN SOXHLET EXTRACTOR APPARATUS
10. TRANSFER SOLVENT TO TURBOTUBE
11. SOLVENT REDUCTION, USING THE ZYMARK TURBOVAP EVAPORATION SYSTEM
12. TRANSFER AND SET VOLUME
13. EXTRACT CLEANUP (ACID, MERCURY OR TBA, FLORISIL)
14. EXTRACT DILUTION
15. GC SCREENING/ ANALYSIS

STANDARD OPERATING PROCEDURE REVIEW

SOP Name	Review Number	Reviewers	Title	QAO Approval	Effective Date
NE005_07	00	Jill Grygas Christina L. Braidwood Robert E. Wagner	QAO Lab Director	Christina Braidwood	03/28/2011

STANDARD OPERATING PROCEDURE

DETERMINATION OF POLYCHLORINATED BIPHENYL (PCB) AROCLORS

Reference Methods: EPA METHOD 8082

LOCAL SOP NUMBER:	NE148_07
EFFECTIVE DATE:	03/11/2011
SUPERSEDES:	NE148_06
SOP TEMPLATE NUMBER:	SOT-ALL-Q-006-rev.03

APPROVALS

Dan Pfalzer
Assistant General Manager

03/11/2011
Date

Christina L. Braidwood
Quality Manager

03/11/2011
Date

PERIODIC REVIEW

SIGNATURES BELOW INDICATE NO CHANGES HAVE BEEN MADE SINCE PREVIOUS APPROVAL.

Signature	Title	Date

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1.0 Identification of Test Method

1.1 This method is used to determine Polychlorinated Biphenyl (PCB) by gas chromatography with electron capture detection and Total Aroclor Quantification using EPA SW 846 Method 8082- Polychlorinated Biphenyl (PCB) Aroclors by Capillary Column GC.

2.0 Applicable Matrix

2.1 This SOP is applicable in the determination and quantification of PCBs as outlined in EPA SW-846 Method 8082. It is applicable to the following matrices: water, soil, sediment, sludge, oil, fuel oil, waste solvent, fish, other aquatic animals, tissue samples, caulk, and air cassette samples including polyurethane foam (PUF) and associated filters for EPA Methods TO-4A and TO-10A.

3.0 Detection Limit

3.1 Detection Limit: Reporting Limits (RLs) and Method Detection Limits (MDLs) vary for each compound.

3.1.1 The following are default Reporting Limits based on the lowest calibration standard and global MDL /Reporting Limits based on MDL studies performed by NEA used for EPA Method 8082. See attachment G for example of MDL study. Reporting Limits (PQLs) are based on the Lowest Calibration Standard.

Matrix	Sample Mass/Volume Extracted	Calibration Curve Low Standard	Extract Volume	Global MDL* (All Aroclors)	RL (PQL) (all Aroclors)
Soil/Sediment Solid	10 g	20 ng/ml	25 mL	0.0115 mg/kg	0.050 mg/kg
Water	1 Liter	5 ng/ml	10 mL	0.0075 ug/L	0.050 ug/L
Biota	10 g (wet weight basis)	20 ng/mL	25 mL	0.0104 mg/kg	0.050 mg/kg
Polyurethane Foam Cassette (TO-4A/TO 10A)	1 PUF	20 ng/ml	5 mL	0.021 ug/Puf	0.100 ug/Puf
Waste Oil	0.5 g	20 ng/ml	25 mL	0.200 mg/kg	1.00 mg/kg
Wipe	1 Wipe	20 ng/ml	25 mL	0.115 ug/Wipe	0.500 ug/wipe

3.2 Individual MDLs and RLs are determined every two years for each instrument with matrix specific MDL studies for each extraction methodology. MDLs must be determined again whenever a major change in instrumentation or extraction methodology occurs.

3.3 MDLs are verified annually by the extraction and analysis of a low level MDL verification check sample. The Aroclor must be observed qualitatively in the MDL verification check sample.

4.0 Scope and application, including components to be analyzed

4.1 This SOP is applicable in the determination and quantification of PCB in the following matrices as outlined in EPA SW-846 Method 8082. : water, soil, sediment, sludge, oil, fuel oil, waste solvent, fish, other aquatic animals, tissue samples, caulk, wipes and air cassette samples including polyurethane foam (PUF) and associated filters for EPA Methods TO-4A and TO-10A.

4.2 In general, samples are extracted, or in the case of oils and waste solvent diluted, with a pesticide grade solvent. Applicable extraction methods for solids and animal tissues include: SW-846 Method 3540 (Soxhlet), SW-846 Method 3545 (Pressurized Fluid Extraction), or SW-846 Method 3550 (Ultrasonic Extraction). Extraction methods for aqueous samples include SW-846 Method 3510 (Separatory Funnel), and SW-846 Method 3520 (Continuous Liquid Liquid Extraction). The extracts are further processed by concentrating or diluting, depending on the PCB concentration, and carried through a series of clean-up

techniques. Applicable cleanup techniques include SW-846 Method 3620 (Florisil Cleanup), SW-846 Method 3660 (Sulfur Cleanup) and SW-846 Method 3665 (Sulfuric Acid/Permanganate Cleanup). The sample is then analyzed by direct injection onto a gas chromatographic system and detected by an electron capture detector.

4.3 This method provides detailed instructions for gas chromatographic conditions, calibration, and analysis of PCB by capillary column gas chromatography. Each matrix requires different sample handling or special preparation procedure before analysis can be performed. Each sample matrix will be covered separately in the extraction standard operating procedures.

5.0 Summary of Test Method

5.1 Samples are extracted with a pesticide analytical grade solvent. The extracts are further processed by concentration and a series of clean-up procedures. The sample extracts are then analyzed by injecting onto a gas chromatographic system and with an electron capture detector in series.

5.2 This purpose of this SOP is to provide a detailed written document for quantification of PCB according to SW-846 Method 8082 specification.

5.3 This SOP provides detailed instructions for gas chromatographic conditions, calibration, and analysis of PCBs by gas chromatography. Sample extraction and cleanup procedures are described separately in additional laboratory Standard Operating Procedures.

5.4 The following PCB Aroclors can be determined by this method*:

Compound	CAS Number
Aroclor 1016	12674-11-2
Aroclor-1221	11104-28-2
Aroclor-1232	11141-16-5
Aroclor-1242	53469-21-9
Aroclor-1248	12672-29-6
Aroclor-1254	11097-69-1
Aroclor-1260	11096-82-5

*Note: Additional PCB Aroclor mixtures including Aroclor 1262 and Aroclor 1268 may be analyzed by this method with minor modifications

5.5 Extensive knowledge of this SOP and EPA Method 8082 is required. The analysis portion of this method should be performed by a skilled chemist or by an analyst trained in the quantification of trace organics by gas chromatography.

6.0 Definitions

6.1 Accuracy – The nearness of a result or the mean of a set to the true value. Accuracy is assessed by analysis of references samples and percent recoveries.

6.2 Analytical Batch –The basic unit for analytical quality control is the analytical batch, which is defined as samples which are analyzed together with the sample method sequence and the same lots of reagents and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each batch should be of similar matrices (e.g. water, sediment, soil, etc.).

6.3 Blank – A blank is an artificial sample designed to monitor the introduction of artifacts into the process. For aqueous samples, reagent water is used as a blank matrix, however, a universal blank matrix does not exist for solid samples, but sometimes sodium sulfate is used as a blank matrix. The blank is taken through the appropriate steps of the process. A reagent blank is an aliquot of analyte-free water or solvent analyzed with the analytical batch. Field blanks are aliquots of analyte-free water or solvents brought to the field is sealed containers and transported back to the laboratory with the sample containers. Trip blanks and equipment blanks are two specific types of field blanks. Trip blanks are not opened in the field. They are a check on sample contamination originating from sample transport, shipping and from site conditions. Equipment blanks are opened in the field and the contents are poured appropriately over or through the sample collection device, collected in a sample container, returned to the laboratory as a sample. Equipment blanks are a check on sampling device cleanliness.

6.4 Continuing Calibration Check Standard (CCCS) –The continuing calibration check standard contains all target analytes found in the calibration standards and is used to verify that the initial calibration is prepared correctly and that the instrument system is correctly calibrated. Calibration check solutions are made from a stock solution which is different from the stock used to prepare standards

6.5 Calibration Standard (ICAL)– A series of known standard solutions used by the analyst for instrument calibration. Calibration standards are prepared from primary standard and/or stock standard solutions.

6.6 CAS Number – An assigned number used to identify a chemical. CAS stands for Chemical Abstracts Service, an organization that indexes information published in Chemical Abstracts by the American Chemical Society and that provides index guides by which information about particular substances may be located in the abstracts. Sequentially assigned CAS numbers identify specific chemicals, except when followed by an asterisk (*) which signifies a compound (often naturally occurring) of variable composition. The numbers have no chemical significance. The CAS number is a concise, unique means of material identification. (Chemical Abstracts Service, Division of American Chemical Society, Box 3012, Columbus, OH 43210: [614] 447-3600).

6.7 Duplicate– A second aliquot of a sample that is treated the same as the original sample in order to determine the precision of the method.

6.10 Environmental Sample – An environmental sample or field sample is a representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination as requested or required.

6.11 Initial Calibration – Analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the analytical detector or method.

6.12 Instrument Calibration – Analysis of analytical standards for a series of different specified concentrations; used to define the quantitative response, linearity and dynamic range of the instrument to target analytes.

6.13 Laboratory Control Sample (LCS) – Also known as the Quality Control (QC) Check Standard or Quality Control (QC) Check Sample. The LCS consists of an aliquot or reagent water or other blank matrix to which known quantities of the method analytes are added. The LCS is extracted and analyzed exactly like a field sample, and its purpose is to determine whether the analysis is in control and whether the laboratory is capable of making accurate and precise measurements.

6.14 Laboratory Method Blank – An analytical control consisting of all reagents and surrogate standards that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination.

6.15 Matrix – The predominant material of which the sample to be analyzed is composed. Matrix is not synonymous with phase (liquid or solid).

6.16 Matrix Spike – Aliquot of sample (water or soil) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

6.17 Matrix Spike Duplicate – A second aliquot of the same matrix as the matrix spike (above) that is spiked in order to determine the precision of the method.

6.18 Method Detection Limit (MDL) – The minimum constituent concentration that can be measured and reported with 99% confidence that the signal produced is different from the blank in a given matrix. The MDL is determined from a minimum of seven replicate samples, taken through the entire preparation and analysis procedure. The standard deviation, *s*, of those replicates is multiplied by a student's t factor in order to calculate the MDL.

6.19 MSDS – Material Safety Data Sheet. OSHA has established guidelines for the descriptive data that should be concisely provided on a data sheet to serve as the basis for written hazard communication programs.

6.20 PCB Polychlorinated biphenyls (PCBs) are a class of 209 individual chemical compounds (congeners), in which one to ten chlorine atoms are attached to biphenyl. Use of PCBs has made them a frequent environmental pollutant.

6.21 Precision – The agreement between a set of replicate measurements without assumption of knowledge of the true value. Precision is assessed by means of duplicate/replicate sample analysis.

6.22 Quality Control – Set of measures within a sample analysis methodology to assure that the process is in control.

6.23 Standard Curve – A standard curve is a curve which plots concentrations of known analyte standards versus the instrument response to the analyte. Calibration standards are prepared by diluting the stock analyte solution in graduated amounts which cover the expected range of the samples being analyzed. Standards should be prepared at the frequency specified in the appropriate section. The calibration standards must be prepared using the same type of acid or solvent and at the same concentration as will result in the samples following sample preparation. This is applicable to organic and inorganic chemical analyses.

6.24 Stock Solution – Standard solution which can be diluted to derive the other standards.

6.25 Surrogate – Organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. These compounds are spiked into all blanks, calibration and check standards, samples (including duplicates and QC reference sample) and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.

6.26 Surrogate Standard – A pure compound added to a sample in the laboratory just before processing so that the overall efficiency of a method can be determined.

7.0 Interferences

7.1 Laboratory contamination can occur by the introduction of plasticizers (phthalate esters) into the samples through the use of flexible tubing. Samples and extracts should not be exposed to plastic materials. Phthalate esters exhibit response on electron capture detectors, usually as late eluting peaks, and can interfere in PCB quantification. Laboratory method blanks must be thoroughly reviewed for presence of non-target peaks and comparison of samples with blank chromatographic patterns.

7.2 Elemental sulfur (S_8) is readily extracted from soil samples and may cause chromatographic interferences in the determination of PCBs. Sulfur can be removed through the use of Method 3660.

7.3 Polychloroterphenyls (PCTs), polybrominatedbiphenyls (PBB), polychlorinated napthalenes (PCN), as well as dioxins can co-elute with PCBs. Carry-over from these compounds, when in high concentration, is common if clean-up procedures are not followed. These materials may be removed through the use of specified clean-up procedures.

7.4 Pesticides can be a source of contamination through breakdown into components such as hexachlorobenzene (HCB). This chlorinated compound can carry-over on the GC column, and contaminate samples. Specified clean-up procedures should be followed to eliminate this as a source of contamination when analyzing PCBs. High concentrations of pesticides can cause carry-over on GC columns.

8.0 Safety

8.1 Safety glasses and disposable gloves must be worn when handling samples and extracts.

8.2 All manipulations of sample extracts should be conducted inside a chemical fume hood. Manipulation of sample extracts outside of a fume hood should be minimized by the analyst.

8.3 Safe laboratory practices should be followed by the analyst at all times when conducting work in the lab. The analyst should refer to the reference file of material safety data sheets to familiarize themselves with the precautions for handling

solvents and chemicals used to process samples. The analyst should refer to the laboratory chemical hygiene plan for further safety information.

8.4 Samples remaining after analysis should either be returned to the customer for disposal or disposed of through the laboratory's disposal plan. Refer to the sample custodian for assistance and also standard operating procedure NEO54, disposal of laboratory waste.

9.0 Equipment and Supplies

9.1 Gas Chromatograph: Complete system for high resolution, capillary column capability and all required accessories. Northeast Analytical, Inc. will use a Varian Model 3400 or 3800 (or equivalent) gas chromatograph (or equivalent), equipped with a Model 1077 or 1177 split/splitless injector (or equivalent), temperature programmable oven, Varian Model 8200, Varian Model 8400, or LEAP GC pal automatic sampler (or equivalent), and electron capture detector (or equivalent). A data system and integration of detector signal is interfaced to the gas chromatograph.

9.2 Chromatographic Data System: A data system for measuring peak height and peak area. An Empower computer network based workstation (Waters Corporation), will be employed to capture detector response and digitally store the chromatographic, electronic peak integration for precise calculations, database structuring of the analytical information, and archival capabilities.

9.3 Column (Primary): ZB-1, Phenomenex Cat. No. 7HG-G001-11; 30 m x 0.25mm x 0.25 um ; DB-1, J&W Part No. 122-1032; 30 m x 0.25 mm x 0.25 um ; or equivalent.

9.4 Column (Secondary): ZB-5, Phenomenex Cat. No. ZB-5-G002-11; 30m x 0.25mm x 0.25 um ; DB-5, J&W Part No. 122-5032; 30m x 0.25 mm x0.25 um; or equivalent.

9.5 Class A volumetric flasks: 5.0 – 100mL.

9.6 8 dram vials and 4 vials dram for sample extract storage.

9.7 Pasteur pipettes.

9.8 250ml and 100ml beakers, glass.

9.9 Disposable 1.0, 5.0, and 10.0 ml pipettes.

9.10 Hexane, Burdick and Jackson-Pest Grade.

9.11 Acetone, Burdick and Jackson.-Pest Grade

9.12 Toluene, Baker, (Cat.No. 9336-03)

9.13 Methylene Chloride, Burdick and Jackson, (Cat. No. 300-4)

9.14 Ferrules: 0.4mm graphite/vespel, Restek 20229, and ¼" graphite ferrules, Restek 20210 or equivalent.

9.15 Injector septa: Thermolite Septa, Restek 20365 or equivalent.

9.16 Injector liner: Low Pressure Drop Liner w/Glass Wool, Restek 21033 or equivalent.

9.17 SGE Injector Syringe 10.0 µL: SGE 002987 or equivalent

9.18 Auto sampler vials: Snap vial 12x32mm Clear w/P, Microliter 11-5200

9.19 Snap Caps: 11mm Natural Snap Cap PTFE, Microliter 11-0051N-B.

10.0 Reagents and Standards

10.1 Analytical Standard Solutions.

10.1.1 Aroclor Stock Standard Solutions

10.1.1.1 Polychlorinated Biphenyls - Neat commercial material for standard preparation. These materials are multi-component mixtures of PCB congeners and are the actual materials that were used in products such as electric power transformers and capacitors. Monsanto was the largest producer of PCB formulations and sold them under the trade name Aroclor. These standards should be compared to PCB reference materials to verify commercial materials. To be used as calibration standards, they must have the same pattern and congener distribution.

10.1.1.2 Stock standards are prepared from individual Aroclor formulations by weighing an exact amount of the neat material to the nearest 0.1 g, and dissolving and diluting to volume in a 100 mL volumetric flask with hexane. See Attachment A, Table 1 for exact weights of each compound.

10.1.1.3 The stock standards are transferred into Boston bottles and stored in a refrigerator at 0-6°C, protected from light.

10.1.1.4 The stock standards are transferred into screw-cap boston bottles and stored in a freezer 0°C , protected from light. Stock standards should be checked frequently for signs of evaporation, especially just prior to preparing calibration standards. Stock PCB standards must be replaced after one year, or sooner if a problem with instrument calibration is detected.

10.2 Calibration Standards

10.2.1 Calibration standards are prepared at five concentration levels using a prepared working standard. See Attachment A, Tables 2 and 3A AND 3B for the preparation and exact concentrations of the working standards. The following five standards make up the initial calibration curve standard set for a High Level curve : 20 ng/mL, 100 ng/mL, 250 ng/mL, 500 ng/mL, 1000 ng/mL. The following five standards make up the initial calibration curve set for a Low Level curve: 5 ng/mL, 10 ng/mL, 20 ng/mL, 50 ng/mL, 100 ng/mL.

10.2.1 The two surrogates Tetra-chloro-meta-xylene (TCMX) and Decachlorobiphenyl (DCBP) are included in the A1254 calibration standards. The standard for TCMX/DCBP is prepared by diluting 1 mL of TCMX/DCBP custom standard solution (ULTRA, cat.#CUS-4911, at 500/5000 ng/mL) into a 1000 mL volumetric flask resulting in a solution of TCMX/DCBP at 0.5/5.0 PPM

10.2.2 Refer to Attachment A, Tables 4A and 4B for instructions on preparation of the calibration standards containing A1254 and the surrogates. Refer to Attachment A, Tables 3A and 3B for instructions on preparing the remaining calibration standards.

10.2.3 Transfer all calibration standards to ASE vials and store in a refrigerator at 0-6°C, protected from light. Calibration standards must be replaced after six months, or sooner, if comparison with check standards indicates a problem.

10.3 Continuing Calibration Standards:

10.3.1 The surrogate compounds Tetra-chloro-meta-xylene (TCMX) and Decachlorobiphenyl (DCBP) are included in all Continuing Calibration Check Standards at a concentration near the mid-point of the surrogate calibration curve sequence. All continuing calibration standards are prepared independently from calibration standards, by using an alternate source purchased from standard vendors. Refer to Attachment B, Tables 1-3 for instructions on preparation of these standards.

11.0 Sample Collection, Preservation, Shipment and Storage

11.1 Sample Collection and Preservation:

11.1.1 Routine soil, sediment, sludge, solid, caulk, and concentrated liquid samples should be collected in 8 oz clear glass wide-mouth jars, fitted with a Teflon-lined cap. Aqueous samples should be collected in 1 liter amber glass bottles with a Teflon-lined cap. Project specific protocols may require that containers be pre-cleaned to EPA specification protocol A –. Protect samples from light.

11.1.2 All samples must be placed on ice or refrigerated at >0-6°C from the time they are collected until delivery to the lab.). Samples that are collected within driving distance of the laboratory and delivered the same day may not have reached temperature acceptance limits. These samples are deemed acceptable if evidence of cooling is present (i.e. they are received with ice in the cooler)

11.2 Sample Shipment:

11.2.1 Sample Shipment is accomplished through a carrier such as Federal Express or United Postal Service for overnight 1-day delivery to the lab. Shipment is normally handled by the field personnel collecting the samples and coordinated with sample receiving department at the lab. Samples can also be picked up by the lab courier service if samples are collected within driving distance to the lab.

11.3 Sample Storage:

11.3.1 The samples must be protected from light and refrigerated at >0-6°C from time of receipt until they are removed from storage for extraction. Remaining sample material will be stored protected from light and refrigerated at >0-6°C. Sample will be disposed of or stored / archived according to project specifications.

11.3.2 Routine soil, sediment, sludge, solid, liquid and concentrated liquid samples are stored in a refrigerator dedicated for this type of sample.

11.4 Sample Extract Storage:

11.4.1 Sample extracts must be protected from light and refrigerated at >0-6°C during the analysis. After analysis is complete, sample extracts will be discarded after 60 days or can be archived in a freezer at less than -20°C for longer periods of time depending on the program requirements.

11.4.2 Field samples, sample extracts, and calibration standards must be stored separately.

11.5 Required Hold Times

11.5.1 Extraction of solid samples by appropriate technique must be completed within fourteen days from sample collection.

11.5.2 Extraction of aqueous samples by appropriate technique must be completed within seven days from sample collection.

11.5.3 Sample extracts must be analyzed within forty days of sample extraction.

12.0 Quality Control

12.1 This section outlines the necessary quality control samples that need to be generated at the time of sample extraction. The results of the quality control measurement samples document the quality of the data generated. The following table lists the Quality Control samples required for capillary gas chromatography analysis of PCBs.

Quality Control Requirements

QC Sample	Frequency

Method Blank	With each sample batch (up to 20 samples)
Lab Control Spike	With each sample batch (up to 20 samples)
Cont Cal Check Std	Analyzed prior to each sample batch and at a frequency or one per ten injections. Each analytical sequence must close with a Continuing Calibration Check Standard (CCCS).
Duplicate Analysis	Field generated sample – analyzed at discretion of client.
Matrix Spike	One matrix spike per 20 field samples or designated sample batch may be performed as specified in the client site plan.
Matrix Spike Duplicate	One matrix spike duplicate per 20 field samples or designated sample batch may be performed as specified in the client site plan.

12.2 Method Blank

12.2.1 With each batch of samples to be extracted a method blank is processed. The method blank is carried through all stages of sample preparation and measurement steps. For water samples and organic-free reagent water blank is processed. The method blank must exhibit PCB levels less than the matrix defined reporting limit (RL). If the method blank exhibits PCB contamination above the reportable RL, the samples associated with the contaminated blank should be re-extracted and analysis repeated. If there is no original sample available for re-extraction then the results should be flagged with a "B" indicating blank contamination. The value measured in the blank is reported for those samples associated with the particular blank out of criteria.

12.3 Laboratory Control Spike

12.3.1 A Laboratory Control Spike (LCS), also referred to as a QC reference check standard, is extracted with each batch of samples at a rate of one per 20 samples. For water sample, spike one liter of laboratory organic free water, extract and analyze. For solid and tissue samples spike 10 grams of sodium sulfate, extract and analyze. For oil samples spike 1 gram of PCB free oil, extract and analyze. An Aroclor is chosen for the LCS analyte, typically based on program requirements or expected sample contamination. Calculate the percent recovery for the PCB spike. If the percent recovery for the LCS is out of criteria, (70%-130%) the analysis is out of the control and the problem should be immediately corrected.

12.3.2 The following are default Laboratory Spikes Concentrations:

Aqueous Samples: .1.0 mL of A1242 @ 0.5 ug/mL (ppm) yielding a final sample concentration of 0.500 ug/L

Solid Samples: 1.0 mL of A1242 @ 12.5 ug/mL (ppm) yielding a final sample concentration of 10 ug/g

Note: Alternate spike concentrations and selection of Aroclors may be applicable based on project specific requirements.

12.4 Duplicate Analysis

12.4.1 Duplicate analysis of the same sample is performed to assess method precision. A duplicate can also be performed as a blind duplicate, so that identification with original sample is withheld. The analysis of a duplicate sample precludes that PCBs are to be found at appreciable levels in samples. If this is not

known the analysis of matrix spike/matrix spike duplicates provide more consistent quality control information. The relative percent difference of the two measurements on the sample is calculated on total PCB concentration by the following equation:

RPD = (DUP1-DUP2)/AVG x 100

Where: RPD = Relative Percent Difference
DUP1 = The greater of the measured values
DUP2 = The lesser of the measured values
AVG = Average of the two analysis

The relative percent difference must be less than or equal to 30%.

12.5 Matrix Spike and Matrix Spike Duplicate (MS/MSD)

12.5.1 A matrix spike is to be analyzed at a rate of one matrix spike per every 20 samples. Also matrix spike duplicate or duplicate sample is to be analyzed at a rate of one per every 20 samples. Duplicate samples may be appropriate in place of matrix spike duplicate, for soil and waste samples, where detectable amounts of organics are present.

12.5.2 The following are default Laboratory Matrix Spike Concentrations:

Aqueous Samples: 1.0 mL of A1242 @ 0.5 ug/mL (ppm) yielding a final sample added concentration of 0.500 ug/L

Solid Samples: 1.00 mL of A1242 @ 100 ug/mL (ppm) yielding a final sample added concentration of 10 ug/g

Note: Alternate spike concentrations and selection of Aroclors may be applicable based on project specific requirements.

12.5.3 Analyze one unspiked and one spiked sample. Calculate the percent recovery based on PCB concentration of both samples as follow:

P = A-B/T x 100

Where: P = Percent recovery, %
A = concentration of analyte in the spike sample aliquot
T = Know true values of the spike concentration
B = Background concentration of PCB in the unspiked sample aliquot

12.5.4 Matrix spike recovery information is used to assess the long-term precision and accuracy of the method for each encountered matrix. Matrix spike/matrix spike duplicate results are not used alone to qualify an extraction batch. Generally, percent recovery for MS/MSD samples should be greater than or equal to 70% and less than or equal to 130% based on the total PCB concentration. If the percent recovery is outside the limits, all calculations should be checked and the data should be narrated to describe possible matrix interference.

12.6 Surrogates

12.6.1 A surrogate compound is added to each sample, matrix spike, matrix spike duplicate, duplicate, method blank, and LCS at time of extraction. The surrogate compounds chosen for this method are Tetra-chloro-meta-xylene (TCMX) and Decachlorobiphenyl (DCBP). The following are typical surrogate amounts added to normal encountered matrices. These amounts can be adjusted if the PCB background levels are high and the surrogate is being diluted out of analysis range.

12.6.1.1 Soil, sediment, sludge, oil, fuel oil, waste solvent, fish, other aquatic animals, tissue samples: 0.5ml of 0.5ppm TCMX/ 5.0ppm DCBP set to 25ml final extract volume.

12.6.1.2 Water: 1.0ml of 0.05ppm TCMX/ 0.5ppm DCBP set to 10ml final extract volume.

12.6.2 Only one surrogate analyte needs to meet established control limits for the analysis to be valid. The recovery must fall within lab established limits of 60-140% if lab limits are not available for the analysis to be valid. If percent surrogate recovery is not within laboratory established limits for either surrogate, the following steps are required.

12.6.2.1 Review calculations that were used to generated surrogate percent recovery values to make certain there are no errors.

12.6.2.2 Check by GC analysis surrogate solutions used during sample extraction steps to ensure that no problems exist with spiking solutions.

12.6.2.3 Review data for chromatographic interferences.

12.6.2.4 Re-extraction and/or re-analysis of samples may be indicated if problems persist with surrogate recoveries. If the surrogate percent recovery is out of limits on the re-extracted samples, low or high surrogate recovery is due to matrix affects and the data can be reported as estimated. If above steps do not lead to satisfactory results then consult with organics manager to resolve the situation.

12.7 Continuing Calibration Check Standard (CCCS)

12.7.1 The initial CCCS is from an alternative source independent of the calibration check standards. It is prepared at a concentration approximately equal to the midlevel standard. This standard is analyzed after the initial calibration standards, every tenth injection, and at the end an analytical sequence. One check standards must be run with a 24 hour time period. The percent recover must be ±15% of the true value.

12.7.2 If the criterion is exceeded, the analyst should inspect the system to determine the cause and perform maintenance as necessary. The system can then be recalibrated and sample analysis can proceed. Note that all samples which are not bracketed by valid check standards must be re-analyzed when the system is in-control.

12.8 Retention Time

12.8.1 The retention time (RT) windows are established from the Continuing Calibration Check Standard (CCS) peak retention times. The CCS is analyzed three times over a 72-hour period and the standard deviation is calculated from the three retention time measurements. The standard deviation is multiplied by three and this establishes the retention time window for each quantified peak (±3SD). Use the retention time for a peak in the continuing calibration check standard to determine the mid point of the retention time window for the analysis sequence. If the continuing calibration checks fall outside of these windows update the windows using the previous check standard. If the retention times are still outside the established windows instrument maintenance must be performed and recalibration may be required.

12.8.2 This function is performed in the chromatography software graphically as vertical dropdown retention time markers with retention time window brackets. Besides using the retention time window to assign peaks for quantification, the analyst should also rely on their experience in pattern recognition of multi-response sample analysis.

12.8.3 See attachment F for an example of calculated retention time windows.
Retention Time Window Study for GC18F Column DB-1

12.9 Analytical Sequence Queue:

12.9.1 The following is an example of the order that initial calibration standards, continuing calibration check standards, method blanks, QC samples, and samples are placed in an analytical sequence. A continuing calibration check standard is run after every nine samples in the analytical sequence. All analytical sequences must end with a continuing calibration check standard regardless of the number of samples. Below is an example of an analytical sequence:

Injections	Material Injected
1	Hexane Blank
2-36	Initial Calibration Standards
37-43	Continuing Calibration Check Standard
44-52	Samples analyses, including method blanks, matrix spikes, matrix duplicates, matrix spike duplicates, and QC reference check standard. A maximum of nine samples between continuing calibration check standards.
53	Continuing calibration check standard
54 and higher	repeat inject. 44-53 sequence

12.10 PCB Aroclor Qualitative Identification and Secondary GC Column Confirmation:

12.10.1 Positive identification of PCB Aroclors is based on comparison of retention time of the five selected quantitation peaks and major non-quantitation peaks for the unknown sample with retention time of reference standards (continuing calibration verification standards). Additionally pattern recognition is used for comparison of unknown samples with reference standards for positive identification. Confirmation of Aroclor presence by secondary GC column analysis may be necessary for highly altered/degraded PCB patterns or for programs including PCB air monitoring, US-EPA CLP protocol and other projects as specified in the site sampling and analysis quality assurance plan.

12.10.1.1 Dual Column/Confirmatory Column Analysis by GC:

Inject samples under same operating conditions and analytical run QA/QC parameters on a secondary GC column of dissimilar phase (e.g ZB-1 and ZB-5). Note: If using dual GC column system, samples are injected sequentially through separate injection ports onto both columns. Samples are analyzed and concentration results are reported.

12.10.1.2 Dual Column/Confirmatory Column Laboratory Default by SW-846:

12.10.1.2. 1 Report **highest** concentration of the 2 column results for each individual Aroclor on the merged EDD, Form 1 or Certificate of Analysis (Note: This is appropriate for Aroclor regulated projects. E.g. Air Monitoring for EPA TO-10A alternative reporting may be based upon total PCB values for PCB- Total regulated projects).

12.10.1.2.2 If **RPD percent** exceeds 40% report the highest concentration result of the two analyses unless observed chromatographic interference or instrumental analysis QA/QC indicates the lower value may be more accurate. P-flag all excursions > 40% and describe interferences or rationale for reporting lower value in Data Narrative.

12.10.1.2.3 If a concentration is above the PQL on one column and below the PQL on the second column, the qualitative presence is not confirmed and the sample is reported as not detected. **Note: If reporting to the MDL is required do the following:**

For reporting the MDL:

a) If one result is greater than the PQL and other result is < PQL (J-flag) Report the **highest** result as confirmed (*unless interference or QC reasons indicate lower value*)

b) If one result is above MDL (J-Flag) and second is Not Detected report the concentration as **not detected.** (Presence not confirmed).

c) If both results are J-Flag values (< PQL) report the **highest** value of the two.

12.10.1.3 USEPA-CLP/ASP Program Protocols

a) Report **Lowest** Value of the 2 column results for each individual Aroclor on the merged EDD, Form 1 or Certificate of Analysis (Note: This is appropriate for Aroclor regulated projects. E.g. Air Monitoring for EPA TO-10A alternative reporting may be based upon total PCB values for PCB- Total regulated projects).

b) If **Percent Difference** (not RPD%) exceeds 25% then P-flag all excursions > 25%. Note any chromatographic interferences present in Case Narrative.

c) If one result is greater than PQL and other result is < PQL (J-Flag) Report the **lowest** result (J-Flagged) value (*confirmed hit*).

d) If one result is above MDL (J-Flag) and second is Not detected, report the concentration as **not detected** (*presence not confirmed*).

13.0 Calibration and Standardization

13.1 Gas chromatographic operation parameters: See Attachment C

13.2 Initial GC Calibration

13.2.1 GC calibration is performed by the external standard calibration procedure. Prior to running samples the system must be calibrated and system performance must be verified.

13.2.2 Establish the gas chromatographic operating parameters outlined in the Procedure section and prepare the calibration standards at the five concentrations outlined in the Reagent and Standard section. Inject each calibration standard using the GC Autosampler and the parameters outlined in the Procedure section. Note: The same parameters are used for actual samples.

13.2.3 For each Aroclor, 5 peaks are selected to prepare calibration curves. The peaks selected from the multi-component Aroclor formulations were based on maximizing the separation for each Aroclor (i.e., minimizing peak overlap in retention time). Consideration was also given to selecting peaks that normally did not have problems with co-elution with interfering peaks or possible co-elution with organochlorine pesticides. The determined area of the five peaks selected for calibration is processed by the data workstation as a group, combining the area for calculations of the calibration factors. The following table lists the Aroclors that are included in the initial calibration and the peak numbers used.

Aroclor	Peak Numbers
A1016	6, 7, 8, 9, 10
A1221	1, 2, 3, 4, 5

A1232	5 , 7 , 8 , 9 , 10
A1242	6 , 7 , 8 , 9 , 10
A1248	11 , 12 , 13 , 14 , 15
A1254	16 , 17 , 18 , 19 , 20
A1260	20 , 21 , 22 , 23 , 24

13.2.4 For the initial calibration curve to be considered valid, the percent relative standard deviation of response factors must be less than 20% over the working range if average calibration factor quantitation is used. Note: the % RSD is a useful check for linearity through the origin and is used as a data quality indicator. In general an inverse weighted linear calibration curve with intercept is used for quantitation and is not replaced with the average calibration factor. For linear calibration curve the Correlation Coefficient R must be greater than 0.99.

13.2.5 Our laboratory uses a computer based chromatography software module (Water Corporation, Empower software) interfaced to the gas chromatograph. The workstation processes the detector signal, performs an analog to digital conversion, and stores the digitized chromatograms on the computer hard disk. Integration of peak areas and production of chromatograms is performed in the Empower software. All data analysis will be carried out on specialized software developed at Northeast Analytical including calculating calibration curves/response factors, report generation, and archival of data.

13.2.6 If a re-calibration is performed, the CCCS must be analyzed again and values calculated using the new relative response factors. If the CCCS fails to meet the percent difference criteria after re-calibration, sample analysis must not proceed until the problem is found and corrected (*i.e.,* GC gas leak, autosampler syringe plugged, broken injector liner).

13.4 Retention Time Windows

13.4.1 The GC system should be checked by the analyst to make sure it is functioning properly before establishing retention time windows. Select a calibration standard and inject three times within a 72-hour time period.

13.4.2 For each peak calculate the standard deviation resulting from the variation in the three retention times for that peak.

13.4.3 The retention time window is defined as plus or minus three times the standard deviation of the three retention time determination.

13.5.3 If the standard deviation of the selected peak is zero, the standard deviation of the peak eluting after it is used. If it is the last eluting peak that the zero for the standard deviation, then substitute the standard deviation of the peak eluting before the last peak.

14.0 Procedure

14.1 Sample Extraction and Preparation

14.1.1 The following SOP's detail sample extraction procedures that are utilized in preparing samples for analysis by this analytical method:

SOP NAME	TITLE	EPA Method
NE005	Soxhlet Extraction/ Extract Prep	8082, 3540C
NE017	Fish and Biota Extraction	8082
NE088	PCB Extraction Of Wipe	8082, 3540A
NE111	Waste Dilution EPA 3580 for PCB 8082	8082, 3580A
NE120	Extraction and cleanup of PCB by SW-846 3550B	8082, 3550B

NE140	PCB Screening by GC	3510C, 3520C, 3545
NE141	SW-846 3510C H2O PCB extraction	8082, 608, 3510C
NE143	EPA 3545 extraction for 8082 PCB	8082, 3545
NE144	EPA 3545 extraction of wipe for 8082 PCB	8082, 3545
NE151	PUF Extraction for 8082 analysis	8082, 3540C/ TO-10A
NE158	% Lipid Determination Fish & Biota	3540, 3500, 2500A
NE194	High Level PCB extraction for 8082 by SepFunnel	8082, 3510C

14.2 Gas Chromatographic Procedures

14.2.1 Prescreening of sample extracts: See standard operating procedure NE140 for details on the PCB screening procedures used prior to final analysis by this method. Prescreening is a fast and effective way to determine if re-extracts are required and dilutions for over ranged samples. The GC will be standardized by using Aroclor 1221, Aroclor 1242, and Aroclor 1260. These three Aroclor formulations incorporate most environmental PCBs found in sample extracts and provide a good estimate of PCB amount for final dilution for this determinative method. A three level calibration curve is utilized (0.50ug/ml, 2.5ug/ml, and 5.0ug/ml standards). The concentration of each Aroclor (grouped as Aroclor 1221, Aroclor 1242, and Aroclor 1260 only) in a sample will be calculated based on the extract volume (not the sample weight or volume) to supply solution concentration values that show if the extract needs to be diluted for final capillary GC analysis. If a dilution is necessary, sample extracts are diluted to a solution concentration near 0.500ug/g, so ensuring each sample quantifies in the middle of the calibration curve.

14.2.2 Approximately 1.0ml of the final dilution extract is then transferred into a labeled autosampler vial.

14.2.3 The sequence of the analytical queue is set up in the NEA LIMS as a unique batch file. This file contains the exact order in which standards, instrument blanks, and samples will be analyzed. Once the sample set is uploaded into the Empower acquisition/run screen and saved, the sample set is printed and the samples are loaded into the GC autosampler tray in the order specified by the sample set queue.

14.2.4 The following labeling will be used on the autosampler vial and for the sample set file created for the analytical queue.

14.2.4.1 The initial calibration standard will be labeled as 040516A, 040516B, etc. Substitute the actual date of analysis and the Aroclor used in the file name.

14.2.4.2 The instrument blanks will be labeled 070405B01, B02, B03, etc. Substitute the actual date of analysis in the file name.

14.2.4.3 The Continuing calibration check standards will be labeled CS160405A CS160405B, etc. Substitute the actual date of analysis and the Aroclor used in the file name.

14.2.4.4 Samples are labeled with the laboratory identification number on the autosampler vial. In the sample set file the laboratory identification number, along with the client identification, sample weight, set volume and dilution are entered.

14.2.5 At this point the chromatography software can be initiated to start data collection. The gas chromatograph is placed into run mode and sample analysis is performed until the analytical queue is complete.

14.2.6 Peak Identification

14.2.6.1 Target peaks are identified in unknown samples based upon Retention Time (RT). The retention time of an unknown peak must fall within the retention time windows established.

14.2.6.2 Besides using retention time windows to assign peak IDs, the analyst should also rely on their own experience in recognition of multi-response PCB chromatograms. Caution should be exercised when identifying peaks which elute near interferences present in samples and blanks. Comparison of sample chromatograms with method blank and field blank chromatograms is useful in determining chromatographic interferences.

14.2.6.3 This method should be applied with caution when used in determining PCB of interest in unknown sample for which no prior historical information exists. In this case confirmatory column analysis or confirmation by GC/MS analysis may be advised.

14.3 Data Reduction/Reporting

14.3.1 Final peak assignments and quantitation calculations are performed within the software along with the current instrument calibration. The final concentration results are provided in the reporting section of the software. Final concentration results are reviewed by QA department or other approved manager before release to the client.

14.3.2 Data Qualifiers:

Sample Concentration Reports (Certificates of Analysis, Data Package Form 1's and Electronic Data Deliverables (EDDs) are generated using the appropriate data qualifiers as follows:

U – Denotes analyte not detected at concentration greater than or equal to the Practical Quantitation Limit (PQL). Note: PQLs are adjusted for sample weight/volume and dilution factors.

J - Denotes an estimated concentration. The concentration result is greater than or equal to the Method Detection Limit (MDL) but less than the Practical Quantitation Limit (PQL).

P - Indicates relative percent difference between primary and secondary GC column analysis exceeds 40 %.

C- Denotes analyte confirmed by secondary GC column analysis.

B - Denotes analyte observed in associated method blank. Analyte concentration should be considered as estimated.

E - Denotes analyte concentration exceeded calibration range of instrument. Sample could not be re-analyzed at secondary dilution due to insufficient sample amount, quick turn-around request, sample matrix interference or hold time excursion. Concentration result should be considered as estimated.

Z - Laboratory Reserved Qualifier (explained in associated Case Narrative)

15.0 Calculations

15.1 Calibration curve calculation:

15.1.1 PCB Solution concentration calculation from initial Calibration by Linear Regression $Yi = aXi + b$

Xi = Calibrated Solution Concentration (ng/mL)
Yi = total area response of 5 PCB quant. peaks (uV-Sec.)
a = slope
b = intercept

Unknown Solution Conc. $X = (Y - b)\ a$

Y = Total area response of PCB Chromatogram (uV-Sec.)
a = slope of ICAL by linear regression
b = intercept of ICAL by linear regression

15.2 Capillary GC: Sample calculations

15.2.1 The concentration of each identified PCB Aroclor in a sample will be calculated based on the sample weight or volume.

15.2.2 The PCB solution concentration of the extract is calculated as follows:

Solution Conc. = (Y –b)/a

Where:

Y = Total area response of PCB Chromatogram (uV-Sec.)
a = slope of ICAL by linear regression
b = intercept of ICAL by linear regression

15.3 Final concentration of samples:

15.3.1 Calculations of final PCB concentrations will vary upon matrix, calculations are as follows:

(1.) Soil/Sediment/Solids:

Final Conc. = (Sol. Conc.) * (V)*DF/ (M)* (%Total Solids) (1/1000) ug/g

Where: Sol Conc. = Solution Concentration (ng/mL)
V = concentrated extract volume (mL)
DF = analytical dilution factor
M = mass extracted (g)

(2.) Water:

Final Conc.= (Sol. Conc.) * V*DF/[(Vt)](1/1000) ug/L

Where: Sol Conc. = Solution Concentration (ng/mL)
V = concentrated extract volume (mL)
DF = analytical dilution factor
Vt= Total Volume Extraction (L)

(3.) Biota Tissue

Final Conc. = (Sol. Conc.) * (V)*DF/(M)(1/1000) ug/g

Where: Sol Conc. = Solution Concentration (ng/mL)
V = concentrated extract volume (mL)
DF = analytical dilution factor
M = mass extracted (g)

(4.) PUF Cassette

Final Conc. = (Sol. Conc.) * (V)*DF/ (Va) ng/cubic meter

Where: Sol Conc. = Solution Concentration (ng/mL)
V = concentrated extract volume (mL)
DF = analytical dilution factor
Va = volume of air sampled (cubic meters)

(5.) Waste Oil

Final Conc. = (Sol. Conc.) * (V)*DF/ (M)*(%Total Solids) (1/1000) ug/g

Where: Sol Conc. = Solution Concentration (ng/mL)
V = concentrated extract volume (mL)
DF = analytical dilution factor
M = mass extracted (g)

15.3 The calculated concentration for each PCB aroclor will be compared to its respective sample-specific reporting limit (RL) and method detection limit (MDL). The results with concentrations at or above the MDL but below RL will be reported as detects and flagged as estimated J. The results for peaks with concentrations at or above the RL would be reported as unqualified numeric values.

16.0 Method Performance
Method Performance is Assessed by Initial/Continuing Demonstration of Proficiency Studies and MDL Determinations

16.1 Initial Demonstration of Performance (IDOP) Procedure:

16.1.1 Prepare 4 replicates of a fortified laboratory blank sample (using laboratory reagent water or sodium sulfate) by spiking each sample with 1.0 mL of 0.500 ug/mL Aroclor solution (typically Aroclor 1242) for water samples and 0.100 mL of 100 ug/mL Aroclor 1242 solution for solid samples. Prepare one method blank sample with the batch. Extract and analyze each aliquot according to procedures beginning in Section 14.0 below.

16.1.2 For each replicate the recovery value of the sample must fall in the range of 70±30 % (or established lab limits) and the percent RSD must be < 20 % for the method performance to be considered acceptable. See Section 23 Attachment G for example IDOP study.

16.1.3 This procedure must be repeated using four fresh samples until satisfactory performance has been demonstrated. The initial demonstration of capability is used primarily to preclude the laboratory from analyzing unknown samples via a new, unfamiliar method prior to obtaining some experience with it. It is expected that as laboratory personnel gain experience with this method the quality of data will improve beyond those required here.

16.2 Continuing Demonstration of Performance Procedure:

16.2.1 Annual continuing demonstration of performance may be satisfied by a repeat Initial Demonstration of Performance, the acceptable analysis of an unknown samples (for example PT test sample), or the acceptable analysis of 4 consecutive Laboratory Control Spike samples. Records of continuing demonstration of performance are maintained by the laboratory Quality Assurance Department.

16.2.2 With each batch of samples to be extracted a method blank is processed. The method blank is carried through all stages of sample preparation and measurement steps. For water samples an organic-free reagent water blank is processed.

16.2.3 The method blank should exhibit PCB levels less than the practical quantification limit or reporting limt (PQL or RL). If the method blank exhibits PCB contamination above the reportable quantitation limit, the samples associated with the contaminated blank should be re-extracted and analysis repeated when appropriate. If there is no original sample available for re-extraction or if the associated sample concentrations greatly exceed the blank concentration, then all positive concentration results for the associated samples should be flagged with a "B" indicating blank contamination and a case narrative describing the situation prepared.

16.2.4 A matrix spike is to be analyzed at a rate of 1 matrix spike per every 10 samples. A duplicate sample may be prepared in lieu of a matrix spike when detectable PCB concentrations are known to be present.

16.3 Method Detection Limit

16.3.1 A method detection limit will be determined for this method whenever major modification to the extraction or analysis procedures are made or at a minimum frequency of every 2 years. A minimum of seven laboratory organic free water samples or sodium sulfate will be prepared and spiked with chlorinated PCB methyl esters mixture, at a low level and taken through all extraction and analytical procedures.

$MDL = S * t_{(n-1,\ 1-alpha=0.99)}$
Where:

S = Standard deviation of the replicate analyses
n = Number of replicates
$t_{(n-1,\ 1-alpha=0.99)}$ = Student's t value for the 99% confidence level with n-1

For example: t for 8 replicates = $t_{(7,0.99)}$ = 2.998

16.3.2 The determined MDL must be less than the concentration spiked but greater than one tenth (1/10) the spiked concentration. If not, repeat the MDL determination at an appropriate spike concentration for affected analytes.

17.0 Pollution Prevention

17.1 Pollution prevention is practiced in the laboratory by minimizing usage of solvents and chemicals, so that disposal of waste generated is held to the smallest amount possible. This is directly linked to the types of extraction procedures in place at the laboratory to reduce the volumes of solvents used for semi-volatile extraction procedures. Northeast Analytical employs extraction procedures such as continuous liquid/liquid and solid phase extraction methods to reduce solvent requirements for water extraction protocols and ASE and Soxhlet extractions for solid matrices.

17.2 Pollution prevention also relies on minimizing to the best extent the chemicals and solvents required to perform extraction and analysis procedures. The laboratory personnel strive to purchase chemicals and standards that will be consumed based on anticipated workload. For additional information about laboratory pollution prevention, please refer to laboratory SOP NE168.

18.0 Data Assessment and Acceptance Criteria for Quality Control Measures

18.1 The GC analyst is responsible for generating the data and also is the initial individual to review the data. This would include inspection of the chromatographic data, processing the raw data, producing all required data forms, inspection of calibration curves for compliance, surrogate recovery, laboratory control spike recovery, matrix spike/matrix spike duplicate recovery, and continuing calibration compliance.

18.2 Once the initial review of the data is performed by the analyst, decisions are made at that time to accept the data if all criteria are met or to reject sample data if any of the quality control parameters or limits are out of control. Depending on the situation, samples requiring re-extraction will be notified to the appropriate extraction personnel, sample extracts requiring re-injection will be queued for analysis, new calibrations may have to be performed, or samples re-analyzed due to failing continuing check standards.

18.3 The analyst may also consult with the quality control officer as to the best form of action to take or if the situation warrants corrective action beyond routine practices. If no recourse is available and the data is to be reported out of criteria, a Case Narrative Report is generated and the deviation is documented and reported to the client. The Case Narrative Report is filed with the data and is also useful for production of case narratives that are issued with the final data reports. If a problem exists that requires follow-up to rectify, a Corrective Action Report (CAR) is issued to document the problem found, steps taken to resolve the problem, and what samples were affected. This CAR form is filed by the quality control officer and reviewed by management to verify that appropriate actions have been taken to correct the problem.

18.4 Please see Table 19.1 below for specific Quality Assurance Acceptance Criteria.

19.0 Corrective Action for Out-Of-Control Data

19.1 The table below outlines the data assessment, acceptance criteria, and corrective action procedures for out-of-control data.

Quality Control Acceptance Criteria and Corrective Action Plan

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	The five point calibration is analyzed initially and when Continuing Calibration Check standard fails criteria.	- %RSD≤20% for the relative response factors for the calibration standards if using average response factor calibration. Correlation Coefficient R must be >0.99 for Linear Regression.	- Re-analyze the initial calibration standard and/or evaluate/correct instrument malfunction to obtain initial calibration and continuing calibration check standards that meet criteria.
Continuing Calibration Check Standard (CCCS)	- Initially analyze a CCCS immediately following an initial calibration. - After the initial CCCS of the sequence, a CCCS must be analyzed after 9 samples. - Analytical sequence must end with analysis of a CCCS.	- Calibration factor for the continuing calibration check must ±15% of the true value. - Retention time of all quantitated peaks must be within RT window (reset with each initial CCCS of a sequence). - All samples must be bracketed by a CCCS that meet all criteria stated above.	- If the reason for the failure of the CCCS appears to be a poor injection (or a degraded standard solution), the CCCS will be re-injected (or re-prepared and re-injected) immediately following the failed CCCS. This can only occur if the instrument is being attended by an analyst. If upon re-injection, the CCCS meets all the acceptance criteria and there is no apparent impact on the sample data the analytical sequence will continue and samples will not be reanalyzed. The associated sample data will be reported. - If CCCS failure was not due to a poor injection (or degraded standard solution) or the instrument was unattended at the time of the CCCS failure, correct system, if necessary, and recalibrate. Initial calibration and CCS criteria must be met before sample analysis may begin. Samples that are not bracketed by complaint CCCSs must be reanalyzed. -If acceptable CCCSs are observed later in the sequence, samples bracketed by acceptable CCCSs will be reported. Samples between the failed CCS and prior/ subsequent complaint CCCS will be re-analyzed.
-Retention Time (RT)	- Use the retention time for peak in the CCSs to determine midpoint of the relative retention time window for the analysis sequence. -Each sample analysis: Rely on RT windows to identify PCB Aroclor to report. Also use pattern recognition and professional judgment for peaks that shift from RT windows, because compound composition may shift RT for GC peaks.	- Each quantitated peak and surrogate peak should be with established windows.	-Inspect chromatographic system for malfunction, correct problem. Perform re-analysis if necessary.

Method Blank	-One per extraction batch of ≤20 samples of the same matrix per day. -Must be analyzed on each instrument used to analyze associated samples. -Must undergo all sample preparative procedures.	- Concentration does not exceed the RL for any PCB Aroclor. - Must meet surrogate criteria of 60-140% recovery.	- Re-analyze method blank to determine if instrument contamination was the cause. If method blank re-analysis passes, then report samples. -If method blank is found to contain PCB contamination above the RL for any PCB Aroclor compound , then re-extract and re-analyze all associated samples. If no sample exists for re-extraction, report data B flagged to indicate method blank contamination.
Laboratory Control Spike (LCS)	- One per extraction batch of ≤20 samples per matrix per day.	-Percent recovery must be within method limits. - Must meet Aroclor spike criteria of 70-130% recovery -Must meet surrogate criteria of 60-140% recovery.	-Re-analyze LCS to determine if instrument was the cause. If LCS passes, then report samples. -If LCS recovery is still out of limits, the re-extract and re-analyze all associated samples. If no sample exists for re-extraction, report data flagged to indicate LCS failed recovery.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	-Normal method procedure is to extract and analyze a matrix spike sample. One MS per extraction batch of ≤20 samples per matrix per day. -If requested, an MSD can be extracted and analyzed. The MSD would follow the above criteria as for the MS.	- Percent recovery for MS must be within method limits - If MS/MSD is analyzed, relative percent difference (RPD) should be within 30%. - Must meet Aroclor spike criteria of 70-130% recovery -Must meet surrogate criteria of 60-140% (unless original unspiked sample is also outside of criteria)	-Re-analyze MS and/or MSD to determine if instrument was the cause. If MS and/or MSD pass, then report samples. -Check for errors such as calculations and spike preparation. -Check original unspiked sample results and surrogate recovery for indications of matrix effects. -If no errors are found, and the associated LCS is within limits, then sample matrix effects are likely the cause. Note exceedance in case narrative.
Surrogates	-Surrogates are added to all samples and QC samples. Tetra-chloro-meta-xylene (TCMX) and Decachlorobiphenyl (DCBP) solution.	- Percent recovery for the surrogate should be 60-140%.	-Re-analyze the affected sample or QC sample to determine if instrument was the cause. If surrogate passes, then report samples. -Check for errors in surrogate calculation and surrogate solutions. -If no problem is found, then re-extract and re-analyze the sample. -If re-extraction is within limits and sample extract holding time, then report only the re-analysis. -If the re-extraction is within limits, but out of extraction holding time, then report both sets of data.

			-If the re-extraction produces surrogate recovery still out of limits, then report both sets of data. -If no sample exists for re-extraction, report data flagged to indicate surrogate failed recovery or have a client re-sample.

20.0 Contingencies for Handling Out-Of-Control or Unacceptable Data

20.1 Data that is detected to be out-of-control for any reason, when compared to method acceptance criteria, will addressed in the following manner:

20.1.1 If the problem exists with the gas chromatographic instrumentation, appropriate action will be taken to repair and perform maintenance to bring the instrument back to operation condition. Once the instrumentation is determined to be correctly operating analysis can begin again.

20.1.2 If the problem exists with calibration standard solutions, the analyst will prepare new standards and discard the standard solutions that are suspect. Instrument calibration can be performed and analysis can begin once system is control.

20.1.3 If the problem exists with sample extraction and extract preparation, the extraction step that is producing the out of-control situation will be diagnosed and rectified. Once the troubleshooting procedures correct the problem extraction can once again occur and analysis can continue.

20.1.4 In situations where data is reported under out-of-control conditions, the data will be annotated with data qualifiers and/or appropriate descriptive comments defining the nature of the excursion in the sample case narrative. If warranted, a corrective action report (CAR) will be issued to define the problem, steps to correct the problem, and final resolution.

21.0 Waste Management

21.1 All applicable federal and state rules and regulations governing hazardous waste will be followed when disposing of laboratory waste generated during the execution of this method.

21.2 Please refer to standard operating procedures NE089 and NE054 regarding how hazardous waste is handled and disposed of by the laboratory.

22.0 References:

22.1 U.S. EPA SW-846 "Test Methods for Evaluating Solid waste; Volume 1B Laboratory Manual Physical/Chemical Methods", Office of Solid Waste and Emergency Response, Third Edition, Final Update III, December 1996.

22.2 U.S. EPA 40 CFP Part 136, "Guidelines Establishing Test Procedures of the Analysis of Pollutants", July, 1988.

22.3 "Standard Methods for the Examination of Water and Waste Water", 19th Edition 1995, American Public Health Association, American Water Works Association, Water Pollution Control Federation.

22.4 New York State Department of Health, "Environmental Laboratory Approval Program Certification Manual", Wadsworth Center for laboratories and Research, 1996.

22.5 Guide to Environmental Analytical Methods", third edition, Genium Publishing Corporation, 1997.

23.0 Tables, Diagrams, Flowcharts and Validation Data

23.1 Attachment A: PCB Stock Standard/Calibration Standard Preparation

23.2 Attachment B: Continuing Calibration Check Standard Preparation

23.3 Attachment C: GC Operating Parameters

23.4 Attachment D: Chromatograms

23.5 Attachment E: Example Retention Time Window Study

23.6 Attachment F: Example MDL Studies

Attachment A-PCB Stock Standards Prep Table:

Table 1

PCB Stock Standard Preparation Table

PCB Formulation	Supplier	Catalog #	Standard weight(mg)	Conc. (PPM)
A1016	Monsanto Neat Archive	NA	100.0	1000.0
A1221	Monsanto Neat Archive	NA	100.0	1000.0
A1232	Monsanto Neat Archive	NA	100.0	1000.0
A1242	Monsanto Neat Archive	NA	100.0	1000.0
A1248	AccuStandard	C-248N-50mg	100.0	1000.0
A1254	Monsanto Neat Archive	NA	100.0	1000.0
A1260	Monsanto Neat Archive	NA	100.0	1000.0
TCMX/DCBP (Surrogate)	Ultra Scientific	CUS-4911*	0.5/5.0	500/5000

Unless otherwise noted hexane is the solution used to make all dilutions. *Custom Order

Table 2

PCB Calibration Standard Preparation Table (High Level Calibration Curve)

Initial Volume (mL)	Initial Conc. (ug/mL)	Final Volume (mL)	Final Concentration (PPM)					
			A1016	A1221	A1232	A1242	A1248	A1260
5.0	(10.0)	50.0	1.000	1.000	1.000	1.000	1.000	1.000
2.5	(10.0)	50.0	0.500	0.500	0.500	0.500	0.500	0.500
1.25	(10.0)	50.0	0.250	0.250	0.250	0.250	0.250	0.250
1.00	(10.0)	50.0	0.200	0.200	0.200	0.200	0.200	0.200
0.500	(10.0)	50.0	0.100	0.100	0.100	0.100	0.100	0.100
5.0	(0.200)	50.0	0.020	0.020	0.020	0.020	0.020	0.020

Actual Concentration, see Table 1 for actual working standard concentrations for each Aroclor.
See Table 3 for A1254 Standard Preparation (high level)

Table 2A

PCB Calibration Standard Preparation Table (Low Level Calibration Curve)

Init. Volume (mL)	Initial Conc. (ug/ml)	Final Volume (mL)	Final Concentration (PPM)					
			A1016	A1221	A1232	A1242	A1248	A1260
0.5	(10.0)	50.0	0.100	0.100	0.100	0.100	0.100	0.100
2.5	(1.0)	50.0	0.050	0.050	0.050	0.050	0.050	0.050
1.0	(1.0)	50.0	0.020	0.020	0.020	0.020	0.020	0.020
1.0	(0.500)	50.0	0.010	0.010	0.010	0.010	0.010	0.010
0.50	(0.500)	50.0	0.005	0.005	0.005	0.005	0.005	0.005

Actual Concentration, see Tables 1 and 2 for actual working standard concentrations for each Aroclor.
See Table 3A for A1254 Standard Preparation (low level)

Table 3

PCB A1254 Calibration Standard Preparation Table (for High Level Curve)

Initial Volume (mL) A1254	Initial Conc. (ug/mL) A1254	Initial Volume (mL) 0.5/5.0 -PPM Surrogate	Final Volume (mL)	Final Concentration (PPM)		
				A1254	TCMX	DCBP
5.0	10.0	0	50	1.000	0	0
2.5	10.0	0	50	0.500	0	0
10.0	10.00	4.0	100	1.000	0.020	0.200
25.0*	1.000		50	0.500	0.010	0.100
1.25	10.0	0.800	50	0.250	0.008	0.080
0.500	10.0	0.500	50	0.100	0.005	0.050
1.000**	1.000	0.200	50	0.020	0.002	0.020

*This initial volume is of the A1254 1.000 ppm calibration standard WITH surrogates.
**This initial volume is of the A1254 1.000 ppm secondary stock solution WITHOUT surrogates.

Table 3A
PCB A1254, TCMX and DCBP Calibration Standard Preparation Table (for Low Level Curve)

Initial Volume A1254 (mL)	Initial Conc. A1254 (ug/mL)	Initial Volume (mL) 0.5/5.0 -PPM Surrogate	Final Volume (mL)	Final Concentration (PPM)		
				A1254	TCMX	DCBP
5.00	1.000	0.80	50	0.100	0.00800	0.0800
2.50	1.000	0.50	50	0.050	0.00500	0.0500
1.0	1.000	0.40	50	0.020	0.00400	0.0400
1.0	0.500	0.250	50	0.010	0.00250	0.0250
0.50	0.500	0.100	50	0.005	0.00100	0.0100

ATTACHMENT B: PCB Continuing Calibration Standards

Table 1
PCB Continuing Calibration Working Standards
prepared from 1000 PPM Stock Standards

PCB	Stock Source	Initial Volume (mL)	Final Volume (mL)	Concentration (PPM)
A1016	Chem Service Cat # F107AS	1.0	100	10.0
A1221	Chem Service Cat # F108AS	1.0	100	10.0
A1232	Chem Service Cat# F113AS	1.0	100	10.0
A1242	Chem Service Cat# F109AS	1.0	100	10.0
A1248	Chem Service Cat# F110AS	1.0	100	10.0
A1254	Chem Service Cat# F111AS	1.0	100	10.0
A1260	Chem Service Cat# F112AS	1.0	100	10.0

ATTACHMENT B cont'd

Table 2
PCB Continuing Calibration Standards (High Level)
prepared from 10 PPM CCV Working Standards and all contain surrogates

PCB	Surr. Volume* (mL)	Initial Volume (mL)	Final Volume (mL)	Surrogate Concentration TCMX/DCBP (PPM)	Aroclor Concentration (PPM)
A1016	2.0	5.0	100	0.010/0.100	0.500
A1221	2.0	5.0	100	0.010/0.100	0.500
A1232	2.0	5.0	100	0.010/0.100	0.500
A1242	2.0	5.0	100	0.010/0.100	0.500
A1248	2.0	5.0	100	0.010/0.100	0.500
A1254	2.0	5.0	100	0.010/0.100	0.500
A1260	2.0	5.0	100	0.010/0.100	0.500

*Surrogate stock solution 0.500 PPM TCMX and 5.0 PPM DCBP

Table 3
PCB Continuing Calibration Standards (low Level)
prepared from 10.0 PPM CCV Working Standards and all contain surrogates.

PCB	Surr. Volume* (mL)	Initial Volume (mL)	Final Volume (mL)	Surrogate Concentration TCMX/DCBP (PPM)	Aroclor Concentration (PPM)
A1016	1.0	0.500	100	0.005/0.050	0.050
A1221	1.0	0.500	100	0.005/0.050	0.050
A1232	.1.0	0.500	100	0.005/0.050	0.050
A1242	.1.0	0.500	100	0.005/0.050	0.050
A1248	.1.0	0.500	100	0.005/0.050	0.050
A1254	1.0	0.500	100	0.005/0.050	0.050
A1260	1.0	0.500	100	0.005/0.050	0.050

*Surrogate stock solution 0.500 PPM TCMX and 5.0 PPM DCBP

Attachment C: GC Operating Parameters

GC-19 Low Level PCB Method

GC #:	**19**
Method:	**608/8082 Low Level PCB**
GC Method #:	**5**
Date:	**10/27/2006**
Analyst:	**AJM**
File Name:	**S:\FORMS\LOG\GC\[GC19_Parameters.xls]8082 LL M5**
Column:	**19F ZB-1**
	19B ZB-5

Sample Delivery:

Single Method **Method 5**

CP-8400

Injection Mode:	**User**		
Sample Penetration Depth (%)	95	Viscosity Delay (sec)	1.0
Solvent Penetration Depth (%)	95	Plunger Speed During Fill (ul/sec)	1.0
		Plunger Speed During Injection (ul/sec)	5.0
Air Plug after Sample (ul)	1.0	Pre Injection Delay (sec)	3.0
Sample Air Gap	No	Post Injection Delay (sec)	3.0
Number of Fill Strokes	0		
Fill Volume for Fill Strokes	5.0		

Default Clean

Default Clean Vial	I
Default Clean Volume (ul)	5
Number of Clean Strokes	1
Default Clean Drawup Spped (ul/sec)	5

Clean Mode

Number of Pre-Injection Solvent Clean Flushes	1
Number of Post-Injection Solvent Clean Flushes	1
Number of Pre-Injection Sample Clean Flushes	0
Clean Solvent Source Vial	I+II

Solvent Plug

Vial for Solvent Plug	III
Solvent Plug Size (ul)	0.2
Solvent Drawup Speed (ul/sec)	5.0
Solvent Pause Time	1.0
Solvent Air Gap	NO

Select Edit

Select Automation Mode:	Single Method		
Edit Single Method Automation			
Method:	5		
Initial Sample:	0	Injection Possition	Both
Final Sample:	99	First Injector used	Pos. 1
Injections / Sample:	1	Use Injection Delay	No
First Injection Volume (ul):	1.1*	Delay between Injections	0.5
Second Injection Volume (ul):	1.3*	Advance Carrousel between Injections	No
	*can vary	Clean between Injections	Yes

Column Oven:

Step	Temp (°C)	Rate (°C/min)	Hold (min)	Total (min)
Initial	140	-------	2.00	2.00
2	200	10	0.00	8.00
3	245	5	13.23	30.23

Stabilization Time (min): 0.20

Injector Front CP-

1177 Oven	O
1177 Temperature	30

Tim	Split State	Split Ratio
Initial	ON	20

Flow/PSI (Front EFC, Type

Step	Pres (psi)	Rate (psi/min)	Hold (min)	Total (min)
Initial	23.1*	——	30.30	30.30

*last

Constant Flow Mode	N
Column Flow Rate	1.

Injector Middle CP-

1177 Oven	O
1177 Temperature	30

Tim	Split State	Split Ratio
Initial	ON	20

Flow/PSI (Front EFC, Type

Step	Pres (psi)	Rate (psi/min)	Hold (min)	Total (min)
Initial	29.5*	------	30.30	30.30

Constant Flow Mode	N
Column Flow Rate	1.

Detector

	Front	Middle
ECD Oven	O	OF
Temperature	30	5
Electronics	O	O
Range	1	1

Tim	Range	Autozero
Initial	1	YE

Front ECD		
Time Constant:	Fas	Fas
Cell Current:	CAP	CAP
Contact Potential (mV):	-	-
Date of last adjustment	5/2/200	5/2/200
Make-Up Flow (ml/min):	manually set and measured.	

Tim	Range	Autozero
Initial	1	YE

Analog

Detectors Front:
Middle:
Rear:

Tim	Signal Source	Attenuation
Initial	Front Detector	1
Tim	Signal Source	Attenuation
Initial	Middle Detector	1
Tim	Signal Source	Attenuation
Initial	Rear Detector	1

Valve

Time	1 Non	2 Non	3 Non	4 Non	5 Non	6 Non	7 None
Initia	——	——	——	——	——	——	——

Initial valve

GC-19 8082 High Level PCB Method

GC #:	19
Method:	8082 High Level PCB
GC Method #:	7
Date:	2/15/2006
Analyst:	KLL
File Name:	S:\FORMS\LOG\GC\[GC19_Parameters.xls]8082 HL M7
Column:	19F ZB-1
	19B ZB-5

Sample Delivery:

Single Method Method 7

CP-8400

Injection Mode:	User		
Sample Penetration Depth (%)	95	Viscosity Delay (sec)	1.0
Solvent Penetration Depth (%)	95	Plunger Speed During Fill (ul/sec)	1.0
		Plunger Speed During Injection (ul/sec)	5.0
Air Plug after Sample (ul)	1.0	Pre Injection Delay (sec)	3.0
Sample Air Gap	No	Post Injection Delay (sec)	3.0
Number of Fill Strokes	0		
Fill Volume for Fill Strokes	5.0		

Default Clean

Default Clean Vial	I
Default Clean Volume (ul)	5
Number of Clean Strokes	1
Default Clean Drawup Spped (ul/sec)	5

Clean Mode

Number of Pre-Injection Solvent Clean Flushes	1
Number of Post-Injection Solvent Clean Flushes	1
Number of Pre-Injection Sample Clean Flushes	0
Clean Solvent Source Vial	I+II

Solvent Plug

Vial for Solvent Plug	III
Solvent Plug Size (ul)	0.2
Solvent Drawup Speed (ul/sec)	5.0
Solvent Pause Time	1.0
Solvent Air Gap	NO

Select Edit

Select Automation Mode:	Single Method		
Edit Single Method Automation Method:	7		
Initial Sample:	0	Injection Possition	Both
Final Sample:	99	First Injector used	Pos. 1
Injections / Sample:	1	Use Injection Delay	No
First Injection Volume (ul):	1	Delay between Injections	0.5
Second Injection Volume (ul):	1	Advance Carrousel between Injections	No
		Clean between Injections	Yes

Column Oven:

Step	Temp (°C)	Rate (°C/min)	Hold (min)	Total (min)
Initial	140	-------	2.00	2.00
2	200	10	0.00	8.00
3	245	5	13.23	30.23

Stabilization Time (min): 0.20

Injector: Front CP-1177

1177 Oven Power:	ON
1177 Temperature (°C)	300

Time	Split State	Split Ratio
Initial	ON	35

Flow/PSI(Front EFC, Type 1):

Injector: Middle CP-1177

1177 Oven Power:	ON
1177 Temperature (°C)	300

Time	Split State	Split Ratio
Initial	ON	35

Flow/PSI(Front EFC, Type 1):

Leap GC Pal Parameters 3/9/2007					
Sample injection Methods					
Method	**GC Dual**	**GC Duals**		**Method**	**GC Inj s**
Cylcle	GC Dual	GC Dual		**Cylcle**	GC Inj S
Syringe	10 ul	10 ul		**Syringe**	10 ul
1. Sample Vol	1.0 ul	1.0 ul		**1. Sample Vol**	1.0 ul
1. Air Vol	1.0 ul	1.0 ul		**Solvent Plug**	200 nl
1. Inject to	GC Inj 1	GC Inj 1		**Slv Source**	Standard
Inj Time Diff	0s	0s		**Int Standard**	0 nl
2. Sample Offs	1	0		**Std Source**	Standard
2. Sample Vol	1.0 ul	1.0 ul		**Air Gap (s)**	1.0 ul
2. Air Vol	1.0 ul	1.0 ul		**1. Air Vol Ndl**	1.1 ul
2. Inject to	GC Inj 2	GC Inj 2		**Pre Cln Slv 1**	2
Pre Cln Slv 1	2	2		**Pre Cln Slv 2**	2
Pre Cln Slv 2	2	2		**Fill Speed**	5.0 ul/s
Pre Cln Sp 1	0	0		**Pull Up Delay**	1.0 s
Int Cln Slv 1	2	2		**Inject to**	GC Inj 1
Int Cln Slv 2	2	2		**Inject Speed**	5.0 ul/s
Pst Cln Slv 1	2	2		**Pre Inj Del**	0 ms
Pst Cln Slv 2	2	2		**Pst Inj Del**	0 ms
Fill Volume	10 ul	10 ul		**Pst Cln Slv 1**	2
Fill Speed	2.5 ul/s	2.5 ul/s		**Pst Cln Slv 2**	2
Fill Stroke	0	0			
Pull Up Delay	500ms	500ms			
Inject Speed	10 ul/s	10 ul/s			
Pre Inj Del	0 ms	0 ms			
Pst Inj Del	0 ms	0 ms			

ATTACHMENT D ZB5 Chromatograms

FIGURE 1. A1016 @ 0.500PPM PLOT

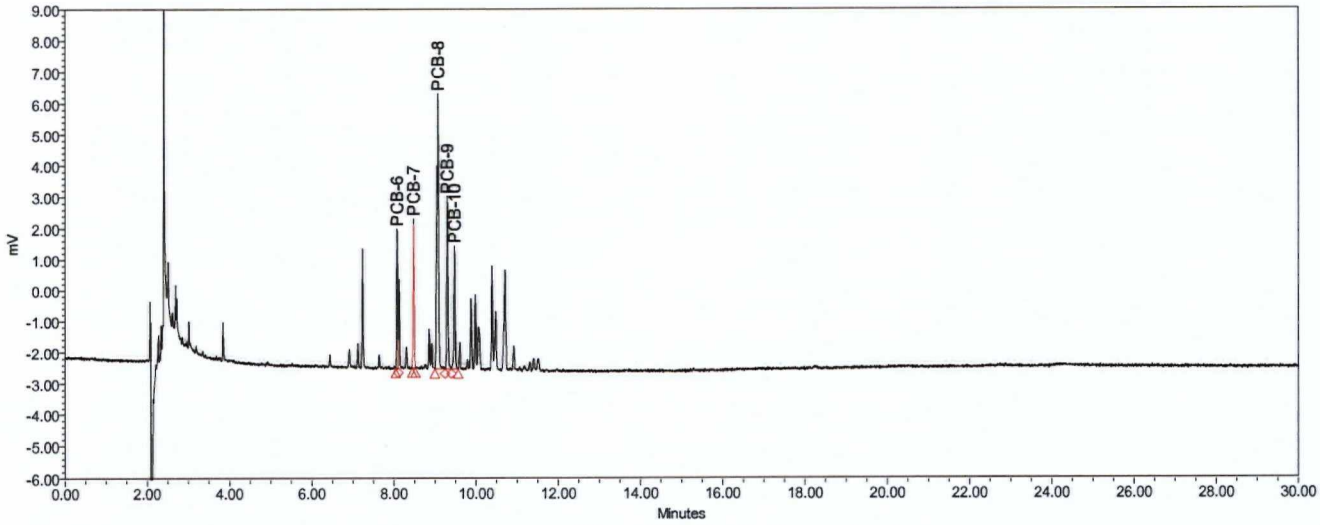


FIGURE 2. A1221 @ 0.500PPM PLOT

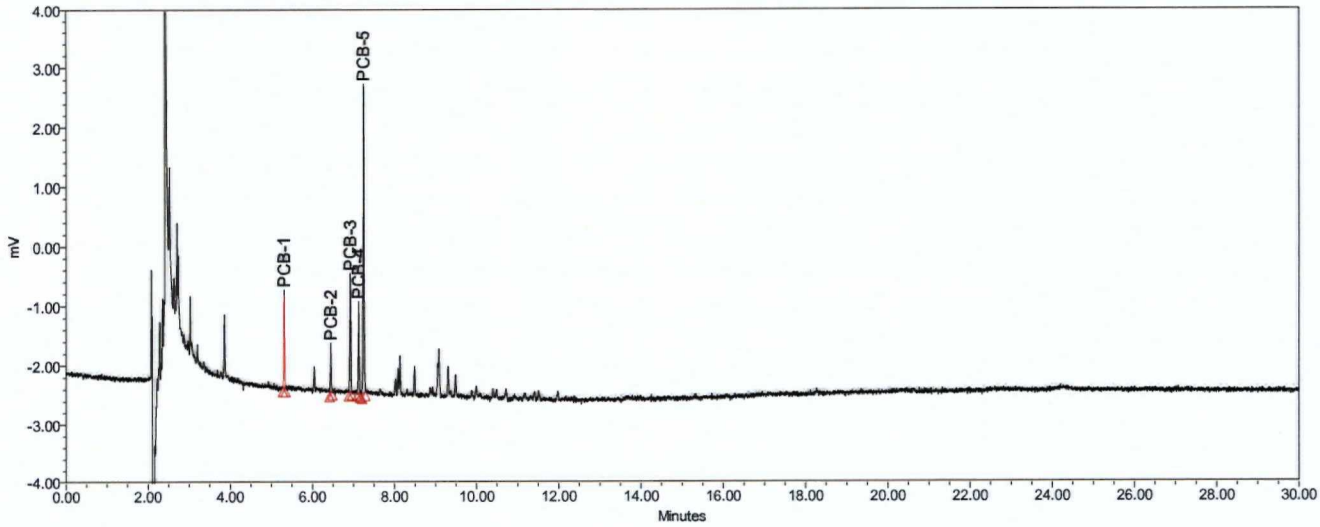


FIGURE 3. A1232 @ 0.500PPM PLOT

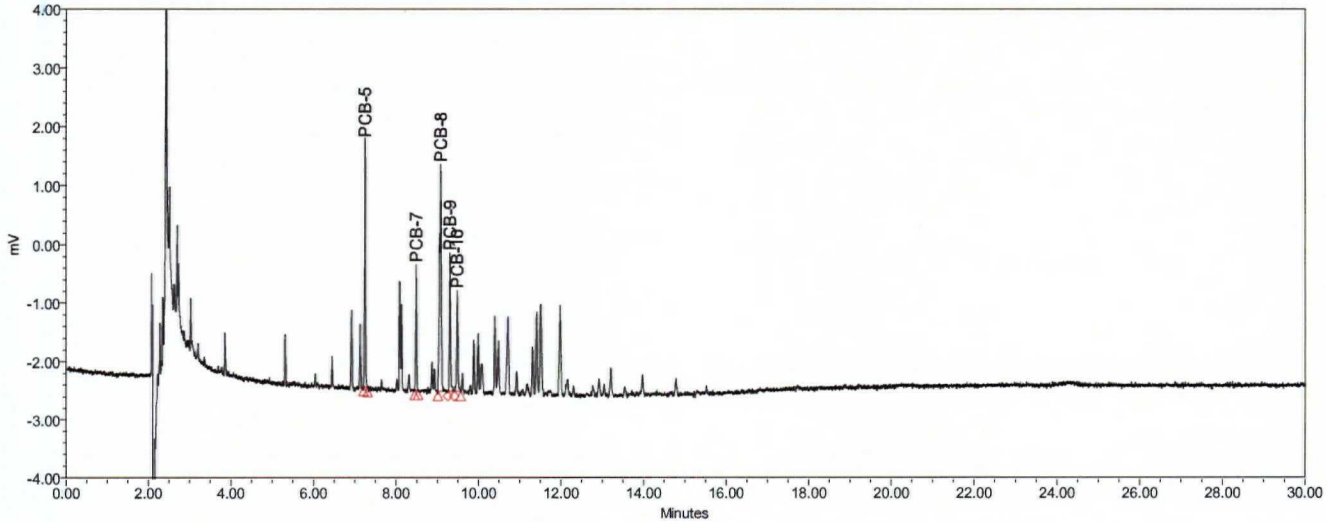


FIGURE 4. A1242 @ 0.500PPM PLOT

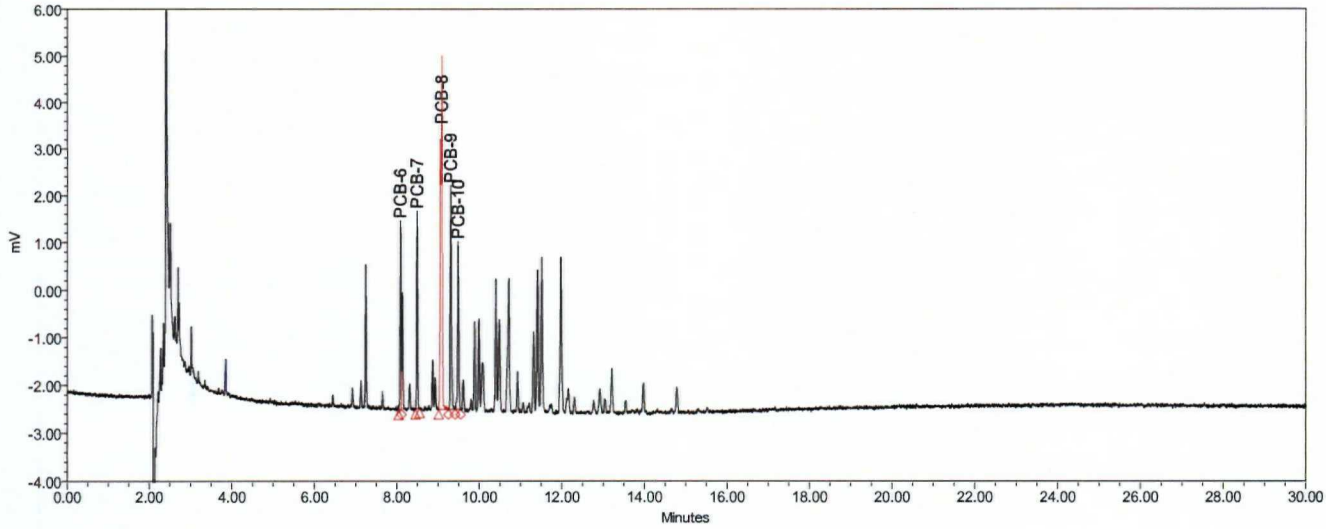


FIGURE 5. A1248 @ 0.500PPM PLOT

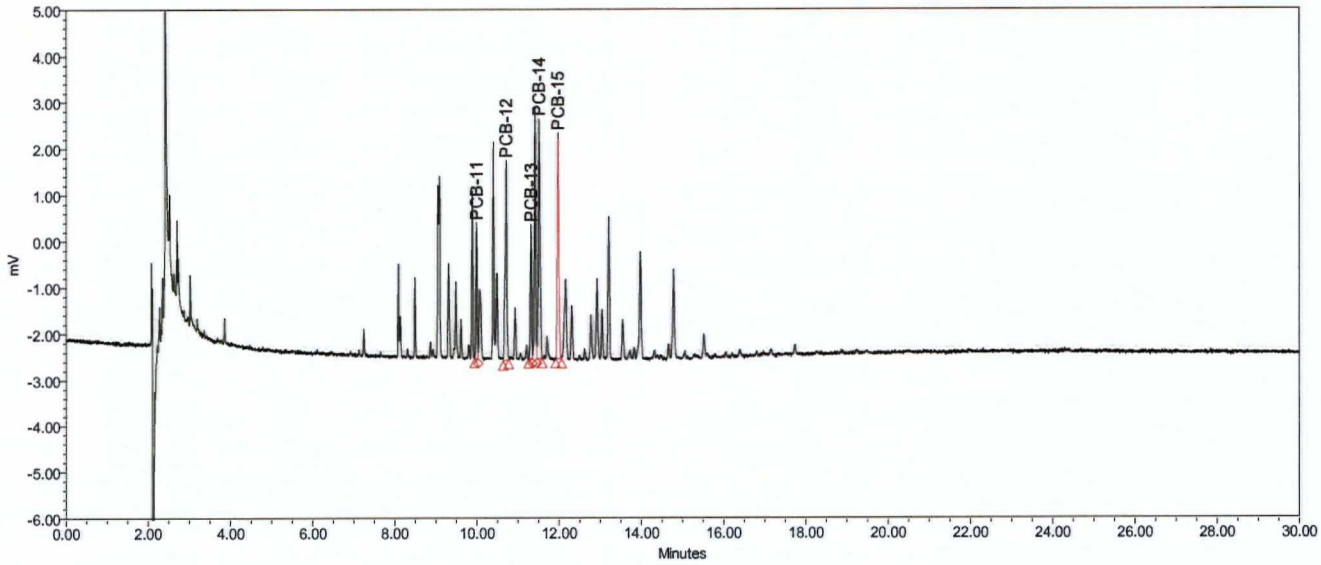


FIGURE 6. A1254 @ 0.500PPM w/ TCMX & DCBP @ 10/100PPB PLOT

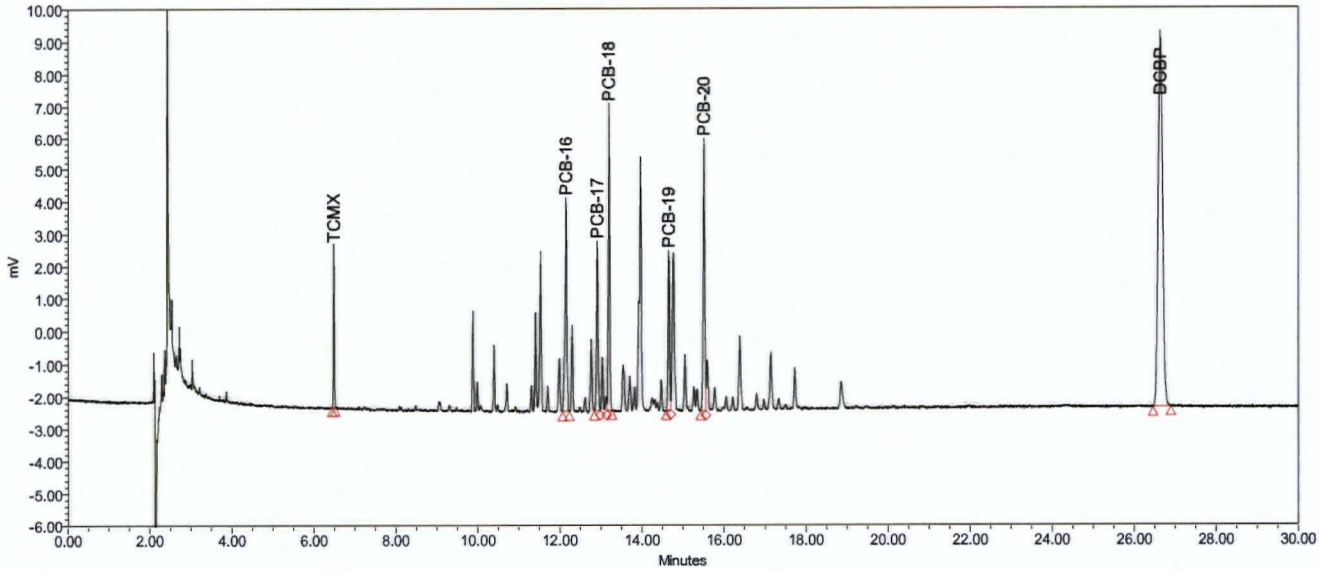
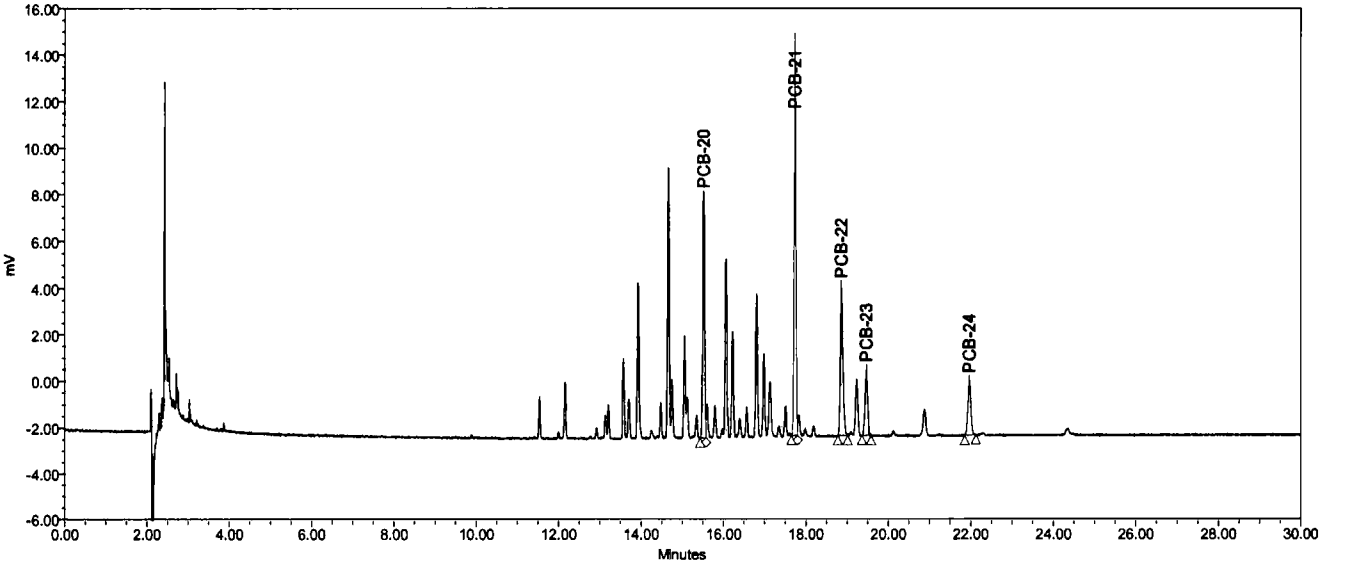


FIGURE 7. A1260 @ 0.500PPM PLOT



ATTACHMENT D cont' ZB1 Chromatograms

FIGURE 1. A1016 @ 0.500PPM PLOT

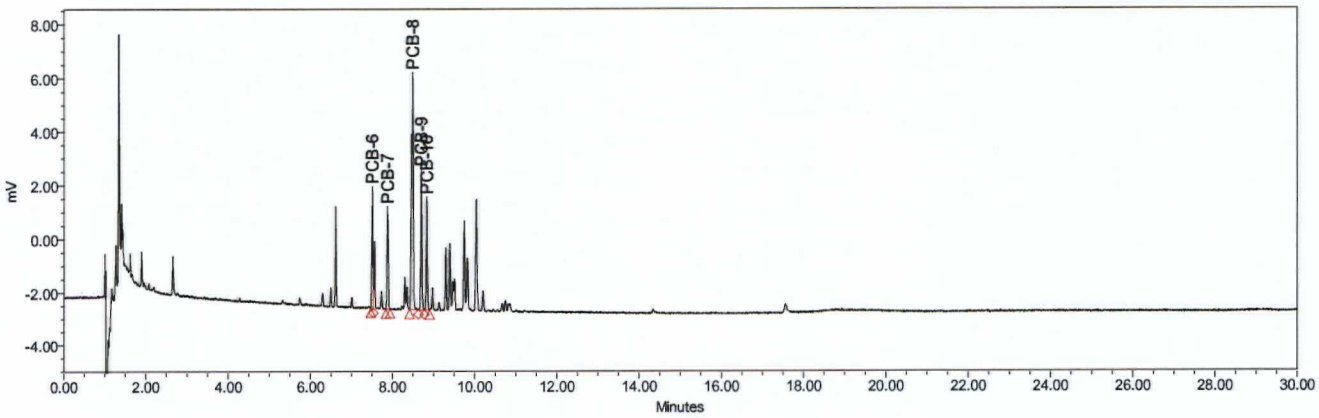


FIGURE 2. A1221 @ 0.500PPM PLOT

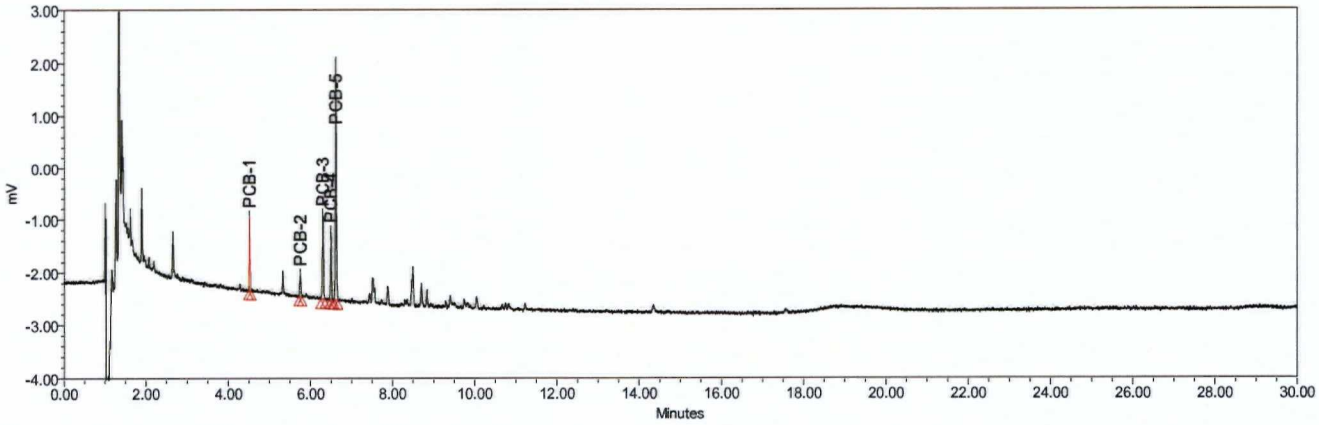


FIGURE 3. A1232 @ 0.500PPM PLOT

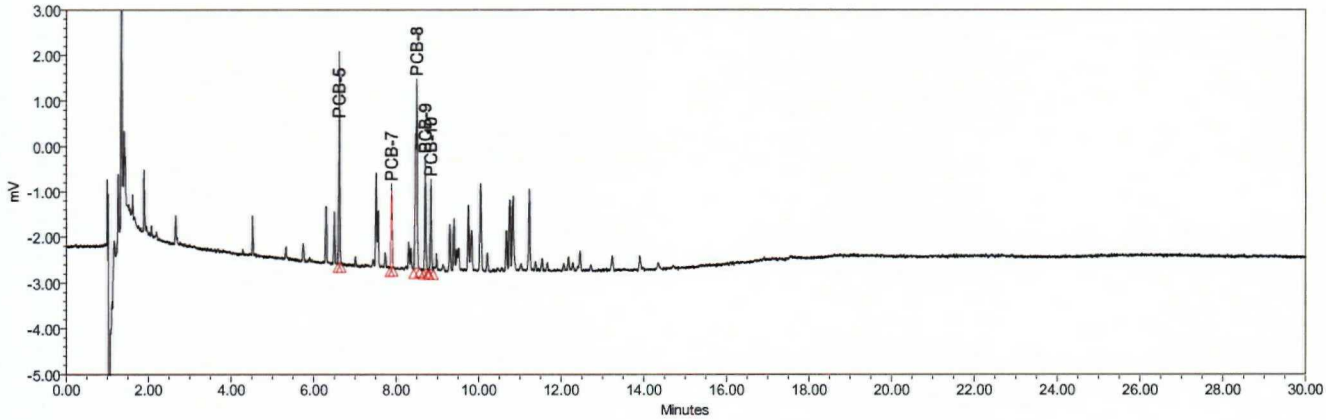


FIGURE 4. A1242 @ 0.500PPM PLOT

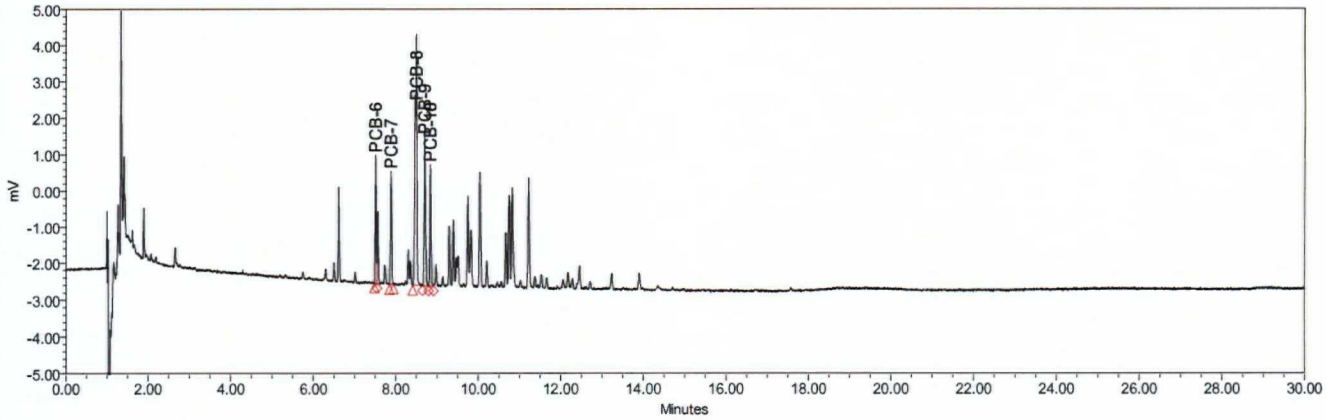


FIGURE 5. A1248 @ 0.500PPM PLOT

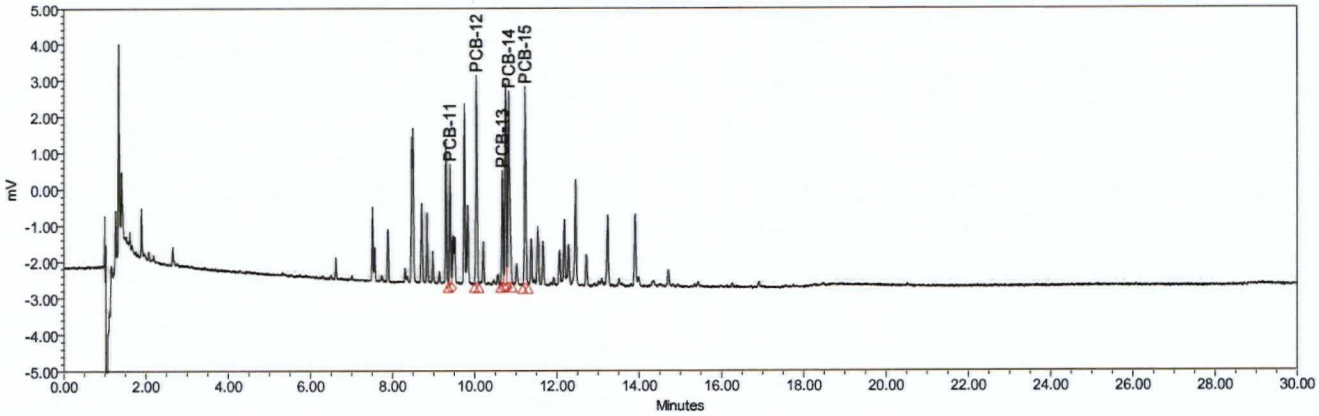


FIGURE 6. A1254 @ 0.500PPM w/ TCMX & DCBP @ 10/100PPB PLOT

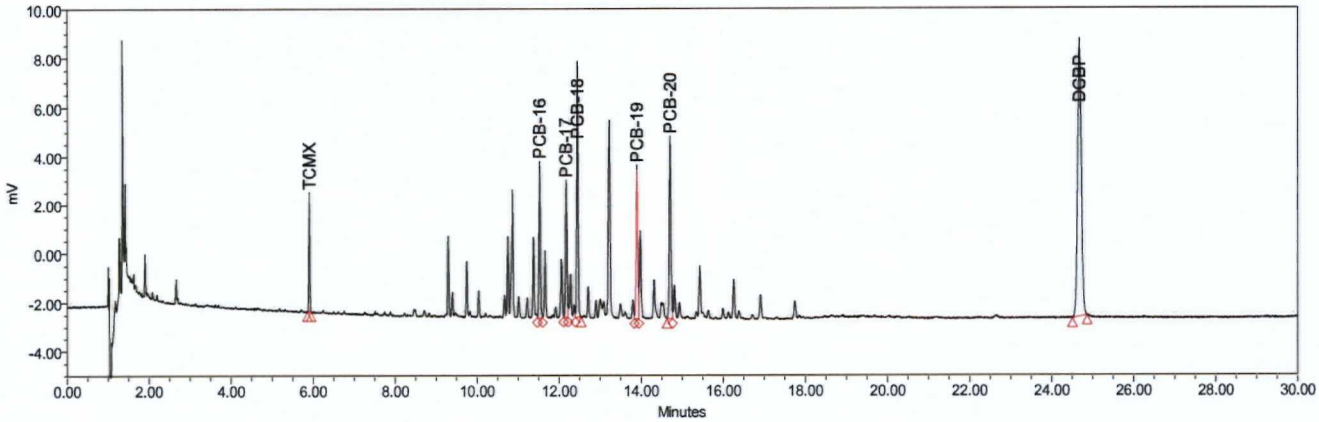
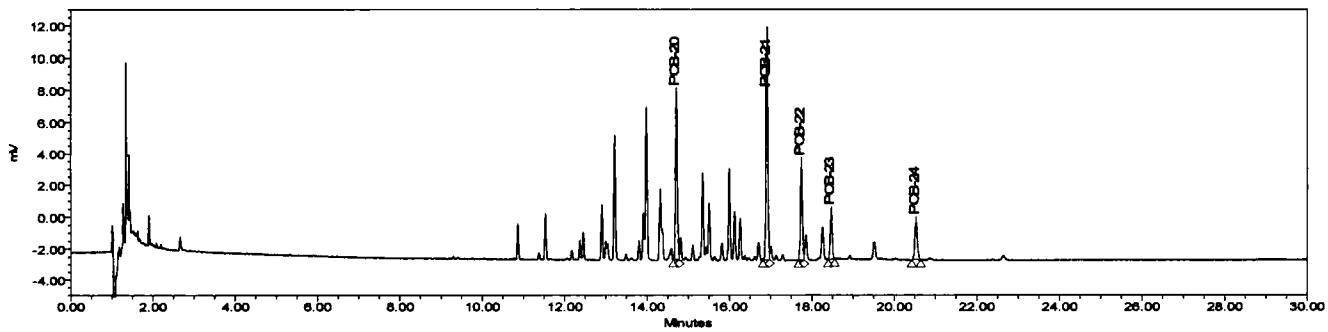


FIGURE 7. A1260 @ 0.500PPM PLOT



Attachment E Retention Time Windows: ZB-1 Column

Attachment E Retention Time Windows: ZB-1

Retention Time Window Study
for Aroclors (PCB) by GC/ECD

Instrument: GC 19F
Column: ZB-1

Analyte	PEAK	Standard 1 500 PPB R.T. Min	Standard 2 50/500 PPB R.T. Min	Standard 3 500 PPB R.T. Min	STD. DEV Min	%RSD	Window +/- Min.
		CS_0327B/A	CS_0328A	CS_0329A			
Aroclor 1016	6	7.927	7.922	7.921	0.0032	0.0406	0.010
	7	8.317	8.312	8.312	0.0029	0.0347	0.009
	8	8.961	8.956	8.956	0.0029	0.0322	0.009
	9	9.178	9.172	9.172	0.0035	0.0378	0.010
	10	9.321	9.317	9.317	0.0023	0.0248	0.007
Aroclor 1221	1	4.894	4.892	4.893	0.0010	0.0204	0.003
	2	6.142	6.142	6.145	0.0017	0.0282	0.005
	3	6.706	6.703	6.705	0.0015	0.0228	0.005
	4	6.904	6.900	6.902	0.0020	0.0290	0.006
	5	7.024	7.021	7.023	0.0015	0.0218	0.005
Aroclor 1232	5	7.025	7.026	7.022	0.0021	0.0296	0.006
	7	8.315	8.318	8.312	0.0030	0.0361	0.009
	8	8.961	8.963	8.957	0.0031	0.0341	0.009
	9	9.178	9.179	9.173	0.0032	0.0350	0.010
	10	9.322	9.324	9.318	0.0031	0.0328	0.009
Aroclor 1242	6	7.925	7.928	7.922	0.0030	0.0379	0.009
	7	8.314	8.318	8.311	0.0035	0.0422	0.011
	8	8.959	8.963	8.956	0.0035	0.0392	0.011
	9	9.176	9.180	9.173	0.0035	0.0383	0.011
	10	9.320	9.324	9.317	0.0035	0.0377	0.011
Aroclor 1248	11	9.906	9.900	9.901	0.0032	0.0325	0.010
	12	10.577	10.573	10.571	0.0031	0.0289	0.009
	13	11.231	11.225	11.225	0.0035	0.0309	0.010
	14	11.396	11.390	11.390	0.0035	0.0304	0.010
	15	11.808	11.803	11.803	0.0029	0.0245	0.009
Aroicor 1254	16	12.121	12.116	12.115	0.0032	0.0265	0.010
	17	12.793	12.786	12.785	0.0044	0.0341	0.013
	18	13.075	13.069	13.070	0.0032	0.0246	0.010
	19	14.572	14.567	14.566	0.0032	0.0221	0.010
	20	15.394	15.389	15.389	0.0029	0.0188	0.009
Aroicor 1260	20	15.396	15.398	15.392	0.0031	0.0198	0.009
	21	17.668	17.670	17.664	0.0031	0.0173	0.009
	22	18.611	18.613	18.606	0.0036	0.0194	0.011
	23	19.417	19.421	19.415	0.0031	0.0157	0.009
	24	21.729	21.731	21.722	0.0047	0.0218	0.014
TCMX (SURROGATE)	Surr.	6.311	6.307	6.307	0.0023	0.0366	0.007
DCB (SURROGATE)	Surr.	26.432	26.421	26.421	0.0064	0.0240	0.019

Attachment E cont' Retention Time Windows: ZB-5 Column

Retention Time Window Study
for Aroclors (PCB) by GC/ECD

Instrument: GC 19B
Column: ZB-5

Analyte	PEAK	Standard 1 500 PPB R.T. Min	Standard 2 500 PPB R.T. Min	Standard 3 500 PPB R.T. Min	STD. DEV Min	%RSD	Window +/- Min.
		CS_0327B/A	CS_0328A	CS_0329A			
Aroclor 1016	6	8.260	8.256	8.256	0.0023	0.0280	0.007
	7	8.669	8.665	8.665	0.0023	0.0266	0.007
	8	9.277	9.272	9.272	0.0029	0.0311	0.009
	9	9.502	9.498	9.498	0.0023	0.0243	0.007
	10	9.685	9.680	9.679	0.0032	0.0332	0.010
Aroclor 1221	1	5.480	5.479	5.476	0.0021	0.0380	0.006
	2	6.618	6.615	6.611	0.0035	0.0531	0.011
	3	7.086	7.084	7.084	0.0012	0.0163	0.003
	4	7.291	7.289	7.288	0.0015	0.0210	0.005
	5	7.410	7.406	7.407	0.0021	0.0281	0.006
Aroclor 1232	5	7.408	7.412	7.409	0.0021	0.0281	0.006
	7	8.667	8.671	8.667	0.0023	0.0266	0.007
	8	9.278	9.278	9.274	0.0023	0.0249	0.007
	9	9.502	9.505	9.501	0.0021	0.0219	0.006
	10	9.684	9.686	9.681	0.0025	0.0260	0.008
Aroclor 1242	6	8.258	8.261	8.255	0.0030	0.0363	0.009
	7	8.667	8.670	8.664	0.0030	0.0346	0.009
	8	9.275	9.279	9.272	0.0035	0.0379	0.011
	9	9.501	9.506	9.498	0.0040	0.0425	0.012
	10	9.682	9.686	9.679	0.0035	0.0363	0.011
Aroclor 1248	11	10.202	10.196	10.198	0.0031	0.0300	0.009
	12	10.936	10.930	10.932	0.0031	0.0279	0.009
	13	11.545	11.540	11.541	0.0026	0.0229	0.008
	14	11.748	11.743	11.742	0.0032	0.0274	0.010
	15	12.219	12.215	12.217	0.0020	0.0164	0.006
Arolcor 1254	16	12.402	12.397	12.397	0.0029	0.0233	0.009
	17	13.175	13.170	13.168	0.0036	0.0274	0.011
	18	13.469	13.463	13.461	0.0042	0.0309	0.012
	19	14.942	14.935	14.934	0.0044	0.0292	0.013
	20	15.812	15.805	15.805	0.0040	0.0256	0.012
Arolcor 1260	20	15.808	15.810	15.804	0.0031	0.0193	0.009
	21	18.082	18.085	18.079	0.0030	0.0166	0.009
	22	19.272	19.274	19.268	0.0031	0.0159	0.009
	23	19.911	19.910	19.912	0.0010	0.0050	0.003
	24	22.558	22.557	22.552	0.0032	0.0143	0.010
TCMX (SURROGATE)	Surr.	6.658	6.653	6.653	0.0029	0.0434	0.009
DCB (SURROGATE)	Surr.	27.519	27.509	27.498	0.0105	0.0382	0.032

Attachment F Example of MDL Study: ZB-1 Column

Compound:	Aroclor 1254		Analysis:	SW-846 8082	
Matrix:	Solid		Instrument:	GC-19F	
Extraction:	Ase		Column:	DB-1	
Spike conc:	75.0	ug/Kg	Detector:	ECD	
			LRF:	09010025	

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug/Kg	Percent Recovery (%)
AM00103	01/08/09	1221/1254 #1 ASE	01/23/09	68.9	91.9%
AM00104	01/08/09	1221/1254 #2 ASE	01/23/09	70.2	93.5%
AM00105	01/08/09	1221/1254 #3 ASE	01/23/09	76.8	102.4%
AM00106	01/08/09	1221/1254 #4 ASE	01/23/09	67.0	89.4%
AM00107	01/08/09	1221/1254 #5 ASE	01/23/09	75.2	100%
AM00108	01/08/09	1221/1254 #6 ASE	01/23/09	67.3	89.7%
AM00109	01/08/09	1221/1254 #7 ASE	01/23/09	69.9	93.2%
AM00110	01/08/09	1221/1254 #8 ASE	01/23/09	69.3	92.4%
			Number (n):	8	
One sided Student's t values (t)			AVG:	70.6	ug/Kg
at the 99% confidence level.			STD (s):	3.55	ug/Kg
Number (n)	(t) value		%RSD:	5.04%	
7	3.143		MDL:	10.7	ug/Kg
8	2.998		PQL:	53.3	ug/Kg
			VALID:	valid	

Attachment F cont' Example of MDL Study: ASE extraction ZB-5 Column

Compound:	Aroclor 1254		Analysis:	SW-846 8082	
Matrix:	Solid		Instrument:	GC-19B	
Extraction:	Ase		Column:	ZB-5	
Spike conc:	75.0	ug/Kg	Detector:	ECD	
			LRF:	09010025	

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug/Kg	Percent Recovery (%)
AM00103	01/08/09	1221/1254 #1 ASE	01/23/09	73.9	98.5%
AM00104	01/08/09	1221/1254 #2 ASE	01/23/09	74.8	99.7%
AM00105	01/08/09	1221/1254 #3 ASE	01/23/09	79.9	107%
AM00106	01/08/09	1221/1254 #4 ASE	01/23/09	75.8	101%
AM00107	01/08/09	1221/1254 #5 ASE	01/23/09	78.6	105%
AM00108	01/08/09	1221/1254 #6 ASE	01/23/09	77.7	104%
AM00109	01/08/09	1221/1254 #7 ASE	01/23/09	70.1	93.5%
AM00110	01/08/09	1221/1254 #8 ASE	01/23/09	78.9	105%
			Number (n):	8	
One sided Student's t values (t)			AVG:	76.2	ug/Kg
at the 99% confidence level.			STD (s):	3.24	ug/Kg
Number (n)	(t) value		%RSD:	4.25%	
7	3.143		MDL:	9.72	ug/Kg
8	2.998		PQL:	48.6	ug/Kg
			VALID:	valid	

Attachment F cont' Example of MDL Study: SOX extraction ZB-1 Column

Compound:	A1221	Analysis:	EPA METHOD 8082
Matrix:	SOIL/SOLID	Instrument:	GC-18F/LEAP GC PAL
Extraction:	SOX	Column:	ZB-1
Spike conc:	75.00 ug/kg		

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug/kg	Percent Recovery (%)
AJ00234	01/17/06	1221/1254 #1 SOX	04/19/06	81.0	108.0%
AJ00235	01/17/06	1221/1254 #2 SOX	04/19/06	79.4	106%
AJ00236	01/17/06	1221/1254 #3 SOX	04/19/06	77.0	102.7%
AJ00237	01/17/06	1221/1254 #4 SOX	04/19/06	81.1	108.1%
AJ00238	01/17/06	1221/1254 #5 SOX	04/19/06	77.1	102.8%
AJ00239	01/17/06	1221/1254 #6 SOX	04/19/06	73.7	98%
AJ00240	01/17/06	1221/1254 #7 SOX	04/19/06	71.8	95.7%
AJ00241	01/17/06	1221/1254 #8 SOX	04/19/06	77.4	103%

Number (n):	8	
AVG:	77.31	ug/kg
STD (s):	3.293	ug/kg
%RSD:	4.26%	
MDL:	9.871	ug/kg
PQL:	49.36	ug/kg
VALID:	valid	

One sided Student's t values (t) at the 99% confidence level.

Number (n)	(t) value
7	3.143
8	2.998

Attachment F cont' Example of MDL Study: SOX extraction ZB-5 Column

Compound:	A1221	Analysis:	EPA METHOD 8082
Matrix:	SOIL/SOLID	Instrument:	GC-18B/LEAP GC PAL
Extraction:	SOX	Column:	ZB-5
Spike conc:	75.00 ug/kg		

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug/kg	Percent Recovery (%)
AJ00234	01/17/06	1221/1254 #1 SOX	07/01/06	79.2	105.7%
AJ00235	01/17/06	1221/1254 #2 SOX	07/01/06	74.7	100%
AJ00236	01/17/06	1221/1254 #3 SOX	07/01/06	80.2	107.0%
AJ00237	01/17/06	1221/1254 #4 SOX	07/01/06	79.8	106.3%
AJ00238	01/17/06	1221/1254 #5 SOX	07/01/06	81.9	109.2%
AJ00239	01/17/06	1221/1254 #6 SOX	07/01/06	78.3	104%
AJ00240	01/17/06	1221/1254 #7 SOX	07/01/06	85.2	113.6%
AJ00241	01/17/06	1221/1254 #8 SOX	07/01/06	82.6	110%

One sided Student's t values (t) at the 99% confidence level.

Number (n)	(t) value
7	3.143
8	2.998

Number (n):	8	
AVG:	80.23	ug/kg
STD (s):	3.146	ug/kg
%RSD:	3.92%	
MDL:	9.432	ug/kg
PQL:	47.16	ug/kg
VALID:	valid	

Attachment F cont' Example of MDL Study: PUF extraction ZB-1 Column

Compound:	A1221	Analysis:	EPA METHOD 8082
Matrix:	PUF	Instrument:	GC-19F/8400
Extraction:	SOX	Column:	ZB-1
Spike conc:	0.150 ug		

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug	Percent Recovery (%)
AJ00508	02/08/06	TO-10A 1221/1254 #1	02/10/06	0.138	91.8%
AJ00509	02/08/06	TO-10A 1221/1254 #2	02/10/06	0.130	86.8%
AJ00510	02/08/06	TO-10A 1221/1254 #3	02/10/06	0.141	93.7%
AJ00511	02/08/06	TO-10A 1221/1254 #4	02/10/06	0.150	99.8%
AJ00512	02/08/06	TO-10A 1221/1254 #5	02/10/06	0.135	90.2%
AJ00513	02/08/06	TO-10A 1221/1254 #6	02/10/06	0.142	94.6%
AJ00514	02/08/06	TO-10A 1221/1254 #7	02/10/06	0.140	93.1%
AJ00515	02/08/06	TO-10A 1221/1254 #8	02/10/06	0.134	89.2%

One sided Student's t values (t) at the 99% confidence level.

Number (n)	(t) value
7	3.143
8	2.998

Number (n):	8	
AVG:	0.139	ug
STD (s):	0.006	ug
%RSD:	4.25%	
MDL:	0.018	ug
PQL:	0.088	ug
VALID:	valid	

Attachment F cont' Example of MDL Study: PUF extraction ZB-5 Column

Compound:	A1221	Analysis:	EPA METHOD 8082
Matrix:	PUF	Instrument:	GC-19B/8400
Extraction:	SOX	Column:	ZB-5
Spike conc:	0.150 ug		

NEA Sample ID	Extraction Date	File Name	Analysis Date	Measured Concentration ug	Percent Recovery (%)
AJ00508	02/08/06	TO-10A 1221/1254 #1	02/10/06	0.143	95.3%
AJ00509	02/08/06	TO-10A 1221/1254 #2	02/10/06	0.127	84.8%
AJ00510	02/08/06	TO-10A 1221/1254 #3	02/10/06	0.135	90.2%
AJ00511	02/08/06	TO-10A 1221/1254 #4	02/10/06	0.134	89.0%
AJ00512	02/08/06	TO-10A 1221/1254 #5	02/10/06	0.134	89.1%
AJ00513	02/08/06	TO-10A 1221/1254 #6	02/10/06	0.136	90.4%
AJ00514	02/08/06	TO-10A 1221/1254 #7	02/10/06	0.143	95.2%
AJ00515	02/08/06	TO-10A 1221/1254 #8	02/10/06	0.140	93.3%

One sided Student's t values (t) at the 99% confidence level.

Number (n)	(t) value
7	3.143
8	2.998

Number (n):	8	
AVG:	0.136	ug
STD (s):	0.005	ug
%RSD:	3.91%	
MDL:	0.016	ug
PQL:	0.080	ug
VALID:	valid	

STANDARD OPERATING PROCEDURE REVIEW

SOP Name	Review Number	Reviewers	Title	QAO Approval	Effective Date
NE148_06	01	Kari Lantiegne Christina L. Braidwood Robert E. Wagner	Lab Analyst QAO Lab Director	Christina Braidwood	02/19/09
Ne148_07	00	Tom Herold Christina L. Braidwood Robert E. Wagner	Lab Analyst QAO Lab Director	Christina Braidwood	03/11/11

APPENDIX A

Cornell-Dubilier OU-1 Field Sampling Plan