QUALITY ASSURANCE PROJECT PLAN
Stephen Foster Indoor Dust Investigation Site
Gainesville, Florida

Prepared for:
United States Environmental Protection Agency/Environmental Response Team
Edison, New Jersey

By:
Lockheed Martin/Scientific, Engineering, Response and Analytical Services
Work Assignment Number: SERAS-166

Based on the Intergovernmental Data Quality Task Force Uniform
Federal Policy for Quality Assurance Project Plans
(Final Version 1.1, June 2006)

May 2, 2012

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Title and Approval Page

Site Name/Project Name: Stephen Foster Indoor Dust Investigation Site

Site Location: Gainesville, FL

Document Title: Quality Assurance Project Plan for Stephen Foster Indoor Dust Investigation Site

Lead Organization: Environmental Protection Agency/Environmental Response Team (EPA/ERT)

Preparer's Name and Organizational Affiliation: David L. Adams, Lockheed Martin/ Scientific, Engineering, Response and Analytical Services (SERAS)

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Preparation Date (Month/Day/Year): May 2, 2012

Investigative Organization's Project Manager/Date: _____
Signature
Printed Name/Organization: Philip Campagna/ERT Work Assignment Manager

Investigative Organization's Project QA Officer/Date: _____
Signature
Printed Name/Organization: Stephen Blaze/ERT Quality Coordinator

Lead Organization's Project Manager/Date: _____
Signature
Printed Name/Organization: David L.Adams/SERAS Task Leader

Approval Signatures/Date: _____
Signature
Printed Name/Title: Deborah Killeen/SERAS QA/QC Officer

Approval Authority: SERAS

Other Approval Signatures/Date: _____
Signature
Printed Name/Title: Dennis A. Miller/SERAS Program Manager

Document Control Numbering System : SERAS-166-DQAPP-050212

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Stephen Foster Indoor Dust Investigation Site.
Site Location: Gainesville, FL
Site Number/Code: 0416
Operable Unit:
Contractor Name: Lockheed Martin
Contractor Number: EP-W-09-031

Contract Title: SERAS
Work Assignment Number: SERAS-166

1. Identify regulatory program: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

2. Identify approval entity: EPA/ERT

3. The QAPP is (select one): Generic ☒ Project Specific

4. List dates of scoping sessions that were held: 3/1/12

5. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date

6. List organizational partners (stakeholders) and connection with lead organization:
EPA Region IV

7. List data users:
EPA Region IV

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:
Worksheet #37 – EPA Region IV is responsible for the usability of the data.

QAPP Worksheet #2
QAPP Identifying Information
(continued)

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Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Required Documents
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QAPP Worksheet #2
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Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
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QAPP Worksheet #3
Distribution List

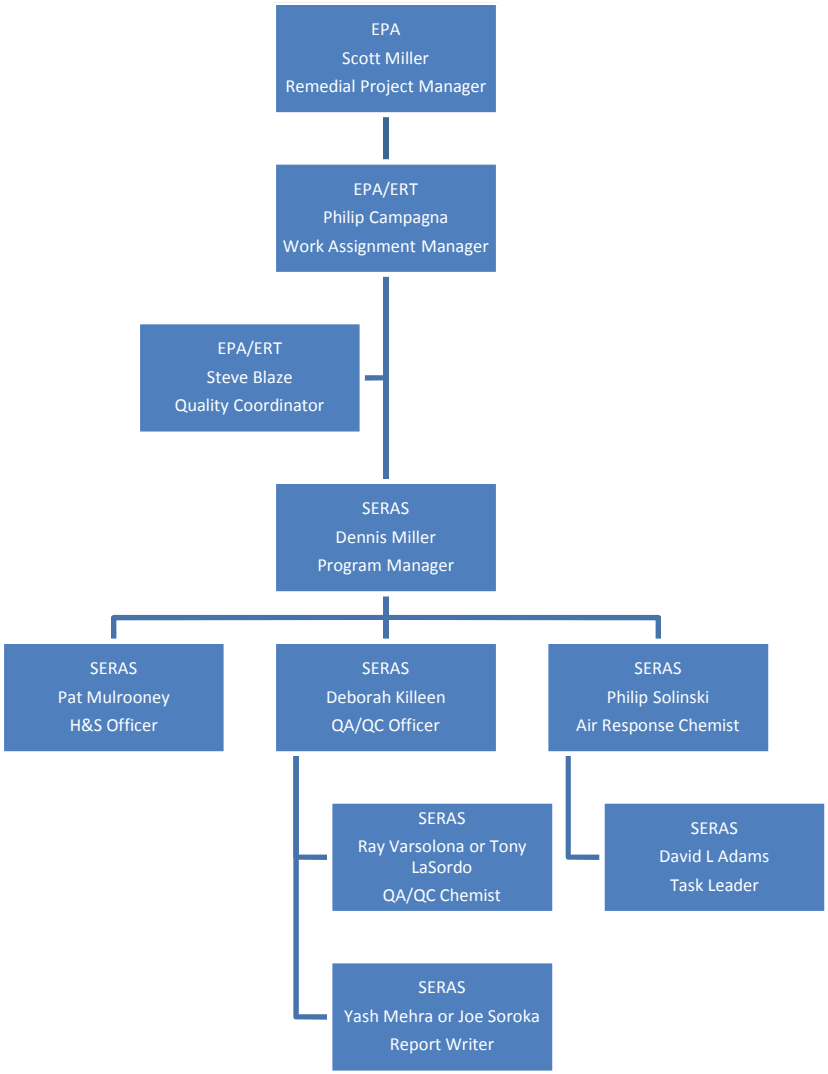
QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Philip Campagna	Work Assignment Manager (WAM)	ERT	(732) 321-6689	(702) 784-8001	campagna.philip@epamail.epa.gov	SERAS-166-DQAPP-050212
Stephen Blaze	Quality Coordinator	ERT	(732) 906-6921	(732) 321-6724	blaze.stephen@epamail.epa.gov	SERAS-166-DQAPP-050212
David L. Adams	Environmental Scientist/Task Leader	SERAS	(732) 494-4008	(732) 494-4021	david.l.adams@lmco.com	SERAS-166-DQAPP-050212
Philip Solinski	Air Response Chemist	SERAS	(732) 321-4283	(732) 494-4021	philip.j.solinski@lmco.com	SERAS-166-DQAPP-050212
Deborah Killeen	QA/QC Officer	SERAS	(732) 321-4245	(732) 494-4021	deborah.a.killeen@lmco.com	SERAS-166-DQAPP-050212
Dennis A. Miller	Program Manager	SERAS	(732) 321-4216	(732) 494-4021	dennis.a.miller@lmco.com	SERAS-166-DQAPP-050212

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Organization: SERAS/ EPA/ERT

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
David L. Adams	SERAS Environmental Scientist/ Task Leader	(732) 494-4008		
Philip Campagna	ERT WAM	(732) 321-6689		
Scott Miller	EPA R4 Remedial Project Manager (RPM)	(404) 562-9120		

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure_(Timing, Pathways, etc.)
Approval of initial QAPP and any amendments	ERT Work Assignment Manager ERT Quality Coordinator SERAS Program Manager SERAS QA/QC Officer SERAS Task Leader	Philip Campagna Stephen Blaze Dennis A. Miller Deborah Killeen David L. Adams	(732) 321-6689 (732) 906-6921 (732) 321-4216 (732) 321-4245 (732) 494-4008	SERAS internal peer review, followed by ERT approval, implementation of changes effective only with approved QAPP or QAPP Change Form.
Nonconformance and Corrective Action	SERAS Task Leader ERT Work Assignment Manager SERAS QA/QC Officer	David L. Adams Philip Campagna Deborah Killeen	(732) 494-4008 (732) 321-6689 (732) 321-4245	Use of the Work Assignment Field Change Form for field issues.
Posting of Deliverables to the ERT_IMS website	SERAS Task Leader SERAS QA/QC Officer SERAS Air Response Chemist SERAS Administrative Support	David L. Adams Deborah Killeen Phil Solinski Eileen Ciambotti	(732) 494-4008 (732) 321-4245 (732) 321-4283 (732) 321-4255	As per work assignment, posting of deliverables to ERT-IMS website constitutes delivery to the Work Assignment Manager.
Work Assignment	SERAS Program Manager	Dennis A. Miller	(732) 321-4216	Describes scope of work to SERAS personnel from the ERT Work Assignment Manager.
PWA/ASRR	SERAS Task Leader/	David L. Adams	(732) 494-4008	Filled out by the Task Leader upon receipt of the work assignment and following the project scoping meeting, and distributed to field, analytical, and support personnel.
Health and Safety On-Site Meeting	Site Health and Safety Officer	David L. Adams	(732) 494-4008	Describe potential site hazards, required personal protective equipments, and access to local emergency services.

QAPP Worksheet #7
Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
David L. Adams	Environmental Scientist/ Task Leader	SERAS	Project Supervision/Sampling operations	Minimum BS degree plus 3 years related experience/Lockheed Martin Employee Files
Raymond Varsolona or Antonio LoSurdo	QA/QC Chemist	SERAS	Data Validation	Minimum BS degree plus 8 years related experience/Lockheed Martin Employee Files
Deborah Killeen	QA/QC Officer	SERAS	QA & Validation Oversight/Deliverable Review	Minimum BS degree plus 14 years related experience/Lockheed Martin Employee Files
Yash Mehra or Joseph Soroka	Report Writer	SERAS	Analytical Report and EDD Preparation	Minimum BS degree plus 8 years related experience/Lockheed Martin Employee Files
Dennis Miller	Program Manager	SERAS	Program Oversight	Minimum B.S. degree plus 14 years related experience/Lockheed Martin Employee Files
Philip Campagna	Work Assignment Manager	EPA/ERT	Technical Direction	EPA job-specific qualifications/In EPA files
Scott Miller	Remedial Project Manager	EPA	Project Oversight	EPA job-specific qualifications/In EPA files
Stephen Blaze	Quality Coordinator	EPA/ERT	QA Oversight	EPA job-specific qualifications/In EPA files

QAPP Worksheet #8
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
Project Oversight	OSHA 8-hour refresher	SERAS	January 2011	David L. Adams	Task Leader/Environmental Scientist/SERAS	Health & Safety Files Quality Files
QA Oversight	Data Review & Validation	Laboratory Data Consultants	January 2007	Deborah Killeen	QA/QC Officer/SERAS	Quality Files
QA Oversight	Uniform Federal Policy for Quality Assurance Project Plans	Advanced Systems	January 2006	Deborah Killeen	QA/QC Officer/SERAS	Quality Files

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Project Name: Stephen Foster Indoor Dust Investigation Site. (WA# SERAS166) Projected Date(s) of Sampling: Week of 5/8/12-5/17/12 Project Manager: David L. Adams	Site Name: Stephen Foster Indoor Dust Investigation Site Site Location: Gainesville, FL
Date of Session: 02/01/12 Scoping Session Purpose: Discuss SERAS utilization of data validation for the work assignment.	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
David L. Adams	Environmental Scientist	SERAS	732-494-4008	david.l.adams@lmco.com	Task Leader
Deb Killeen	QA/QC Officer	SERAS	732-321-4245	deborah.a.killeen@lmco.com	QA/Validation Oversight
Misty Barkley	Property Coordinator	SERAS	732-321-4205	misty.barkley@lmco.com	Analytical Subcontracting
Phil Solinski	Air Response Chemist	SERAS	732-321-4283	philip.j.solinski@lmco.com	Review

Comments/Decisions: Approximately 30 vacuums will be used in local residences to collect dust samples during the weeks of 5/8/12-5/17/12.

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project: Koppers Site History - Chemical treatment of wood to prevent rot and decay occurred on the Koppers portion of the Cabot Carbon-Koppers NPL site between 1916 and 2010. Soil on the 90-acre Koppers site is contaminated with dioxins and other chemicals. In 2009, the highest concentration of dioxins (expressed as 2,3,7,8-tetrachlorodibenzo dioxin toxicity equivalents or TCDD-TEQ) was 170,635 parts per trillion (ppt) in surface soil in the northeastern portion of the site (SS104AA). The highest TCDD-TEQ concentration on the site along the western boundary near the Stephen Foster neighborhood was 907 ppt [AMEC 2007]. In the past, winds likely carried dioxin-contaminated soil (dust) offsite. Since 2009, consultants for the party responsible for the Koppers site have tested over 90 surface soil samples (0-6 inches deep) in the Stephen Foster neighborhood. They found TCDD-TEQ concentrations from a high of 1,302 ppt in the City of Gainesville easement next to the western Koppers site boundary to a low of 1 ppt northwest of the site (Figure 1) [ARCADIS 2010]. The pattern of decreasing dioxin concentration with distance from the Koppers site suggests that wind-blown dust deposition from the Koppers site is a major source of dioxins in Stephen Foster neighborhood surface soil. Further testing of Stephen Foster neighborhood soils is ongoing to complete the delineation of the extent of dioxin contamination. The selected remedy requires the responsible party cleanup dioxin-contaminated soil in the Stephen Foster neighborhood.
The environmental questions being asked: Are Dioxin contaminants present in dust samples collected in the residences adjacent to the Site? Do the TCDD-TEQ concentrations analyzed by the CALUX® method compare with the concentrations obtained from standard dioxin analytical methods? Are there any sources of brominated compounds that contribute to the response of the CALUX® method?
Observations from any site reconnaissance reports: Not applicable (N/A)
A synopsis of secondary data or information from site reports: N/A
The possible classes of contaminants and the affected matrices: Dioxin contaminants present in dust samples.
The rationale for inclusion of chemical and nonchemical analyses: Known Dioxin dust contamination.
Information concerning various environmental indicators: EPA Region IV will be sampling residences in addition to re-sampling residences that have shown concentrations previously close to the project action limits to assess variability in sample concentrations. The dust sample matrices for dioxin will be used by EPA Region IV to determine if no further action is required, whether further sampling is warranted or whether mitigation is needed to minimize current and potential exposures associated with dioxins. Comparison of the results of the standard EPA method 8290 (HRGC/MS) to EPA screening method 4435 (CALUX®) will help clarify the contribution of dioxins to the TCDD Bio-TEQ concentrations reported by representatives of some residents in some homes.
Project decision conditions ("If..., then..." statements): If Dioxin dust concentrations in the Stephen Foster homes are statistically higher than background and pose a significant health risk, then the data will be evaluated by EPA Region IV to determine if further investigations and/or mitigation are warranted.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Who will use the data? EPA Region IV
What will the data be used for? The dust samples for dioxin will be used by EPA Region IV to determine if no further action is required, whether further sampling is warranted or whether mitigation is needed to minimize current and potential exposures associated with dioxins. Comparison of the results of the standard EPA method 1613B to EPA screening Method 4435 (CALUX®) will help clarify the contribution of dioxins to the TCDD Bio-TEQ concentrations reported by representatives of some residents in some homes.
What type of data is needed? Polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs) and polybrominated dibenzo-p-dioxins/polybrominated dibenzofurans (PBDDs/PBDFs) and TCDD-TEQ in dust.
How "good" do the data need to be in order to support the environmental decision? Definitive laboratory data are required for PCDD, PCDF, PBDD and PBDF. Screening level data are required for the CALUX® bioassay method. The quantitation levels are specified in Worksheet #15. All laboratory analyses will be performed by the Vista and XDS Laboratories. Worksheets #12 and #28 show the measurement performance criteria that are needed for the quality indicators. Worksheet #20 outlines the field quality control (QC) samples required. All definitive data will also be validated by SERAS QA/QC Chemists
How much data are needed? Up to 35 dust samples, focusing on homes east of NW 6th Street, where dust deposition from the site is most likely and from homes sufficiently distant from the site to assess background.
Where, when, and how should the data be collected/generated? The collection of dust samples using standard EPA operating procedure 2040 [EPA 2002]. Collection should include one composite dust sample per house. The composite sample should compile dust from high traffic areas: inside the main entrance, the main living area, and a bedroom, preferably a child's. Dust samples should be collected from carpets or rugs using a vacuum. If sufficient sample volume is not collected by SERAS, resident vacuum cleaners' bag will be collected and may be used for sample analysis.
Who will collect and generate the data? Samples will be collected by SERAS personnel and analyzed at outside laboratories.
How will the data be reported? Validated data will be reported in a final analytical report prepared in accordance with SERAS SOP #4020, *Analytical Report Preparation*. A Final Trip Report, prepared in accordance with SERAS SOP #4017, *Preparation of Trip Reports*, will be the final deliverable to the EPA/ERT WAM. Data will be disseminated to EPA Region IV by the ERT WAM.
How will the data be archived? Hard copies of all deliverables will be stored in SERAS Central Files and e-copies will be stored on SERAS Local Area Network (LAN). Data will be imported into a Scribe database and posted to the ERT-Information Management System (IMS) website. Data will be archived by SERAS in accordance with Administrative Procedure (AP) #34, *Archiving Electronic Files*. All analytical data packages will be archived by the SERAS QA/QC Group.

QAPP Worksheet 12-1
Measurement Performance Criteria Table

Matrix	Dust
Analytical Group	PCDD/PCDF
Concentration Level	Low

Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
SERAS SOP #2040	Modified EPA Method 1613B	Accuracy/Bias (Contamination)	<RL	Method Blank	A
		Accuracy/Bias	Within lab limits	LCS	A
		Accuracy/Bias	Within the limits in Table 4	Internal Standards (Labeled Compounds)	A
		Accuracy/Bias	Within the limits in Table 4	Cleanup Recovery Standard	A
		Accuracy/Bias	Within lab limits	Matrix Spike	A
		Precision	Within Lab limits	Matrix Spike Duplicate	A
		Completeness	> 90% sampling, > 90% laboratory analysis	Data Completeness Check	S & A

[1]Reference number from QAPP Worksheet #21 (see Section 3.1.2)
[2]Reference number from QAPP Worksheet #23 (see Section 3.2)

QAPP Worksheet 12-2
Measurement Performance Criteria Table

Matrix	Dust
Analytical Group	PBDD/PBDF
Concentration Level	Low

Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
SERAS SOP #2040	Modified EPA Method 1613B	Accuracy/Bias (Contamination)	<RL	Method Blank	A
		Accuracy/Bias	%R = 40-150%	LCS	A
		Accuracy/Bias	Within the limits in Table 4	Internal Standards (Labeled Compounds)	A
		Accuracy/Bias	%R = 25-300%	Cleanup Recovery Standard	A
		Accuracy/Bias	Within lab limits	Matrix Spike	A
		Precision	RPD ±50%	Matrix Spike Duplicate	A
		Completeness	> 90% sampling, > 90% laboratory analysis	Data Completeness Check	S&A

[1]Reference number from QAPP Worksheet #21 (see Section 3.1.2)
[2]Reference number from QAPP Worksheet #23 (see Section 3.2)

QAPP Worksheet 12-3
Measurement Performance Criteria Table

Matrix	Air
Analytical Group	VOA
Concentration Level	Low

Sampling Procedure[1]	**Analytical Method/SOP**[2]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
SERAS SOP 2040	EPA Method 4435	Accuracy/Bias (Contamination)	<RL	DMSO Blank	A
		Accuracy/Bias	Within lab limits	LCS (Reference Standard)	A
		Accuracy/Bias	Within lab limits	Cleanup Recovery Standard	A
		Completeness	> 90% sampling, > 90% laboratory analysis	Data Completeness Check	S & A

[1]Reference number from QAPP Worksheet #21 (see Section 3.1.2)
[2]Reference number from QAPP Worksheet #23 (see Section 3.2)

QAPP Worksheet #13
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

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks: The collection of dust samples using SOP 2040 [EPA 2002]. Collection should include one composite dust sample per house. The composite sample should compile dust from high traffic areas: inside the main entrance, the main living area, and a bedroom, preferably a child's. Dust samples should be collected from carpets or rugs using a vacuum. If sufficient sample volume is not collected by SERAS, resident vacuum cleaners' bag will be collected and may be used for sample analysis.
Analysis Tasks: PCDDs/PCDFs and PBDD/PBDFs by Modified EPA Method 1613 Revision B and total TCDD-TEQ by EPA Method 4435
Quality Control Tasks: Due to the small volume of sample anticipated, no field QC samples will be collected for analysis. Analytical QC samples will be analyzed in accordance with Worksheets 12 & 28. All QC samples are referenced in SERAS SOP #2005, *Quality Assurance/Quality Control Samples.*
Secondary Data: N/A
Data Management Tasks: All sampling locations will be identified by a field assigned number. Field sampling data will be recorded on field data sheets or in field books. Analytical data will be imported into a Scribe database via comma separated value files supplied by the QA/QC Group for definitive data.
Documentation and Records: All documentation will be recorded in accordance with SERAS SOP #4001, *Logbook Documentation* and SOP #2002, *Sample Documentation*. All Analytical Reports will be prepared in accordance with SERAS SOP #4020, *Analytical Report Preparation*. The Trip Report will provide a description of the project; field and laboratory methodologies and results, and will be prepared in accordance with SERAS SOP #4017, *Preparation of Trip Reports*. Documents and records that may be generated during this project include: WP, QAPP, HASP, Field and Laboratory Logbooks, Site Map, Sample Labels, COC Records, Custody Seals, Air Sampling Work Sheets, Projected Work Assignment (PWA), Data Review Records, Data Reduction Records, Data Assessment Forms, Data Validation Records, Instrument Printouts, Scribe Database, Trip Report, Analytical Report and Field Change Forms (if required). All deliverables will be generated in accordance to the appropriate SERAS SOP and posted to the ERT-IMS website upon completion. Posting to the ERT-IMS site will be considered as completion of the deliverable.
Assessment/Audit Tasks: No performance audits of field operations are anticipated for this project. The tasks associated with this QAPP are assessed using peer reviews and management system reviews. Peer review enables the field team to identify and correct reporting errors before reports are submitted. Management system reviews establish compliance with prevailing management structure, policies and procedures, and ensures that the required data are obtained.
Data Review Tasks: Laboratory procedures will be reviewed and the data verified for the appropriate quality assurance objectives. Analytical data will be validated in accordance with SERAS SOP# 1018, *Data Validation Procedures for Dioxin/Furan Analysis by HRGC/HRMS.* All project deliverables will receive an internal peer review prior to release, per guidelines established in the SERAS AP #22, *Peer Review of SERAS Deliverables.*

QAPP Worksheet #15-1
Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: Dioxins/Furans

Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ng/kg)	Project Quantitation Limit* (ng/kg)	Analytical Method EPA Method 1613B		Achievable Laboratory Limits	
				MDLs	Method QLs (ng/kg)	MDLs (ng/kg)[1]	QLs (ng/kg)[2]
2378 - TCDD	1746-01-6	NS	5.0	NA	0.50	0.0808	0.50
12378 - PeCDD	40321-76-4	NS	25	NA	2.5	0.133	2.5
123678-HxCDD	57653-85-7	NS	25	NA	2.5	0.226	2.5
123478-HxCDD	39227-28-6	NS	25	NA	2.5	0.190	2.5
123789-HxCDD	19408-74-3	NS	25	NA	2.5	0.192	2.5
1234678 - HpCDD	35822-46-9	NS	25	NA	2.5	0.117	2.5
OCDD	3268-87-9	NS	50	NA	5.0	0.200	5.0
2378-TCDF	51207-31-9	NS	5.0	NA	0.50	0.0379	0.50
12378-PeCDF	57117-41-6	NS	25	NA	2.5	0.135	2.5
23478-PeCDF	57117-31-4	NS	25	NA	2.5	0.129	2.5
123678-HxCDF	57117-44-9	NS	25	NA	2.5	0.119	2.5
123789-HxCDF	72918-21-9	NS	25	NA	2.5	0.0784	2.5
123478-HxCDF	70648-26-9	NS	25	NA	2.5	0.119	2.5
234678-HxCDF	60851-34-5	NS	25	NA	2.5	0.108	2.5
1234678-HpCDF	67562-39-4	NS	25	NA	2.5	0.136	2.5
1234789-HpCDF	55673-89-7	NS	25	NA	2.5	0.0798	2.5
OCDF	39001-02-0	NS	50	NA	5.0	0.492	5.0

[1]Based on LOD/LOQ Study from Vista Analytical Laboratory dated 8/18/11
NS = not specified, NA = not applicable
ng/kg = nanograms per kilogram
[2]Based on the use of 10 grams of sample and a final volume of 20 µL
*Project Quantitation Limit based on the use of ~1g of sample to a final volume of 20 µL.

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Dust

Analytical Group: PBDDs/PBDFs

Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ng/kg)	Project Quantitation Limit (ng/kg)*	Analytical Method EPA Method 1613B		Achievable Laboratory Limits	
				MDLs	Method QLs (ng/kg)	MDLs (ng/kg)	QLs[1] (ng/kg)
2378-TBDD		NS	50	NA	1.0	NA	5.0
2378TBDF		NS	500	NA	5.0	NA	50
12378-PeBDD		NS	250	NA	5.0	NA	25
12378-PeBDF		NS	2500	NA	5.0	NA	250
23478-PeBDF		NS	2500	NA	5.0	NA	250
123478-HxBDD		NS	150	NA	5.0	NA	15
123678-HxBDD		NS	1250	NA	10	NA	125
123789-HxBDD		NS	1250	NA	1.0	NA	125
123478-HxBDF		NS	2000	NA	5.0	NA	200
1234678-HpBDD		NS	1250	NA	5.0	NA	125
1234678-HpBDF		NS	5000	NA	5.0	NA	500

NS = not specified, NA = not applicable
ng/kg = nanograms per kilogram
[1]Based on the use of 10 grams of sample and a final volume of 20 µL
*Project Quantitation Limit based on the use of ~1g of sample to a final volume of 20 µL.

QAPP Worksheet #15-3
Reference Limits and Evaluation Table

Matrix: Dust

Analytical Group: PCDD/PCDF as Total TEQ

Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ng/kg)	Project Quantitation Limit (ng/kg)*	Analytical Method EPA Method 4435		Achievable Laboratory Limits	
				MDLs	Method QLs (ng/kg)	MDLs (ng/kg)	QLs (ng/kg)
PCDD/PCDF TEQ	NA	NS	1.0	NS	1.0	NS	1.0

NS = not specified, NA = not applicable
ng/kg = nanograms per kilogram

QAPP Worksheet #16
Project Schedule Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Field Activities	SERAS	05/7/12	05/17/12	No	NA
Sample Analysis	Vista Laboratory	05/23/12	06/13/12	Preliminary Analytical Results	15Business Days (BD) after receipt of samples
Preparation of Analytical Data Package	Vista Laboratory	06/14/12	06/21/12	Final Data Package	20 BD after receipt of samples
Data Validation/Preparation of Analytical Report & EDD	SERAS	06/22/12	07/06/12	Final Analytical Report	10 BD after receipt of Data Package
Final Trip Report	SERAS	07/9/12	07/23/11	Final Trip Report	10 BD after receipt of Final Analytical Report

QAPP Worksheet #17
Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): Sampling locations will be duplicated from the last sampling event. Original sampling locations were determined by the EPA Region IV RPM. Additional sampling locations will be determined by the EPA Region IV RPM and ERT WAM. Samples from the living space will be collected from homes east of NW 6th Street within the Stephen Foster neighborhood west of the Koppers Site and also from two designated background areas.
Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [Refer to Worksheet #18 for details]: The collection of dust samples using SERAS standard operating procedure 2040. Collection should include one composite dust sample per residence, possibly 35 residences. The composite sample should compile dust from high traffic areas: inside the main entrance, the main living area, and a bedroom, preferably a child's. Dust samples should be collected from carpets or rugs using a vacuum. If sufficient sample volume is not collected by SERAS, resident vacuum cleaners' bag will be collected and may be used for sample analysis.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Sample Depth/Zone	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
4225 NW 21st Terrace	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
4236 NW 21st Terrace	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
4332 NW 21st Terrace	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
4343 NW 21st Drive	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3835 SW 3rd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3838 SW 5th Place	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3956 SW 3rd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3946 SW 3rd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3806 SW 3rd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3908 SW 1st Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Sample Depth/Zone	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
3826 SW 1st Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3806 SW 6th Place	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3908 SW 6th Place	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3841 SW 2nd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Background
3027 NW 4th Terrace	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
520 NW 26th Street	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
446 NW 32nd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
444 NW 27th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
410 NW 26th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
533 NW 30th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Sample Depth/Zone	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
3215 NW 4th Street	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
550 NW 31st Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
501 NW 30th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
211 NW 33rd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
536 NW 31st Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
523 NW 28th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
524 NW 32nd Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
3119 NW 4th Street	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
444 NW 26th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
550 NW 26th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Sample Depth/Zone	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location[2]
437 NW 29th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
517 NW 28th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
431 NW 28th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical
509 NW 28th Avenue	Dust	Floor Composite	PCDD/PCDF PBDD/PBDF TCDD-TEQ	Low	1	SERAS SOP #2040	Historical

[1]Refer to the Analytical SOP References table (Worksheet #21)
[2]Refer to Worksheet #17 for description of rationale for sampling locations

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Dust	PCDD/PCDF	Low	Modified EPA Method 1613B	40 g	Vacuum Filter	4ºC	30 days for extraction/Up to 1 year for analysis
Dust	PBDD/PBDF	Low	Modified EPA Method 1613B	40 g	Vacuum Filter	4ºC	30 days for extraction/Up to 1 year for analysis

[1] Complete reference provided in Analytical SOP References table (Worksheet #23)

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS	No. of Trip Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Dust	PCDD/PCDF	Low	Modified EPA 1613B	Up to 35	NA	1 per 20	NA	NA	NA	Up to 35
Dust	PBDD/PBDF	Low	Modified EPA 1613B	Up to 35	NA	1 per 20	NA	NA	NA	Up to 35
Dust	TCDD-TEQ	Low	EPA Method 4435	Up to 35	NA	NA	NA	NA	NA	Up to 35

[1]Complete reference provided in Analytical SOP References table (Worksheet #23)
N/A = Not Applicable

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
2001	General Field Sampling Guidelines	SERAS	General Sampling		
2002	Sample Documentation	SERAS	General Sampling		
2003	Sample Storage, Preservation and Handling	SERAS	General Sampling		
2004	Sample Packaging and Shipment	SERAS	General Sampling		
2005	Quality Assurance/Quality Control Samples	SERAS	General Sampling		
2040	Collection of Indoor Dust Samples from Carpeted Surfaces for Chemical Analysis Using a Nilfisk GS-80 Vacuum Cleaner	SERAS	Dust Sampling		
4001	Logbook Documentation	SERAS	Site Activities		
4005	Chain of Custody Procedures	SERAS	General Sampling		

QAPP Worksheet #22
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[1]
Nilfisk GM-80 Vacuum	NA	Clean	Turn on	Check fittings	As needed	NA	Remove from service	Field Personnel	SERAS SOP 2040

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21)
RL = Reporting Limit

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Type of Data Generated	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
Modified EPA 1613B	Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS	Definitive	PCDD/PCDF PBDD/PBDF	HRGC/HRMS	Vista	Yes
EPA Method 4435	Method for Toxic Equivalents (TEQs) Determinations for Dioxin-Like Chemical Activity with the CALUX® Bioassay	Screening	TCDD-TEQ	Spectrophotometer	XDS	No

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
HRGC/MS (PCDD/PCDF)	Initial calibration (IC), minimum 6-points for all analytes	Initial calibration: prior to sample analysis, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met. Calibration verification: Once every 12 hours	ICAL: isotopic ratios within specified limits; lock mass ±20%, S/N ratio ≥ 10; isomer specificity resolved with valley ≤25% in all standards VER: Within limits specified in Table 4	Inspect system, perform maintenance and re-calibrate	HRGC/HRMS Chemist	EPA Method 1613B
HRGC/MS (PBDD/PBDF)	Initial calibration (IC), minimum 4-points for all analytes (see Table 2)	Initial calibration: prior to sample analysis, whenever major instrument maintenance or modification is performed or if the calibration verification technical acceptance criteria have not been met. Calibration verification: Once every 12 hours	ICAL: isotopic ratios within specified limits; lock mass ±20%, S/N ratio ≥ 10; isomer specificity resolved with valley ≤25% in all standards VER: Within limits specified in Table 5	Inspect system, perform maintenance and re-calibrate	HRGC/HRMS Chemist	EPA Method 1613B

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23)

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #25
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[1]
HRGC/HRMS	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations	Acceptable recalibration	Inspect the system, correct problem, recalibrate and/or reanalyze samples.	HRGC/HRMS Chemist	EPA Method 1613B	HRGC/HRMS

[1]Specify the appropriate reference letter or number from Analytical SOP References table (Worksheet #23)

QAPP Worksheet #26
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): SERAS Field Personnel
Sample Packaging (Personnel/Organization): SERAS Field Personnel
Coordination of Shipment (Personnel/Organization): SERAS Field Personnel
Type of Shipment/Carrier: SERAS Field Personnel/ Federal Express
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): SERAS Sample Receiving Personnel and Vista and XDS laboratories
Sample Custody and Storage (Personnel/Organization): SERAS Sample Receiving Technician & and Vista and XDS laboratories
Sample Preparation (Personnel/Organization): SERAS Laboratory Personnel
Sample Determinative Analysis (Personnel/Organization) Vista and XDS laboratories
SAMPLE ARCHIVING
Sample Receiving: Samples to be shipped 1 to 10 days after collection
Sample Extract/Digestate Storage (No. of days from extraction/digestion): As per analytical methods
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization: Vista and XDS laboratories
Number of Days from Analysis: N/A

QAPP Worksheet #27
Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): EPA/ERT Scribe software will be used for sample management, as well as, generation of sample documentation, such as, labels and COC records. All COC records will be peer reviewed prior to shipment of samples in accordance with SERAS SOP # 4005, *Chain of Custody Procedures.* Dust samples collected by SERAS personnel will be shipped within one to five business days of sampling completion for following day delivery under COC to the ERT/SERAS Laboratory for sieving and then to the Vista and XDS laboratories for analysis in accordance with SERAS SOP #2004, *Sample Packaging and Shipment.* Procedures outlined in SOP #2002, #2003 and #2004 will be applied (refer to Worksheet #21). All samples will be delivered under chain of custody (COC) to Vista and XDS laboratories.
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): A sample custodian at the contract laboratory will accept custody of the samples and inspect the samples for discrepancies and container integrity before forwarding the samples to the appropriate department for analysis. No samples will be archived at the laboratories.
Sample Identification Procedures: Each sample will be identified with a unique identification number at the time of collection and a laboratory identification number will be assigned to each sample at receipt at the Vista and XDS laboratories. The number will be listed on the label of every sample container collected at a given location. Procedures outlined in SOP #2002 will be applied (refer to Worksheet #21).
Chain-of-custody Procedures: Chain-of-custody records will be generated for all samples submitted for analysis using Scribe database software. Procedures outlined in SOP #4005 will be applied (refer to Worksheet #21).

QAPP Worksheet #28-1
QC Samples Table

Matrix	Dust
Analytical Group	PCDD/PCDF
Concentration Level	Low
Sampling SOP	SERAS SOP #2040
Analytical Method/ SOP Reference	Modified EPA Method 1613B
Sampler's Name	David L. Adams
Field Sampling Organization	SERAS
Analytical Organization	Vista Analytical Laboratory
No. of Sample Locations	Up to 35

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	With each batch of 20 samples	<RL	Reanalyze or reextract batch	HRGC/HRMS Chemist	Accuracy/Bias (Contamination)	<RL
Laboratory Control Sample	5% of samples	Within lab limits	Reanalyze or reextract batch	HRGC/HRMS Chemist	Accuracy/Bias	Within lab limits
Internal standards (Labeled Compounds)	Each sample	Within the limits in Table 4	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within the limits in Table 4
Cleanup Recovery Standard	Each sample	Within the limits in Table 4	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within the limits in Table 4
Matrix Spike	5% of samples	Within lab limits	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within lab limits
Matrix Spike Duplicate	5% of samples	Within lab limits	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Precision	Within lab limits

QAPP Worksheet #28-2
QC Samples Table

Matrix	Dust
Analytical Group	PBDD/PBDF
Concentration Level	Low
Sampling SOP	SERAS SOP #2040
Analytical Method/ SOP Reference	Modified EPA Method 1613B
Sampler's Name	David L. Adams
Field Sampling Organization	SERAS
Analytical Organization	Vista Analytical Laboratory
No. of Sample Locations	Up to 35

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	With each batch of 20 samples	<RL	Reanalyze or reextract batch	HRGC/HRMS Chemist	Accuracy/Bias (Contamination)	<RL
Laboratory Control Sample	5% of samples	Within lab limits	Reanalyze or reextract batch	HRGC/HRMS Chemist	Accuracy/Bias	Within lab limits
Internal standards (Labeled Compounds)	Each sample	Within the limits in Table 4	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within the limits in Table 4
Cleanup Recovery Standard	Each sample	Within the limits in Table 4	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within the limits in Table 4
Matrix Spike	5% of samples	Within lab limits	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Accuracy/Bias	Within lab limits
Matrix Spike Duplicate	5% of samples	Within lab limits	Reanalyze, document in case narrative	HRGC/HRMS Chemist	Precision	Within lab limits

QAPP Worksheet #28-3
QC Samples Table

Matrix	Dust
Analytical Group	TCDD-TEQ
Concentration Level	Low
Sampling SOP	SERAS SOP #2040
Analytical Method/ SOP Reference	EPA Method 4435
Sampler's Name	David L. Adams
Field Sampling Organization	SERAS
Analytical Organization	Xenobiotic Detection Systems
No. of Sample Locations	Up to 35

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
DMSO Blank	With each batch of 20 samples	<RL	Reanalyze or re-extract batch	XDS Bioassay Technician	Accuracy/Bias (Contamination)	<RL
LCS (Reference Standard)	5% of samples	Within lab limits	Reanalyze or re-extract batch	XDS Bioassay Technician	Accuracy/Bias	Within lab limits
Cleanup Recovery Standard	Each sample	Within lab limits	Reanalyze, document in case narrative	XDS Bioassay Technician	Accuracy/Bias	Within lab limits

QAPP Worksheet #29
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
Chain of Custody Records Sample Labels Custody Seals Field Change Form (if necessary)	NA	Instrument run logs Preventive Maintenance logs Instrument printouts Internal COC Records Standard receipt logs Data Reduction Records Data Review Records Analytical Results	Data Assessment Forms Data Validation Check Records	Analytical Report Trip Reports

QAPP Worksheet #30
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
Dust	PCDD/PCDF	Low	See Worksheet #18	Modified EPA Method 1613B	20 BD preliminary data	Vista Analytical Laboratory 1104 Windfield Way El Dorado Hills, California 95762 (916) 673-1520 Attn: Rose Harrelson	N/A
	PBDD/PBDF			Modified EPA Method 1613B			
	TCDD-TEQ			EPA Method 4435		Xenobiotic Detection Systems 1601 East Geer Street, Suite S Durham, North Carolina 27704 (919) 688-4804 Attn: Nick Army	N/A

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #31
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)
Laboratory Accreditation Audit	Every 2 years	External	NELAC accrediting agency	NELAC accrediting agency	Laboratory Manager, Vista Analytical	QA Manager, Vista Analytical	NELAC Accrediting Authority

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #32
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
Field Observations /Deviations from Work Plan	Logbook	David L. Adams Task Leader/SERAS	Immediately	Field Change Form	David L. Adams Task Leader/SERAS	Within 24 hours of change
External Lab Performance Audits	Audit Report	Laboratory Manager, Vista Analytical	Within 30 Days	Corrective Action Plan	Regulatory Agency	Within 30 Days
Peer Review	In the deliverable	David L. Adams Task Leader/SERAS	Prior to deliverable due date	Comments directly in the deliverable	David L. Adams Task Leader/SERAS	Prior to deliverable due date

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #33
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)
Technical Report	Monthly	10th of the month following performance period	David L. Adams, Task Leader/SERAS	ERT Project Officer and Work Asssignment Manager
QA Report	Quarterly	February, May, August, November	Deborah Killeen, QA/QC Officer/SERAS	ERT Project Officer and Quality Coordinator

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain of Custody Record	Reviewed by Field Sampling Personnel in field and Data QA/QC Group prior to final analytical report preparation	Int.	SERAS
Laboratory Data Package	Reviewed for completeness	Int.	Vista and XDS laboratories
Analytical Report	Reviewed for accuracy	Int.	Peer Review Team
Trip Report	Reviewed for accuracy	Int.	Peer Review Team
Completeness Check	Review of Planning Documents, Analytical Data Package, Sampling Documents and External Reports, as applicable, using the UFP-QAPP Checklist	Int.	SERAS Task Leader, QA/QC Chemist

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in the QAPP were followed and any deviations noted	SERAS TL, ERT WAM
IIa	COC records	Examine COC records and match with requested analyses	SERAS QA/QC Chemist
IIa	Lab Data Package	Examine packages against COC forms (holding times, sample handling, methods, sample identifications, qualifiers)	SERAS QA/QC Chemist
IIb	Lab Data Package	Quantify data based on QC deficiencies (precision/accuracy, %RSD, %D, etc.)	SERAS QA/QC Chemist, TL, QA/QC Officer, GC/MS Chemist

☐ Worksheet Not Applicable (State Reason)

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIb	Dust	PCDD/PCDF	Low	SERAS SOP # 1019 *Data Validation Procedures for Dioxin/Furan Analysis by HRGC/HRMS*	Ray Varsolona or Tony LoSurdo, SERAS QA/QC Chemist
IIb	Dust	PBDD/PBDF	Low	SERAS SOP # 1019 *Data Validation Procedures for Dioxin/Furan Analysis by HRGC/HRMS*	Ray Varsolona or Tony LoSurdo, SERAS QA/QC Chemist

☑ Worksheet Not Applicable (State Reason) EPA Region IV will be responsible for assessing the usability of the data.

QAPP Worksheet #37
Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
Describe the evaluative procedures used to assess overall measurement error associated with the project:
Identify the personnel responsible for performing the usability assessment: EPA Region IV
Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

APPENDIX A
QC Tables for PCDD/PCDF
Stephen Foster Indoor Dust Investigation QAPP
May 2012

Polychlorinated Dioxins and Furans

Table 1
Theoretical Ion Abundance Ratios and Their Control Limits for PCDDs and PCDFs

Number of Chlorine Atoms	Ion Type	Theoretical Ratio	Control Limits (1)	
			Lower	Upper
4(2)	M/M+2	0.77	0.65	0.89
5 (CDD) (5)	M/M+2	0.63	0.54	0.72
5 (CDF)	M+2/M+4	1.55	1.32	1.78
6	M+2/M+4	1.24	1.05	1.43
6(3)	M/M+2	0.51	0.43	0.59
7	M+2/M+4	1.05	0.88	1.20
7(4)	M/M+2	0.44	0.37	0.51
8	M+2/M+4	0.89	0.76	1.02

(1) Represents ± 15% windows around the theoretical ion abundance ratios
(2) Does not apply to $^{37}Cl_4$-2,3,7,8-TCDD (cleanup standard)
(3) Used for ^{13}C-HxCDF
(4) Used for ^{13}C-HpCDF
(5) Modified to mitigate PCB interference

Table 2
Retention Time Window Defining Solution and Isomer Specificity Test Standard

Primary Column	First Eluter	Last Eluter
TCDF	1,3,6,8-	1,2,8,9-
TCDD	1,3,6,8-	1,2,8,9-
PeCDF	1,3,4,6,8-	1,2,3,8,9-
PeCDD	1,2,4,7,9-	1,2,3,8,9-
HxCDF	1,2,3,4,6,8-	1,2,3,7,8,9-
HxCDD	1,2,4,6,7,9-	1,2,3,7,8,9-
HpCDF	1,2,3,4,6,7,8-	1,2,3,4,7,8,9-
HpCDD	1,2,3,4,6,7,9-	1,2,3,4,6,7,8-

Table 3
Calibration Curve Concentration (pg/µL)

Native CDDs and CDFs	CS0	CS1	CS2	CS3*	CS4	CS5
2,3,7,8-TCDD	0.25	0.5	2	10	40	200
2,3,7,8-TCDF	0.25	0.5	2	10	40	200
1,2,3,7,8-PeCDD	1.25	2.5	10	50	200	1000
1,2,3,7,8-PeCDF	1.25	2.5	10	50	200	1000
2,3,4,7,8-PeCDF	1.25	2.5	10	50	200	1000
1,2,3,4,7,8-HxCDD	1.25	2.5	10	50	200	1000
1,2,3,6,7,8-HxCDD	1.25	2.5	10	50	200	1000
1,2,3,7,8,9-HxCDD	1.25	2.5	10	50	200	1000
1,2,3,4,7,8-HxCDF	1.25	2.5	10	50	200	1000
1,2,3,6,7,8-HxCDF	1.25	2.5	10	50	200	1000
1,2,3,7,8,9-HxCDF	1.25	2.5	10	50	200	1000
2,3,4,6,7,8-HxCDF	1.25	2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDD	1.25	2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDF	1.25	2.5	10	50	200	1000
1,2,3,4,7,8,9-HpCDF	1.25	2.5	10	50	200	1000
OCDD	2.5	5	20	100	400	2000
OCDF	2.5	5	20	100	400	2000
Labeled Compounds						
^{13}C-2,3,7,8-TCDD	100	100	100	100	100	100
^{13}C-2,3,7,8-TCDF	100	100	100	100	100	100
^{13}C-1,2,3,7,8-PeCDD	100	100	100	100	100	100
^{13}C-1,2,3,7,8-PeCDF	100	100	100	100	100	100
^{13}C-2,3,4,7,8-PeCDF	100	100	100	100	100	100
^{13}C-1,2,3,4,7,8-HxCDD	100	100	100	100	100	100
^{13}C-1,2,3,6,7,8-HxCDD	100	100	100	100	100	100
^{13}C-1,2,3,4,7,8-HxCDF	100	100	100	100	100	100
^{13}C-1,2,3,6,7,8-HxCDF	100	100	100	100	100	100
^{13}C-1,2,3,7,8,9-HxCDF	100	100	100	100	100	100
^{13}C-2,3,4,6,7,8-HxCDF	100	100	100	100	100	100
^{13}C-1,2,3,4,6,7,8-HpCDD	100	100	100	100	100	100
^{13}C-1,2,3,4,6,7,8-HpCDF	100	100	100	100	100	100
^{13}C-1,2,3,4,7,8,9-HpCDF	100	100	100	100	100	100
^{13}C-OCDD	200	200	200	200	200	200
^{13}C-OCDF	200	200	200	200	200	200
Cleanup Recovery Standard						
$^{37}Cl_4$-2,3,7,8-TCDD	0.25	0.5	2.0	10	40	200
Recovery Standard						
^{13}C-1,2,3,4-TCDD	100	100	100	100	100	100
^{13}C-1,2,3,4-TCDF	100	100	100	100	100	100
^{13}C-1,2,3,4,6,9-HxCDF	100	100	100	100	100	100

* Calibration Verification Solution

Table 4
Acceptance Criteria for Performance Tests

CDD/CDF	Conc. (ng/mL)	OPR (ng/mL)	VER (ng/mL)	Labeled % Recovery in Samples
2,3,7,8-TCDD	10	6.7-15.8	7.8-12.9	
2,3,7,8-TCDF	10	7.5-15.8	8.4-12.0	
1,2,3,7,8-PeCDD	50	35-71	39-65	
1,2,3,7,8-PeCDF	50	40-67	41-60	
2,3,4,7,8-PeCDF	50	34-80	41-61	
1,2,3,4,7,8-HxCDD	50	35-82	39-64	
1,2,3,6,7,8-HxCDD	50	38-67	39-64	
1,2,3,7,8,9-HxCDD	50	32-81	41-61	
1,2,3,4,7,8-HxCDF	50	36-67	45-56	
1,2,3,6,7,8-HxCDF	50	42-65	44-57	
1,2,3,7,8,9-HxCDF	50	39-65	45-56	
2,3,4,6,7,8-HxCDF	50	35-78	44-57	
1,2,3,4,6,7,8-HpCDD	50	35-70	43-58	
1,2,3,4,6,7,8-HpCDF	50	41-61	45-55	
1,2,3,4,7,8,9-HpCDF	50	39-69	43-58	
OCDD	100	78-144	79-126	
OCDF	100	63-170	63-159	
$^{13}C_{12}$-2,3,7,8-TCDD	100	20-175	82-121	25-164
$^{13}C_{12}$-2,3,7,8-TCDF	100	22-152	71-140	24-169
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	21-227	62-160	25-181
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	21-192	76-130	24-185
$^{13}C_{12}$-2,3,4,7,8-PeCDF	100	13-328	77-130	21-178
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	100	21-193	85-117	32-141
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	25-163	85-118	28-130
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	100	21-193	85-117	32-141
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	100	19-202	76-131	26-152
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	21-159	70-143	26-123
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	100	17-205	74-135	29-147
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	100	22-176	73-137	28-136
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	26-166	72-138	23-140
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	21-158	78-129	28-143
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	100	20-186	77-129	26-138
$^{13}C_{12}$-OCDD	200	26-397	96-415	17-157
$^{13}C_{12}$-OCDF	200	26-397	96-415	17-157
$^{37}Cl_4$-2,3,7,8-TCDD	10	3.1-19.1	7.9-12.7	35-197

A Method Blank and OPR is prepared as part of every analytical batch of 20 or fewer samples.

A verification standard from the initial calibration curve containing the column performance standard mix is injected at the beginning of an analytical 12-hour sequence.

APPENDIX B
QC Tables for PBDD/PBDF
Stephen Foster Indoor Dust Investigation QAPP
May 2012

Polybrominated Dioxins and Furans

Table 1

Theoretical Ion Abundance Ratios and Control Limits for PBDDs and PBDFs

Number of Bromine Atoms	Theoretical Ratio	Control Limits	
		Lower	Upper
4	0.69	0.59	0.79
5	1.02	0.87	1.17
6	0.77	0.65	0.89
7	1.02	0.87	1.17

Table 2

Calibration Solutions (pg/µL)

Compound	Calibration Solutions (pg/µL)			
Native BDDs and BDFs	**CS1**	**CS2**	**CS3***	**CS4**
2,3,7,8-TBDD	2.5	25.0	50	125
2,3,7,8-TBDF	25.0	250	500	1250
1,2,3,7,8-PeBDD	12.5	125	250	625
1,2,3,7,8-PeBDF	125	1250	2500	6250
2,3,4,7,8-PeBDF	125	1250	2500	6250
1,2,3,4,7,8-HxBDD	62.5	625	1250	3125
1,2,3,6,7,8-HxBDD	62.5	625	1250	3125
1,2,3,7,8,9-HxBDD	62.5	625	1250	3125
1,2,3,4,7,8-HxBDF	100	1000	2000	5000
1,2,3,4,6,7,8-HpBDF	250	2500	5000	12500
Labeled Compounds				
13C-2,3,7,8-TBDD	100	100	100	100
13C-2,3,7,8-TBDF	100	100	100	100
13C-1,2,3,7,8-PeBDD	100	100	100	100
13C-2,3,4,7,8-PeBDF	100	100	100	100
13C-1,2,3,6,7,8-HxBDD	250	250	250	250
13C-1,2,3,4,7,8-HxBDF	250	250	250	250
Cleanup Recovery Standard				
$_{13}$C-OCDF	50	500	1250	2500
Recovery Standard				
$_{13}$C-OCDD	500	500	500	500

* Calibration Verification Solution

Table 3

Ions Monitored for Analysis of PBDD/PBDF

Descriptor	Exact M/Zs	Substance
1	481.6975	TBDF
	483.6955	TBDF
	493.7378	TBDF
	495.7357	TBDF
	497.6724	TBDD
	499.6904	TBDD
	509.7328	TBDD
	511.7306	TBDD
	492.9697	PFK
2	566.9665	PFK
	561.6060	PeBDF
	562.6039	PeBDF
	573.6462	PeBDF
	575.6442	PeBDF
	577.6009	PeBDD
	579.5988	PeCDD
	453.7830, 455.7800	13C OCDF
	589.6412	PeBDD
	591.6391	PeBDD
	469.7780, 471.7750	13C OCDD
3	639.5165	HxBDF
	641.5144	HxBDF
	654.9601	PFK
	651.5567	HxBDF
	653.5547	HxBDF
	655.5114	HxBDD
	657.5094	HxBDD
4	719.4250	HpCDF
	721.4229	HpCDF
	735.4199	HpCDD
	737.4178	HpCDD
	704.9569	PFK

Table 4

Quantitation Limits

PBDD/F	Quantitation Limit Solid (pg/g)
2,3,7,8-TBDD	5.0
2,3,7,8-TBDF	50
1,2,3,7,8-PeBDD	25
1,2,3,7,8-PeBDF	250
2,3,4,7,8-PeBDF	250
1,2,3,4,7,8-HxBDD	125
1,2,3,6,7,8-HxBDD	125
1,2,3,7,8,9-HxBDD	125
1,2,3,4,7,8-HxBDF	200
1,2,3,4,6,7,8-HpBDD	125
1,2,3,4,6,7,8-HpBDF	500

Based on a 20 μL final volume and 10 g sample size

Table 5

Acceptance Criteria

BDD/BDF	Conc. (ng/mL)	RPD (%)	OPR (%)	VER (ng/mL)	Labeled Rec. (%)
2,3,7,8-TBDD	50	50	40-150	37.5-62.5	
2,3,7,8-TBDF	500	50	40-150	375-625	
1,2,3,7,8-PeBDD	250	50	40-150	187.5-312.5	
1,2,3,7,8-PeBDF	2500	50	40-150	1875-3125	
2,3,4,7,8-PeBDF	2500	50	40-150	1875-3125	
1,2,3,4,7,8-HxBDD/ 1,2,3,7,8,9-HxBDD	2500	50	40-150	1875-3125	
1,2,3,6,7,8-HxBDD	1250	50	40-150	937.5-1562.5	
1,2,3,4,7,8-HxBDF	2000	50	40-150	1500-2500	
1,2,3,4,6,7,8-HpBDF	5000	50	40-150	3750-6250	
$^{13}C_{12}$-2,3,7,8-TBDD	100	50	40-150	65-135	25-300
$^{13}C_{12}$-2,3,7,8-TBDF	100	50	40-150	65-135	25-300
$^{13}C_{12}$-1,2,3,7,8-PeBDD	100	50	40-150	65-135	25-300
$^{13}C_{12}$-1,2,3,7,8-PeBDF	100	50	40-150	65-135	25-300
$^{13}C_{12}$-2,3,4,7,8-PeBDF	100	50	40-150	65-135	25-300
$^{13}C_{12}$-1,2,3,4,7,8-HxBDD/ $^{13}C_{12}$-1,2,3,7,8,9-HxBDD	500	50	40-150	325-675	25-300
$^{13}C_{12}$-1,2,3,6,7,8-HxBDD	250	50	40-150	162.5-337.5	25-300
$^{13}C_{12}$-1,2,3,4,7,8-HxBDF	250	50	40-150	162.5-337.5	25-300
$^{13}C_{12}$-OCDF	1250	50	40-150	812.5-1687.5	25-300
$^{13}C_{12}$-OCDD	500	50	40-150	325-675	25-300

A Method Blank and OPR is prepared as part of every analytical batch of 20 or fewer samples.

A verification standard from the initial calibration curve containing the column performance standard mix is injected at the beginning of an analytical 12-hour sequence.