SITE-SPECIFIC UFP QUALITY ASSURANCE PROJECT PLAN

JJ METAL RECYCLING FACILITY FIRE SITE

Carolina, Puerto Rico

SSID No: 02ZZ

DC No: RST3-05-D-0109
TDD No: TO-0370-0114
EPA Contract No: EP-S2-14-01

Prepared for:

U.S. Environmental Protection Agency
Region II – Removal Action Branch
2890 Woodbridge Avenue
Edison, New Jersey 08837

Prepared by:

Removal Support Team 3
Weston Solutions, Inc.
Federal East Division
Edison, New Jersey 08837

December 2018

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ATTACHMENT B: Sampling SOPs

- EPA ERT/SERAS SOP # 2001: *General Field Sampling Guidelines*
- EPA ERT/SERAS contractor's SOP # 2012: *Soil Sampling*
- EPA ERT/SERAS contractor's SOP # 2013: *Surface Water Sampling*
- Weston Solutions, Inc.'s Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Chemical (PFC) Sites.

ATTACHMENT C: EPA RMLs - May 2018

ATTACHMENT D: Laboratory Method Detection Limits

LIST OF ACRONYMS

ADR	Automated Data Review
ANSETS	Analytical Services Tracking System
AOC	Acknowledgment of Completion
ASTM	American Society for Testing and Materials
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
CFM	Contract Financial Manager
CO	Contract Officer
COI	Conflict of Interest
COO	Chief Operations Officer
CRDL	Contract Required Detection Limit
CRTL	Core Response Team Leader
CRQL	Contract Required Quantitation Limit
CQLOSS	Corporate Quality Leadership and Operations Support Services
CWA	Clean Water Act
DCN	Document Control Number
DESA	Division of Environmental Science and Assessment
DI	Deionized Water
DPO	Deputy Project Officer
DQI	Data Quality Indicator
DQO	Data Quality Objective
EM	Equipment Manager
EDD	Electronic Data deliverable
ENVL	Environmental Unit Leader
EPA	Environmental Protection Agency
ERT	Environmental Response Team
FASTAC	Field and Analytical Services Teaming Advisory Committee
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/MS	Gas Chromatography/Mass Spectrometry
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSO	Health and Safety Officer
ITM	Information Technology Manager
LEL	Lower Explosive Limit
MSA	Mine Safety Appliances
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS (Concluded)

OSWER	Office of Solid Waste and Emergency Response
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PIO	Public Information Officer
PM	Program Manager
PO	Project Officer
PRP	Potentially Responsible Party
PT	Proficiency Testing
QA	Quality Assurance
QAL	Quality Assurance Leader
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RC	Readiness Coordinator
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
RSCC	Regional Sample Control Coordinator
RST	Removal Support Team
SARA	Superfund Amendments and Reauthorization Act
SEDD	Staged Electronic Data Deliverable
SOP	Standard Operating Practice
SOW	Statement of Work
SPM	Site Project Manager
START	Superfund Technical Assessment and Response Team
STR	Sampling Trip Report
TAL	Target Analyte List
TCL	Total Compound List
TDD	Technical Direction Document
TDL	Technical Direction Letter
TO	Task Order
TQM	Total Quality Management
TSCA	Toxic Substances Control Act
UFP	Uniform Federal Policy
VOA	Volatile Organic Analysis

TABLE 1: Crosswalk: UFP-QAPP Workbook to 2106-G-05 QAPP

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
A. Project Management and Objectives			
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7, & 8	Personnel Qualifications and Sign-Off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certifications
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model (CSM)	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP ELEMENTS FOR EVALUATING EXISTING DATA
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
B. Measurement/Data Acquisition			
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field Quality Control (QC) Sample Summary	2.3.5	QC Requirements
21	Field Standard Operating Procedures (SOPs)	2.3.2	Sampling Procedures and Requirements

TABLE 1: Crosswalk: UFP-QAPP Workbook to 2106-G-05 QAPP (Concluded)

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
B. Measurement/Data Acquisition			
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical QC and Corrective Action	2.3.5	QC Requirements
29	Project Documents and Records	2.2.8	Document and Records Requirements
C. Assessment/Oversight			
31, 32, & 33	Assessments and Corrective Action	2.4	ASSESSMENTS AND DATA REVIEW (CHECK)
		2.5.5	Reports to Management
D. Data Review			
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #1& 2: Title and Approval Page

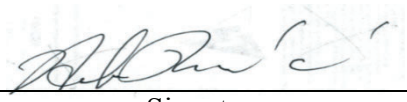
1. Project Identifying Information

a) Site Name/Project Name: JJ Metal Recycling Facility Fire Site
b) Site Location/EPA ID No.: Carolina, Puerto Rico/ Not applicable
c) Contract/Work Assignment Number: EP-S2-14-01 / TDD#: 0370-0114

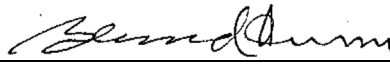
2. Lead Organization

Weston Solutions, Inc.
1090 King Georges Post Road, Suite 201
Edison, New Jersey 08837

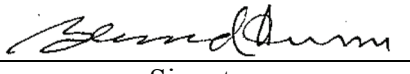
Lead Organization's Site Project Manager:

Hector Rodriguez		11/30/2018
Printed Name/Title	Signature	Date

Lead Organization's Technical Review:

Bernard Nwosu		11/30/2018
Printed Name/Title	Signature	Date

Lead Organization's QA/QC Chemist:

For: Smita Sumbaly		11/30/2018
Printed Name/Title	Signature	Date

EPA Region II On-Scene Coordinator:

Carlos Huertas		12/3/2018
Printed Name/Title	Signature	Date

ERT Region II Quality Assurance Officer:

Printed Name/Title	Signature	Date

Document Control Number: RST3-05-D-0105

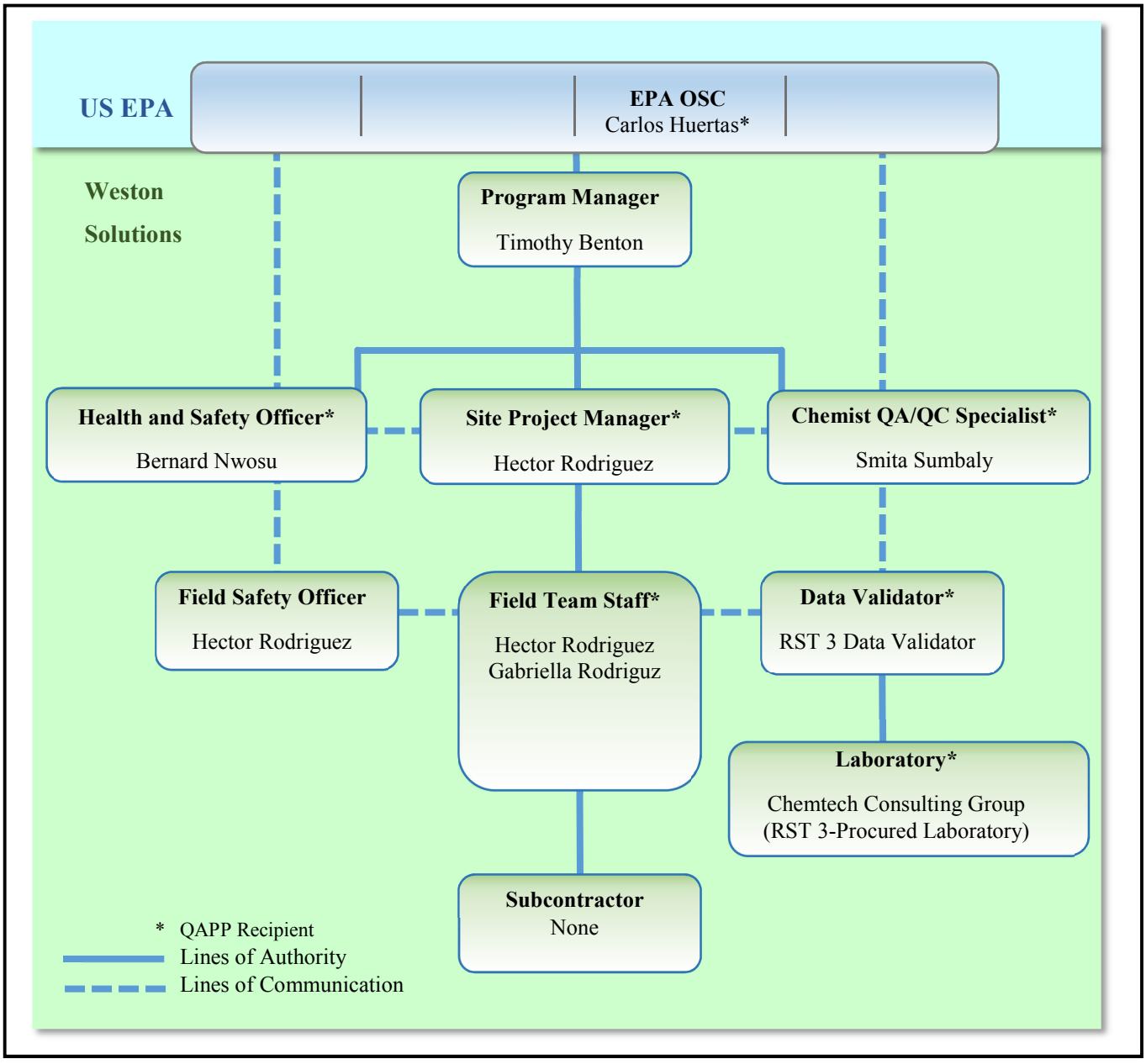
QAPP Worksheet #1& 2: Title and Approval Page (Concluded)

3. List Plans and reports from previous investigation relevant to this project.

- Site-Specific UFP QAPP, November 30, 2018; DCN: RST3-05-D-0105

Exclusions:
Not Applicable

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution



Acronyms:
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
RST 3 – Removal Support Team 3
QA/QC – Quality Assurance/Quality Control

QAPP Worksheet #3 & 5: Project Organizational and QAPP Distribution (Concluded)

QAPP Recipient	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Carlos Huertas	OSC	EPA, Region II	(787) 692-9453	(787) 289-7104	huertas-hernandez.carlos@epa.gov	RST3-05-D-0109
Hector Rodriguez	SPM	Weston Solutions, Inc., RST 3	(787) 602-8424	(787) 256-2508	Hector.Rodriguez-Cesani@WestonSolutions.com	RST3-05-D-0109
Gabriela Rodriguez	Field Personnel	Weston Solutions, Inc., RST 3	(787) 365-9290	(787) 256-2508	Gabriela.Rodriguez-Rosario@WestonSolutions.com	RST3-05-D-0109
Smita Sumbaly	QAO	Weston Solutions, Inc., RST 3	(732) 585-4410	(732) 225-7037	S.Sumbaly@westonsolutions.com	RST3-05-D-0109
Bernard Nwosu	HSO	Weston Solutions, Inc., RST 3	(732) 585-4413	(732) 225-7037	Ben.Nwosu@westonsolutions.com	RST3-05-D-0109
Site TDD File	RST 3 Site TDD File	Weston Solutions, Inc., RST 3	Not Applicable	Not Applicable	Not Applicable	-

EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
SPM – Site Project Manager
RST 3 – Removal Support Team 3
QAO – Quality Assurance Officer
HSO – Health & Safety Officer
TDD – Technical Direction Document

QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet

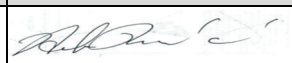
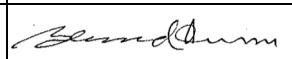
Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates[1]	Date of Training
[Specify location of training records and certificates for samplers]							
QAPP Training	This training is presented to new employees and Site project Manager's to introduce the provisions, requirements, and responsibilities detailed in the QAPP. The training presents the relationship between the QAPPs, SOPs, and work plans. QAPP refresher training will be presented to all employees following a major QAPP revision.	QA Officer	As needed	All RST 3 members upon initial employment and as refresher training	Weston Solutions, Inc., RST 3	Within Division	February 2018
Health and Safety Training	Health and safety training will be provided to ensure compliance with Occupational Safety and Health Administration (OSHA) as established in 29 CFR 1910.120.	Health and Safety Officer	Yearly at a minimum	All Employee upon initial employment and as refresher training every year	Weston Solutions, Inc., RST 3	Within Division	February 2018
Others	SCRIBE, ICS 100 and 200, and Air Monitoring Equipment Trainings provided to all employees	EPA ERT – all trainings	Upon initial employment and as needed				February 2018
	Dangerous Goods Shipping	JJ Keller Corporation	Every 3 years				February 2018

All team members are trained in the concepts and procedures in recognizing opportunities for continual improvement, and the approaches required to improve procedures while maintaining conformance with legal, technical, and contractual obligations.

[1]If training records and/or certificates are on file elsewhere; document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.

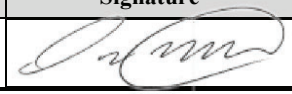
QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet (Concluded)

Organization: Weston Solutions, Inc., RST 3

Name	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Hector Rodriguez-Cesani	SPM, RST 3	10+ years*	Implementing and executing the technical, QA and health and safety during sampling event, sample collection and sample management.	Weston Solutions, Inc.		11/30/2018
Gabriella Rodriguez-Rosario	Field Personnel, RST 3	1+ years*	Sample collection and field support	Weston Solutions, Inc.		
Smita Sumbaly	QAO, RST 3	30 years	Chemist QA/QC Specialist	Weston Solutions, Inc.		
Bernard Nwosu	HSO, RST 3	25 years	Health and Safety Officer	Weston Solutions, Inc.		11/30/2018

*All RST 3 members, including subcontractor's resumes are in possession of RST 3 Program Manager, EPA Project Officer, and Contracting officers.
SPM – Site Project Manager
RST 3 – Removal Support Team 3
QAO – Quality Assurance Officer
HSO – Health & Safety Officer

Organization: EPA Region II, OSC

Name	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Carlos Huertas	EPA OSC	NA	All project coordination, direction and decision making.	EPA, Region II		12/3/2018

EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
NA – Not Applicable

QAPP Worksheet #6: Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Point of contact with EPA OSC	SPM, Weston Solutions, Inc., RST 3	Hector Rodriguez	(787) 602-8424	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic)
Adjustments to QAPP	SPM, Weston Solutions, Inc., RST 3	Hector Rodriguez	(787) 602-8424	QAPP approval dialogue
Health and Safety On-Site Meeting	HSO, Weston Solutions, Inc., RST 3	Hector Rodriguez	(787) 602-8424	Explain Site hazards, personnel protective equipment, hospital location, etc.
Lab Data Quality Issues (including sample receipt variances and laboratory quality control variances)	Laboratory Project Manager	Kurt Hummler	(908) 789-8900	Laboratory PM will report any issues with project samples to the WESTON Chemist QA/QC Specialist within 1 business day of notification. The WESTON Chemist QA/QC Specialist will contact the field sampler if necessary to resolve sample receiving discrepancies.
Data verification and data validation issues	RST 3 Data Validator	Smita Sumbaly	(732) 585-4410	The RST 3 Data Validator will review the data verification and validation.
Analytical Corrective Actions	WESTON Chemist QA/QC Specialist Laboratory PM	Smita Sumbaly	(732) 585-4410	If laboratory corrective actions are necessary, the WESTON Chemist QA/QC Specialist will communicate with the laboratory PM.
Data Tracking and Management, Release of Analytical Data	SPM, Weston Solutions, Inc., RST 3	Hector Rodriguez	(787) 602-8424	The need for corrective actions will be determined by the SPM upon review of the data. No analytical data will be released prior to validation and all releases must be approved by the Chemist QA/QC Specialist, SPM and EPA OSC/TM.

EPA: U.S. Environmental Protection Agency
OSC: On-Scene Coordinator
QAPP: Quality Assurance Project Plan
SPM: Site Project Manager
RST 3: Removal Support Team 3
HSO: Health and Safety Officer
QA/QC: Quality Assurance/Quality Control

QAPP Worksheet #9: Project Planning Session Summary

Date of Planning Session: 12/5/2018
Location: Off-site
Purpose: Scoping meeting for UFP-QAPP for EPA Region II Removal Support Team 3

Name	Title/Role	Organization	E-mail Address	Phone No.
Carlos Huertas	EPA OSC	EPA	huertas-hernandez.carlos@epa.gov	(787) 692-9453
Hector Rodriguez	RST 3 SPM	WESTON	Hector.Rodriguez-Cesani@WestonSolutions.com	(787) 602-8424

Notes/Comments: Site-Specific Initial Scoping Meeting:

Weston Solutions, Inc., Removal Support Team 3 (RST 3) has been tasked by the U.S. Environmental Protection Agency (EPA) with conducting soil and surface water sampling activities in support of the emergency response at the JJ Metal Recycling Facility Fire Site (the Site). Up to 20 soil samples and 16 surface water samples, including quality assurance/quality control (QA/QC) samples, will be collected from locations surrounding the Site which may have been potentially impacted by the on-site fire, and from background locations at least ¼ mile from the Site. All soil and surface water sample locations will be determined by the EPA On-Scene Coordinator (OSC). The soil and surface water samples will be submitted to an RST 3-procured laboratory for total compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), target analyte list (TAL) metals including mercury (Hg), dioxins and furans, and perfluoroalkyl and polyfluoroalkyl substances (PFAS), analyses. The soil and water samples will be collected for a definitive data quality assurance (QA) objective. The QA/QC samples for both soil and surface water samples will include field duplicates and additional volumes of field samples designated as matrix spike/matrix spike duplicate (MS/MSD), and will be collected at a rate of one per 20 field samples. Additional QA/QC samples collected for surface water sampling will include one trip blank sample collected for each cooler used to store and ship surface water samples being submitted for TCL VOC analysis. All Site activities will be noted in the Site logbook and documented with digital photographs.

Consensus Decisions Made:

The Removal Assessment is scheduled to begin on December 6, 2018 and will be completed in approximately one week. The analytical results from this sampling event will enable EPA determine the any potential environmental impact of the emissions from the fire.

Action Items:

Action	Responsible Party	Due Date
Prepare CLP Analytical Request Form	SPM, RST 3	12/4/2018
Prepare RST Analytical Request Form	SPM, RST 3	12/5/2018
Develop Health and Safety Plan	SPM, RST 3	11/29/2018
Develop QAPP	SPM, RST 3	12/7/2018
Develop Work Plan (driller, sampler, survey, etc.)	SPM, RST 3	Not Required
Develop Equipment List	SPM, RST 3	12/4/2018
Develop Site-Specific Data Management Plan	SPM, RST 3	12/4/2018

QAPP Worksheet #10: Conceptual Site Model

Background Information:

At approximately 1545 hours on November 28, 2018, RST 3 was activated by the EPA OSC to provide emergency response support at the Site. A fire was reported at 1345 hours on November 28, 2018 at the metal recycling plant located on PR-1, in front of Los Colobos. It is believed that a tank may have exploded at the facility. No other initial information was provided by the EPA.

QAPP Worksheet #11: Project/Data Quality Objectives

1. State the Problem:

A fire was reported on November 28, 2018 at the metal recycling plant located on PR-1, in front of Los Colobos. It is believed that a tank containing an unknown substance may have exploded at the facility. RST 3 has been tasked with performing soil and surface water sampling at areas surrounding the Site which may have been potentially impacted by the fire. The soil and surface water samples will be submitted to an RST 3-procured laboratory for TCL VOCs, TCL SVOCs, PCBs, TAL metals including Hg, dioxins and furans, and PFAS analyses.

2. Identify the Goals of the Study:

The analytical results from this sampling event will enable EPA determine any potential environmental impact of the emissions from the fire.

3. Identify Information Inputs:

Up to 20 soil samples, including one field duplicate sample, and additional volume of one field sample designated as MS/MSD will be collected from depths of 0 to 2 inches below ground surface (bgs) at locations throughout the immediate perimeter of the Site and at one background location at least ¼ mile from the Site. Up to 16 surface water samples including one field duplicate sample, and additional volume of one field sample designated as MS/MSD will be collected from standing water at locations where standing water exists in the immediate perimeter of the Site, sections of the Rio Grande De Loiza River immediately adjacent to the Site, and one background location at least ¼ mile from the Site and from. All soil and surface water sample locations will be determined by the EPA OSC. The soil and surface water samples will be submitted to an RST 3-procured laboratory for TCL VOCs, TCL SVOCs, PCBs, TAL metals including Hg, dioxins and furans, and PFAS, analyses.

4. Define the Boundaries of the Study:

Overall project objectives include: RST 3 is tasked with collecting soil and surface water samples at areas surrounding the Site which may have been potentially impacted by the fire and submitting to RST 3-procurred laboratory for analysis in order to determine if there are any potential environmental impacts associated with the fire at the Site.

Who will use the data? Data will be used by EPA, Region II OSC.

5. Develop the Analytic Approach:

Analytical Techniques:
Soil/ Surface Water/Trip Blanks: TCL VOCs SW-846 – 8260B/C
Soil/ Surface Water TCL SVOCs – SW-846 8270D
Soil/ Surface Water: PCBs – SW-846 8082
Soil/Surface Water: Dioxins and Furans – SW-846 8290A
Soil/Surface Water: TAL Metals + Hg – SW-846 6010C/7471A/B
Soil/Surface Water: PFAS – Appropriate EPA Method to be determined by RST 3 procured laboratory

QAPP Worksheet #11: Project/Data Quality Objectives (Concluded)

Type of Data: Definitive data
Matrix: Soil and Surface Water
Parameters: Soil and Surface Water– TCL VOCs, TCL SVOCs, PCBs, TAL Metals including Hg, Dioxins and Furans and PFAS
Sampling Equipment:
Soil – Dedicated plastic scoops, re-sealable plastic bags, Encore samplers, and sample jars.
Surface Water– Glass sample jars, poly sample containers
Access Agreement: Obtained by EPA, Region II OSC.
Sampling Locations: Sample locations will be identified by the EPA OSC.

How much data are needed? Up to 20 soil samples and 16 surface water samples, including QA/QC samples will be collected.

6. Specify Performance or Acceptance Criteria:

How "good" does the data need to be in order to support the environmental decision?
Sampling/analytical measurement performance criteria (MPC) for Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameters will be established. Refer to Worksheet #12, criteria for performance measurement for definitive data.

Where, when, and how should the data be collected/generated?

The soil samples will be collected from 0 to 2 inches bgs at up to 19 soil sample locations throughout the immediate perimeter of the Site and at one background soil sample location at least ¼ mile from the Site. The surface water samples will be collected at up to 16 locations where standing water exists in the immediate perimeter of the Site, and throughout sections of the Rio Grande De Loiza River immediately adjacent to the Site. In addition, one background surface water sample will be collected at a location at least ¼ mile from the Site.

7. Develop the Detailed Plan for Obtaining Data

Who will collect and generate the data? The soil and surface water samples will be collected by RST 3 and submitted to the assigned RST 3-procurred laboratory for analysis. The analytical data will be generated by the assigned laboratory and validated by the RST 3 data validator.

How will the data be reported? All data will be reported by the assigned laboratory (Preliminary, Electronic, and Hard Copy format). The Site Project Manager will provide a Sampling Trip Report, Status Reports, Maps/Figures, Analytical Report, and Data Validation Report to the EPA OSC.

How will the data be archived? Electronic data deliverables will be archived in a Scribe database.

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12A: TCL VOCs – Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	TCL VOCs / SW-846 8260B/C
Concentration Level	Low/Medium (µg/kg and µg/L)

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)
EPA ERT/SERAS contractor's SOP#'s 2001, 2012, and 2013	SW-846 Method 8260	Precision (field)	Project-Specific 50% RPD	Field Duplicate	S & A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	Project-Specific 50% RPD; List compound specific RPD	Field Duplicate; MS/MSD	S & A
		Accuracy (laboratory)	List compound specific %R	DMCs; MS/MSD	A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.
*Reference USEPA Region 2 SOP No. 24/Low/Medium VOA - Blank Type Criteria Table

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12B: TCL SVOCs – Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	TCL SVOCs / SW-846 8270D
Concentration Level	Low/Medium (µg/kg and µg/L)

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)
EPA ERT/SERAS contractor's SOP#'s 2001, 2012, and 2013	SW-846 Method 8270D	Precision (field)	Project-Specific <50%RPD	Field Duplicate	S & A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	Project-Specific <50%RPD; List compound specific RPD	Field Duplicate; MS/MSD	S & A
		Accuracy (laboratory)	List compound specific %R	DMCs; MS/MSD	A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.
*Reference USEPA Region 2 Low/Medium semivolatile Data Validation SOP# HW-22; http://www.epa.gov/region2/qa/documents.htm

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12C: PCBs – Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	TCL PCBs / SW-846 8082
Concentration Level	Low/Medium (µg/kg or µg/L)

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)
EPA ERT/SERAS contractor's SOP#'s 2001, 2012, and 2013	SW-846 Method 8082A	Precision (field)	Project-Specific <50%RPD	Field Duplicate	S & A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	Project-Specific RPD; List compound specific RPD	MS/MSD	S & A
		Accuracy (laboratory)	List compound specific %R	LCS; MS/MSD	A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.
*Reference USEPA Region 2 Low/Medium PCB Data Validation SOP# HW-45; http://www.epa.gov/region2/qa/documents.htm

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12D: Dioxins and Furans – Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	Dioxins and Furans / SW-846 8290A
Concentration Level	Low/Medium (ug/kg or µg/L)

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)
EPA ERT/SERAS contractor's SOP#'s 2001, 2012, and 2013	SW 846 Method 8290A	Precision (field)	<25%for 2,3,7 2,3,7,8-Substituted analytes, <50% RPD for rest of the analytes	Field Duplicate	S & A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	50-150%	MS/MSD**	S & A
		Accuracy (laboratory)	List compound specific %R	***LCS	A
		Accuracy (Laboratory)	<7 ug/kg	Toxicity Equivalency Factor (TEF)	A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.
*Reference USEPA Region 2 SOP No. 55/Tetra-through Octa-chlorinated Dioxins and furans by Isotope Dilution (HRGC/HRMS)
**MS/MSD – Not required by this Method, although labs may routinely perform this analysis as part of the internal QA/QC.
***Laboratory Control Sample (LCS) – Reference CLP DLM02.2, Exhibit D, Table 6 and QAPP Worksheet #28 for Criteria.

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12E: TAL Metals + Hg– Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	TAL Metals including Hg / SW-846 846 6010C/7471A/B
Concentration Level	Low/Medium (mg/kg or µg/L)

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)**
EPA ERT/SERAS contractor's SOP#'s 2001, 2012, and 2013	846 6010C/7471A/B	Precision (field)	≤ 20% RPD*(Aq) ≤35% RPD (soil)	Field Duplicate	S & A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	≤ 20% RPD*(Aq) <35% RPD (soil)	Duplicate Sample	A
		Accuracy (laboratory)	75–125%; 80–120 %	Matrix Spike; LCSW	A A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.

QAPP Worksheet #12: Measurement Performance Criteria
QAPP Worksheet #12F: PFAs – Soil and Surface Water (non-CLP Worksheet)

Matrix	Soil/ Surface Water / Trip Blanks/ Field Blanks
Analytical Group	PFAs / RST 3 Procured Laboratory's Analytical Method
Concentration Level	Medium/Low (ng/g or ng/L)

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)
WESTON Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Chemical (PFC) Sites	Appropriate EPA Method determined by RST 3 Procured Laboratory	Accuracy/Bias/Sensitivity-Contamination	MB/Instrument Blank	No target compound >QL[b]	S&A
		Accuracy/Bias/Sensitivity-Contamination	Equipment Rinsate Blanks	No target compound >QL[c]	S&A
		Accuracy/Bias	Labeled compounds	Laboratory Specified	A
		Accuracy/Bias	LCS	50%-150% (Soil), 70%-130% (Water)	A
		Precision	MS/MSD	RPD ≤50% (Soil), RPD ≤30% (Water)	A
		Completeness	Data Completeness Check	≥90%	A

[1]Reference number from QAPP Worksheet #21.
[2]Reference number from QAPP Worksheet #23.

QAPP Worksheet #13: Secondary Data Criteria and Limitations

Any data needed for project implementation or decision making that are obtained from non-direct measurement sources such as computer databases, background information, technologies and methods, environmental indicator data, publications, photographs, topographical maps, literature files and historical data bases will be compared to the DQOs for the project to determine the acceptability of the data. Thus, for example, analytical data from historical surveys will be evaluated to determine whether they satisfy the validation criteria for the project and to determine whether sufficient data was provided to allow an appropriate validation to be done. If not, then a decision to conduct additional sampling for the site may be necessary.

Data Type	Data Source (Originating Organization, Report Title, and Date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Not Applicable	Not Applicable	Not Applicable	Not Applicable

QAPP Worksheet #14 & 16: Project Tasks and Schedules

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop Project-Specific Health and Safety Plan (HASP)	WESTON	12/5/2018	12/5/2018	HASP	12/5/2018
Develop Project-Specific QAPP	WESTON	12/5/2018	12/7/2018	QAPP	12/7/2018
Procure WESTON-subcontracted laboratory for analytical services	WESTON	12/5/2018	12/5/2018	WESTON Purchase Order for analytical services	NA
Scoping meeting Operations Manager, SPM, HSO, and sampling team to discuss data collection activities, objectives, and logistics	WESTON	12/5/2018	12/5/2018	Meeting Notes	12/5/2018
Mobilization/Demobilization	WESTON	12/6/2018	12/6/2018	Field Notes	12/6/2018
Sample Collection Tasks	WESTON	12/6/2018	12/7/2018	Field Notes	12/7/2018
Analytical Tasks	WESTON	12/7/2018	12/14/2018	Field Notes/Laboratory Reports	12/14/2018
Quality Control Tasks	WESTON	12/7/2018	12/14/2018	Report of Analyses/Data Package	12/14/2018
Data Validation	WESTON	12/14/2018	12/21/2018	Validation Summary Report	12/21/2018
Summarize Data	WESTON	12/21/2018	12/31/2018	Project-Specific Summary Report/Table	12/31/2018
Develop Project-Specific Report	WESTON	12/21/2018	1/11/2019	Draft Project-Specific Report	1/11/2019
Address EPA comments on Draft Project-Specific Report	WESTON	1/21/2019	1/25/2019	Project-Specific Report	1/25/2019
Contract Closeout	WESTON	8/29/2018	6/30/2019	Contract Closeout Report	6/30/2019

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Sampling Tasks:

RST 3 has been tasked by EPA with collecting up to 20 soil samples and 16 surface water samples, including QA/QC samples, from locations surrounding the Site which may have been potentially impacted by the on-site fire, and from background locations at least ¼ mile from the Site. Up to 20 soil samples, including one field duplicate sample, and additional volume of one field sample designated as MS/MSD will be collected from depths 0 to 2 inches below ground surface (bgs) at locations throughout the immediate perimeter of the Site and at one background location at least ¼ mile from the Site. Up to 16 surface water samples including one field duplicate sample, and additional volume of one field sample designated as MS/MSD will be collected at locations where standing water exists in the immediate perimeter of the Site, at sections of the Rio Grande De Loiza River immediately adjacent to the Site, and one background location at least ¼ mile from the Site. All soil and surface water sample locations will be determined by the EPA OSC. The soil and surface water samples will be submitted to RST 3-procured laboratory for TCL VOCs, TCL SVOCs, PCBs, TAL metals including Hg, dioxins and furans, and PFAS, analyses.

Analysis Tasks:
Soil/ Surface Water/Trip Blanks: TCL VOCs SW-846 – 8260B/C
Soil/ Surface Water TCL SVOCs – SW-846 8270D
Soil/ Surface Water: PCBs – SW-846 8082
Soil/Surface Water: Dioxins and Furans – SW-846 8290A
Soil/Surface Water: TAL Metals + Hg – SW-846 6010C/7471A/B
Soil/Surface Water: PFAS – Appropriate EPA Method to be determined by RST 3 procured laboratory

Decontamination:

It is anticipated that all multi-media sampling activities will be completed utilizing dedicated sampling equipment which will be disposed of off-site in accordance with state and local regulations. However, if non-dedicated sampling equipment is utilized it will be decontaminated in accordance with EPA's ERT/SERAS contractor's SOP No. 2006: *Sampling Equipment Decontamination* as follows: Alconox/potable water scrub, deionized (DI) water rinse, propanol rinse, DI water rinse, air dry.

Quality Control Tasks:

All samples will be collected for definitive data and QA objective. Field duplicate and additional volumes of samples designated as MS/MSD will be collected at the rate of one per 20 field samples. Aqueous trip blanks will be collected and placed in each cooler used to store and ship surface water samples being submitted for TCL VOC analysis.

Data Management Tasks:

Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports. The following deliverables will be provided under this project:

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Trip Report: A trip report will be prepared to provide a detailed accounting of what occurred during each sampling mobilization. The trip report will be prepared within two weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations).

Maps/Figures: Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

Analytical Report: An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Data Review: A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be provided separately, or as part of the analytical report.

Documentation and Records:

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook: The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. Field logbook will be bound and paginated. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody information
11. Record of photographs
12. Site sketches

* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

Sample Labels: Sample labels will clearly identify the particular sample, and should include the following:

1. RST 3 Sample identification number.
2. Sample collection date and time

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Concluded)

3. Analytical Parameters
4. Sample preservation

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

Custody Seals: Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

Assessment/Audit Tasks: No performance audit of field operations is anticipated at this time. If conducted, performance and system audit will be in accordance with the project plan.

Data Review Tasks: All non-CLP data will be validated by the RST 3 data validator.

The data generated under this QA/QC Sampling Plan will be evaluated according to guidance in the Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental Data Collection and Use Programs Part 1: UFP-QAPP (EPA-105-B-04-900A, March 2005); Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities (EPA-105-B-04-900B, March 2005). Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits
QAPP Worksheet #15A: TCL VOCs

Matrix: Soil/Surface Water/Trip Blank
Analytical Group: TCL VOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
1,1,1,2-Tetrachloroethane	630-20-6	See Attachment C	See Attachment D
1,1,1-Trichloroethane	71-55-6		
1,1,2,2-Tetrachloroethane	79-34-5		
1,1,2-Trichloroethane	79-00-5		
1,1,2-Trichlorotrifluoroethane	76-13-1		
1,1-Dichloroethane	75-34-3		
1,1-Dichloroethene	75-35-4		
1,1-Dichloropropene	563-58-6		
1,2,3-Trichlorobenzene	87-61-6		
1,2,3-Trichloropropane	96-18-4		
1,2,4-Trichlorobenzene	120-82-1		
1,2,4-Trimethylbenzene	95-63-6		
1,2-Dibromo-3-chloropropane	96-12-8		
1,2-Dibromoethane	106-93-4		
1,2-Dichlorobenzene	95-50-1		
1,2-Dichloroethane	107-06-2		
1,2-Dichloropropane	78-87-5		
1,3,5-Trimethylbenzene	108-67-8		
1,3-Dichlorobenzene	541-73-1		
1,3-Dichloropropane	142-28-9		
1,4-Dichlorobenzene	106-46-7		
1,4-Dioxane	123-91-1		
2,2-Dichloropropane	594-20-7		
2-Butanone	78-93-3		
2-Chloroethyl vinyl ether	110-75-8		
2-Chlorotoluene	95-49-8		
2-Hexanone	591-78-6		
4-Chlorotoluene	106-43-4		
4-Methyl-2-pentanone	108-10-1		
Acetone	67-64-1		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15A: TCL VOCs (Continued)

Matrix: Soil and Surface Water
Analytical Group: TCL VOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
Acrolein	107-02-8	See Attachment C	See Attachment D
Acrylonitrile	107-13-1		
Allyl chloride	107-05-1		
Benzene	71-43-2		
Bromobenzene	108-86-1		
Bromochloromethane	74-97-5		
Bromodichloromethane	75-27-4		
Bromoform	75-25-2		
Bromomethane	74-83-9		
Carbon disulfide	75-15-0		
Carbon tetrachloride	56-23-5		
Chlorobenzene	108-90-7		
Chlorodibromomethane	124-48-1		
Chloroethane	75-00-3		
Chloroform	67-66-3		
Chloromethane	74-87-3		
cis-1,2-Dichloroethene	156-59-2		
cis-1,3-Dichloropropene	10061-01-5		
Cyclohexane	110-82-7		
Dibromomethane	74-95-3		
Dichlorodifluoromethane	75-71-8		
Diethyl Ether	60-29-7		
Di-isopropyl ether	108-20-3		
Ethyl Acetate	141-78-6		
Ethyl Benzene	100-41-4		
Ethyl methacrylate	97-63-2		
Hexachlorobutadiene	87-68-3		
Hexachloroethane	67-72-1		
Isopropyl Acetate	108-21-4		
Isopropylbenzene	98-82-8		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15A: TCL VOCs (Concluded)

Matrix: Soil/ Surface Water/Trip Blanks
Analytical Group: TCL VOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
m/p-Xylenes	1330-20-7	See Attachment C	See Attachment D
Methacrylonitrile	126-98-7		
Methyl Acetate	79-20-9		
Methyl Cyclohexane	108-87-2		
Methyl iodide	74-88-4		
Methyl methacrylate	80-62-6		
Methyl tert-butyl Ether	1634-04-4		
Methylene chloride	75-09-2		
n-amyl acetate	628-63-7		
Naphthalene	91-20-3		
n-Butylbenzene	104-51-8		
N-propylbenzene	103-65-1		
o-xylene	95-47-6		
p-Isopropyltoluene	99-87-6		
Sec-butylbenzene	135-98-8		
Styrene	100-42-5		
t-1,3-Dichloropropene	10061-02-6		
Tert butyl alcohol	75-65-0		
tert-Butylbenzene	98-06-6		
Tetrachloroethene	127-18-4		
Tetrahydrofuran	109-99-9		
Toluene	108-88-3		
Total Xylenes	1330-20-7		
Trans-1,2-dichloroethene	156-60-5		
trans-1,4-dichloro-2-butene	110-57-6		
Trichloroethene	79-01-6		
Trichlorofluoromethane	75-69-4		
Vinyl Acetate	108-05-4		
Vinyl chloride	75-01-4		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15B: TCL SVOCs

Matrix: Soil and Surface Water
Analytical Group: TCL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
1,1-Biphenyl	92-52-4	See Attachment C	See Attachment D
1,2,4,5-Tetrachlorobenzene	95-94-3		
1,2,4-Trichlorobenzene	120-82-1		
1,2-Dichlorobenzene	95-50-1		
1,3-Dichlorobenzene	541-73-1		
1,4-Dichlorobenzene	106-46-7		
1,4-Dioxane	123-91-1		
2,2-oxybis(1-Chloropropane)	540-54-5		
2,3,4,6-Tetrachlorophenol	58-90-2		
2,4,5-Trichlorophenol	95-95-4		
2,4,6-Trichlorophenol	88-06-2		
2,4-Dichlorophenol	120-83-2		
2,4-Dimethylphenol	105-67-9		
2,4-Dinitrophenol	51-28-5		
2,4-Dinitrotoluene	121-14-2		
2,6-Dinitrotoluene	606-20-2		
2-Chloronaphthalene	91-58-7		
2-Chlorophenol	95-57-8		
2-Methylnaphthalene	91-57-6		
2-Methylphenol	95-48-7		
2-Nitroaniline	88-74-4		
2-Nitrophenol	88-75-5		
3,3-Dichlorobenzidine	91-94-1		
3+4-Methylphenols	108-39-4		
3-Nitroaniline	99-09-2		
4,6-Dinitro-2-methylphenol	534-52-1		
4-Bromophenyl-phenylether	101-55-3		
4-Chloro-3-methylphenol	59-50-7		
4-Chloroaniline	106-47-8		
4-Chlorophenyl-phenylether	7005-72-3		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15B: TCL SVOCs (Continued)

Matrix: Soil and Surface Water
Analytical Group: TCL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
4-Nitroaniline	100-01-6	See Attachment C	See Attachment D
4-Nitrophenol	100-02-7		
Acenaphthene	83-32-9		
Acenaphthylene	208-96-8		
Acetophenone	98-86-2		
Aniline	62-53-3		
Anthracene	120-12-7		
Atrazine	1912-24-9		
Azobenzene	103-33-3		
Benzaldehyde	100-52-7		
Benzidine	92-87-5		
Benzo(a)anthracene	56-55-3		
Benzo(a)pyrene	50-32-8		
Benzo(b)fluoranthene	205-99-2		
Benzo(g,h,I)perylene	191-24-2		
Benzo(k)fluoranthene	207-08-9		
Benzoic acid	65-85-0		
Benzyl Alcohol	100-51-6		
bis(2-Chloroethoxy)methane	111-91-1		
bis(2-Chloroethyl)ether	111-44-4		
bis(2-Ethylhexyl)phthalate	108-60-1		
Butylbenzylphthalate	117-81-7		
Caprolactam	85-68-7		
Carbazole	105-60-2		
Chrysene	86-74-8		
Dibenzo(a,h)anthracene	218-01-9		
Dibenzofuran	132-64-9		
Diethylphthalate	84-66-2		
Dimethylphthalate	131-11-3		
Di-n-butylphthalate	84-74-2		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15B: TCL SVOCs (Concluded)

Matrix: Soil and Surface Water
Analytical Group: TCL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
Di-n-octyl phthalate	117-84-0	See Attachment C	See Attachment D
Fluoranthene	206-44-0		
Fluorene	86-73-7		
Hexachlorobenzene	118-74-1		
Hexachlorobutadiene	87-68-3		
Hexachlorocyclopentadiene	77-47-4		
Hexachloroethane	67-72-1		
Indeno(1,2,3-cd)pyrene	193-39-5		
Isophorone	78-59-1		
Naphthalene	91-20-3		
Nitrobenzene	98-95-3		
n-Nitrosodimethylamine	62-75-9		
N-Nitroso-di-n-propylamine	621-64-7		
n-Nitrosodiphenylamine	86-30-6		
Pentachlorophenol	87-86-5		
Phenanthrene	85-01-8		
Phenol	108-95-2		
Pyrene	129-00-0		
Pyridine	110-86-1		
Di-n-octyl phthalate	117-84-0		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15C: PCBs

Matrix: Soil and Surface Water
Analytical Group: TCL PCBss
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
Aroclor-1016	12674-11-2	See Attachment C	See Attachment D
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		
Aroclor-1262	37324-23-5		
Aroclor-1268	11100-14-4		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15D: Dioxins and Furans

Matrix: Soil and Surface Water
Analytical Group: Dioxins and Furans
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
2,3,7,8-TCDD	1746-01-6	See Attachment C	See Attachment D
1,2,3,7,8-PeCDD	40321-76-4		
1,2,3,6,7,8-HxCDD	57653-85-7		
1,2,3,4,7,8-HxCDD	39227-28-6		
1,2,3,7,8,9-HxCDD	19408-74-3		
1,2,3,4,6,7,8-HpCDD	35822-46-9		
OCDD	3268-87-9		
2,3,7,8-TCDF	51207-31-9		
1,2,3,7,8-PeCDF	57117-41-6		
2,3,4,7,8-PeCDF	57117-31-4		
1,2,3,6,7,8-HxCDF	57117-44-9		
1,2,3,7,8,9-HxCDF	72918-21-9		
1,2,3,4,7,8-HxCDF	70648-26-9		
2,3,4,6,7,8-HxCDF	60851-34-5		
1,2,3,4,6,7,8-HpCDF	67562-39-4		
1,2,3,4,7,8,9-HpCDF	55673-89-7		
OCDF	39001-02-0		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15E: TAL Metals + Hg

Matrix: Soil and Surface Water
Analytical Group: TAL Metals + Hg
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels	Laboratory Method Detection/Quantitation Limits
Aluminum	7429-90-5	See Attachment C	See Attachment D
Antimony	7440-36-0		
Arsenic	7440-38-2		
Barium	7440-39-3		
Beryllium	7440-41-7		
Cadmium	7440-43-9		
Calcium	7440-70-2		
Chromium	7440-47-3		
Cobalt	7440-48-4		
Copper	7440-50-8		
Iron	7439-89-6		
Lead	7439-92-1		
Magnesium	7439-95-4		
Manganese	7439-96-5		
Mercury	7439-97-6		
Nickel	7440-02-0		
Potassium	7440-09-7		
Selenium	7782-49-2		
Silver	7440-22-4		
Sodium	7440-23-5		
Thallium	7440-28-0		
Vanadium	7440-62-2		
Zinc	7440-66-6		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
QAPP Worksheet #15F: PFAS

Matrix: Soil
Analytical Group: PFAS
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels[1]	Laboratory Method Detection/Quantitation Limits
Perfluoropentanoic acid (PFPeA)	2706-90-3	See Attachment C	See Attachment D
Perfluorohexanoic acid (PFHxA)	307-24-4		
Perfluoroheptanoic acid (PFHpA)	375-85-9		
Perfluorooctanoic Acid (PFOA)	335-67-1		
Perfluorononanoic acid (PFNA)	375-95-1		
Perfluorodecanoic acid (PFDA)	335-76-2		
Perfluoroundecanoic acid (PFUnA)	2058-94-8		
Perfluorododecanoic acid (PFDoA)	307-55-1		
Perfluorobutanesulfonic acid (PFBS)	375-73-5		
Perfluorohexanesulfonic acid (PFHxS)	335-46-4		
Perfluorooctanesulfonic acid (PFOS)	1763-23-1		
Perfluorodecanesulfonic acid (PFDS)	CASID30783		

[1]EPA RMLs for soil are currently established for perfluorobutanesulfonic acid (PFBS) only. The EPA RML for PFBS is 1,300,000 ng/g for residential soil, 1,600,000 ng/g for industrial soil.

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Concluded)
QAPP Worksheet #15F: PFAS (Concluded)

Matrix: Surface Water
Analytical Group: PFAS
Concentration Level: Low/Medium

Analyte	CAS Number	EPA Action Levels (ng/L)	Laboratory Method Detection/Quantitation Limits
Perfluoropentanoic acid (PFPeA)	2706-90-3	See Attachment C	See Attachment D
Perfluorohexanoic acid (PFHxA)	307-24-4	Not Established	
Perfluoroheptanoic acid (PFHpA)	375-85-9	Not Established	
Perfluorooctanoic Acid (PFOA)	335-67-1	0.07[1]	
Perfluorononanoic acid (PFNA)	375-95-1	Not Established	
Perfluorodecanoic acid (PFDA)	335-76-2	Not Established	
Perfluoroundecanoic acid (PFUnA)	2058-94-8	Not Established	
Perfluorododecanoic acid (PFDoA)	307-55-1	Not Established	
Perfluorobutanesulfonic acid (PFBS)	375-73-5	400,000[2]	
Perfluorohexanesulfonic acid (PFHxS)	335-46-4	Not Established	
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.07[1]	
Perfluorodecanesulfonic acid (PFDS)	CASID30783	Not Established	

[1]Action level based on the EPA 2016 Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) Drinking Water Health Advisory of 70 parts per trillion (ppt) for either individual or combined concentrations of PFOA and PFOS. Obtained from https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf
[2]Action level based on the May 2018 EPA RML for tap water.

QAPP Worksheet #17: Sampling Design and Rationale

Soil Sampling

Soil Sampling will be conducted in accordance with EPA's ERT/SERAS contractor's SOP Nos. 2001: *General Field Sampling Guidelines*, 2012: *Soil Sampling*, and Weston Solutions, Inc.'s *Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Chemical (PFC) Sites.* Soil samples will be collected from depths 0 to 2 inches bgs at locations to be determined by the EPA OSC throughout the immediate perimeter of the Site and at one background location at least ¼ mile from the Site. Soil samples designated for TCL VOC analysis will be collected using Encore™ samplers. For each soil sample designated for VOC analysis, additional soil will be collected into a 4 ounce (oz.) jar and submitted for percent moisture analysis. Soil samples designated for TCL SVOC, TCL PCB, Dioxins and Furans, and TAL metals, including Hg analyses will be collected using dedicated plastic scoops, thoroughly homogenized after removing organic debris, and transferred into the appropriate sample containers for each of the required analyses. Soil samples designated for PFAS analysis will be collected using dedicated high density polyethylene (HDPE) scoops, thoroughly homogenized after removing organic debris, and transferred into a 4.5 oz. HDPE sample container. In order to minimize PFAS cross-contamination, soil samples will be collected for PFAS, prior to being collected for the additional analyses. Field duplicate samples and additional volumes of samples designated as MS/MSD will be collected at a rate of one per 20 field samples.

Fresh nitrile gloves will be donned between sampling locations and depth intervals prior to collecting each soil sample. All sample information will be entered into the EPA SCRIBE database, from which sample labels and COC record will be generated. Samples will be stored on ice to maintain a temperature of 4 degrees Celsius (°C).

Surface Water Sampling

Surface water sampling will be conducted in in accordance with EPA's ERT/SERAS contractor's SOP Nos. 2001, 2013: *Surface Water Sampling*, and Weston Solutions, Inc.'s *Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Chemical (PFC) Sites.* Surface water samples will be collected at locations where standing water exists in the immediate perimeter of the Site, sections of the Rio Grande De Loiza River immediately adjacent to the Site, and one background location at least ¼ mile from the Site as determined on-site by the EPA OSC. Grab surface water samples will be collected directly into the dedicated sample containers required for each analysis. In order to minimize PFAS cross-contamination, surface water samples will be collected for PFAS, prior to being collected for the additional analyses. The surface water samples will be submitted to the assigned laboratory for TCL VOCs, TCL SVOCs, TCL PCBs, dioxins and furans, TAL metals including Hg, and PFAS analyses. Surface water samples designated for TCL VOC and TAL metals including Hg, analyses will be preserved with hydrochloric acid (HCL) and nitric acid, respectively to a pH less than two. Field duplicate samples and additional volumes of samples designated as MS/MSD will be collected at the rate of one per 20 field samples. Aqueous trip blank samples will be collected and placed in each cooler used to store and ship surface water samples being submitted for TCL VOC analysis.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)	Data Package Turnaround Time
Soil	TCL VOCs	SW-846 826B/C	(3) Encores (1) 4 oz. glass jar w/ Teflon lined cap	Cool to 4°C	48 hours	10 days preliminary data, 14 days validated data
Soil	TCL SVOCs	SW-846 8270D	(1) 8 oz. glass jar w/ Teflon lined cap	Cool to 4°C	14 days	10 days preliminary data, 14 days validated data
Soil	PCBs	SW-846 8082	Included with SVOCs	Cool to 4°C	14 days	10 days preliminary data, 14 days validated data
Soil	Dioxins and Furans	SW-846 8290A	(1) 8 oz. glass jar w/ Teflon lined cap	Cool to 4°C	180 days	10 days preliminary data, 14 days validated data
Soil	TAL Metals + Hg	SW-846 6010C/7471A/B	(1) 8 oz. glass jar w/ Teflon lined cap	Cool to 4°C	14 days	10 days preliminary data, 14 days validated data
Soil	PFAS	Appropriate EPA Method	(1) 4.5 oz. HDPE container	Cool to 4°C	14 days	10 days preliminary data, 14 days validated data
Surface Water / Trip Blank	TCL VOCs	SW-846 826B/C	(2) 40 mL VOA vials	Cool to 4°C, HCl to pH < 2	14 days	10 days preliminary data, 14 days validated data
Surface Water	TCL SVOCs	SW-846 8270D	(1) 1 L amber glass bottle	Cool to 4°C	7 days	10 days preliminary data, 14 days validated data
Surface Water	PCBs	SW-846 8082	(1) 1 L amber glass bottle	Cool to 4°C	7 days	10 days preliminary data, 14 days validated data
Surface Water	Dioxins and Furans	SW-846 8290A	(2) 1 L amber glass bottle	Cool to 4°C	7 days	10 days preliminary data, 14 days validated data
Surface Water	TAL Metals + Hg	SW-846 6010C/7471A/B	(1) 500 mL poly bottle	Cool to 4°C, HNO_3 to pH < 2	180 days	10 days preliminary data, 14 days validated data
Surface Water	PFAS	Appropriate EPA Method	(1) 250 mL HDPE bottle	Cool to 4°C	14 days	10 days preliminary data, 14 days validated data

QAPP Worksheet #17: Sampling Design and Rationale (Concluded)

Fresh nitrile gloves will be donned between sampling locations and depth intervals prior to collecting each surface water sample. All sample information will be entered into the EPA SCRIBE database, from which sample labels and COC record will be generated. Samples will be stored on ice to maintain a temperature of 4 °C

The following sampling design is based on information currently available and may be modified on-site based on other acquired information.

Lab Name/Location	Matrix	Parameters
Chemtech Consulting Group 284 Sheffield Street Mountainside, New Jersey 07092 Contact: Kurt Hummler Phone: (908) 789-8900	Soil and Surface Water	TCL VOCs, TCL SVOCs, PCBs, Dioxins and Furans, TAL Metals + Hg, and PFAS

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

The following information is project-specific and will be included in the site-specific QAPP.

Sampling Location	Matrix	Concentration Units	No. of Samples (identify field duplicates)	Analyte/Analytical Group(s)	Sampling SOP Reference[1]	Comments
Up to 19	Soil	mg/kg / µg/kg / ng/g	Up to 20 (1)	TCL VOCs, TCL SVOCs, TCL PCBs, Dioxins and Furans, TAL Metals + Hg, PFAS	EPA ERT/SERAS contractor's SOP Nos. 2001 and 2012	NA
Up to 19	Surface Water	mg/L / µg/L / ng/L	Up to 20 (1)	TCL VOCs, TCL SVOCs, TCL PCBs, Dioxins and Furans, TAL Metals + Hg, PFAS	EPA ERT/SERAS contractor's SOP Nos. 2001 and 2013	NA

[1]The website for EPA-ERT SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107

QAPP Worksheet #20: Field Quality Control Sample Summary

Matrix	Analytical Group	No. of Field Samples[1]	No. of Field Duplicates	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Field Blanks	No. of Equip. Blanks	No. of Trip. Blanks	No of others	Total No. of Samples to Lab
Soil	TCL VOCs, TCL SVOCs, TCL PCBs, Dioxins and Furans, TAL Metals + Hg, PFAS	Up to 19	1/20 samples per matrix	1/20 samples per matrix	NR	NR	NR	NR	Up to 20
Surface Water	TCL VOCs, TCL SVOCs, TCL PCBs, Dioxins and Furans, TAL Metals + Hg, PFAS	Up to 15	1/20 samples per matrix	1/20 samples per matrix	1 per day	NR	1 per day per cooler (TCL VOCs)	NR	Up to 20

NR – Not Required

QAPP Worksheet #21: Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP #2001	General Field Sampling Guidelines; Rev. 1.0, June 2013	EPA's ERT/SERAS Contractor	Site Specific	N	--
SOP #2012	Soil Sampling; Rev. 1.0, July 2001	EPA's ERT/SERAS Contractor	Stainless steel bowls, scoops and augers or plastic scoops, aluminum trays, sample jars	N	--
SOP #2013	Surface Water Sampling; Rev. 0.0, February 2002	EPA's ERT/SERAS Contractor	Poly bottles, glass bottles, VOA vials	N	--

See attachment B for SOP # 2001, 2006, 2007, 2009, 2012, 2013, and 2016
https://response.epa.gov/site/doc_list.aspx?site_id=2107&category=Field%20Activities

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Trimble® GeoXT™ handheld GPS unit	Factory-calibrated by Manufacturer	Charge battery when low	Confirm optimum satellite reception and battery status	Charge battery at least daily	For data accuracy, the unit should receive communication from at least 5 satellites	Charge battery when low or replace battery if it does not hold charge	Equipment Vendor	Not applicable

QAPP Worksheet #23: Analytical SOPs

Lab SOP#	Title, Revision Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP option or Equipment Type	Modified for Project Work? (Y/N)*
SW-846 8260B/C	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Rev. 3, August 2006	Definitive	Soil, Surface Water, Trip Blanks, Field Blanks / TCL VOCs	GC/MS	N
SW-846 8270D	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Rev. 4, January 1998	Definitive	Soil, Surface Water, Field Blanks / TCL SVOCs	GC/MS	N
SW-846 8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography, Rev. 1, February 2007	Definitive	Soil, Surface Water, Field Blanks / TCL PCBs	GC	N
SW-846 8092A	Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High Resolution Mass Spectrometry February 2007	Definitive	Soil, Surface Water, Field Blanks / Dioxins and Furans	GC/MS	N
SW-846 846 6010C/7471A/B	Inductively Coupled Plasma – Mass Spectrometry, Rev. 2, July 2014 / Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), Rev. 2, February 2007	Definitive	Soil, Surface Water, Field Blanks / TAL Metals + Hg	ICP-MS / CVAA	N
Appropriate EPA Method Determined by RST 3 procured laboratory	To Be Determined	Definitive	Soil, Surface Water, Field Blanks / PFAS	LC-MS/MS	N

***** If yes, explain the modification
GC/MS – Gas Chromatography/Mass Spectrometry
GC – Gas Chromatograph
LC-MS/MS – Liquid Chromatography/Mass Spectroscopy
ICP-MS – Inductively Coupled Plasma Mass Spectrometry
CVAA – Cold Vapor Atomic Absorption
IC – Ion Chromatrography

QAPP Worksheet #24: Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC/MS Technician	See SW-846 Methods
GC	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC Technician	See SW-846 Methods
ICP-MS / CVAA	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory ICP-MS / CVAA Technician	See SW-846 Methods
LC-MS/MS	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Non-CLP Laboratory IC Technician	EPA Method to be determined by Non-CLP Laboratory

GC/MS – Gas Chromatography/Mass Spectrometry
LC-MS/MS – Liquid Chromatography/Mass Spectroscopy
GC – Gas Chromatograph
ICP-MS – Inductively Coupled Plasma Mass Spectrometry
CVAA – Cold Vapor Atomic Absorption
IC – Ion Chromatrography

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	Non-CLP Laboratory GC/MS Technician	SW-846 Methods
GC	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	Non-CLP Laboratory GC Technician	SW-846 Methods
ICP-MS / CVAA	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	See SW-846 methods; as per instrument manufacturer's recommendations	Non-CLP Laboratory ICP-MS / CVAA Technician	SW-846 Methods
LC MS/MS	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Per Appropriate EPA Method determined by Non-CLP Laboratory	Non-CLP Laboratory LC-MS / MS Technician	EPA Methods

[1] Specify the appropriate letter or number form the Analytical SOP References table (Worksheet #23).
GC/MS – Gas Chromatography/Mass Spectrometry
LC-MS/MS – Liquid Chromatography/Mass Spectroscopy
GC – Gas Chromatograph
ICP-MS – Inductively Coupled Plasma Mass Spectrometry
CVAA – Cold Vapor Atomic Absorption
IC – Ion Chromatrography

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal

Sampling Organization: Weston Solutions, Inc., RST 3
Laboratory: Chemtech Consulting Group
Method of sample delivery (shipper/carrier): FedEx
Number of days from reporting until sample disposal: 60 days

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference[1]
Sample Labeling	RST 3 Site Project Manager, RST 3 Sampling Team	EPA-540-R-014-013, October 2014
Chain-of-Custody Form Completion	RST 3 Site Project Manager, RST 3 Sampling Team	EPA-540-R-014-013, October 2014
Sample Packaging	RST 3 Site Project Manager, RST 3 Sampling Team	EPA-540-R-014-013, October 2014
Shipping Coordination	RST 3 Site Project Manager, RST 3 Sampling Team	EPA-540-R-014-013, October 2014
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	As per non-CLP Laboratory SOP
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	As per non-CLP Laboratory SOP
Sample Disposal	Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	As per non-CLP Laboratory SOP

Sample Identification Procedures: Each sample collected by RST 3 will be designated by a code that will identify the sample in accordance with previous sampling (if applicable). For soil, sediment and surface water, an alpha-numeric code that identifies the site-specific property number will begin the sample nomenclature, followed by media type and location, followed by the collection method, followed by the depth (soil samples only). After the depth, the sequential sample numbers will be listed. Duplicate samples will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

Example soil sample: P001-SS001-0002-01 = Property Identification Number (P001), Soil Sample Location Number 001 (SS001), Depth Interval of 0 to 2 inches, First Sample from Location SS001 (01), Field Duplicate (02)

Example surface water sample: P001-SW001-01 = Property Identification Number (P001), Surface Water Sample Location Number 001 (SW001), First Sample from Location SW001 (01), Field Duplicate (02)

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal (Concluded)

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Each sample will be individually identified and labeled after collection, then sealed with custody seals and enclosed in a plastic cooler. The sample information will be chain of custody (COC) forms, and the samples shipped to the appropriate laboratory via overnight delivery service or courier. COC records must be prepared in Scribe to accompany samples from the time of collection and throughout the shipping process. Each individual in possession of the samples must sign and date the sample COC Record. The chain-of-custody record will be considered completed upon receipt at the laboratory. A traffic report and chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook. The chain-of-custody record should include (at minimum) the following: 1) Sample identification number; 2) Sample information; 3) Sample location; 4) Sample date; 5) Sample Time; 6) Sample Type Matrix; 7) Sample Container Type; 8) Sample Analysis Requested; 9) Name(s) and signature(s) of sampler(s); and 10) Signature(s) of any individual(s) with custody of samples.

A separate chain-of-custody form must accompany each cooler for each daily shipment. The chain-of-custody form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the chain-of-custody for all samples in case of mis-shipment.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. At this time, no samples will be archived at the laboratory. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

[1]Note: Refer to Contract Laboratory Program Guidance for Field Samplers, EPA-540-R-014-013, October 2014 at:
https://www.epa.gov/sites/production/files/2015-03/documents/samplers_guide.pdf

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28A: TCL VOCs – SW-846 8260 B/C

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL VOCs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8260B/C
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab 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	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	Subcontracted RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
* Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	70-130 %R	Flag outliers, conjunction with other QC criteria.	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	1,1-Dichloroethene	70-130 %R
		Trichloroethene	70-130 %R				Trichloroethene	70-130 %R
		Benzene	70-130 %R				Benzene	70-130 %R
		Toluene	70-130 %R				Toluene	70-130 %R
* Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	0-20 %RPD	Flag outliers, conjunction with other QC criteria.	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	1,1-Dichloroethene	0-20 %RPD
		Trichloroethene	0-20 %RPD				Trichloroethene	0-20 %RPD
		Benzene	0-20 %RPD				Benzene	0-20 %RPD
		Toluene	0-20 %RPD				Toluene	0-20 %RPD
Surrogate Recovery	All Samples	4-Bromofluorobenzene	70-130 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (follow SOP: HW-24 for qualifications)	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	4-Bromofluorobenzene	70-130 %R
		Dibromofluoromethane	70-130 %R				Dibromofluoromethane	70-130 %R
		Toluene-d8	70-130 %R				Toluene-d8	70-130 %R
		Dichloroethane-d4	70-130 %R				Dichloroethane-d4	70-130 %R

* Laboratory spike entire list of compounds, but at the minimum, above compounds are require. For MS/MSD and LCS Laboratory can also use in house performance criteria

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28A: TCL VOCs – SW-846 8260B/C (Concluded)

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL VOCs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8260B/C
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	all samples	50-100% of area, ± 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45/VOC of SOM02.4)	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	50-100% of area, ± 30 sec retention time shift
LCS	1 per ≤ 20 samples; if requested	70-130 %R %RPD < 20	Flag outliers	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy Precision	70-130 %R %RPD < 20
Field Duplicate	1 per ≤ 20 samples; if requested	%RPD < 20	Check calculation, and Flag outliers	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	% RPD < 20

***** Laboratory spike entire list of compounds, but at the minimum, above compounds are require. FOR MS/MSD and LCS

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28B: TCL SVOCs – SW-846 8270D

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL SVOCs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8270D
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab 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	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL*		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	Phenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6)	No action is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	Phenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6
		2-Chlorophenol					2-Chlorophenol	
		N-Nitroso-di-n-propylamine					N-Nitroso-di-n-propylamine	
		4-Chloro-3-methylphenol					4-Chloro-3-methylphenol	
		Acenaphthene					Acenaphthene	
		4-Nitrophenol					4-Nitrophenol	
		2,4-Dinitrotoluene					2,4-Dinitrotoluene	
		Pentachloro-phenol					Pentachloro-phenol	
		1,2,4-Trichlorobenzene					1,2,4-Trichlorobenzene	
		1,4-Dichlorobenzene					1,4-Dichlorobenzene	
		2-Chlorophenol					2-Chlorophenol	
		Pyrene					Pyrene	
Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	Phenol		Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	Phenol	0-35 %RPD
		2-Chlorophenol					2-Chlorophenol	0-50 %RPD
		N-Nitroso-di-n-propylamine					N-Nitroso-di-n-propylamine	0-38 %RPD

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28B: TCL SVOCs – SW-846 8270D (Continued)

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL SVOCs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8270D
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Matrix Spike Duplicate (Not Required) [cont'd]	1 per ≤ 20 samples; if requested	4-Chloro-3-methylphenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6)	No anion is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	4-Chloro-3-methylphenol	0-33 %RPD
		Acenaphthene					Acenaphthene	0-19 %RPD
		4-Nitrophenol					4-Nitrophenol	0-50 %RPD
		2,4-Dinitrotoluene					2,4-Dinitrotoluene	0-47 %RPD
		Pentachloro-phenol					Pentachloro-phenol	0-47 %RPD
		1,2,4-Trichlorobenzene						
		1,4-Dichlorobenzene						
		2-Chlorophenol						
		Pyrene					Pyrene	0-36 %RPD
Surrogate Compounds	all samples	Phenol-d5	Lab In House recovery limit or SW 846 Method 8270B-43; 8000C-24	Check calculations and instruments, reanalyze affected samples; (follow SOP: HW-22 for qualifications)	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	Phenol-d5	17-103 %R
		2-Fluorophenol					Bis(2-chloroethyl)ether-d8	12-98 %R
		2-Fluorobiphenyl					2-Chlorophenol-d4	13-101 %R
		2,4,6-Tribromophenol					4-Methylphenol-d8	8-100 %R
		Nitrobenzene-d5					Nitrobenzene-d5	16-103 %R
		Terphenyl-d14					2-Nitrophenol-d4	16-104 %R

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28B: TCL SVOCs – SW-846 8270D (Concluded)

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL SVOCs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8270D
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	all samples	50-100% of area, $\pm$ 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	50-100% of area, $\pm$ 30 sec retention time shift

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28C: PCBs – SW-846 8082

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TCL PCBs
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8082
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab 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	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples	Aroclor-1016	29-135 %R	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Accuracy	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R				Aroclor-1260	29-135 %R
Matrix Spike Duplicate	1 per ≤ 20 samples	Aroclor-1016	0-15 %RPD	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Precision	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD				Aroclor-1260	0-20 %RPD
Laboratory Control Sample	all samples	Aroclor-1016	50-150 %R	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Accuracy	Aroclor-1016	50-150 %R
		Aroclor-1260	50-150 %R				Aroclor-1260	50-150 %R
Surrogate	all samples		30-150%R	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Weston Subcontracted RAS/non-RAS Laboratory GC Technician	Accuracy		30-150%R

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28D: Dioxins and Furans – SW-846 8290A

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	Dioxins and Furans
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8290A
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab 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	1 every 20 samples/each time samples are extracted	No analyte > CRQL*		Suspend analysis unit source recertified	EPA CLP RAS Laboratory HRGC/HRMS Technician	Accuracy	No analyte > CRQL*	
LCS	1 per ≤ 20 samples/ each time samples are extracted	2,3,7,8-TCDD	67-158%	Flag outliers	EPA CLP RAS Laboratory HRGC/HRMS Technician	Accuracy	2,3,7,8-TCDD	67-158%
		2,3,7,8-TCDF	75-158%				2,3,7,8-TCDF	75-158%
		1,2,3,7,8-PeCDD	70-142%				1,2,3,7,8-PeCDD	70-142%
		1,2,3,7,8-PeCDF	80-134%				1,2,3,7,8-PeCDF	80-134%
		2,3,4,7,8-PeCDF	68-160%				2,3,4,7,8-PeCDF	68-160%
		1,2,3,4,7,8-HxCDD	70-164%				1,2,3,4,7,8-HxCDD	70-164%
		1,2,3,6,7,8-HxCDD	76-134%				1,2,3,6,7,8-HxCDD	76-134%
		1,2,3,7,8,9-HxCDD	64-162%				1,2,3,7,8,9-HxCDD	64-162%
		1,2,3,4,7,8-HxCDF	72-134%				1,2,3,4,7,8-HxCDF	72-134%
		1,2,3,6,7,8-HxCDF	84-130%				1,2,3,6,7,8-HxCDF	84-130%
		1,2,3,7,8,9-HxCDF	78-130%				1,2,3,7,8,9-HxCDF	78-130%
		2,3,4,6,7,8-HxCDF	70-156%				2,3,4,6,7,8-HxCDF	70-156%
		1,2,3,4,6,7,8-HpCDD	70-140%				1,2,3,4,6,7,8-HpCDD	70-140%

QAPP Worksheet #28D: Dioxins and Furans – SW-846 8290A (Concluded)

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	Dioxins and Furans
Concentration Level	Low/Medium/High (µg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW 846 8290A
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
LCS	1 per ≤ 20 samples/ each time samples are extracted	,2,3,4,6, 17,8-HpCDF	82-132%	Flag outliers	EPA CLP RAS Laboratory HRGC/HRMS Technician	Accuracy	1,2,3,4,6,7,8-HpCDF	82-132
		1,2,3,4,7,8,9-HpCDF	78-138%				1,2,3,4,7,8,9-HpCDF	78-138%
		OCDD	78-144%				OCDD	78-144%
		OCDF	63-170%				OCDF	63-170%
Internal Standards	all samples	Area Upper Limit = +135% of Internal Standard Area Area Lower Limit = -40% for Internal Standard Area		Check calculations and instruments, reanalyze affected samples.	EPA CLP RAS Laboratory HRGC/HRMS Technician	Accuracy	Area Upper Limit = +100% of Internal Standard Area Area Lower Limit = -50% for Internal Standard Area	

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28E: TAL Metals + Hg – SW-846 846 6010C/7471A/B

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TAL Metals + Hg
Concentration Level	Low/Medium/High (mg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW-846 846 6010C/7471A/B
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; redigest and reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Accuracy	No constituent > RL
Matrix Spike	1 per ≤ 20 samples	75-125%R*	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Accuracy	75-125%R*
Duplicate	1 per ≤ 20 samples	± 20% RPD**	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Precision	± 20% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	80-120%R	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Accuracy	80-120%R
ICP Serial Dilution	1 per ≤ 20 samples	< 10% D**	Flag outliers		Accuracy	< 10% D**
Interference Check Sample [ICP Analysis Only]	beginning, end and periodically during run (2 times every 8 hours)	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Sensitivity	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater***

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken
**Reference Principal outline in USEPA Region II SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP – (include absolute difference criteria)
ICP serial dilution required only when initial concentration is ≥ 50 X MDL
***except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28E: TAL Metals + Hg – SW-846 846 6010C/7471A/B (Concluded)

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	TAL Metals + Hg
Concentration Level	Low/Medium/High (mg/kg/µg/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	SW-846 846 6010C/7471A/B
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per ≤ 20 samples	Control limits 80 - 120% R or established by EPA*	Suspend analysis until source rectified; redigest and reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Accuracy	Control limits 80 - 120% R or established by EPA*
Internal Standard (ICP-MS)	All Samples	60 – 125% RI	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-MS/CVAA Technician	Accuracy	60 – 125% RI

* If the EPA LCS is unavailable, other EPA QC samples or other certified materials may be used. In such cases, control limits for the LCS must be documented and provided.

QAPP Worksheet #28: QC Samples Table – Continued
QAPP Worksheet #28F: PFAS

Matrix	Soil/ Surface Water / Trip Blanks
Analytical Group	PFAS
Concentration Level	Low/Medium/High (ng/g/ng/L)
Sampling SOP(s)	2001, 2012, 2013,
Analytical Method/SOP Reference	Applicable EPA Method Determined by Non-CLP Laboratory
Sampler's Name	RST 3
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	Chemtech Consulting Group
No. of Sample Locations	19/15/NA/NA

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LOD determination and verification	At initial set-up and verified quarterly. If a laboratory uses multiple instruments for a given method, the LOD must be verified on each.	The apparent signal to noise ratio must be at least 3 and the results must meet all method requirements for analyte identification.	If the LOD verification fails, the laboratory must: 1) Repeat the detection limit determination and LOD verification at a higher concentration; or 2) Perform and pass two consecutive LOD verifications at a higher concentration. The LOD is set at the higher concentration.	Analyst Lab QA Officer Project Chemist	Bias/ Representativeness	QC acceptance criteria as specified by Lab SOP
LOQ establishment and verification	At initial setup: 1) Verify LOQ; and 2) Determine precision and bias at the LOQ. QSM 5.0	1) The LOQ and associated precision and bias must meet client requirements and must be reported; or 2) In the absence of client requirements, must meet control limits of the LCS. QSM 5.0	If the LOQ verification fails, the laboratory must either establish a higher LOQ or modify method to meet the client-required precision and bias.	Analyst Lab QA Officer Project Chemist	Sensitivity/Bias	QC acceptance criteria as specified by Lab SOP

QAPP Worksheet #29: Project Documents and Records

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Field Logbook or Data Collection Sheets	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Chain-of-Custody Forms	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Custody Seals	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Air Bills	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Daily QC Reports	SPM	Group Leader or Operations Manager	Project File
Deviations	SPM/Field Scientist	Group Leader or Operations Manager	Project File
Corrective Action Reports	Delegated QA Manager	Operations Manager or Program Manager or designee	Project File
Correspondence	SPM	Delegated QA Manager	Project File
Field Sample Results/Measurements	SPM/Field Scientist	Delegated QA Manager	Project File
Tailgate Safety Meeting Items	SPM/Field Safety Officer	Delegated QA Manager	Project File

Project Assessments			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Data Verification Checklists	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Validation Report	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Usability Assessment Report	Site Project Manager	Group Leader or Operations Manager	Project File
Corrective Action Reports	Group Leader/HSO/Chemist QA/QC Specialist	Group Leader	Project File
Correspondence	Group Leader/HSO/Chemist QA/QC Specialist	Program Manager or designee	Project File

QAPP Worksheet #29: Project Documents and Records (Concluded)

Laboratory Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Sample Receipt, Custody, and Checklist	Laboratory Sample Receiving	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Calibration Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Standard Traceability Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Prep Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Run Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Maintenance, Testing, and Inspection Logs	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File
Corrective Action Reports	Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File and Project File
Laboratory Analytical Results	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Laboratory QC Samples, Standards, and Checks	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Instrument Results (raw data) for Primary Samples, Standards, QC Checks, and QC Samples	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Disposal Records	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory File

Laboratory Data Deliverables[1]						
Record	**VOCs**	**SVOCs**	**PCBs**	**Pesticides**	**Metals**	**Other[2]**
Narrative	Y	Y	Y	Y	Y	Y
Chain of Custody	Y	Y	Y	Y	Y	Y
Summary Results	Y	Y	Y	Y	Y	Y
QC Results	Y	Y	Y	Y	Y	Y
Chromatograms or raw data	Y	Y	Y	Y	Y	Y
Tentatively Identified Compounds	Y	Y	Y	Y	Y	Y

[1] The blank Laboratory Data Deliverables table is designed to be a checklist for use in supporting data completeness. The records and analytical groups in this table are not all inclusive of those that may be used on a specific project and should be modified and utilized by the Delegated SPM as applicable
[2]PFAS

Worksheet 31, 32 & 33 — Assessments and Corrective Action

Information in this worksheet is program-specific and is incorporated by reference into the site-specific QAPP. All reports will be prepared by WESTON and distributed to the following, to include but not be limited to, the WESTON Operations Manager, Program Manager, and Chemist QA/QC Specialist; and the EPA OSC, PO, TM, and QA Manager as applicable.

Assessments:

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
Field Sampling Technical Systems Audit (TSA)[1]	Chemist QA/QC Specialist (or designee) and Group Leader or Operations Manager WESTON	As needed, as determined by WESTON Chemist QA/QC Specialist (or designee) and Group Leader or Program Manager WESTON	To be completed near the beginning of field sample collection activities/TBD	TSA Memorandum and Checklist	48 to 72 hours following assessment
Laboratory TSA[2]	Laboratory QA Manager Regulatory Agency	CLP, DESA, and certified subcontract laboratories are routinely audited by accrediting authorities.	Every Year	Written Report	14 Days
Data Validation	Chemist QA/QC Specialist or Data Validator WESTON	Each data package for which data validation was requested; varies by site	TBD	Data Validation Report	Varies by site
Management Review	Group Leader and/or Operations Manager WESTON	Varies; as determined by WESTON Program Manager	TBD	Quality Management Report (memo/e-mail to file)	1-2 weeks following assessment

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

Worksheet 31, 32 & 33 — Assessments and Corrective Action (Concluded)

Assessment Response and Corrective Action:

Assessment Type	Responsibility for Responding to Assessment Findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for Monitoring Corrective Action Implementation
Field Sampling Technical Systems Audit (TSA)[1]	SPM WESTON	Findings of field audit.	24 hours of receipt of audit report	Operations Manager WESTON	SPM or Operations Manager WESTON
Laboratory TSA[2]	Laboratory QA Manager TBD Chemist QA/QC Specialist (or designee) WESTON	Written response to EPA Region II to address deficiencies	1 week of receipt of request from EPA Region II (or RST on behalf of EPA)	Laboratory Manager	Quality Manager (or designee) and/or Chemist WESTON
Project-Specific PT/PE Samples	Laboratory QA Manager TBD	Written response to EPA Region II to address deficiencies for failing scores on PE samples	1 week of receipt of request from EPA Region II (or RST on behalf of EPA)	Laboratory Manager	Laboratory QA Manager
Data Validation	Chemist QA/QC Specialist (or designee) WESTON	Validation Report	Within 48 hours of receipt of validation inquiry	Laboratory QA Manager and/or Chemist	Chemist WESTON
Management Review	Program Manager WESTON	Quality Management Response	48 hours of receipt of Quality Management report	Program Manager WESTON	Chemist QA/QC Specialist (or designee) and Program Manager WESTON

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

QAPP Worksheet #34: Data Verification and Validation Inputs

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
3	Field SOPs	X	
4	Laboratory SOPs	X	
5	Laboratory QA Manual	NA	
6	Laboratory Certifications	X	
Field Records			
7	Field Logbooks	X	X
8	Equipment Calibration Records	X	X
9	Chain of Custody Forms	X	X
10	Sampling Diagrams/Surveys	X	X
11	Drilling Logs	NA	NA
12	Geophysics Reports	NA	NA
13	Relevant Correspondence	X	X
14	Change Orders/Deviations	X	X
15	Field Audit Reports	X	X
16	Field Corrective Action Reports	X	X
17	Sample Location Verification (Worksheet 18)	X	X
Analytical Data Package and Other Laboratory Deliverables			
18	Cover Sheet (laboratory identifying information)	X	X
19	Case Narrative	X	X
20	Internal Laboratory Chain of Custody	X	X
21	Sample Receipt Records	X	X
22	Sample Chronology (i.e. dates and times of receipt, preparation, & analysis)	X	X
23	Communication Records	X	X
24	Project-specific PT Sample Results	NA	NA
25	RL/MDL Establishment and Verification	X	X
26	Standards Traceability	NA	NA
27	Instrument Calibration Records	X	X
28	Definition of Laboratory Qualifiers	X	X
29	Results Reporting Forms	X	X
30	QC Sample Results	X	X
31	Corrective Action Reports	X	X
32	Raw Data	X	X
33	Electronic Data Deliverable	X	X

QAPP Worksheet #35: Data Verification Procedures

The following information includes program-specific and project-specific documents which may be incorporated by reference in the site-specific QAPP. Inputs may include, but are not limited to, those identified in the table below.

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
Contract QAPP	Contract, EPA and UFP-QAPP Guidance documents	Verify completeness, correctness, and contractual compliance of all program QA/QC against the methods, SOPs, and contract requirements.	Timothy Benton WESTON Program Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Site-specific QAPP	Contract QAPP, Work Scope in TDD	Verify sampling and analytical methods specified in site-specific QAPP are correct and all contract QAPP protocols are followed and required QC samples will be collected in the correct bottles and properly preserved.	Bernard Nwosu WESTON Operations Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logs and SOPs	Contract and site-specific QAPP, SOPs	Ensure that all field sampling SOPs specified in site-specific QAPP were followed.	WESTON SPM and Data Validation Personnel
Analytical SOPs	Analytical Method and Contract QAPP	Ensure that laboratory analytical SOPs comply with the published method.	Kurt Hummler, Laboratory QA Manager, Smita Sumbaly, WESTON Chemist QA/QC Specialist /Data validation Personnel
Laboratory QA Manual	EPA Guidance Documents	Verify that best practices specified in EPA Guidance Documents are incorporated into the Laboratory QA Manual.	Kurt Hummler, Laboratory QA Manager
Laboratory Certifications	Generic and site-specific QAPP	Ensure that laboratory performing analytical sample analyses has current State, National Environmental Laboratory Accreditation Program, National Voluntary Laboratory Accreditation Program, or American Industrial Hygiene Association certifications as required by the project.	Kurt Hummler, Laboratory PM Smita Sumbaly, WESTON Chemist QA/QC Specialist
Laboratory Deliverables	Contract and site-specific QAPP	Verify that the laboratory deliverable contains all records specified in the contract QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported. Compare the data package with Chains of custody to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. If Stage 2B or higher validation is required, verify that analytical instrumentation met calibration requirements. Check for evidence that any required notifications were provided to project personnel. Verify that necessary signatures and dates are present.	Data Validator, WESTON Smita Sumbaly, Chemist QA/QC Specialist

* Site-specific QAPP may contain additional data validation inputs as required by the project objectives.

QAPP Worksheet #35: Data Verification Procedures (Concluded)

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
WESTON Data Validation Deliverables	Laboratory Report, Analytical Method and Laboratory SOPs	Verify that the report consists of the following for all field samples submitted to the laboratory: 1) Data validation report (pdf), 2) Sample Summary Report with data validation qualifiers, and 3) Excel EDD file with data validation qualifiers	WESTON Data Validator Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logbook, Field Sheets, Sample Diagrams/ Surveys	Contract and site-specific QAPP	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	WESTON SPM and Operations Manager
Field Equipment Calibration Records	Contract and site-specific QAPP, SOPs, field logbook	Ensure that all field analytical instrumentation SOPs for equipment calibration were followed.	WESTON SPM and Operations Manager
Chain of Custody Forms	Site-specific QAPP; Field Logbook; and other sampling records (e.g., boring logs, etc.)	Verify the completeness of Chain-of-Custody records. Examine entries for consistency with the field logbook. Check that appropriate methods were requested and sample preservation was recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for Laboratory QC samples (e.g., MS/MSD and S/D). Verify that all required signatures and dates are present. Check for transcription errors.	WESTON SPM, WESTON Chemist QA/QC Specialist, and Laboratory PM
Relevant reports and correspondence	Contract and site-specific QAPP	Verify that reports are present and complete for each day of field activities. Verify that correspondence is documented and was reported in accordance with requirements.	WESTON Operations Manager and SPM
Audit Reports, Corrective Action Reports	Generic and site-specific QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Smita Sumbaly, WESTON Chemist QA/QC Specialist Laboratory PM, TBD

QAPP Worksheet #36: Data Validation Procedures

The following information is project-specific and will be identified in the site-specific or QAPP.

Data Validator: WESTON

Analytical Group/ Method	Data Deliverable Requirements	Analytical Specifications	MPC	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code	Electronic Validation Program/Version
TCL VOCs/ SW-846 8260B/C	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP#HW-33	NA	Excel EDD
TCL SVOCs/ SW-846 8270D	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP# HW-35	NA	Excel EDD
PCBs/ SW-846 8082	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP#HW-37	NA	Excel EDD
Dioxins and Furans/ SW-846 8290A	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP#HW-37	NA	Excel EDD
TAL Metals + Hg/ SW-846 846 6010C/7471A/B	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	EPA Region II SOP#HW-2b/2c	NA	Excel EDD
PFAS/ Applicable EPA Method Determined by Non-CLP Laboratory	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	Applicable EPA Method	NA	Excel EDD

NA – Not Applicable

QAPP Worksheet #37: Usability Assessment

Data usability assessments will be performed as directed by EPA. This worksheet documents procedures that will be used to perform the data usability assessment (DUA). The DUA is performed at the conclusion of data collection activities using the outputs from data verification and data validation (i.e., data of known and documented quality). It is the data interpretation phase, which involves a qualitative and quantitative evaluation of environmental data to determine whether the Site data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective evaluation of the systematic planning process, and involves participation by key members of the project team. The DUA evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

Data, whether generated in the field or by the laboratory, are tabulated and reviewed for Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCCS) by the SPM for field data or the data validator for laboratory data. The review of the PARCC Data Quality Indicators (DQI) will compare with the Data Quality Objectives (DQO) detailed in the site-specific QAPP, the analytical methods used and impact of any qualitative and quantitative trends will be examined to determine if bias exists. A hard copy of field data is maintained in a designated field or site logbook. Laboratory data packages are validated, and final data reports are generated. All documents and logbooks are assigned unique and specific control numbers to allow tracking and management.

Where applicable, the following documents will be followed to evaluate data for fitness in decision making: EPA QA/G-4, Guidance on Systematic Planning using the Data Quality Objectives Process, EPA/240/B-06/001, February 2006, and EPA QA/G-9R, Guidance for Data Quality Assessment, A reviewer's Guide EPA/240/B-06/002, February 2006.

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

- RST 3 Operations Manager;
- RST 3 Quality Manager (or designee);
- RST 3 Risk Assessor;
- RST 3 SPM;
- RST 3 Chemist QA/QC Specialist;
- RST 3 Statistician.

Based on project-specific oversight responsibilities and analytical scopes, this DUA worksheet outlines the approach that will be taken as the analytical scope expands on a project-specific basis.

The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

QAPP Worksheet #37: Usability Assessment (Concluded)

Step 1 – Review the project's objectives and sampling design: This includes reviewing the DQOs and MPC to make sure they are still applicable. The sampling design should be consistent with stated DQOs.

Step 2 – Review the data verification and data validation outputs: Graphs, maps, and tables can be prepared to summarize the data. Deviations from activities planned in the Project QAPP should be considered, including samples not collected (potential data gaps), holding time exceedances, damaged samples, impact of non-compliant PE sample results, and SOP deviations. The implications of unacceptable QC sample results should be assessed.

Step 3 – Verify the assumptions of the selected statistical method: Verify whether underlying assumptions for the selected statistical methods (if specified in the QAPP) are valid. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may need to be selected.

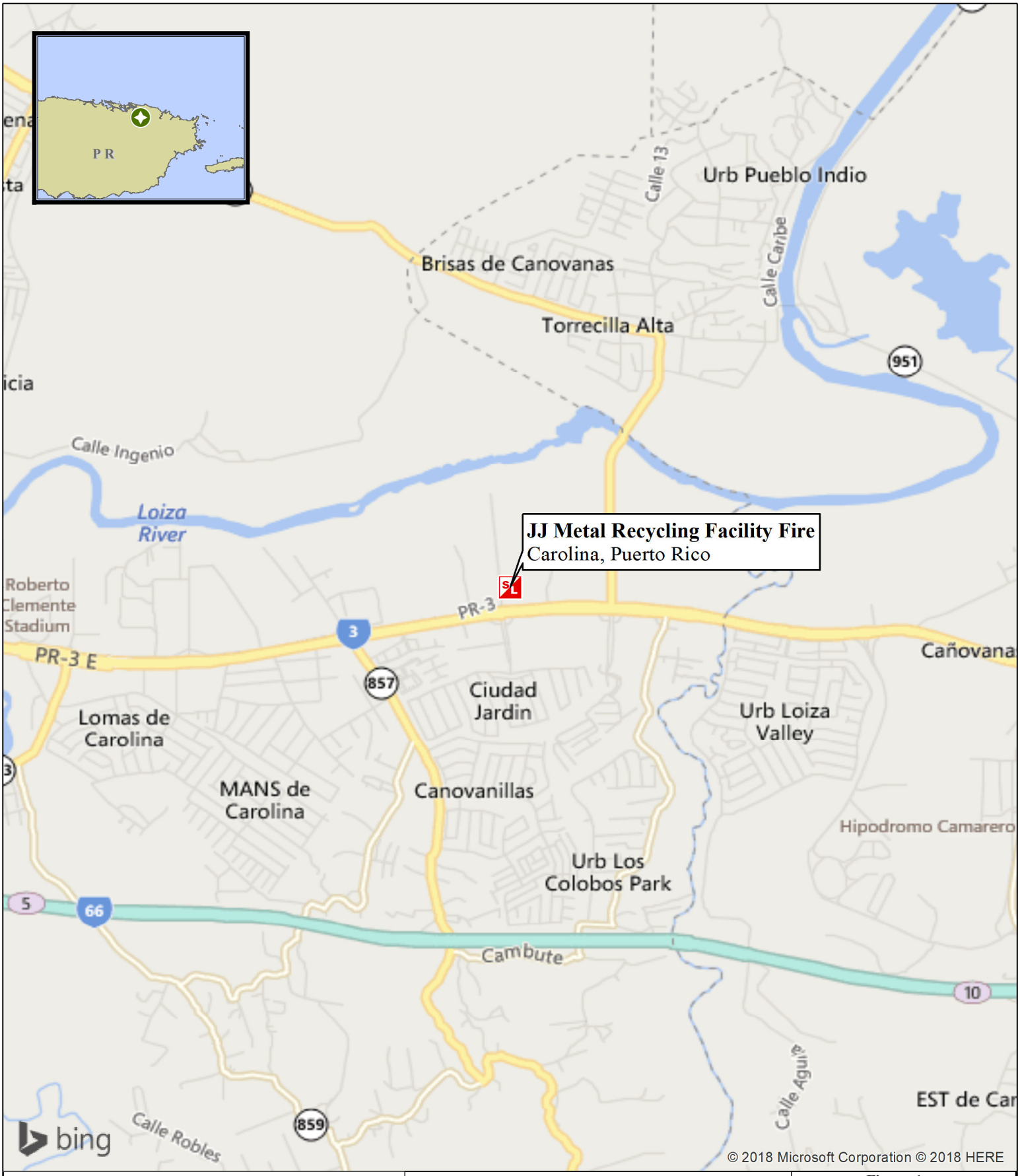
Step 4 - Implement the statistical method: Implement the statistical procedures, if specified in the site-specific QAPP, for analyzing the data and review underlying assumptions. For a decision project that involves hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") consider the consequences of selecting the incorrect alternative; for estimation projects (e.g., establishing a boundary for surface soil contamination), consider the tolerance for uncertainty in measurements.

Step 5 – Document data usability and draw conclusions: Determine whether the data can be used as intended, considering any deviations and corrective actions. Discuss whether DQOs were achieved based on comparison with the site DQIs. Assess the performance of the sampling design and identify limitations on data use. Update the conceptual site model and document conclusions. Prepare a DUA report or include the data usability summary in the final site report. The DUA can be in the form of text and/or a table.

The data usability assessment is considered the final step in the data evaluation process. All data will be assessed for usability regardless of data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and site-specific QAPP with the obtained results. The results of the data usability assessment, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be communicated in accordance with Worksheet 6.

ATTACHMENT A

Figure 1: Site Location Map



Legend

Site Location

N

0 0.125 0.25 0.5 0.75 1 Miles

Weston Solutions, Inc.
East Division

In Association With
Scientific and Environmental Associates, Inc.,
Environmental Compliance Consultants, Inc.,
Avatar Environmental, LLC, On-Site Environmental,
Inc.and Sovereign Consulting, Inc

Figure 1:
Site Location Map

JJ Metal Recycling Facility Fire Site
Carolina, Puerto Rico

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM 3
CONTRACT # EP-S2-14-01

DATE MODIFIED: 11/30/2018

GIS ANALYST:	M. MANNINO
EPA OSC:	C. HUERTAS
RST SPM:	H. RODRIGUEZ
CHARGE #::	03700114

\\FSED2DATA1\GISDATA\RST_3\03700114\MXD\181130_SITELOCATIONMAP.MXD

ATTACHMENT B

Sampling SOPs
EPA ERT/SERAS SOP #s 2001, 2012, and 2013

GENERAL FIELD SAMPLING GUIDELINES

CONTENTS

Complete Rewrite: SOP #2001; Revision 1.0; 03/15/13; U.S. EPA Contract EP-W-09-031

SUPERCEDES: SOP #2001; Revision 0.0; 08/11/94; U.S. EPA Contract 68-C4-0022

GENERAL FIELD SAMPLING GUIDELINES

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to describe the general field sampling techniques and guidelines that will assist the Scientific Engineering Response and Analytical Services (SERAS) personnel in planning, choosing sampling strategies and sampling locations, and frequency of Quality Control (QC) samples for proper assessment of site characteristics. The ultimate goal is to ensure data quality during field collection activities.

2.0 APPLICABILITY

This SOP applies to the collection of aqueous and non-aqueous samples for subsequent laboratory analysis to determine the presence, type, and extent of contamination at a site.

3.0 DESCRIPTION

Representative sampling ensures that a sample or a group of samples accurately reflect the concentration of the contaminant at a given time and location. Depending on the contaminant of concern and matrix, several variables may affect the representativeness of the samples and subsequent measurements. Environmental variability due to non-uniform distribution of the pollutant due to topographic, meteorological and hydrogeological factors, changes in species, and dispersion of contaminants and flow rates contribute to uncertainties in sampling design.

Determining the sampling approach depends on what is known about the site from prior sampling (if any) and the site history, variation of the contaminant concentrations throughout a site, potential migration pathways, and human and environmental receptors. The objectives of an investigation determine the appropriate sampling design.

The frequency of sampling and the specific sample locations that are required must be defined in the site-specific Quality Assurance Project Plan (QAPP).

3.1 Planning Stage

The objectives of an investigation are established and documented in the site-specific QAPP. The technical approach including the media/matrix to be sampled, sampling equipment to be used, sampling design and rationale, and SOPs or descriptions of the procedure to be implemented are included in the QAPP. Refer to the matrix-specific SOPs for sampling techniques which include the equipment required for sampling.

During the planning stage, the data quality objectives (DQOs) will be determined. In turn, the project's DQOs will determine the need for screening data or definitive data. Screening data supports an intermediate or preliminary decision but eventually is supported by definitive data before the project is complete (i.e., placement of monitor wells, estimation of extent of contamination). Definitive data is suitable for final decision making, has defined precision and accuracy requirements and is legally defensible (i.e., risk assessments, site closures).

3.2. Sampling Design

Representative sampling approaches include judgmental, random, systematic grid, systematic simple random, stratified random and transect sampling. Sampling designs may be applied to soil,

sediment and water; however, the random and systematic random approaches are not practical for sampling water systems, especially flowing water systems.

3.2.1 Judgmental Sampling

Judgmental sampling is the subjective selection of sampling locations based on the professional judgment of the field team. This method is useful to locate and to identify potential sources of contamination. It may not be representative of the full site and is used to document worst case scenarios. For example, groundwater sampling points are typically chosen based on professional judgment, whether permanently installed wells or temporary well points.

3.2.2 Systematic Sampling

Systematic grid sampling involves the collection of samples at fixed intervals when the contamination is assumed to be randomly distributed. A random point is chosen as the origin for the placement of the grid. A grid is constructed over a site and samples are collected from the nodes (where the grid lines intersect). Depending on the number of samples that are required to be collected, the distance between the sampling locations can be adjusted. The representativeness of the sampling may be improved by shortening the distance between sample locations.

Systematic random sampling is used for estimating contaminant concentrations within grid cells. Instead of sampling at each node, a random location is chosen within each grid cell. The systematic grid and random sampling approaches are useful for delineating the extent of contamination, documenting the attainment of clean-up goals, and evaluating and determining treatment and disposal options.

Transect sampling involves one or more transect lines established across the site. Samples are collected at systematic intervals along the transect lines. The number of samples to be collected and the length of the transect line determines the spacing between the sampling points. This type of sampling design is useful for delineating the extent of contamination at a particular site, for documenting the attainment of clean-up goals, and for evaluating and determining treatment and disposal options.

3.2.3 Simple and Stratified Random Sampling

Statistical random sampling includes simple, stratified and systematic sampling. Simple random sampling is appropriate for estimating means and total concentrations, if the site or population does not contain a major trend or pattern of contamination. A statistician will generate the sampling locations based on sound statistical methods. Stratified random sampling is a useful tool for estimating average contaminant concentrations and total amounts of contaminants within specified strata and across the entire site. It is useful when a heterogeneous population or area can be broken down into regions with less variability within the boundaries of a stratum then between the strata. Additionally, strata can be defined based on the decisions that will be made. This type of sampling design uses historical information, known ecological and human receptors, soil type, fate and transport mechanism and other ecological factors to divide the sampling area into smaller regions or strata. Sampling locations are selected from each stratum using random sampling.

The simple random sampling approach is applied when there are many sample locations and the concentrations are assumed to be homogeneous across a site with respect to the parameter(s) that are going to be analyzed or monitored for. The stratified random sampling approach is useful for sampling drums, evaluating and determining treatment and disposal options, and locating and identifying sources of contamination.

3.3 Sampling Techniques

Sampling is the selection of a representative portion of a larger population or body. The primary objective of all sampling activities is to characterize a site accurately in a way that the impact on human health and the environment can be evaluated appropriately.

3.3.1 Sample Collection Techniques

Sample collection techniques may be either grab or composite. A grab sample is a discrete aliquot representative of a specific location at a given time and collected all at once from one location. The representativeness of such samples is defined by the nature of the materials that are sampled. Samples collected for volatile organic compounds (VOCs) are always grab samples and are never homogenized. Composite samples are non-discrete samples composed of more than one specific aliquot collected at selected sampling locations. Composite samples must be homogenized by mixing prior to putting the sample into containers. Composite samples can, in certain instances, be used as an alternative to analyzing a number of individual grab samples and calculating an average value. Incremental sampling conducted over a grid is a special case of composite sampling and is detailed in SOP #2019, *Incremental Soil Sampling*. Choice of collecting discrete or composite samples is based on project's DQOs.

3.3.2 Homogenization

Mixing of soil and sediment samples is critical to obtain a representative sample. An adequate volume/weight of sample is collected and placed in a stainless steel or Teflon® container, and is thoroughly mixed using a spatula or spoon made of an inert material. Once the sample is thoroughly mixed the sample is placed into sample containers specific for an analysis. Avoid the use of equipment made of plastic or polyvinyl chloride (PVC) when sampling for organic compounds when the reporting limit (RL) is in the parts per billion (ppb) or parts per trillion (ppt) ranges. Refer to SERAS SOP #2012, *Soil Sampling*, for more details on homogenization.

3.3.3 Filtration

In-line filters are used specifically for collecting groundwater samples for dissolved metals analysis and for filtering large volumes of turbid groundwater. Groundwater samples collected for VOCs are typically not filtered due to potential VOC losses. Filtering groundwater is performed to remove silt particulates from samples to prevent interference with the laboratory analysis. The filters used in groundwater sampling are either cartridge type filters inserted into a reusable housing, or are self-contained and disposable. Filter chambers are usually made of polypropylene housing an inert filtering material that removes particles larger than 0.45 micrometers (µm). Refer to SERAS SOP

#2007, *Groundwater Well Sampling* and SERAS SOP #2013, *Surface Water Sampling*, for more details on filtration techniques.

3.4 Quality Assurance /Quality Control Samples

QA/QC samples provide an evaluation of both the laboratory's and the field sampling team's performance. Including QA/QC samples in a sampling design allows for identifying and measuring sources of error potentially introduced from the time of sample container preparation through analysis. The most common QA/QC samples collected in the field are collocated field duplicates, field replicates, equipment blanks, field blanks and trip blanks. Extra volume/mass is collected for a matrix spike/matrix spike duplicate (MS/MSD) at a frequency of 5% (one in 20 samples). Spiking is performed in the laboratory. For additional information or other QA/QC samples pertinent to sample analysis, refer to SERAS SOP #2005, *Quality Assurance/Quality Control Samples*.

Collocated field duplicates may be collected based on site objectives and used to measure variability associated with the sampling process including sample heterogeneity, sampling methodology, and analytical procedures. Field replicates are field samples obtained from one location, homogenized, and divided into separate containers. This is useful for determining whether the sample has been homogenized properly. Equipment blanks (also known as rinsate blanks) are typically collected at a rate of one per day. The equipment blank is used to evaluate the relative cleanliness of non-dedicated equipment.

3.5 Sample Containers, Preservation, Storage and Holding Times

The amount of sample to be collected, the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix sampled and the analyses to be conducted. This information is provided in SERAS SOP #2003, *Sample Storage, Preservation, and Handling*. Field personnel need to be cognizant of any short holding times that warrant immediate shipment/transfer to the laboratory.

3.6 Documentation

Field conditions and site activities must be documented. Scribe will be used to document sample locations and generate chain of custody records. Other field measurements not typically entered into Scribe will be documented in a site-specific logbook or in a personal logbook. All sample documentation will be maintained in accordance with SERAS SOP #2002, *Sample Documentation* and SERAS SOP #4005, *Chain of Custody Procedures.*

4.0 RESPONSIBILITIES

4.1 SERAS Task Leaders

Task Leaders (TLs) are responsible for the overall management of the project. Task Leader responsibilities include ensuring that field personnel are well informed of the sampling requirements for a specific project and that SOP and QA/QC procedures stated in the site-specific QAPP are adhered to, issuing a Field Change Form that documents any changes to sampling activities after the QAPP has been approved and maintaining sample documentation.

4.2 SERAS Field Personnel

Field personnel are responsible for reading the QAPP prior to site activities and performing sample collection activities as written. They are responsible for notifying the TL of deviations from sample collection protocols which occurred during the execution of sampling activities. Field staff will collect samples and prepare documentation in accordance with SERAS SOP #2002, *Sample Documentation*. In addition, field personnel are responsible for reading and conforming to the approved site-specific Health and Safety Plan (HASP).

4.3 SERAS Program Manager

The SERAS Program Manager is responsible for the overall technical and financial management of the project.

4.4 SERAS QA/QC Officer

The QA/QC Officer is responsible for reviewing this SOP and ensuring that the information in this SOP is updated on a timely basis. Compliance to this SOP may be monitored by either conducting a field audit or reviewing deliverables prepared by the SERAS TL.

4.5 Health and Safety (H&S) Officer

The H&S Officer is responsible for ensuring that a HASP has been written in conformance with SOP # 3012, *SERAS Health and Safety Guidelines for Field Activities* and approved prior to field activities. Additionally, the H& S Officer is responsible for ensuring that SERAS site personnel's H&S training is current as per SOP # 3006, *SERAS Field Certification Program* and that their medical monitoring is current as per *SERAS SOP #3004, SERAS Medical Monitoring Program.*

SOIL SAMPLING

CONTENTS

*These sections affected by Revision 1.0.

SUPERCEDES: SOP #2012; Revision 0.0; 2/18/00; U.S. EPA Contract 68-C99-223.

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative surface soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push technology, or other mechanized equipment (except for a back-hoe). Sample depths typically extend up to 1-foot below ground surface. Analysis of soil samples may define the extent of contamination, determine whether concentrations of specific contaminants exceed established action levels, or if the concentrations of contaminants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with a final report.

Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Surface soil samples can be used to investigate contaminants that are persistent in the near surface environment. Contaminants that are detected in the near surface environment may extend to considerable depths, may migrate to the groundwater, surface water, the atmosphere, or may enter biological systems.

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (discrete or composite), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and/or scoop. Sampling at greater depths may be performed using a hand auger, continuous-flight auger, trier, split-spoon sampler, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples must be cooled and maintained at 4^{o}C and protected from sunlight immediately upon collection to minimize any potential reaction. The amount of sample to be collected, proper sample container type and handling requirements are discussed in the Scientific, Engineering, Response Analytical Services (SERAS) SOP #2003, *Sample Storage, Preservation and Handling.*

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary problems associated with soil sampling: 1) cross contamination of samples, and 2) improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, decontamination of sampling equipment is necessary. The guidelines for preventing, minimizing and limiting cross contamination of samples are discussed in the Environmental Response Team (ERT)/SERAS SOP #2006, *Sampling Equipment Decontamination*. Improper sample collection procedures can disturb the sample matrix, resulting in volatilization of contaminants, compaction of the sample, or inadequate homogenization of the samples (when required), resulting in variable, non-representative results.

5.0 EQUIPMENT/APPARATUS

Soil sampling equipment includes the following:

- Site maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan (HASP)
- Traditional survey equipment or global positioning system (GPS)
- Tape measure
- Survey stakes or flags
- Camera and image collection media
- Stainless steel, plastic*, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Site logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Plastic sheeting
- Spade or shovel
- Spatula(s)
- Scoop(s)
- Plastic* or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoon sampler
- Soil core sampler
  - Tubes, points, drive head, drop hammer, puller jack and grip
- Photoionization detector (PID), Flame ionization detector (FID) and/or Respirable Aerosol Monitor (RAM)

- Backhoe (as required)
- En Core® samplers

* Not used when sampling for semivolatile compounds.

6.0 REAGENTS

Decontamination solutions are specified in ERT/SERAS SOP #2006, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the analytes to be determined, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.

2. Obtain the necessary sampling and air monitoring equipment.

3. Prepare schedules and coordinate with staff, client, and regulatory agencies, as appropriate.

4. Perform a general site reconnaissance survey prior to site entry in accordance with the site specific HASP.

5. Use stakes or flags to identify and mark all sampling locations. Specific site factors, including extent and nature of contamination, should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared prior to soil sampling; utility clearances must be confirmed before beginning intrusive work.

6. Pre-clean and decontaminate equipment in accordance with the site specific work plan, and ensure that it is in working order.

7.2 Sample Collection

7.2.1 Surface Soil Samples

The collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. The over-burden or over-lying surface material is removed to the required depth and a stainless steel or plastic scoop is used to collect the sample. Plastic utensils are not to be used when sampling for semivolatile compounds.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected by this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials must not be used.

The following procedure is used to collect surface soil samples:

1. If volatile organic compound (VOC) contamination is suspected, use a PID to monitor the sampler's breathing zone during soil sampling activities.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard sticks, rocks, vegetation and other debris from the sampling area.

3. Accumulate an adequate volume of soil, based on the type(s) of analyses to be performed, in

a stainless, plastic or other appropriate container.

4. If volatile organic analysis is to be performed, immediately transfer the sample directly into an appropriate, labeled sample container with a stainless steel spoon, or equivalent, and secure the cap tightly to ensure that the volatile fraction is not compromised. Thoroughly mix the remainder of the soil to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly, or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, head, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger head. If additional sample volume is required, multiple grabs at the same depth are made. If a core sample is to be collected, the auger head is then replaced with a tube auger. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected.

Several types of augers are available; these include bucket or tube type, and continuous flight (screw) or post-hole augers. Bucket or tube type augers are better for direct sample recovery because a large volume of sample can be collected from a discrete area in a short period of time. When continuous flight or post-hole augers are used, the sample can be collected directly from the flights or from the borehole cuttings. The continuous flight or post-hole augers are satisfactory when a composite of the complete soil column is desired, but have limited utility for sample collection as they cannot be used to sample a discrete depth.

The following procedure is used for collecting soil samples with an auger:

1. Attach the auger head to an extension rod and attach the "T" handle.

2. Clear the area to be sampled of surface debris (e.g., twigs, rocks, litter). It may be advisable to remove a thin layer of surface soil for an area approximately six inches in radius around the sampling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents the accidental brushing of loose material back down the borehole when removing the auger or adding extension rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger head, proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a tube sampler. Install the

proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler and unscrew the extension rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the core or a discrete portion of the core into the appropriate labeled sample container using a clean, decontaminated stainless steel spoon. If required, homogenize the sample as described in Step 10.

10. If VOC analysis is to be performed, transfer the sample directly from the auger head into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger head to the drill assembly, and follow steps 3 through 11, making sure to decontaminate the auger head and tube sampler between samples.

12. Abandon the hole according to applicable state regulations.

7.2.3 Sampling at Depth with a Trier

The system consists of a trier and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a zero degree to forty-five degree (0^{o} to 45^{o}) angle from the soil surface plane. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If VOC analyses are required, transfer the sample directly from the trier into an appropriate, labeled sample container with a stainless steel spoon, or equivalent device and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; if composite samples are to be collected, place a sample from another sampling interval into the

homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18- or 24- inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with American Society for Testing and Materials (ASTM) D1586-99, "*Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".*

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of the barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler at a 90 degree (90^{o}) angle to the sample material.

3. Using a well ring, drive the sampler. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain the sample.

5. Withdraw the sampler, and open it by unscrewing the bit and head, and then splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2- and 3.5-inch diameter tubes. A larger barrel (diameter and/or length) may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to the appropriately labeled sample container(s) and seal tightly. Place the remainder of the sample into a stainless steel, plastic, or appropriate homogenization container, and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into the appropriate, labeled containers and secure the caps tightly, or if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the hole according to applicable state regulations.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil when a detailed examination of stratigraphy and soil characteristics is required. The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is imperative to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific HASP and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by Occupational Safety and Health Administration (OSHA) regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If VOC analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations.

7.2.6 Sampling for VOCs in Soil Using an En Core® Sampler

An En Core® sampler is a single-use device designed to collect and transport samples to the laboratory. The En Core® sampler is made of an inert composite polymer and reduces the open-air handling of soil samples in the field and in the laboratory; thereby, minimizing losses of VOCs.

1. Assemble the coring body, plunger rod and T-handle according to the instructions provided with the En Core® sampler.

2. Turn the T-handle with the T-up and the coring body down and push the sampler into the soil until the coring body is completely full. Remove the sampler from the soil. Wipe excess soil from the coring body exterior.

3. Cap the coring body while it is still on the T-handle. Push the cap over the flat area of the ridge. Be sure that the cap is seated properly to seal the sampler. Push and cap to lock arm in place.

4. Remove the capped sampler by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.

5. Attach the label to the coring body cap, place in a plastic zippered bag, seal and put on ice.

Generally, three En Core® samplers are required for each sample location. These samplers are shipped to the laboratory where the cap is removed and the soil samples are preserved with methanol or sodium bisulfate.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities that apply to the implementation of these procedures. However, the following general QA procedures apply:

2. All data must be documented in site logbooks or on field data sheets. At a minimum, the following data is recorded:

Sampler's name and affiliation with project
Sample number
Sample location
Sample depth
Approximate volume of sample collected
Type of analyses to be performed
Sample description
Date and time of sample collection
Weather conditions at time of sampling
Method of sample collection
Sketch of sample location

2. All instrumentation must be operated in accordance with applicable SOPs and/or the manufacturer's operating instructions, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.

3. The types of quality control (QC) samples to be collected in the field shall be documented in the site-specific Work Plan.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures, in addition to the procedures specified in the site specific HASP.

12.0 REFERENCES

Mason, B.J. 1983. *Preparation of Soil Sampling Protocol: Technique and Strategies*. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1989. *Soil Sampling Quality Assurance User's Guide*. EPA-600/8-89-046.

U.S. Environmental Protection Agency. 1984. *Characterization of Hazardous Waste Sites - A Methods Manual: Volume II.* Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, ER, B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. *Samplers and Sampling Procedures for Hazardous Waste Streams*. EPA-600/2-80-018.

American Society for Testing and Materials. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*. Method D 1586-99.

En Novative Technologies, Inc. 2001. *En Core® Sampler Sampling Procedures*. Web site access. March 13, 2001.

APPENDIX A
Figures
SOP #2012
July 2001

FIGURE 1. Sampling Augers

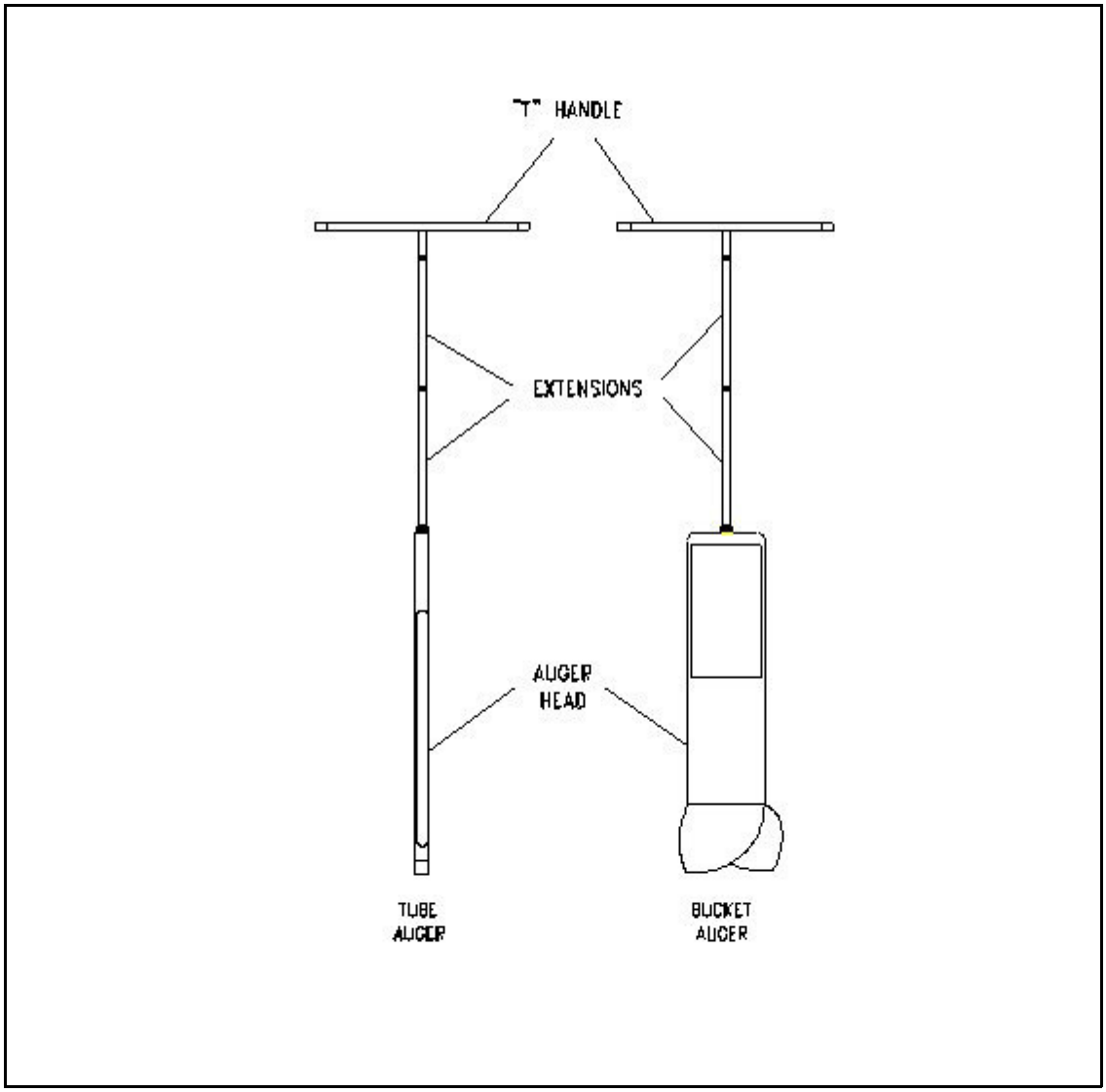
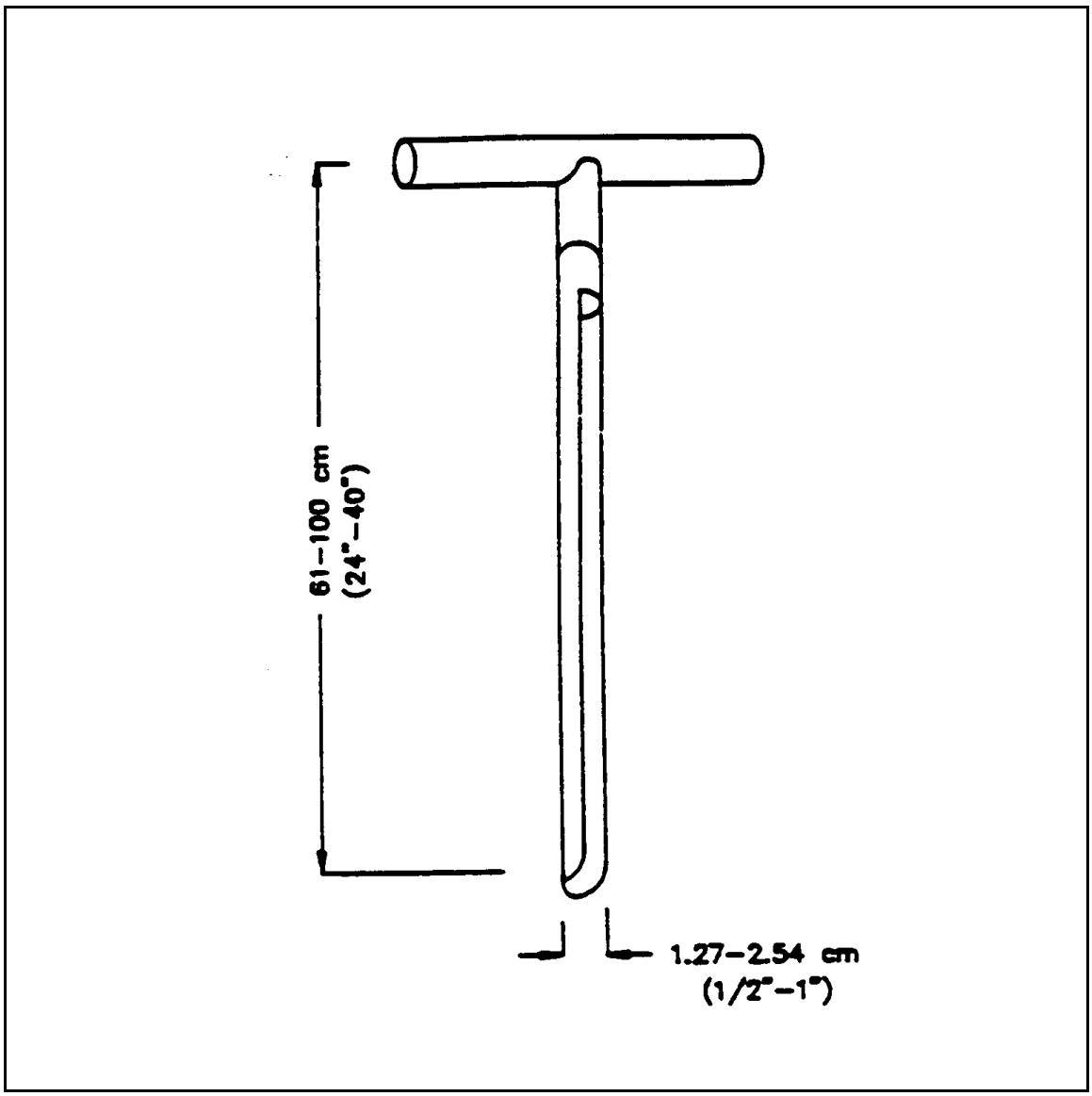


FIGURE 2. Sampling Trier


61-100 cm
(24"-40")
1.27-2.54 cm
(1/2"-1")

SURFACE WATER SAMPLING

CONTENTS

CONTENTS (cont)

* These sections affected by Revision 0.0.

SUPERSEDES: SOP #2013; Revision 0.0; 11/17/94; U.S. EPA Contract EP-W-09-031.

SURFACE WATER SAMPLING

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative surface water samples from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sampling situations vary widely; therefore, no universal sampling procedure can be recommended. However, surface water sampling is generally accomplished through the use of one of the following samplers or techniques:

- Kemmerer bottle
- Van Doren sampler
- Bacon bomb sampler
- Dip sampler
- Direct method

These samplers and sampling techniques will result in the collection of representative samples from the majority of surface waters and impoundments encountered.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, the following procedures should be followed:

1. Transfer the sample(s) into suitable, labeled sample containers specific for the analyses to be performed.

2. Preserve the sample, if appropriate, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.

3. Cap the container securely, place in a resealable plastic bag, and cool to 4^{o}C.

4. Record all pertinent data in the site logbook and/or on field data sheets.

5. Complete the Chain of Custody record.

6. Attach custody seals to cooler prior to shipment.

7. Decontaminate all non-dedicated sampling equipment prior to the collection of additional samples.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems associated with surface water sampling. These include cross contamination of samples and improper sample collection.

1. Cross contamination problems can be eliminated or minimized through the use of dedicated or disposable sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to ERT/SERAS SOP #2006, *Sampling Equipment Decontamination*.

2. Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed or non-representative area.

Following proper decontamination procedures, minimizing disturbance of the sample site, and careful selection of sampling locations will eliminate these problems. Proper timing for the collection of samples must be taken into consideration due to tidal influences and low or fast-flowing streams or rivers.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples may include (depending on technique chosen):

- Kemmerer bottles
- Van Doren sampler
- Bacon bomb sampler
- Dip sampler
- Line and messengers
- Peristalic pump
- Tygon tubing
- 0.45 micron (µm) filters
- Sample bottles/preservatives
- pH paper
- Resealable plastic bags
- Ice
- Coolers, packing material
- Chain of Custody records, custody seals
- Field data sheets
- Decontamination equipment/supplies
- Maps/plot plan
- Safety equipment
- Compass
- Tape measure
- Survey stakes, flags, or buoys and anchors
- Camera and film

- Logbook/waterproof pen
- Sample bottle labels
- Paper towels
- Disposable pipets
- Hydrolab

6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed and are summarized in ERT/SERAS SOP #2003, *Sample Storage, Preservation and Handling*. Decontamination solutions are specified in ERT/SERAS SOP #2006, *Sampling Equipment Decontamination.*

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.

2. Obtain the necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.

5. Perform a general site survey prior to site entry, in accordance with the site specific Health and Safety Plan (HASP).

6. Use stakes, flags, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and obstructions.

7.2 Representative Sampling Considerations

In order to collect a representative sample, the hydrology and morphometrics of a stream, river, pond, lake or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons or impoundments, flow patterns in streams, and appropriate sample locations and depths.

Water quality data should be collected in ponds, lakes and impoundments to determine if stratification is present. Measurements of dissolved oxygen, pH, conductivity, oxidation-potential, temperature and turbidity can indicate if strata exist that would affect analytical results. Measurements should be collected at one-meter intervals from the surface to the bottom using the appropriate instrument (i.e., a Hydrolab or equivalent). These water quality measurements can assist in the interpretation of analytical data, and the selection of sampling sites and depths when

surface water samples are collected.

Factors that contribute to the selection of a sampling device used for sampling surface waters in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

- Width, depth, flow and accessibility of the location being sampled
- Whether the sample will be collected onshore or offshore

7.2.1 Sampler Composition

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, polyvinyl chloride (PVC) or PFTE (Teflon) should be based upon the suspected contaminants and the analyses to be performed.

7.3 Sample Collection

7.3.1 Kemmerer Bottle

A Kemmerer bottle (Figure 1, Appendix A) may be used in most situations where site access is from a boat or structure, such as a bridge or pier, and where samples at specific depths are required. Sampling procedures are as follows:

1. Use a properly decontaminated Kemmerer bottle. Set the sampling device so that the upper and lower stoppers are pulled away from the body, allowing the surface water to enter tube.

2. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.

3. When the Kemmerer bottle is at the required depth, send the weighted messenger down the suspension line, closing the sampling device.

4. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

7.3.2 Van Doren Sampler

A Van Doren sampler (Figure 2, Appendix A) is used to collect surface water from a very specific sampling depth or from a shallow water body. Since the sampler is suspended horizontally, the depth interval sampled is the diameter of the sampling tube. The sampling procedure is as follows:

1. Use a properly decontaminated Van Doren sampler. Set the device so that the end stoppers are pulled away from the body allowing surface water to enter the

tube.

2. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.

3. When the Van Doren is at the required depth, send the weighted messenger down the suspension line, closing the sampling device.

4. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

7.3.3 Bacon Bomb Sampler

A bacon bomb sampler (Figure 3, Appendix A) may be used in situations similar to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

1. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut. This will allow the sampler to fill.

2. Release the trigger line and retrieve the sampler.

3. Discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

7.3.4 Dip Sampler

A dip sampler (Figure 4, Appendix A) is useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.

2. Extend the device to the sample location and collect the sample by dipping the sampler into the water.

3. Retrieve the sampler and transfer the sample to the appropriate sample container(s).

7.3.5 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples directly into the sample container(s). Health and safety considerations must be addressed when sampling lagoons or other impoundments where specific conditions may exist that warrant the use of additional safety equipment. These issues must be addressed in the site-specific HASP.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface while avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

3. To avoid the incidental inclusion of disturbed sediment in the sample, surface water should be collected from a downstream to upstream direction and upstream of any activity that may disturb the sediment (i.e., wading).

4. While collecting surface water using the direct method, the sample container should be held below the surface to avoid the collection of floating debris.

5. Water quality data should be collected to detect the presence of stratified layers or other site-specific characteristics that would affect the sample.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, Occupational Health and Safety (OSHA) and corporate health and safety procedures.

More specifically, when sampling lagoons or surface impoundments containing known or suspected hazardous substances, adequate health and safety and boating precautions must be taken to ensure the safety of sampling personnel.

12.0 REFERENCES

Wilde, F.D., D.B. Radtke, J. Gibs and R.T. Iwatsubo. 1998. National Field Manual for the Collection of Water-Quality Data - Selection of Equipment for Water Sampling. U.S. Geological Survey Techniques of Water - Resources Investigations, Book 9, Chap. A2, variously paged.

http://water.usgs.gov/owq/FieldManual/index.htmland
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13.0 APPENDICES

A - Figures

APPENDIX A
Figures
SOP #2013
February 2002

FIGURE 1. Kemmerer Bottle

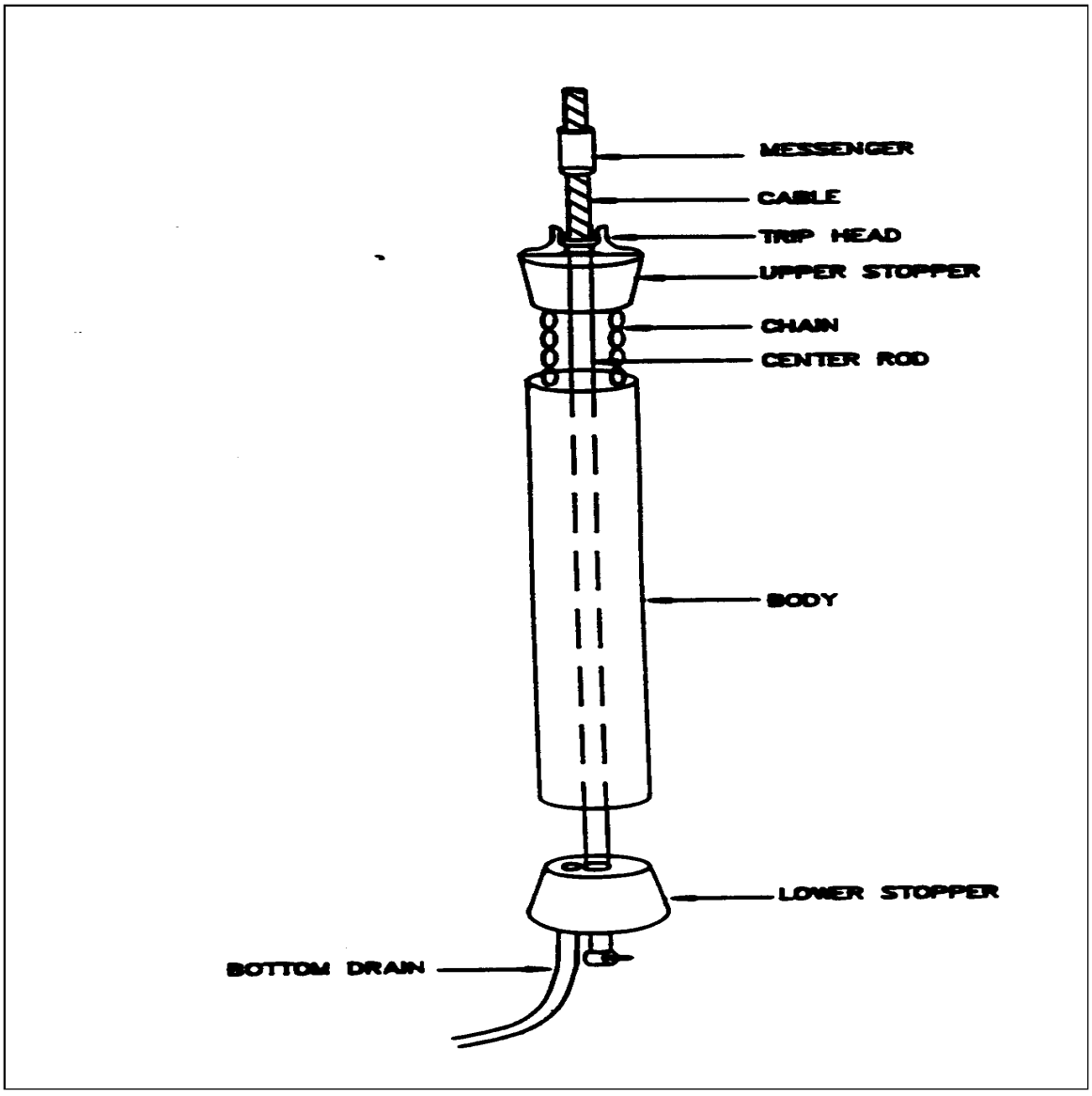


FIGURE 2. Van Doren Sampler

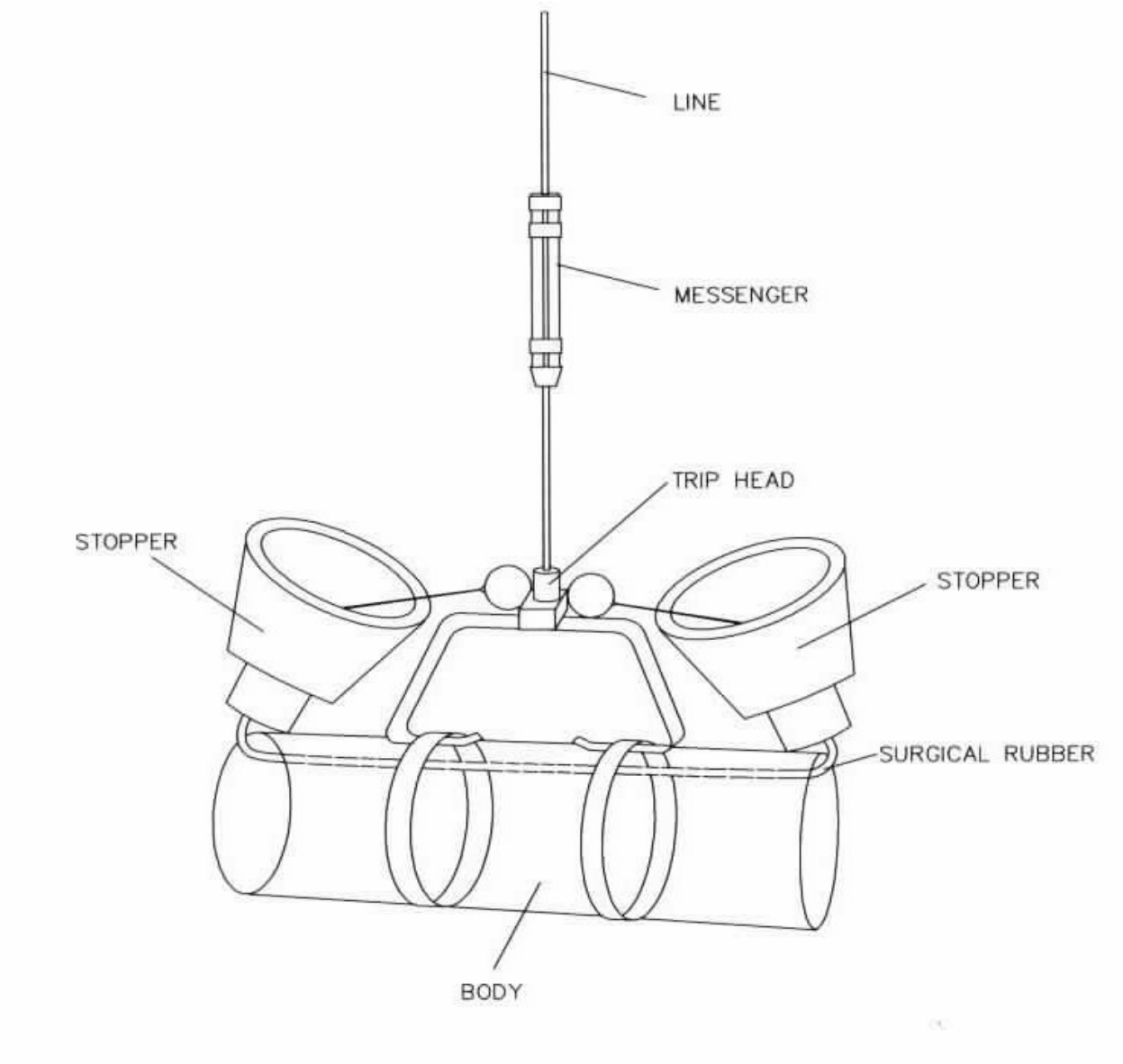


FIGURE 3. Bacon Bomb Sampler

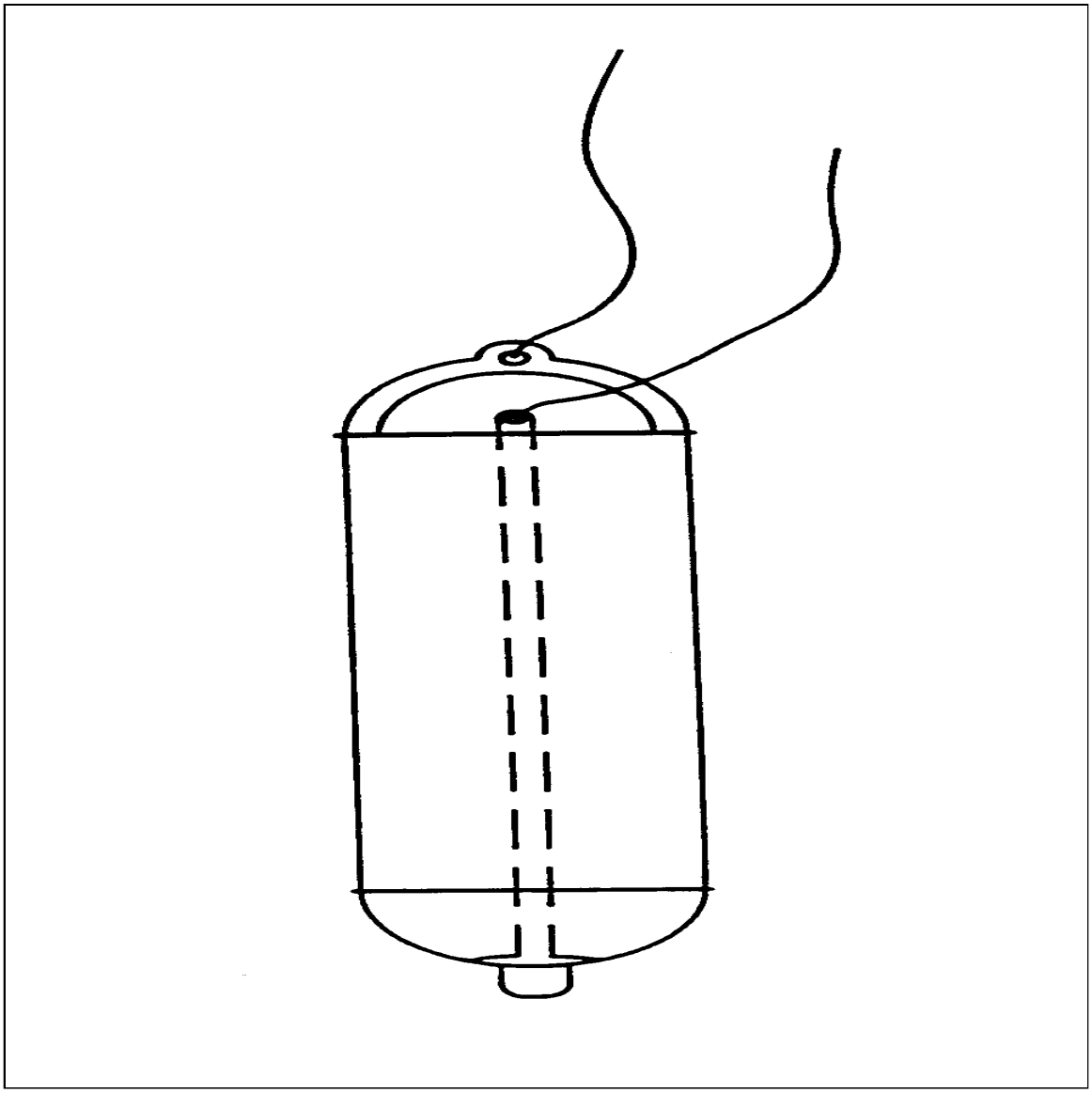
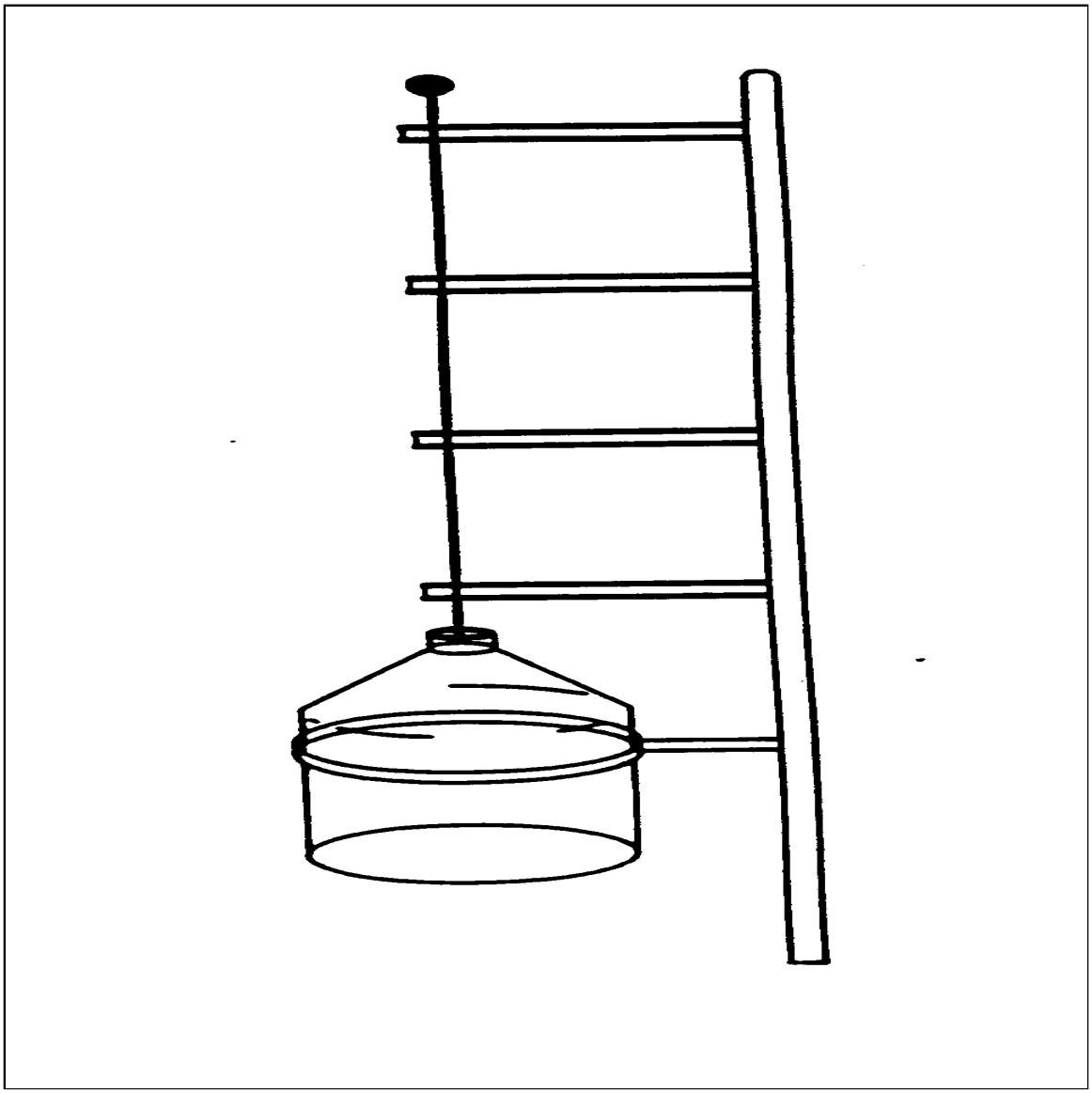


FIGURE 4. Dip Sampler



ATTACHMENT C

Action Levels
EPA RMLs – May 2018

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				1.2E-03	O					1	0.1		Acephate	30560-19-1	7.6E+01	n	9.8E+02	n	2.4E+01	n	
		2.2E-06	I			9.0E-03	I	V		1		1.07E+05	Acetaldehyde	75-07-0	8.2E+01	n	3.4E+02	n	1.9E+01	n	
				2.0E-02	I					1	0.1		Acetochlor	34256-82-1	1.3E+03	n	1.6E+04	n	3.5E+02	n	
				9.0E-01	I	3.1E+01	A	V		1		1.14E+05	Acetone	67-64-1	6.1E+04	n	6.7E+05	nms	1.4E+04	n	
						2.0E-03	X			1	0.1		Acetone Cyanohydrin	75-86-5	2.8E+06	nm	1.2E+07	nm			
						6.0E-02	I	V		1		1.28E+05	Acetonitrile	75-05-8	8.1E+02	n	3.4E+03	n	1.3E+02	n	
				1.0E-01	I			V		1		2.52E+03	Acetophenone	98-86-2	7.8E+03	ns	1.2E+05	nms	1.9E+03	n	
3.8E+00	C	1.3E-03	C							1	0.1		Acetylaminofluorene, 2-	53-96-3	1.4E+01	c	6.0E+01	c	1.6E+00	c	
				5.0E-04	I	2.0E-05	I	V		1		2.27E+04	Acrolein	107-02-8	1.4E-01	n	6.0E-01	n	4.2E-02	n	
5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I		M	1	0.1		Acrylamide	79-06-1	2.4E+01	c**	4.6E+02	c**	5.0E+00	c**	
				5.0E-01	I	1.0E-03	I	V		1		1.09E+05	Acrylic Acid	79-10-7	9.9E+01	n	4.2E+02	n	2.1E+00	n	
5.4E-01	I	6.8E-05	I	4.0E-02	A	2.0E-03	I	V		1		1.13E+04	Acrylonitrile	107-13-1	1.6E+01	n	6.7E+01	n	4.1E+00	n	
						6.0E-03	P			1	0.1		Adiponitrile	111-69-3	8.5E+06	nm	3.6E+07	nm			
5.6E-02	C			1.0E-02	I					1	0.1		Alachlor	15972-60-8	6.3E+02	n	4.1E+03	c**	1.1E+02	c**	2.0E+00
				1.0E-03	I					1	0.1		Aldicarb	116-06-3	6.3E+01	n	8.2E+02	n	2.0E+01	n	3.0E+00
				1.0E-03	I					1	0.1		Aldicarb Sulfone	1646-88-4	6.3E+01	n	8.2E+02	n	2.0E+01	n	2.0E+00
										1	0.1		Aldicarb sulfoxide	1646-87-3							4.0E+00
1.7E+01	I	4.9E-03	I	3.0E-05	I			V		1			Aldrin	309-00-2	2.3E+00	n	1.8E+01	c**	9.2E-02	c**	
				5.0E-03	I	1.0E-04	X	V		1		1.11E+05	Allyl Alcohol	107-18-6	3.5E+00	n	1.5E+01	n	2.1E-01	n	
2.1E-02	C	6.0E-06	C			1.0E-03	I	V		1		1.42E+03	Allyl Chloride	107-05-1	1.7E+00	n	6.9E+00	n	2.1E+00	n	
				1.0E+00	P	5.0E-03	P			1			Aluminum	7429-90-5	7.7E+04	n	1.1E+06	nm	2.0E+04	n	
				4.0E-04	I					1			Aluminum Phosphide	20859-73-8	3.1E+01	n	4.7E+02	n	8.0E+00	n	
				9.0E-03	I					1	0.1		Ametryn	834-12-8	5.7E+02	n	7.4E+03	n	1.5E+02	n	
2.1E+01	C	6.0E-03	C							1	0.1		Aminobiphenyl, 4-	92-67-1	2.6E+00	c	1.1E+01	c	3.0E-01	c	
				8.0E-02	P					1	0.1		Aminophenol, m-	591-27-5	5.1E+03	n	6.6E+04	n	1.6E+03	n	
				4.0E-03	X					1	0.1		Aminophenol, o-	95-55-6	2.5E+02	n	3.3E+03	n	7.9E+01	n	
				2.0E-02	P					1	0.1		Aminophenol, p-	123-30-8	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				2.5E-03	I					1	0.1		Amitraz	33089-61-1	1.6E+02	n	2.1E+03	n	8.2E+00	n	
						5.0E-01	I	V		1			Ammonia	7664-41-7							
				2.0E-01	I					1			Ammonium Sulfamate	7773-06-0	1.6E+04	n	2.3E+05	nm	4.0E+03	n	
						3.0E-03	X	V		1		1.37E+04	Amyl Alcohol, tert-	75-85-4	8.2E+01	n	3.4E+02	n	6.3E+00	n	
5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I			1	0.1		Aniline	62-53-3	4.4E+02	n	5.7E+03	n	1.4E+02	n	
4.0E-02	P			2.0E-03	X					1	0.1		Anthraquinone, 9,10-	84-65-1	1.3E+02	n	1.6E+03	n	3.0E+01	n	
				4.0E-04	I					0.15			Antimony (metallic)	7440-36-0	3.1E+01	n	4.7E+02	n	7.8E+00	n	6.0E+00
				5.0E-04	H					0.15			Antimony Pentoxide	1314-60-9	3.9E+01	n	5.8E+02	n	9.7E+00	n	
				4.0E-04	H					0.15			Antimony Tetroxide	1332-81-6	3.1E+01	n	4.7E+02	n	7.8E+00	n	
						2.0E-04	I			0.15			Antimony Trioxide	1309-64-4	2.8E+05	nm	1.2E+06	nm			
1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C			1	0.03		Arsenic, Inorganic	7440-38-2	3.5E+01	nR	3.0E+02	c**R	5.2E+00	c**	1.0E+01
				3.5E-06	C	5.0E-05	I			1			Arsine	7784-42-1	2.7E-01	n	4.1E+00	n	7.0E-02	n	
				3.6E-02	O					1	0.1		Asulam	3337-71-1	2.3E+03	n	3.0E+04	n	7.2E+02	n	
2.3E-01	C			3.5E-02	I					1	0.1		Atrazine	1912-24-9	2.4E+02	c**	1.0E+03	c*	3.0E+01	c*	3.0E+00
8.8E-01	C	2.5E-04	C							1	0.1		Auramine	492-80-8	6.2E+01	c	2.6E+02	c	6.7E+00	c	
				4.0E-04	I					1	0.1		Avermectin B1	65195-55-3	2.5E+01	n	3.3E+02	n	8.0E+00	n	
				3.0E-03	A	1.0E-02	A			1	0.1		Azinphos-methyl	86-50-0	1.9E+02	n	2.5E+03	n	5.6E+01	n	
1.1E-01	I	3.1E-05	I					V		1			Azobenzene	103-33-3	5.6E+02	c	2.6E+03	c	1.2E+01	c	
				1.0E+00	P	7.0E-06	P			1	0.1		Azodicarbonamide	123-77-3	8.6E+03	n	4.0E+04	n	2.0E+04	n	
				2.0E-01	I	5.0E-04	H			0.07			Barium	7440-39-3	1.5E+04	n	2.2E+05	nm	3.8E+03	n	2.0E+03
				5.0E-03	O			V		1			Benfluralin	1861-40-1	3.9E+02	n	5.8E+03	n	2.8E+01	n	
				5.0E-02	I					1	0.1		Benomyl	17804-35-2	3.2E+03	n	4.1E+04	n	9.7E+02	n	
				2.0E-01	I					1	0.1		Bensulfuron-methyl	83055-99-6	1.3E+04	n	1.6E+05	nm	3.9E+03	n	
				3.0E-02	I					1	0.1		Bentazon	25057-89-0	1.9E+03	n	2.5E+04	n	5.7E+02	n	
4.0E-03	P			1.0E-01	I			V		1		1.16E+03	Benzaldehyde	100-52-7	7.8E+03	ns	8.2E+04	c**s	1.9E+03	c**	
5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	V		1		1.82E+03	Benzene	71-43-2	8.2E+01	n	4.2E+02	n	3.3E+01	n	5.0E+00
1.0E-01	X			3.0E-04	X					1	0.1		Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	1.9E+01	n	2.5E+02	n	6.0E+00	n	
				1.0E-03	P			V		1		1.26E+03	Benzenethiol	108-98-5	7.8E+01	n	1.2E+03	n	1.7E+01	n	
2.3E+02	I	6.7E-02	I	3.0E-03	I				M	1	0.1		Benzidine	92-87-5	5.3E-02	c	1.0E+00	c	1.1E-02	c	
				4.0E+00	I					1	0.1		Benzoic Acid	65-85-0	2.5E+05	nm	3.3E+06	nm	7.5E+04	n	
1.3E+01	I							V		1		3.24E+02	Benzotrichloride	98-07-7	5.3E+00	c	2.5E+01	c	3.0E-01	c	
				1.0E-01	P					1	0.1		Benzyl Alcohol	100-51-6	6.3E+03	n	8.2E+04	n	2.0E+03	n	
1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	V		1		1.46E+03	Benzyl Chloride	100-44-7	2.3E+01	n	1.1E+02	n	2.0E+00	n	
		2.4E-03	I	2.0E-03	I	2.0E-05	I			0.007			Beryllium and compounds	7440-41-7	1.6E+02	n	2.3E+03	n	2.5E+01	n	4.0E+00
				9.0E-03	P					1	0.1		Bifenox	42576-02-3	5.7E+02	n	7.4E+03	n	1.0E+02	n	

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				1.5E-02	I					1	0.1		Biphenthrin	82657-04-3	9.5E+02	n	1.2E+04	n	3.0E+02	n	
8.0E-03	I			5.0E-01	I	4.0E-04	X	V		1			Biphenyl, 1,1'-	92-52-4	4.7E+01	n	2.0E+02	n	8.3E-01	n	
				4.0E-02	I			V		1		1.02E+03	Bis(2-chloro-1-methylethyl) ether	108-60-1	3.1E+03	ns	4.7E+04	ns	7.1E+02	n	
				3.0E-03	P					1	0.1		Bis(2-chloroethoxy)methane	111-91-1	1.9E+02	n	2.5E+03	n	5.9E+01	n	
1.1E+00	I	3.3E-04	I					V		1		5.05E+03	Bis(2-chloroethyl)ether	111-44-4	2.3E+01	c	1.0E+02	c	1.4E+00	c	
2.2E+02	I	6.2E-02	I					V		1		4.22E+03	Bis(chloromethyl)ether	542-88-1	8.3E-03	c	3.6E-02	c	7.2E-03	c	
				5.0E-02	I					1	0.1		Bisphenol A	80-05-7	3.2E+03	n	4.1E+04	n	7.7E+02	n	
				2.0E-01	I	2.0E-02	H			1			Boron And Borates Only	7440-42-8	1.6E+04	n	2.3E+05	nm	4.0E+03	n	
				2.0E+00	P	2.0E-02	P	V		1			Boron Trichloride	10294-34-5	1.6E+05	nm	2.3E+06	nm	4.2E+01	n	
				4.0E-02	C	1.3E-02	C	V		1			Boron Trifluoride	7637-07-2	3.1E+03	n	4.7E+04	n	2.6E+01	n	
7.0E-01	I			4.0E-03	I					1			Bromate	15541-45-4	9.9E+01	c**	4.7E+02	c*	1.1E+01	c**	1.0E+01
2.0E+00	X	6.0E-04	X					V		1		2.38E+03	Bromo-2-chloroethane, 1-	107-04-0	2.6E+00	c	1.1E+01	c	7.4E-01	c	
				3.0E-04	X			V		1		8.96E+02	Bromo-3-fluorobenzene, 1-	1073-06-9	2.3E+01	n	3.5E+02	n	4.9E+00	n	
				3.0E-04	X			V		1		3.23E+02	Bromo-4-fluorobenzene, 1-	460-00-4	2.3E+01	n	3.5E+02	ns	4.6E+00	n	
				8.0E-03	I	6.0E-02	I	V		1		6.79E+02	Bromobenzene	108-86-1	2.9E+02	n	1.8E+03	ns	6.2E+01	n	
						4.0E-02	X	V		1		4.04E+03	Bromochloromethane	74-97-5	1.5E+02	n	6.3E+02	n	8.3E+01	n	
6.2E-02	I	3.7E-05	C	2.0E-02	I			V		1		9.32E+02	Bromodichloromethane	75-27-4	2.9E+01	c*	1.3E+02	c	1.3E+01	c*	8.0E+01(F) 8.0E+01(F)
7.9E-03	I	1.1E-06	I	2.0E-02	I			V		1		9.15E+02	Bromoform	75-25-2	1.6E+03	ns	8.6E+03	c**s	3.3E+02	c**	
				1.4E-03	I	5.0E-03	I	V		1		3.59E+03	Bromomethane	74-83-9	6.8E+00	n	3.0E+01	n	7.5E+00	n	
				5.0E-03	H			V		1			Bromophos	2104-96-3	3.9E+02	n	5.8E+03	n	3.5E+01	n	
						1.0E-01	A	V		1		9.66E+02	Bromopropane, 1-	106-94-5	2.2E+02	n	9.4E+02	n	2.1E+02	n	
1.0E-01	O			1.5E-02	O					1	0.1		Bromoxynil	1689-84-5	5.3E+02	c**	2.2E+03	c**	6.1E+01	c**	
1.0E-01	O			1.5E-02	O			V		1			Bromoxynil Octanoate	1689-99-2	6.7E+02	c**	3.2E+03	c**	2.4E+01	c**	
3.4E+00	C	3.0E-05	I			2.0E-03	I	V		1		6.67E+02	Butadiene, 1,3-	106-99-0	1.8E+00	n	7.6E+00	n	1.8E+00	c**	
				3.0E-02	O					1	0.1		Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6	1.9E+03	n	2.5E+04	n	4.5E+02	n	
				1.0E-01	I			V		1		7.64E+03	Butanol, N-	71-36-3	7.8E+03	ns	1.2E+05	nms	2.0E+03	n	
				2.0E+00	P	3.0E+01	P	V		1		2.13E+04	Butyl alcohcl, sec-	78-92-2	1.3E+05	nms	1.5E+06	nms	2.4E+04	n	
				5.0E-02	I			V		1			Butylate	2008-41-5	3.9E+03	n	5.8E+04	n	4.6E+02	n	
2.0E-04	C	5.7E-08	C							1	0.1		Butylated hydroxyanisole	25013-16-5	2.7E+05	cm	1.1E+06	cm	1.5E+04	c	
3.6E-03	P			3.0E-01	P					1	0.1		Butylated hydroxytoluene	128-37-0	1.5E+04	c**	6.4E+04	c**	3.4E+02	c**	
				5.0E-02	P			V		1		1.08E+02	Butylbenzene, n-	104-51-8	3.9E+03	ns	5.8E+04	ns	1.0E+03	n	
				1.0E-01	X			V		1		1.45E+02	Butylbenzene, sec-	135-98-8	7.8E+03	ns	1.2E+05	nms	2.0E+03	n	
				1.0E-01	X			V		1		1.83E+02	Butylbenzene, tert-	98-06-6	7.8E+03	ns	1.2E+05	nms	6.9E+02	n	
				2.0E-02	A					1	0.1		Cacodylic Acid	75-60-5	1.3E+03	n	1.6E+04	n	4.0E+02	n	
		1.8E-03	I	1.0E-03	I	1.0E-05	A			0.025	0.001		Cadmium (Diet)	7440-43-9	7.1E+01	n	9.8E+02	n			
		1.8E-03	I	5.0E-04	I	1.0E-05	A			0.05	0.001		Cadmium (Water)	7440-43-9					9.2E+00	n	5.0E+00
				5.0E-01	I	2.2E-03	C			1	0.1		Caprolactam	105-60-2	3.1E+04	n	4.0E+05	nm	9.9E+03	n	
1.5E-01	C	4.3E-05	C	2.0E-03	I					1	0.1		Captafol	2425-06-1	1.3E+02	n	1.5E+03	c**	3.2E+01	n	
2.3E-03	C	6.6E-07	C	1.3E-01	I					1	0.1		Captan	133-06-2	8.2E+03	n	1.0E+05	c**	2.4E+03	n	
				1.0E-01	I					1	0.1		Carbaryl	63-25-2	6.3E+03	n	8.2E+04	n	1.8E+03	n	
				5.0E-03	I					1	0.1		Carbofuran	1563-66-2	3.2E+02	n	4.1E+03	n	9.4E+01	n	4.0E+01
				1.0E-01	I	7.0E-01	I	V		1		7.38E+02	Carbon Disulfide	75-15-0	7.7E+02	ns	3.5E+03	ns	8.1E+02	n	
7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	V		1		4.58E+02	Carbon Tetrachloride	56-23-5	6.5E+01	c**	2.9E+02	c**	4.6E+01	c**	5.0E+00
						1.0E-01	P	V		1		5.89E+03	Carbonyl Sulfide	463-58-1	6.7E+01	n	2.8E+02	n	2.1E+02	n	
				1.0E-02	I					1	0.1		Carbosulfan	55285-14-8	6.3E+02	n	8.2E+03	n	5.1E+01	n	
				1.0E-01	I					1	0.1		Carboxin	5234-68-4	6.3E+03	n	8.2E+04	n	1.9E+03	n	
						9.0E-04	I			1			Ceric oxide	1306-38-3	1.3E+06	nm	5.4E+06	nm			
				1.0E-01	I			V		1			Chloral Hydrate	302-17-0	7.8E+03	n	1.2E+05	nm	2.0E+03	n	
				1.5E-02	I					1	0.1		Chloramben	133-90-4	9.5E+02	n	1.2E+04	n	2.9E+02	n	
4.0E-01	H									1	0.1		Chloranil	118-75-2	1.3E+02	c	5.7E+02	c	1.8E+01	c	
3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I	V		1	0.04		Chlordane	12789-03-6	3.5E+01	n	4.5E+02	n	7.4E-01	n	2.0E+00
1.0E+01	I	4.6E-03	C	3.0E-04	I					1	0.1		Chlordecone (Kepone)	143-50-0	5.4E+00	c**	2.3E+01	c*	3.5E-01	c**	
				7.0E-04	A					1	0.1		Chlorfenvinphos	470-90-6	4.4E+01	n	5.7E+02	n	1.1E+01	n	
				9.0E-02	O					1	0.1		Chlorimuron, Ethyl-	90982-32-4	5.7E+03	n	7.4E+04	n	1.8E+03	n	
				1.0E-01	I	1.5E-04	A	V		1		2.78E+03	Chlorine	7782-50-5	1.8E-01	n	7.8E-01	n	3.0E-01	n	
				3.0E-02	I	2.0E-04	I	V		1			Chlorine Dioxide	10049-04-4	2.3E+03	n	3.4E+04	n	4.2E-01	n	
				3.0E-02	I					1			Chlorite (Sodium Salt)	7758-19-2	2.3E+03	n	3.5E+04	n	6.0E+02	n	1.0E+03
						5.0E+01	I	V		1		1.15E+03	Chloro-1,1-difluoroethane, 1-	75-68-3	5.4E+04	ns	2.3E+05	nms	1.0E+05	n	
		3.0E-04	I	2.0E-02	H	2.0E-02	I	V		1		7.86E+02	Chloro-1,3-butadiene, 2-	126-99-8	1.0E+00	c*	4.4E+00	c*	1.9E+00	c*	
4.6E-01	H									1	0.1		Chloro-2-methylaniline HCl, 4-	3165-93-3	1.2E+02	c	5.0E+02	c	1.7E+01	c	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
1.0E-01	P	7.7E-05	C	3.0E-03	X					1	0.1		Chloro-2-methylaniline, 4-	95-69-2	1.9E+02	n	2.3E+03	c**	5.4E+01	n	
2.7E-01	X							V		1		1.18E+04	Chloroacetaldehyde, 2-	107-20-0	2.6E+02	c	1.2E+03	c	2.9E+01	c	
										1	0.1		Chloroacetic Acid	79-11-8							6.0E+01
						3.0E-05	I			1	0.1		Chloroacetophenone, 2-	532-27-4	4.3E+04	n	1.8E+05	nm			
2.0E-01	P			4.0E-03	I					1	0.1		Chloroaniline, p-	106-47-8	2.5E+02	n	1.1E+03	c**	3.7E+01	c**	
				2.0E-02	I	5.0E-02	P	V		1		7.61E+02	Chlorobenzene	108-90-7	2.8E+02	n	1.3E+03	ns	7.8E+01	n	1.0E+02
				1.0E-01	X					1	0.1		Chlorobenzene sulfonic acid, p-	98-66-8	6.3E+03	n	8.2E+04	n	2.0E+03	n	
1.1E-01	C	3.1E-05	C	2.0E-02	I					1	0.1		Chlorobenzilate	510-15-6	4.9E+02	c**	2.1E+03	c**	3.1E+01	c**	
				3.0E-02	X					1	0.1		Chlorobenzoic Acid, p-	74-11-3	1.9E+03	n	2.5E+04	n	5.1E+02	n	
				3.0E-03	P	3.0E-01	P	V		1		2.90E+02	Chlorobenzotrifluoride, 4-	98-56-6	2.1E+02	n	2.5E+03	ns	3.5E+01	n	
				4.0E-02	P			V		1		7.28E+02	Chlorobutane, 1-	109-69-3	3.1E+03	ns	4.7E+04	ns	6.4E+02	n	
						5.0E+01	I	V		1		1.68E+03	Chlorodifluoromethane	75-45-6	4.9E+04	ns	2.1E+05	nms	1.0E+05	n	
				2.0E-02	P			V		1		1.11E+05	Chloroethanol, 2-	107-07-3	1.6E+03	n	2.3E+04	n	4.0E+02	n	
																					8.0E+01(F
3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	V		1		2.54E+03	Chloroform	67-66-3	3.2E+01	c**	1.4E+02	c**	2.2E+01	c**	)
						9.0E-02	I	V		1		1.32E+03	Chloromethane	74-87-3	1.1E+02	n	4.6E+02	n	1.9E+02	n	
2.4E+00	C	6.9E-04	C					V		1		9.32E+03	Chloromethyl Methyl Ether	107-30-2	2.0E+00	c	8.9E+00	c	6.5E-01	c	
3.0E-01	P			3.0E-03	P	1.0E-05	X			1	0.1		Chloronitrobenzene, o-	88-73-3	1.8E+02	c**	7.7E+02	c**	2.4E+01	c**	
6.0E-02	P			7.0E-04	P	2.0E-03	P			1	0.1		Chloronitrobenzene, p-	100-00-5	4.4E+01	n	5.7E+02	n	1.3E+01	n	
				5.0E-03	I			V		1		2.74E+04	Chlorophenol, 2-	95-57-8	3.9E+02	n	5.8E+03	n	9.1E+01	n	
						4.0E-04	C	V		1		6.17E+02	Chloropicrin	76-06-2	2.0E+00	n	8.2E+00	n	8.3E-01	n	
3.1E-03	C	8.9E-07	C	1.5E-02	I					1	0.1		Chlorothalonil	1897-45-6	9.5E+02	n	1.2E+04	n	2.6E+02	n	
				2.0E-02	I			V		1		9.07E+02	Chlorotoluene, o-	95-49-8	1.6E+03	ns	2.3E+04	ns	2.4E+02	n	
				2.0E-02	X			V		1		2.53E+02	Chlorotoluene, p-	106-43-4	1.6E+03	ns	2.3E+04	ns	2.5E+02	n	
2.4E+02	C	6.9E-02	C							1	0.1		Chlorozotocin	54749-90-5	2.3E-01	c	9.6E-01	c	3.2E-02	c	
				5.0E-02	O					1	0.1		Chlorpropham	101-21-3	3.2E+03	n	4.1E+04	n	7.1E+02	n	
				1.0E-03	A					1	0.1		Chlorpyrifos	2921-88-2	6.3E+01	n	8.2E+02	n	8.4E+00	n	
				1.0E-02	H					1	0.1		Chlorpyrifos Methyl	5598-13-0	6.3E+02	n	8.2E+03	n	1.2E+02	n	
				5.0E-02	O					1	0.1		Chlorsulfuron	64902-72-3	3.2E+03	n	4.1E+04	n	9.9E+02	n	
				1.0E-02	I					1	0.1		Chlorthal-dimethyl	1861-32-1	6.3E+02	n	8.2E+03	n	1.2E+02	n	
				8.0E-04	H					1	0.1		Chlorthiophos	60238-56-4	5.1E+01	n	6.6E+02	n	2.8E+00	n	
				1.5E+00	I					0.013			Chromium(III), Insoluble Salts	16065-83-1	1.2E+05	nm	1.8E+06	nm	2.2E+04	n	
5.0E-01	C	8.4E-02	S	3.0E-03	I	1.0E-04	I		M	0.025			Chromium(VI)	18540-29-9	3.0E+01	c**	6.3E+02	c**	3.5E+00	c*	
										0.013			Chromium, Total	7440-47-3							1.0E+02
				1.3E-02	I					1	0.1		Clofentezine	74115-24-5	8.2E+02	n	1.1E+04	n	2.3E+02	n	
		9.0E-03	P	3.0E-04	P	6.0E-06	P			1			Cobalt	7440-48-4	2.3E+01	n	3.5E+02	n	6.0E+00	n	
		6.2E-04	I					V	M	1			Coke Oven Emissions	8007-45-2							
				4.0E-02	H					1			Copper	7440-50-8	3.1E+03	n	4.7E+04	n	8.0E+02	n	1.3E+03
				5.0E-02	I	6.0E-01	C			1	0.1		Cresol, m-	108-39-4	3.2E+03	n	4.1E+04	n	9.3E+02	n	
				5.0E-02	I	6.0E-01	C			1	0.1		Cresol, o-	95-48-7	3.2E+03	n	4.1E+04	n	9.3E+02	n	
				1.0E-01	A	6.0E-01	C			1	0.1		Cresol, p-	106-44-5	6.3E+03	n	8.2E+04	n	1.9E+03	n	
				1.0E-01	A					1	0.1		Cresol, p-chloro-m-	59-50-7	6.3E+03	n	8.2E+04	n	1.4E+03	n	
				1.0E-01	A	6.0E-01	C			1	0.1		Cresols	1319-77-3	6.3E+03	n	8.2E+04	n	1.5E+03	n	
1.9E+00	H			1.0E-03	P			V		1		1.66E+04	Crotonaldehyde, trans-	123-73-9	3.7E+01	c**	1.7E+02	c**	4.0E+00	c**	
				1.0E-01	I	4.0E-01	I	V		1		2.68E+02	Cumene	98-82-8	1.9E+03	ns	9.9E+03	ns	4.5E+02	n	
2.2E-01	C	6.3E-05	C							1	0.1		Cupferron	135-20-6	2.5E+02	c	1.0E+03	c	3.5E+01	c	
8.4E-01	H			2.0E-03	H					1	0.1		Cyanazine	21725-46-2	6.5E+01	c**	2.7E+02	c**	8.8E+00	c**	
													Cyanides								
				1.0E-03	I					1			~Calcium Cyanide	592-01-8	7.8E+01	n	1.2E+03	n	2.0E+01	n	
				5.0E-03	I					1			~Copper Cyanide	544-92-3	3.9E+02	n	5.8E+03	n	1.0E+02	n	
				6.0E-04	I	8.0E-04	S	V		1		9.54E+05	~Cyanide (CN-)	57-12-5	2.3E+01	n	1.5E+02	n	1.5E+00	n	2.0E+02
				1.0E-03	I			V		1			~Cyanogen	460-19-5	7.8E+01	n	1.2E+03	n	2.0E+01	n	
				9.0E-02	I			V		1			~Cyanogen Bromide	506-68-3	7.0E+03	n	1.1E+05	nm	1.8E+03	n	
				5.0E-02	I			V		1			~Cyanogen Chloride	506-77-4	3.9E+03	n	5.8E+04	n	1.0E+03	n	
				6.0E-04	I	8.0E-04	I	V		1		1.00E+07	~Hydrogen Cyanide	74-90-8	2.3E+01	n	1.5E+02	n	1.5E+00	n	
				2.0E-03	I					1			~Potassium Cyanide	151-50-8	1.6E+02	n	2.3E+03	n	4.0E+01	n	
				5.0E-03	I					0.04			~Potassium Silver Cyanide	506-61-6	3.9E+02	n	5.8E+03	n	8.2E+01	n	
				1.0E-01	I					0.04			~Silver Cyanide	506-64-9	7.8E+03	n	1.2E+05	nm	1.8E+03	n	
				1.0E-03	I					1			~Sodium Cyanide	143-33-9	7.8E+01	n	1.2E+03	n	2.0E+01	n	2.0E+02
				2.0E-04	P					1			~Thiocyanates	E1790664	1.6E+01	n	2.3E+02	n	4.0E+00	n	
				2.0E-04	X			V		1			~Thiocyanic Acid	463-56-9	1.6E+01	n	2.3E+02	n	4.0E+00	n	
				5.0E-02	I					1			~Zinc Cyanide	557-21-1	3.9E+03	n	5.8E+04	n	1.0E+03	n	

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
						6.0E+00	I	V		1		1.17E+02	Cyclohexane	110-82-7	6.5E+03	ns	2.7E+04	ns	1.3E+04	n	
2.0E-02	X			2.0E-02	X					1	0.1		Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	1.3E+03	n	1.1E+04	c**	2.8E+02	c**	
				5.0E+00	I	7.0E-01	P	V		1		5.11E+03	Cyclohexanone	108-94-1	2.8E+04	ns	1.3E+05	nms	1.4E+03	n	
				5.0E-03	P	1.0E+00	X	V		1		2.83E+02	Cyclohexene	110-83-8	3.1E+02	ns	3.1E+03	ns	7.0E+01	n	
				2.0E-01	I			V		1		2.93E+05	Cyclohexylamine	108-91-8	1.6E+04	n	2.3E+05	nm	3.8E+03	n	
				2.5E-02	I					1	0.1		Cyfluthrin	68359-37-5	1.6E+03	n	2.1E+04	n	1.2E+02	n	
				1.0E-03	O					1	0.1		Cyhalothrin	68085-85-8	6.3E+01	n	8.2E+02	n	2.0E+01	n	
				5.0E-01	O					1	0.1		Cyromazine	66215-27-8	3.2E+04	n	4.1E+05	nm	9.9E+03	n	
2.4E-01	I	6.9E-05	C	3.0E-05	X					1	0.1		DDD, p,p`- (DDD)	72-54-8	1.9E+00	n	2.5E+01	n	6.3E-02	n	
3.4E-01	I	9.7E-05	C	3.0E-04	X			V		1			DDE, p,p'-	72-55-9	2.3E+01	n	3.5E+02	n	4.6E+00	c**	
3.4E-01	I	9.7E-05	I	5.0E-04	I					1	0.03		DDT	50-29-3	3.7E+01	n	5.2E+02	n	1.0E+01	n	
				3.0E-02	I					1	0.1		Dalapon	75-99-0	1.9E+03	n	2.5E+04	n	6.0E+02	n	2.0E+02
1.8E-02	C	5.1E-06	C	1.5E-01	I					1	0.1		Daminozide	1596-84-5	3.0E+03	c**	1.3E+04	c**	4.3E+02	c**	
7.0E-04	I			7.0E-03	I					1	0.1		Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	4.4E+02	n	5.7E+03	n	1.4E+02	n	
				4.0E-05	I					1	0.1		Demeton	8065-48-3	2.5E+00	n	3.3E+01	n	4.2E-01	n	
1.2E-03	I			6.0E-01	I					1	0.1		Di(2-ethylhexyl)adipate	103-23-1	3.8E+04	n	1.9E+05	c** m	6.5E+03	c**	4.0E+02
6.1E-02	H									1	0.1		Diallate	2303-16-4	8.9E+02	c	3.8E+03	c	5.4E+01	c	
				7.0E-04	A					1	0.1		Diazinon	333-41-5	4.4E+01	n	5.7E+02	n	1.0E+01	n	
				1.0E-02	X			V		1			Dibenzothiophene	132-65-0	7.8E+02	n	1.2E+04	n	6.5E+01	n	
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	1		9.79E+02	Dibromo-3-chloropropane, 1,2-	96-12-8	5.3E-01	c**	6.4E+00	c**	3.3E-02	c*	2.0E-01
				4.0E-04	X			V		1		1.59E+02	Dibromobenzene, 1,3-	108-36-1	3.1E+01	n	4.7E+02	ns	5.3E+00	n	
				1.0E-02	I			V		1			Dibromobenzene, 1,4-	106-37-6	7.8E+02	n	1.2E+04	n	1.3E+02	n	8.0E+01(F
8.4E-02	I			2.0E-02	I			V		1		8.02E+02	Dibromochloromethane	124-48-1	8.3E+02	c**s	3.9E+03	c**s	8.7E+01	c**	)
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1		1.34E+03	Dibromoethane, 1,2-	106-93-4	3.6E+00	c*	1.6E+01	c*	7.5E-01	c*	5.0E-02
						4.0E-03	X	V		1		2.82E+03	Dibromomethane (Methylene Bromide)	74-95-3	2.4E+01	n	9.9E+01	n	8.3E+00	n	
				3.0E-04	P					1	0.1		Dibutyltin Compounds	E1790660	1.9E+01	n	2.5E+02	n	6.0E+00	n	
				3.0E-02	I					1	0.1		Dicamba	1918-00-9	1.9E+03	n	2.5E+04	n	5.7E+02	n	
		4.2E-03	P					V		1		5.54E+02	Dichloro-2-butene, 1,4-	764-41-0	2.1E-01	c	9.4E-01	c	1.3E-01	c	
		4.2E-03	P					V		1		5.19E+02	Dichloro-2-butene, cis-1,4-	1476-11-5	7.4E-01	c	3.2E+00	c	1.3E-01	c	
		4.2E-03	P					V		1		7.60E+02	Dichloro-2-butene, trans-1,4-	110-57-6	7.4E-01	c	3.2E+00	c	1.3E-01	c	
5.0E-02	I			4.0E-03	I					1	0.1		Dichloroacetic Acid	79-43-6	2.5E+02	n	3.3E+03	n	7.9E+01	n	6.0E+01
				9.0E-02	I	2.0E-01	H	V		1		3.76E+02	Dichlorobenzene, 1,2-	95-50-1	1.8E+03	ns	9.3E+03	ns	3.0E+02	n	6.0E+02
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V		1			Dichlorobenzene, 1,4-	106-46-7	2.6E+02	c*	1.1E+03	c*	4.8E+01	c*	7.5E+01
4.5E-01	I	3.4E-04	C							1	0.1		Dichlorobenzidine, 3,3'-	91-94-1	1.2E+02	c	5.1E+02	c	1.3E+01	c	
				9.0E-03	X					1	0.1		Dichlorobenzophenone, 4,4'-	90-98-2	5.7E+02	n	7.4E+03	n	7.8E+01	n	
				2.0E-01	I	1.0E-01	X	V		1		8.45E+02	Dichlorodifluoromethane	75-71-8	8.7E+01	n	3.7E+02	n	2.0E+02	n	
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1		1.69E+03	Dichloroethane, 1,1-	75-34-3	3.6E+02	c*	1.6E+03	c	2.8E+02	c*	
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		1		2.98E+03	Dichloroethane, 1,2-	107-06-2	3.1E+01	n	1.4E+02	n	1.3E+01	n	5.0E+00
				5.0E-02	I	2.0E-01	I	V		1		1.19E+03	Dichloroethylene, 1,1-	75-35-4	2.3E+02	n	1.0E+03	n	2.8E+02	n	7.0E+00
				2.0E-03	I			V		1		2.37E+03	Dichloroethylene, 1,2-cis-	156-59-2	1.6E+02	n	2.3E+03	n	3.6E+01	n	7.0E+01
				2.0E-02	I			V		1		1.85E+03	Dichloroethylene, 1,2-trans-	156-60-5	1.6E+03	n	2.3E+04	ns	3.6E+02	n	1.0E+02
				3.0E-03	I					1	0.1		Dichlorophenol, 2,4-	120-83-2	1.9E+02	n	2.5E+03	n	4.6E+01	n	
				1.0E-02	I					1	0.05		Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	7.0E+02	n	9.6E+03	n	1.7E+02	n	7.0E+01
3.7E-02	P	3.7E-06	P	4.0E-02	P	4.0E-03	I	V		1		1.36E+03	Dichloropropane, 1,2-	78-87-5	1.6E+01	n	6.6E+01	n	8.2E+00	n	5.0E+00
				2.0E-02	P			V		1		1.49E+03	Dichloropropane, 1,3-	142-28-9	1.6E+03	ns	2.3E+04	ns	3.7E+02	n	
				3.0E-03	I					1	0.1		Dichloropropanol, 2,3-	616-23-9	1.9E+02	n	2.5E+03	n	5.9E+01	n	
1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		1		1.57E+03	Dichloropropene, 1,3-	542-75-6	7.2E+01	n	3.1E+02	n	3.9E+01	n	
2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I			1	0.1		Dichlorvos	62-73-7	3.2E+01	n	4.1E+02	n	9.9E+00	n	
				3.0E-05	O					1	0.1		Dicrotophos	141-66-2	1.9E+00	n	2.5E+01	n	6.0E-01	n	
				8.0E-02	P	3.0E-04	X	V		1		2.56E+02	Dicyclopentadiene	77-73-6	1.3E+00	n	5.4E+00	n	6.3E-01	n	
1.6E+01	I	4.6E-03	I	5.0E-05	I					1	0.1		Dieldrin	60-57-1	3.2E+00	n	1.4E+01	c**	1.8E-01	c**	
		3.0E-04	C			5.0E-03	I			1	0.1		Diesel Engine Exhaust	E17136615							
				2.0E-03	P	2.0E-04	P			1	0.1		Diethanolamine	111-42-2	1.3E+02	n	1.6E+03	n	4.0E+01	n	
				3.0E-02	P	1.0E-04	P			1	0.1		Diethylene Glycol Monobutyl Ether	112-34-5	1.9E+03	n	2.4E+04	n	6.0E+02	n	
				6.0E-02	P	3.0E-04	P			1	0.1		Diethylene Glycol Monoethyl Ether	111-90-0	3.8E+03	n	4.8E+04	n	1.2E+03	n	
				1.0E-03	P			V		1		1.12E+05	Diethylformamide	617-84-5	7.8E+01	n	1.2E+03	n	2.0E+01	n	
3.5E+02	C	1.0E-01	C							1	0.1		Diethylstilbestrol	56-53-1	1.6E-01	c	6.6E-01	c	5.1E-03	c	
				8.3E-02	O					1	0.1		Difenzoquat	43222-48-6	5.2E+03	n	6.8E+04	n	1.7E+03	n	
				2.0E-02	I					1	0.1		Diflubenzuron	35367-38-5	1.3E+03	n	1.6E+04	n	2.9E+02	n	
						4.0E+01	I	V		1		1.43E+03	Difluoroethane, 1,1-	75-37-6	4.8E+04	ns	2.0E+05	nms	8.3E+04	n	

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
						3.0E+01	X	V		1		6.91E+02	Difluoropropane, 2,2-	420-45-1	2.4E+04	ns	1.0E+05	ns	6.3E+04	n	
4.4E-02	C	1.3E-05	C					V		1			Dihydrosafrole	94-58-6	9.9E+02	c	4.5E+03	c	3.0E+01	c	
						7.0E-01	P	V		1		2.26E+03	Diisopropyl Ether	108-20-3	2.2E+03	n	9.4E+03	ns	1.5E+03	n	
				8.0E-02	I			V		1		5.30E+02	Diisopropyl Methylphosphonate	1445-75-6	6.3E+03	ns	9.3E+04	ns	1.6E+03	n	
				2.2E-02	O					1	0.1		Dimethipin	55290-64-7	1.4E+03	n	1.8E+04	n	4.4E+02	n	
				2.2E-03	O					1	0.1		Dimethoate	60-51-5	1.4E+02	n	1.8E+03	n	4.4E+01	n	
1.6E+00	P									1	0.1		Dimethoxybenzidine, 3,3'-	119-90-4	3.4E+01	c	1.4E+02	c	4.7E+00	c	
1.7E-03	P			6.0E-02	P					1	0.1		Dimethyl methylphosphonate	756-79-6	3.8E+03	n	4.9E+04	n	1.2E+03	n	
4.6E+00	C	1.3E-03	C							1	0.1		Dimethylamino azobenzene [p-]	60-11-7	1.2E+01	c	5.0E+01	c	5.0E-01	c	
5.8E-01	H									1	0.1		Dimethylaniline HCl, 2,4-	21436-96-4	9.4E+01	c	4.0E+02	c	1.3E+01	c	
2.0E-01	P			2.0E-03	X					1	0.1		Dimethylaniline, 2,4-	95-68-1	1.3E+02	n	1.1E+03	c**	3.7E+01	c**	
2.7E-02	P			2.0E-03	I			V		1		8.30E+02	Dimethylaniline, N,N-	121-69-7	1.6E+02	n	2.3E+03	ns	3.5E+01	n	
1.1E+01	P									1	0.1		Dimethylbenzidine, 3,3'-	119-93-7	4.9E+00	c	2.1E+01	c	6.5E-01	c	
				1.0E-01	P	3.0E-02	I	V		1		1.06E+05	Dimethylformamide	68-12-2	2.6E+03	n	1.5E+04	n	6.1E+01	n	
				1.0E-04	X	2.0E-06	X	V		1		1.72E+05	Dimethylhydrazine, 1,1-	57-14-7	5.7E-02	n	2.4E-01	n	4.2E-03	n	
5.5E+02	C	1.6E-01	C					V		1		1.89E+05	Dimethylhydrazine, 1,2-	540-73-8	8.8E-02	c	4.1E-01	c	2.8E-03	c	
				2.0E-02	I					1	0.1		Dimethylphenol, 2,4-	105-67-9	1.3E+03	n	1.6E+04	n	3.6E+02	n	
				6.0E-04	I					1	0.1		Dimethylphenol, 2,6-	576-26-1	3.8E+01	n	4.9E+02	n	1.1E+01	n	
				1.0E-03	I					1	0.1		Dimethylphenol, 3,4-	95-65-8	6.3E+01	n	8.2E+02	n	1.8E+01	n	
4.5E-02	C	1.3E-05	C					V		1		4.73E+02	Dimethylvinylchloride	513-37-1	1.1E+02	c	4.8E+02	cs	3.3E+01	c	
				8.0E-05	X					1	0.1		Dinitro-o-cresol, 4,6-	534-52-1	5.1E+00	n	6.6E+01	n	1.5E+00	n	
				2.0E-03	I					1	0.1		Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	1.3E+02	n	1.6E+03	n	2.3E+01	n	
				1.0E-04	P					1	0.1		Dinitrobenzene, 1,2-	528-29-0	6.3E+00	n	8.2E+01	n	1.9E+00	n	
				1.0E-04	I					1	0.1		Dinitrobenzene, 1,3-	99-65-0	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				1.0E-04	P					1	0.1		Dinitrobenzene, 1,4-	100-25-4	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				2.0E-03	I					1	0.1		Dinitrophenol, 2,4-	51-28-5	1.3E+02	n	1.6E+03	n	3.9E+01	n	
6.8E-01	I									1	0.1		Dinitrotoluene Mixture, 2,4/2,6-	E1615210	8.0E+01	c	3.4E+02	c	1.1E+01	c	
3.1E-01	C	8.9E-05	C	2.0E-03	I					1	0.102		Dinitrotoluene, 2,4-	121-14-2	1.3E+02	n	7.4E+02	c**	2.4E+01	c**	
1.5E+00	P			3.0E-04	X					1	0.099		Dinitrotoluene, 2,6-	606-20-2	1.9E+01	n	1.5E+02	c**	4.9E+00	c**	
				2.0E-03	S					1	0.006		Dinitrotoluene, 2-Amino-4,6-	35572-78-2	1.5E+02	n	2.3E+03	n	3.9E+01	n	
				2.0E-03	S					1	0.009		Dinitrotoluene, 4-Amino-2,6-	19406-51-0	1.5E+02	n	2.3E+03	n	3.9E+01	n	
4.5E-01	X			9.0E-04	X					1	0.1		Dinitrotoluene, Technical grade	25321-14-6	5.7E+01	n	5.1E+02	c**	1.0E+01	c**	
				1.0E-03	I					1	0.1		Dinoseb	88-85-7	6.3E+01	n	8.2E+02	n	1.5E+01	n	7.0E+00
1.0E-01	I	5.0E-06	I	3.0E-02	I	3.0E-02	I	V		1		1.16E+05	Dioxane, 1,4-	123-91-1	5.3E+02	c**	2.4E+03	c**	4.6E+01	c**	
													Dioxins								
6.2E+03	I	1.3E+00	I							1	0.03		~Hexachlorodibenzo-p-dioxin, Mixture		1.0E-02	c	4.7E-02	c	1.3E-03	c	
1.3E+05	C	3.8E+01	C	7.0E-10	I	4.0E-08	C	V		1	0.03		~TCDD, 2,3,7,8-	1746-01-6	5.1E-05	n	7.2E-04	n	1.2E-05	c**	3.0E-05
				3.0E-02	I					1	0.1		Diphenamid	957-51-7	1.9E+03	n	2.5E+04	n	5.3E+02	n	
						4.0E-04	X	V		1			Diphenyl Ether	101-84-8	3.4E+01	n	1.4E+02	n	8.3E-01	n	
				8.0E-04	X					1	0.1		Diphenyl Sulfone	127-63-9	5.1E+01	n	6.6E+02	n	1.5E+01	n	
				1.0E-01	O					1	0.1		Diphenylamine	122-39-4	6.3E+03	n	8.2E+04	n	1.3E+03	n	
8.0E-01	I	2.2E-04	I							1	0.1		Diphenylhydrazine, 1,2-	122-66-7	6.8E+01	c	2.9E+02	c	7.8E+00	c	
				2.2E-03	I					1	0.1		Diquat	85-00-7	1.4E+02	n	1.8E+03	n	4.4E+01	n	2.0E+01
7.1E+00	C	1.4E-01	C							1	0.1		Direct Black 38	1937-37-7	7.6E+00	c	3.2E+01	c	1.1E+00	c	
7.4E+00	C	1.4E-01	C							1	0.1		Direct Blue 6	2602-46-2	7.3E+00	c	3.1E+01	c	1.1E+00	c	
6.7E+00	C	1.4E-01	C							1	0.1		Direct Brown 95	16071-86-6	8.1E+00	c	3.4E+01	c	1.2E+00	c	
				4.0E-05	I					1	0.1		Disulfoton	298-04-4	2.5E+00	n	3.3E+01	n	5.0E-01	n	
				1.0E-02	I			V		1			Dithiane, 1,4-	505-29-3	7.8E+02	n	1.2E+04	n	2.0E+02	n	
				2.0E-03	I					1	0.1		Diuron	330-54-1	1.3E+02	n	1.6E+03	n	3.6E+01	n	
				2.0E-02	O					1	0.1		Dodine	2439-10-3	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				5.0E-02	O			V		1			EPTC	759-94-4	3.9E+03	n	5.8E+04	n	7.5E+02	n	
				6.0E-03	I			V		1			Endosulfan	115-29-7	4.7E+02	n	7.0E+03	n	1.0E+02	n	
				2.0E-02	I					1	0.1		Endothall	145-73-3	1.3E+03	n	1.6E+04	n	3.8E+02	n	1.0E+02
				3.0E-04	I					1	0.1		Endrin	72-20-8	1.9E+01	n	2.5E+02	n	2.3E+00	n	2.0E+00
9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	V		1		1.05E+04	Epichlorohydrin	106-89-8	1.9E+01	n	8.2E+01	n	2.0E+00	n	
						2.0E-02	I	V		1		1.53E+04	Epoxybutane, 1,2-	106-88-7	1.6E+02	n	6.7E+02	n	4.2E+01	n	
				4.0E-02	P					1	0.1		Ethanol, 2-(2-methoxyethoxy)-	111-77-3	2.5E+03	n	3.3E+04	n	8.0E+02	n	
				5.0E-03	I					1	0.1		Ethephon	16672-87-0	3.2E+02	n	4.1E+03	n	1.0E+02	n	
				5.0E-04	I					1	0.1		Ethion	563-12-2	3.2E+01	n	4.1E+02	n	4.3E+00	n	
				1.0E-01	P	6.0E-02	P	V		1		2.38E+04	Ethoxyethanol Acetate, 2-	111-15-9	2.6E+03	n	1.4E+04	n	1.2E+02	n	
				9.0E-02	P	2.0E-01	I	V		1		1.06E+05	Ethoxyethanol, 2-	110-80-5	5.2E+03	n	4.7E+04	n	3.4E+02	n	
				9.0E-01	I	7.0E-02	P	V		1		1.08E+04	Ethyl Acetate	141-78-6	6.2E+02	n	2.6E+03	n	1.4E+02	n	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$ [1]	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				5.0E-03	P	8.0E-03	P	V		1		2.50E+03	Ethyl Acrylate	140-88-5	4.7E+01	n	2.1E+02	n	1.4E+01	n	
						1.0E+01	I	V		1		2.12E+03	Ethyl Chloride (Chloroethane)	75-00-3	1.4E+04	ns	5.7E+04	ns	2.1E+04	n	
				2.0E-01	I			V		1		1.01E+04	Ethyl Ether	60-29-7	1.6E+04	ns	2.3E+05	nms	3.9E+03	n	
						3.0E-01	P	V		1		1.10E+03	Ethyl Methacrylate	97-63-2	1.8E+03	ns	7.6E+03	ns	6.3E+02	n	
				1.0E-05	I					1	0.1		Ethyl-p-nitrophenyl Phosphonate	2104-64-5	6.3E-01	n	8.2E+00	n	8.9E-02	n	
1.1E-02	C	2.5E-06	C	1.0E-01	I	1.0E+00	I	V		1		4.80E+02	Ethylbenzene	100-41-4	5.8E+02	c**s	2.5E+03	c**s	1.5E+02	c**	7.0E+02
				7.0E-02	P					1	0.1		Ethylene Cyanohydrin	109-78-4	4.4E+03	n	5.7E+04	n	1.4E+03	n	
				9.0E-02	P			V		1		1.89E+05	Ethylene Diamine	107-15-3	7.0E+03	n	1.1E+05	nm	1.8E+03	n	
				2.0E+00	I	4.0E-01	C			1	0.1		Ethylene Glycol	107-21-1	1.3E+05	nm	1.6E+06	nm	4.0E+04	n	
				1.0E-01	I	1.6E+00	I			1	0.1		Ethylene Glycol Monobutyl Ether	111-76-2	6.3E+03	n	8.2E+04	n	2.0E+03	n	
3.1E-01	C	3.0E-03	I			3.0E-02	C	V	M	1		1.21E+05	Ethylene Oxide	75-21-8	2.0E-01	c	2.5E+00	c	6.7E-02	c	
4.5E-02	C	1.3E-05	C	8.0E-05	I					1	0.1		Ethylene Thiourea	96-45-7	5.1E+00	n	6.6E+01	n	1.6E+00	n	
6.5E+01	C	1.9E-02	C					V		1		1.54E+05	Ethyleneimine	151-56-4	2.7E-01	c	1.2E+00	c	2.4E-02	c	
				3.0E+00	I					1	0.1		Ethylphthalyl Ethyl Glycolate	84-72-0	1.9E+05	nm	2.5E+06	nm	5.8E+04	n	
				2.5E-04	I					1	0.1		Fenamiphos	22224-92-6	1.6E+01	n	2.1E+02	n	4.4E+00	n	
				2.5E-02	I					1	0.1		Fenpropathrin	39515-41-8	1.6E+03	n	2.1E+04	n	6.4E+01	n	
				2.5E-02	I					1	0.1		Fenvalerate	51630-58-1	1.6E+03	n	2.1E+04	n	5.0E+02	n	
				1.3E-02	I					1	0.1		Fluometuron	2164-17-2	8.2E+02	n	1.1E+04	n	2.4E+02	n	
				4.0E-02	C	1.3E-02	C			1			Fluoride	16984-48-8	3.1E+03	n	4.7E+04	n	8.0E+02	n	4.0E+03
				6.0E-02	I	1.3E-02	C			1			Fluorine (Soluble Fluoride)	7782-41-4	4.7E+03	n	7.0E+04	n	1.2E+03	n	4.0E+03
				8.0E-02	I					1	0.1		Fluridone	59756-60-4	5.1E+03	n	6.6E+04	n	1.4E+03	n	
				4.0E-02	O					1	0.1		Flurprimidol	56425-91-3	2.5E+03	n	3.3E+04	n	6.9E+02	n	
				2.0E-03	O					1	0.1		Flusilazole	85509-19-9	1.3E+02	n	1.6E+03	n	3.1E+01	n	
				5.0E-01	O					1	0.1		Flutolanil	66332-96-5	3.2E+04	n	4.1E+05	nm	7.9E+03	n	
				1.0E-02	I					1	0.1		Fluvalinate	69409-94-5	6.3E+02	n	8.2E+03	n	2.0E+02	n	
				9.0E-02	O					1	0.1		Folpet	133-07-3	5.7E+03	n	7.4E+04	n	1.6E+03	n	
				2.5E-03	O					1	0.1		Fomesafen	72178-02-0	1.6E+02	n	2.1E+03	n	4.8E+01	n	
				2.0E-03	I					1	0.1		Fonofos	944-22-9	1.3E+02	n	1.6E+03	n	2.4E+01	n	
		1.3E-05	I	2.0E-01	I	9.8E-03	A	V		1		4.24E+04	Formaldehyde	50-00-0	7.6E+02	n	3.3E+03	n	2.0E+01	n	
				9.0E-01	P	3.0E-04	X	V		1		1.06E+05	Formic Acid	64-18-6	2.9E+01	n	1.2E+02	n	6.3E-01	n	
				2.5E+00	O					1	0.1		Fosetyl-AL	39148-24-8	1.6E+05	nm	2.1E+06	nm	5.0E+04	n	
													Furans								
				1.0E-03	X			V		1	0.03		~Dibenzofuran	132-64-9	7.3E+01	n	1.0E+03	n	7.9E+00	n	
				1.0E-03	I			V		1	0.03	6.22E+03	~Furan	110-00-9	7.3E+01	n	1.0E+03	n	1.9E+01	n	
				9.0E-01	I	2.0E+00	I	V		1	0.03	1.65E+05	~Tetrahydrofuran	109-99-9	1.8E+04	n	9.4E+04	n	3.4E+03	n	
3.8E+00	H									1	0.1		Furazolidone	67-45-8	1.4E+01	c	6.0E+01	c	2.0E+00	c	
				3.0E-03	I	5.0E-02	H	V		1		1.01E+04	Furfural	98-01-1	2.1E+02	n	2.6E+03	n	3.8E+01	n	
1.5E+00	C	4.3E-04	C							1	0.1		Furium	531-82-8	3.6E+01	c	1.5E+02	c	5.1E+00	c	
3.0E-02	I	8.6E-06	C							1	0.1		Furmecyclox	60568-05-0	1.8E+03	c	7.7E+03	c	1.1E+02	c	
				6.0E-03	O					1	0.1		Glufosinate, Ammonium	77182-82-2	3.8E+02	n	4.9E+03	n	1.2E+02	n	
				1.0E-01	A	8.0E-05	C			1	0.1		Glutaraldehyde	111-30-8	6.0E+03	n	7.0E+04	n	2.0E+03	n	
				4.0E-04	I	1.0E-03	H	V		1		1.06E+05	Glycidyl	765-34-4	2.3E+01	n	2.1E+02	n	1.7E+00	n	
				1.0E-01	I					1	0.1		Glyphosate	1071-83-6	6.3E+03	n	8.2E+04	n	2.0E+03	n	7.0E+02
				1.0E-02	X			V		1			Guanidine	113-00-8	7.8E+02	n	1.2E+04	n	2.0E+02	n	
				2.0E-02	P					1	0.1		Guanidine Chloride	50-01-1	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				3.0E-02	X					1	0.1		Guanidine Nitrate	506-93-4	1.9E+03	n	2.5E+04	n	6.0E+02	n	
				5.0E-05	I					1	0.1		Haloxyfop, Methyl	69806-40-2	3.2E+00	n	4.1E+01	n	7.6E-01	n	
4.5E+00	I	1.3E-03	I	5.0E-04	I			V		1			Heptachlor	76-44-8	1.3E+01	c**	6.3E+01	c**	1.4E-01	c**	4.0E-01
9.1E+00	I	2.6E-03	I	1.3E-05	I			V		1			Heptachlor Epoxide	1024-57-3	1.0E+00	n	1.5E+01	n	1.2E-01	n	2.0E-01
						3.0E-03	X	V		1		2.09E+02	Heptanal, n-	111-71-7	2.4E+01	n	1.0E+02	n	6.3E+00	n	
				3.0E-04	X	4.0E-01	P	V		1		5.79E+01	Heptane, N-	142-82-5	2.2E+01	n	2.9E+02	ns	6.0E+00	n	
				2.0E-03	I			V		1			Hexabromobenzene	87-82-1	1.6E+02	n	2.3E+03	n	4.0E+01	n	
				2.0E-04	I					1	0.1		Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	1.3E+01	n	1.6E+02	n	4.0E+00	n	
1.6E+00	I	4.6E-04	I	8.0E-04	I			V		1			Hexachlorobenzene	118-74-1	2.1E+01	c**	9.6E+01	c**	9.8E-01	c*	1.0E+00
7.8E-02	I	2.2E-05	I	1.0E-03	P			V		1		1.68E+01	Hexachlorobutadiene	87-68-3	7.8E+01	ns	5.3E+02	c**s	6.5E+00	n	
6.3E+00	I	1.8E-03	I	8.0E-03	A					1	0.1		Hexachlorocyclohexane, Alpha-	319-84-6	8.6E+00	c*	3.6E+01	c	7.2E-01	c	
1.8E+00	I	5.3E-04	I							1	0.1		Hexachlorocyclohexane, Beta-	319-85-7	3.0E+01	c	1.3E+02	c	2.5E+00	c	
1.1E+00	C	3.1E-04	C	3.0E-04	I					1	0.04		Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	2.1E+01	n	2.5E+02	c**	3.6E+00	n	2.0E-01
1.8E+00	I	5.1E-04	I							1	0.1		Hexachlorocyclohexane, Technical	608-73-1	3.0E+01	c	1.3E+02	c	2.5E+00	c	
				6.0E-03	I	2.0E-04	I	V		1		1.57E+01	Hexachlorocyclopentadiene	77-47-4	1.8E+00	n	7.5E+00	n	4.1E-01	n	5.0E+01
4.0E-02	I	1.1E-05	C	7.0E-04	I	3.0E-02	I	V		1			Hexachloroethane	67-72-1	4.5E+01	n	4.6E+02	n	6.2E+00	n	
				3.0E-04	I					1	0.1		Hexachlorophene	70-30-4	1.9E+01	n	2.5E+02	n	6.0E+00	n	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
1.1E-01	I			3.0E-03	I					1	0.015		Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	2.3E+02	n	2.8E+03	c**	6.0E+01	n	
						1.0E-05	I	V		1		3.39E+03	Hexamethylene Diisocyanate, 1,6-	822-06-0	3.1E+00	n	1.3E+01	n	2.1E-02	n	
				4.0E-04	P					1	0.1		Hexamethylphosphoramide	680-31-9	2.5E+01	n	3.3E+02	n	8.0E+00	n	
						7.0E-01	I	V		1		1.41E+02	Hexane, N-	110-54-3	6.1E+02	ns	2.5E+03	ns	1.5E+03	n	
				2.0E+00	P					1	0.1		Hexanedioic Acid	124-04-9	1.3E+05	nm	1.6E+06	nm	4.0E+04	n	
				5.0E-03	I	3.0E-02	I	V		1		3.28E+03	Hexanone, 2-	591-78-6	2.0E+02	n	1.3E+03	n	3.8E+01	n	
				3.3E-02	I					1	0.1		Hexazinone	51235-04-2	2.1E+03	n	2.7E+04	n	6.4E+02	n	
				2.5E-02	I					1	0.1		Hexythiazox	78587-05-0	1.6E+03	n	2.1E+04	n	1.1E+02	n	
				1.7E-02	O					1	0.1		Hydramethylnon	67485-29-4	1.1E+03	n	1.4E+04	n	3.4E+02	n	
3.0E+00	I	4.9E-03	I			3.0E-05	P	V		1		1.12E+05	Hydrazine	302-01-2	2.0E+00	n	8.6E+00	n	6.3E-02	n	
3.0E+00	I	4.9E-03	I							1			Hydrazine Sulfate	10034-93-2	2.3E+01	c	1.1E+02	c	2.6E+00	c	
						2.0E-02	I	V		1			Hydrogen Chloride	7647-01-0	2.8E+07	nm	1.2E+08	nm	4.2E+01	n	
				4.0E-02	C	1.4E-02	C	V		1			Hydrogen Fluoride	7664-39-3	3.1E+03	n	4.7E+04	n	2.8E+01	n	
						2.0E-03	I	V		1			Hydrogen Sulfide	7783-06-4	2.8E+06	nm	1.2E+07	nm	4.2E+00	n	
6.0E-02	P			4.0E-02	P					1	0.1		Hydroquinone	123-31-9	9.0E+02	c**	3.8E+03	c**	1.3E+02	c**	
6.1E-02	O			2.5E-03	O					1	0.1		Imazalil	35554-44-0	1.6E+02	n	2.1E+03	n	3.6E+01	n	
				2.5E-01	I					1	0.1		Imazaquin	81335-37-7	1.6E+04	n	2.1E+05	nm	4.9E+03	n	
				2.5E+00	O					1	0.1		Imazethapyr	81335-77-5	1.6E+05	nm	2.1E+06	nm	4.7E+04	n	
				1.0E-02	A					1			Iodine	7553-56-2	7.8E+02	n	1.2E+04	n	2.0E+02	n	
				4.0E-02	I					1	0.1		Iprodione	36734-19-7	2.5E+03	n	3.3E+04	n	7.4E+02	n	
				7.0E-01	P					1			Iron	7439-89-6	5.5E+04	n	8.2E+05	nm	1.4E+04	n	
				3.0E-01	I			V		1		1.00E+04	Isobutyl Alcohol	78-83-1	2.3E+04	ns	3.5E+05	nms	5.9E+03	n	
9.5E-04	I			2.0E-01	I	2.0E+00	C			1	0.1		Isophorone	78-59-1	1.3E+04	n	1.6E+05	nm	3.8E+03	n	
				1.5E-02	I			V		1			Isopropalin	33820-53-0	1.2E+03	n	1.8E+04	n	4.0E+01	n	
				2.0E+00	P	2.0E-01	P	V		1		1.09E+05	Isopropanol	67-63-0	5.6E+03	n	2.4E+04	n	4.1E+02	n	
				1.0E-01	I					1	0.1		Isopropyl Methyl Phosphonic Acid	1832-54-8	6.3E+03	n	8.2E+04	n	2.0E+03	n	
				5.0E-02	I					1	0.1		Isoxaben	82558-50-7	3.2E+03	n	4.1E+04	n	7.3E+02	n	
						3.0E-01	A	V		1			JP-7	E1737665	4.3E+08	nm	1.8E+09	nm	6.3E+02	n	
				8.0E-03	O					1	0.1		Lactofen	77501-63-4	5.1E+02	n	6.6E+03	n	1.0E+02	n	
				2.0E-04	X					1	0.1		Lactonitrile	78-97-7	1.3E+01	n	1.6E+02	n	4.0E+00	n	
													Lead Compounds								
8.5E-03	C	1.2E-05	C							1			~Lead Phosphate	7446-27-7	8.2E+03	c	3.8E+04	c	9.1E+02	c	
8.5E-03	C	1.2E-05	C							1	0.1		~Lead acetate	301-04-2	6.4E+03	c	2.7E+04	c	9.2E+02	c	
										1			~Lead and Compounds	7439-92-1	4.0E+02	L	8.0E+02	L	1.5E+01	L	1.5E+01
8.5E-03	C	1.2E-05	C							1	0.1		~Lead subacetate	1335-32-6	6.4E+03	c	2.7E+04	c	9.2E+02	c	
				1.0E-07	I			V		1		2.43E+00	~Tetraethyl Lead	78-00-2	7.8E-03	n	1.2E-01	n	1.3E-03	n	
				5.0E-06	P			V		1		3.83E+02	Lewisite	541-25-3	3.9E-01	n	5.8E+00	n	9.0E-02	n	
				7.7E-03	O					1	0.1		Linuron	330-55-2	4.9E+02	n	6.3E+03	n	1.3E+02	n	
				2.0E-03	P					1			Lithium	7439-93-2	1.6E+02	n	2.3E+03	n	4.0E+01	n	
				5.0E-04	I					1	0.1		MCPA	94-74-6	3.2E+01	n	4.1E+02	n	7.5E+00	n	
				4.4E-03	O					1	0.1		MCPB	94-81-5	2.8E+02	n	3.6E+03	n	6.5E+01	n	
				1.0E-03	I					1	0.1		MCPP	93-65-2	6.3E+01	n	8.2E+02	n	1.6E+01	n	
				2.0E-02	I					1	0.1		Malathion	121-75-5	1.3E+03	n	1.6E+04	n	3.9E+02	n	
				1.0E-01	I	7.0E-04	C			1	0.1		Maleic Anhydride	108-31-6	6.3E+03	n	8.0E+04	n	1.9E+03	n	
				5.0E-01	I					1	0.1		Maleic Hydrazide	123-33-1	3.2E+04	n	4.1E+05	nm	1.0E+04	n	
				1.0E-04	P					1	0.1		Malononitrile	109-77-3	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				3.0E-02	H					1	0.1		Mancozeb	8018-01-7	1.9E+03	n	2.5E+04	n	5.4E+02	n	
				5.0E-03	I					1	0.1		Maneb	12427-38-2	3.2E+02	n	4.1E+03	n	9.8E+01	n	
				1.4E-01	I	5.0E-05	I			1			Manganese (Diet)	7439-96-5							
				2.4E-02	S	5.0E-05	I			0.04			Manganese (Non-diet)	7439-96-5	1.8E+03	n	2.6E+04	n	4.3E+02	n	
				9.0E-05	H					1	0.1		Mephosfolan	950-10-7	5.7E+00	n	7.4E+01	n	1.8E+00	n	
				3.0E-02	I					1	0.1		Mepiquat Chloride	24307-26-4	1.9E+03	n	2.5E+04	n	6.0E+02	n	
1.1E-02	P			4.0E-03	P					1	0.1		Mercaptobenzothiazole, 2-	149-30-4	2.5E+02	n	3.3E+03	n	7.2E+01	n	
													Mercury Compounds								
				3.0E-04	I	3.0E-04	S			0.07			~Mercuric Chloride (and other Mercury salts)	7487-94-7	2.3E+01	n	3.5E+02	n	5.7E+00	n	2.0E+00
						3.0E-04	I	V		1		3.13E+00	~Mercury (elemental)	7439-97-6	1.1E+01	ns	4.6E+01	ns	6.3E-01	n	2.0E+00
				1.0E-04	I					1			~Methyl Mercury	22967-92-6	7.8E+00	n	1.2E+02	n	2.0E+00	n	
				8.0E-05	I					1	0.1		~Phenylmercuric Acetate	62-38-4	5.1E+00	n	6.6E+01	n	1.6E+00	n	
				3.0E-05	I			V		1			Merphos	150-50-5	2.3E+00	n	3.5E+01	n	6.0E-01	n	
				1.0E-04	O					1	0.1		Merphos Oxide	78-48-8	6.3E+00	n	8.2E+01	n	2.8E-01	n	
				6.0E-02	I					1	0.1		Metalaxyl	57837-19-1	3.8E+03	n	4.9E+04	n	1.2E+03	n	
				1.0E-04	I	3.0E-02	P	V		1		4.58E+03	Methacrylonitrile	126-98-7	7.5E+00	n	1.0E+02	n	1.9E+00	n	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				5.0E-05	I					1	0.1		Methamidophos	10265-92-6	3.2E+00	n	4.1E+01	n	1.0E+00	n	
				2.0E+00	I	2.0E+01	I	V		1		1.06E+05	Methanol	67-56-1	1.2E+05	nms	1.2E+06	nms	2.0E+04	n	
				1.5E-03	O					1	0.1		Methidathion	950-37-8	9.5E+01	n	1.2E+03	n	2.9E+01	n	
				2.5E-02	I					1	0.1		Methomyl	16752-77-5	1.6E+03	n	2.1E+04	n	5.0E+02	n	
4.9E-02	C	1.4E-05	C							1	0.1		Methoxy-5-nitroaniline, 2-	99-59-2	1.1E+03	c	4.7E+03	c	1.5E+02	c	
				5.0E-03	I					1	0.1		Methoxychlor	72-43-5	3.2E+02	n	4.1E+03	n	3.7E+01	n	4.0E+01
				8.0E-03	P	1.0E-03	P	V		1		1.15E+05	Methoxyethanol Acetate, 2-	110-49-6	1.1E+02	n	5.1E+02	n	2.1E+00	n	
				5.0E-03	P	2.0E-02	I	V		1		1.06E+05	Methoxyethanol, 2-	109-86-4	3.3E+02	n	3.5E+03	n	2.9E+01	n	
				1.0E+00	X			V		1		2.90E+04	Methyl Acetate	79-20-9	7.8E+04	ns	1.2E+06	nms	2.0E+04	n	
						2.0E-02	P	V		1		6.75E+03	Methyl Acrylate	96-33-3	1.5E+02	n	6.1E+02	n	4.2E+01	n	
				6.0E-01	I	5.0E+00	I	V		1		2.84E+04	Methyl Ethyl Ketone (2-Butanone)	78-93-3	2.7E+04	n	1.9E+05	nms	5.6E+03	n	
		1.0E-03	X	1.0E-03	P	2.0E-05	X	V		1		1.80E+05	Methyl Hydrazine	60-34-4	1.0E+00	n	4.4E+00	n	4.2E-02	n	
						3.0E+00	I	V		1		3.36E+03	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	3.3E+04	ns	1.4E+05	nms	6.3E+03	n	
						1.0E-03	C	V		1		1.01E+04	Methyl Isocyanate	624-83-9	4.6E+00	n	1.9E+01	n	2.1E+00	n	
				1.4E+00	I	7.0E-01	I	V		1		2.36E+03	Methyl Methacrylate	80-62-6	4.4E+03	ns	1.9E+04	ns	1.4E+03	n	
				2.5E-04	I					1	0.1		Methyl Parathion	298-00-0	1.6E+01	n	2.1E+02	n	4.5E+00	n	
				6.0E-02	X					1	0.1		Methyl Phosphonic Acid	993-13-5	3.8E+03	n	4.9E+04	n	1.2E+03	n	
				6.0E-03	H	4.0E-02	H	V		1		3.93E+02	Methyl Styrene (Mixed Isomers)	25013-15-4	3.2E+02	n	2.6E+03	ns	2.3E+01	n	
9.9E-02	C	2.8E-05	C							1	0.1		Methyl methanesulfonate	66-27-3	5.5E+02	c	2.3E+03	c	7.9E+01	c	
1.8E-03	C	2.6E-07	C			3.0E+00	I	V		1		8.87E+03	Methyl tert-Butyl Ether (MTBE)	1634-04-4	4.7E+03	c**	2.1E+04	c**s	1.4E+03	c**	
				3.0E-04	X					1	0.1		Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2	1.9E+01	n	2.5E+02	n	6.0E+00	n	
						3.0E+00	X	V		1		2.45E+03	Methyl-2-Pentanol, 4-	108-11-2	5.4E+04	ns	2.3E+05	nms	6.3E+03	n	
9.0E-03	P			2.0E-02	X					1	0.1		Methyl-5-Nitroaniline, 2-	99-55-8	1.3E+03	n	1.6E+04	n	3.8E+02	n	
8.3E+00	C	2.4E-03	C							1	0.1		Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	6.5E+00	c	2.8E+01	c	9.4E-01	c	
1.3E-01	C	3.7E-05	C							1	0.1		Methylaniline Hydrochloride, 2-	636-21-5	4.2E+02	c	1.8E+03	c	6.0E+01	c	
				1.0E-02	A					1	0.1		Methylarsonic acid	124-58-3	6.3E+02	n	8.2E+03	n	2.0E+02	n	
				2.0E-04	X					1	0.1		Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7	1.3E+01	n	1.6E+02	n	4.0E+00	n	
1.0E-01	X			3.0E-04	X					1	0.1		Methylbenzene-1,4-diamine sultate, 2-	615-50-9	1.9E+01	n	2.5E+02	n	6.0E+00	n	
2.2E+01	C	6.3E-03	C						M	1	0.1		Methylcholanthrene, 3-	56-49-5	5.5E-01	c	1.0E+01	c	1.1E-01	c	
2.0E-03	I	1.0E-08	I	6.0E-03	I	6.0E-01	I	V	M	1		3.32E+03	Methylene Chloride	75-09-2	3.5E+02	n	3.2E+03	n	1.1E+02	n	5.0E+00
1.0E-01	P	4.3E-04	C	2.0E-03	P				M	1	0.1		Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.2E+02	c**	1.6E+03	n	1.6E+01	c**	
4.6E-02	I	1.3E-05	C							1	0.1		Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.2E+03	c	5.0E+03	c	4.8E+01	c	
1.6E+00	C	4.6E-04	C			2.0E-02	C			1	0.1		Methylenebisbenzenamine, 4,4'-	101-77-9	3.4E+01	c	1.4E+02	c	4.7E+00	c	
						6.0E-04	I			1	0.1		Methylenediphenyl Diisocyanate	101-68-8	8.5E+05	nm	3.6E+06	nm			
				7.0E-02	H			V		1		5.00E+02	Methylstyrene, Alpha-	98-83-9	5.5E+03	ns	8.2E+04	ns	7.8E+02	n	
				1.5E-01	I					1	0.1		Metolachlor	51218-45-2	9.5E+03	n	1.2E+05	nm	2.7E+03	n	
				2.5E-02	I					1	0.1		Metribuzin	21087-64-9	1.6E+03	n	2.1E+04	n	4.9E+02	n	
				2.5E-01	I					1	0.1		Metsulfuron-methyl	74223-64-6	1.6E+04	n	2.1E+05	nm	4.9E+03	n	
				3.0E+00	P			V		1		3.42E-01	Mineral oils	8012-95-1	2.3E+05	nms	3.5E+06	nms	6.0E+04	n	
1.8E+01	C	5.1E-03	C	2.0E-04	I			V		1			Mirex	2385-85-5	3.6E+00	c**	1.7E+01	c*	8.8E-02	c*	
				2.0E-03	I					1	0.1		Molinate	2212-67-1	1.3E+02	n	1.6E+03	n	3.0E+01	n	
				5.0E-03	I					1			Molybdenum	7439-98-7	3.9E+02	n	5.8E+03	n	1.0E+02	n	
				1.0E-01	I					1			Monochloramine	10599-90-3	7.8E+03	n	1.2E+05	nm	2.0E+03	n	4.0E+03
				2.0E-03	P					1	0.1		Monomethylaniline	100-61-8	1.3E+02	n	1.6E+03	n	3.8E+01	n	
				2.5E-02	I					1	0.1		Myclobutanil	88671-89-0	1.6E+03	n	2.1E+04	n	4.5E+02	n	
				3.0E-04	X					1	0.1		N,N'-Diphenyl-1,4-benzenediamine	74-31-7	1.9E+01	n	2.5E+02	n	3.6E+00	n	
				2.0E-03	I			V		1			Naled	300-76-5	1.6E+02	n	2.3E+03	n	4.0E+01	n	
				3.0E-02	X	1.0E-01	P	V		1			Naphtha, High Flash Aromatic (HFAN)	64742-95-6	2.3E+03	n	3.5E+04	n	1.5E+02	n	
1.8E+00	C	0.0E+00	C							1	0.1		Naphthylamine, 2-	91-59-8	3.0E+01	c	1.3E+02	c	3.9E+00	c	
				1.2E-01	O					1	0.1		Napropamide	15299-99-7	7.6E+03	n	9.8E+04	n	2.0E+03	n	
		2.6E-04	C	1.1E-02	C	1.4E-05	C			1	0.1		Nickel Acetate	373-02-4	6.7E+02	n	8.1E+03	n	2.2E+02	n	
		2.6E-04	C	1.1E-02	C	1.4E-05	C			1	0.1		Nickel Carbonate	3333-67-3	6.7E+02	n	8.1E+03	n	2.2E+02	n	
		2.6E-04	C	1.1E-02	C	1.4E-05	C	V		1			Nickel Carbonyl	13463-39-3	8.2E+02	n	1.1E+04	n	2.9E-02	n	
		2.6E-04	C	1.1E-02	C	1.4E-05	C			0.04			Nickel Hydroxide	12054-48-7	8.2E+02	n	1.1E+04	n	2.0E+02	n	
		2.6E-04	C	1.1E-02	C	2.0E-05	C			0.04			Nickel Oxide	1313-99-1	8.4E+02	n	1.2E+04	n	2.0E+02	n	
		2.4E-04	I	1.1E-02	C	1.4E-05	C			0.04			Nickel Refinery Dust	E715532	8.2E+02	n	1.1E+04	n	2.2E+02	n	
		2.6E-04	C	2.0E-02	I	9.0E-05	A			0.04			Nickel Soluble Salts	7440-02-0	1.5E+03	n	2.2E+04	n	3.9E+02	n	
1.7E+00	C	4.8E-04	I	1.1E-02	C	1.4E-05	C			0.04			Nickel Subsulfide	12035-72-2	4.1E+01	c*	1.9E+02	c*	4.5E+00	c*	
		2.6E-04	C	1.1E-02	C	1.4E-05	C			1	0.1		Nickelocene	1271-28-9	6.7E+02	n	8.1E+03	n	2.2E+02	n	
				1.6E+00	I					1			Nitrate	14797-55-8	1.3E+05	nm	1.9E+06	nm	3.2E+04	n	1.0E+04
										1			Nitrate + Nitrite (as N)	E701177							1.0E+04
				1.0E-01	I					1			Nitrite	14797-65-0	7.8E+03	n	1.2E+05	nm	2.0E+03	n	1.0E+03

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				1.0E-02	X	5.0E-05	X			1	0.1		Nitroaniline, 2-	88-74-4	6.3E+02	n	8.0E+03	n	1.9E+02	n	
2.0E-02	P			4.0E-03	P	6.0E-03	P			1	0.1		Nitroaniline, 4-	100-01-6	2.5E+02	n	3.3E+03	n	7.8E+01	n	
		4.0E-05	I	2.0E-03	I	9.0E-03	I	V		1		3.05E+03	Nitrobenzene	98-95-3	1.3E+02	n	1.3E+03	n	1.3E+01	n	
				3.0E+03	P					1	0.1		Nitrocellulose	9004-70-0	1.9E+08	nm	2.5E+09	nm	6.0E+07	n	
				7.0E-02	H					1	0.1		Nitrofurantoin	67-20-9	4.4E+03	n	5.7E+04	n	1.4E+03	n	
1.3E+00	C	3.7E-04	C							1	0.1		Nitrofurazone	59-87-0	4.2E+01	c	1.8E+02	c	6.0E+00	c	
1.7E-02	P			1.0E-04	P					1	0.1		Nitroglycerin	55-63-0	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				1.0E-01	I					1	0.1		Nitroguanidine	556-88-7	6.3E+03	n	8.2E+04	n	2.0E+03	n	
		8.8E-06	P			5.0E-03	P	V		1		1.80E+04	Nitromethane	75-52-5	8.8E+01	n	3.7E+02	n	1.0E+01	n	
		2.7E-03	H			2.0E-02	I	V		1		4.86E+03	Nitropropane, 2-	79-46-9	1.4E+00	c	6.0E+00	c	2.1E-01	c	
2.7E+01	C	7.7E-03	C						M	1	0.1		Nitroso-N-ethylurea, N-	759-73-9	4.5E-01	c	8.5E+00	c	9.2E-02	c	
1.2E+02	C	3.4E-02	C						M	1	0.1		Nitroso-N-methylurea, N-	684-93-5	1.0E-01	c	1.9E+00	c	2.1E-02	c	
5.4E+00	I	1.6E-03	I					V		1			Nitroso-di-N-butylamine, N-	924-16-3	9.9E+00	c	4.6E+01	c	2.7E-01	c	
7.0E+00	I	2.0E-03	C							1	0.1		Nitroso-di-N-propylamine, N-	621-64-7	7.8E+00	c	3.3E+01	c	1.1E+00	c	
2.8E+00	I	8.0E-04	C							1	0.1		Nitrosodiethanolamine, N-	1116-54-7	1.9E+01	c	8.2E+01	c	2.8E+00	c	
1.5E+02	I	4.3E-02	I						M	1	0.1		Nitrosodiethylamine, N-	55-18-5	8.1E-02	c	1.5E+00	c	1.7E-02	c	
5.1E+01	I	1.4E-02	I	8.0E-06	P	4.0E-05	X	V	M	1		2.37E+05	Nitrosodimethylamine, N-	62-75-9	2.0E-01	c**	3.4E+00	c**	1.1E-02	c**	
4.9E-03	I	2.6E-06	C							1	0.1		Nitrosodiphenylamine, N-	86-30-6	1.1E+04	c	4.7E+04	c	1.2E+03	c	
2.2E+01	I	6.3E-03	C					V		1		1.08E+05	Nitrosomethylethylamine, N-	10595-95-6	2.0E+00	c	9.1E+00	c	7.1E-02	c	
6.7E+00	C	1.9E-03	C							1	0.1		Nitrosomorpholine [N-]	59-89-2	8.1E+00	c	3.4E+01	c	1.2E+00	c	
9.4E+00	C	2.7E-03	C							1	0.1		Nitrosopiperidine [N-]	100-75-4	5.8E+00	c	2.4E+01	c	8.2E-01	c	
2.1E+00	I	6.1E-04	I							1	0.1		Nitrosopyrrolidine, N-	930-55-2	2.6E+01	c	1.1E+02	c	3.7E+00	c	
				1.0E-04	X					1	0.1		Nitrotoluene, m-	99-08-1	6.3E+00	n	8.2E+01	n	1.7E+00	n	
2.2E-01	P			9.0E-04	P			V		1		1.51E+03	Nitrotoluene, o-	88-72-2	7.0E+01	n	1.1E+03	n	1.6E+01	n	
1.6E-02	P			4.0E-03	P					1	0.1		Nitrotoluene, p-	99-99-0	2.5E+02	n	3.3E+03	n	7.1E+01	n	
				3.0E-04	X	2.0E-02	P	V		1		6.86E+00	Nonane, n-	111-84-2	1.1E+01	ns	7.2E+01	ns	5.3E+00	n	
				1.5E-02	O					1	0.1		Norflurazon	27314-13-2	9.5E+02	n	1.2E+04	n	2.9E+02	n	
				3.0E-03	I					1	0.1		Octabromodiphenyl Ether	32536-52-0	1.9E+02	n	2.5E+03	n	6.0E+01	n	
				5.0E-02	I					1	0.006		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	3.9E+03	n	5.7E+04	n	1.0E+03	n	
				2.0E-03	H					1	0.1		Octamethylpyrophosphoramide	152-16-9	1.3E+02	n	1.6E+03	n	4.0E+01	n	
7.8E-03	O			1.4E-01	O					1	0.1		Oryzalin	19044-88-3	7.0E+03	c**	2.9E+04	c**	7.9E+02	c**	
				5.0E-03	I					1	0.1		Oxadiazon	19666-30-9	3.2E+02	n	4.1E+03	n	4.7E+01	n	
				2.5E-02	I					1	0.1		Oxamyl	23135-22-0	1.6E+03	n	2.1E+04	n	5.0E+02	n	2.0E+02
7.3E-02	O			3.0E-02	O					1	0.1		Oxyfluorfen	42874-03-3	7.4E+02	c**	3.1E+03	c**	5.4E+01	c**	
				1.3E-02	I					1	0.1		Paclobutrazol	76738-62-0	8.2E+02	n	1.1E+04	n	2.3E+02	n	
				4.5E-03	I					1	0.1		Paraquat Dichloride	1910-42-5	2.8E+02	n	3.7E+03	n	9.0E+01	n	
				6.0E-03	H					1	0.1		Parathion	56-38-2	3.8E+02	n	4.9E+03	n	8.6E+01	n	
				5.0E-02	H			V		1			Pebulate	1114-71-2	3.9E+03	n	5.8E+04	n	5.6E+02	n	
				3.0E-01	O					1	0.1		Pendimethalin	40487-42-1	1.9E+04	n	2.5E+05	nm	1.4E+03	n	
				2.0E-03	I			V		1		3.12E-01	Pentabromodiphenyl Ether	32534-81-9	1.6E+02	ns	2.3E+03	ns	4.0E+01	n	
				1.0E-04	I					1	0.1		Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				8.0E-04	I			V		1			Pentachlorobenzene	608-93-5	6.3E+01	n	9.3E+02	n	3.2E+00	n	
9.0E-02	P							V		1		4.57E+02	Pentachloroethane	76-01-7	7.7E+02	cs	3.6E+03	cs	6.5E+01	c	
2.6E-01	H			3.0E-03	I			V		1			Pentachloronitrobenzene	82-68-8	2.3E+02	n	1.3E+03	c**	1.2E+01	c**	
4.0E-01	I	5.1E-06	C	5.0E-03	I					1	0.25		Pentachlorophenol	87-86-5	1.0E+02	c**	4.0E+02	c**	4.1E+00	c**	1.0E+00
4.0E-03	X			2.0E-03	P					1	0.1		Pentaerythritol tetranitrate (PETN)	78-11-5	1.3E+02	n	1.6E+03	n	3.9E+01	n	
						1.0E+00	P	V		1		3.88E+02	Pentane, n-	109-66-0	8.1E+02	ns	3.4E+03	ns	2.1E+03	n	
													Perchlorates								
				7.0E-04	I					1			~Ammonium Perchlorate	7790-98-9	5.5E+01	n	8.2E+02	n	1.4E+01	n	
				7.0E-04	I					1			~Lithium Perchlorate	7791-03-9	5.5E+01	n	8.2E+02	n	1.4E+01	n	1.5E+01(F
				7.0E-04	I					1			~Perchlorate and Perchlorate Salts	14797-73-0	5.5E+01	n	8.2E+02	n	1.4E+01	n	)
				7.0E-04	I					1			~Potassium Perchlorate	7778-74-7	5.5E+01	n	8.2E+02	n	1.4E+01	n	
				7.0E-04	I					1			~Sodium Perchlorate	7601-89-0	5.5E+01	n	8.2E+02	n	1.4E+01	n	
				2.0E-02	P					1	0.1		Perfluorobutane sulfonic acid (PFBS)	375-73-5	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				2.0E-02	P					1	0.1		Perfluorobutanesulfonate	45187-15-3	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				5.0E-02	I					1	0.1		Permethrin	52645-53-1	3.2E+03	n	4.1E+04	n	1.0E+03	n	
2.2E-03	C	6.3E-07	C							1	0.1		Phenacetin	62-44-2	2.5E+04	c	1.0E+05	cm	3.4E+03	c	
				2.4E-01	O					1	0.1		Phenmedipham	13684-63-4	1.5E+04	n	2.0E+05	nm	3.8E+03	n	
				3.0E-01	I	2.0E-01	C			1	0.1		Phenol	108-95-2	1.9E+04	n	2.5E+05	nm	5.8E+03	n	
				4.0E-03	I					1	0.1		Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	2.5E+02	n	3.3E+03	n	7.8E+01	n	
				5.0E-04	X					1	0.1		Phenothiazine	92-84-2	3.2E+01	n	4.1E+02	n	4.3E+00	n	

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$ [1]	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				2.0E-04	X			V		1		1.29E+02	Phenyl Isothiocyanate	103-72-0	1.6E+01	n	2.3E+02	ns	2.6E+00	n	
				6.0E-03	I					1	0.1		Phenylenediamine, m-	108-45-2	3.8E+02	n	4.9E+03	n	1.2E+02	n	
1.2E-01	P			4.0E-03	P					1	0.1		Phenylenediamine, o-	95-54-5	2.5E+02	n	1.9E+03	c**	6.5E+01	c**	
				1.0E-03	X					1	0.1		Phenylenediamine, p-	106-50-3	6.3E+01	n	8.2E+02	n	2.0E+01	n	
1.9E-03	H									1	0.1		Phenylphenol, 2-	90-43-7	2.8E+04	c	1.2E+05	cm	3.0E+03	c	
				2.0E-04	H					1	0.1		Phorate	298-02-2	1.3E+01	n	1.6E+02	n	3.0E+00	n	
						3.0E-04	I	V		1		1.61E+03	Phosgene	75-44-5	3.1E-01	n	1.3E+00	n			
				2.0E-02	I					1	0.1		Phosmet	732-11-6	1.3E+03	n	1.6E+04	n	3.7E+02	n	
													Phosphates, Inorganic									
				4.9E+01	P					1			~Aluminum metaphosphate	13776-88-0	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Ammonium polyphosphate	68333-79-9	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Calcium pyrophosphate	7790-76-3	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Diammonium phosphate	7783-28-0	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Dicalcium phosphate	7757-93-9	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Dimagnesium phosphate	7782-75-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Dipotassium phosphate	7758-11-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Disodium phosphate	7558-79-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monoaluminum phosphate	13530-50-2	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monoammonium phosphate	7722-76-1	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monocalcium phosphate	7758-23-8	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monomagnesium phosphate	7757-86-0	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monopotassium phosphate	7778-77-0	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Monosodium phosphate	7558-80-7	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Polyphosphoric acid	8017-16-1	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Potassium tripolyphosphate	13845-36-8	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium acid pyrophosphate	7758-16-9	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium aluminum phosphate (acidic)	7785-88-8	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium aluminum phosphate (anhydrous)	10279-59-1	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium aluminum phosphate (tetrahydrate)	10305-76-7	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium hexametaphosphate	10124-56-8	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium polyphosphate	68915-31-1	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium trimetaphosphate	7785-84-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Sodium tripolyphosphate	7758-29-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Tetrapotassium phosphate	7320-34-5	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Tetrasodium pyrophosphate	7722-88-5	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Tricalcium phosphate	7758-87-4	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Trimagnesium phosphate	7757-87-1	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Tripotassium phosphate	7778-53-2	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				4.9E+01	P					1			~Trisodium phosphate	7601-54-9	3.8E+06	nm	5.7E+07	nm	9.7E+05	n	
				3.0E-04	I	3.0E-04	I	V		1			Phosphine	7803-51-2	2.3E+01	n	3.5E+02	n	5.7E-01	n	
				4.9E+01	P	1.0E-02	I			1			Phosphoric Acid	7664-38-2	3.0E+06	nm	2.9E+07	nm	9.7E+05	n	
				2.0E-05	I			V		1			Phosphorus, White	7723-14-0	1.6E+00	n	2.3E+01	n	4.0E-01	n	
													Phthalates									
1.4E-02	I	2.4E-06	C	2.0E-02	I					1	0.1		~Bis(2-ethylhexyl)phthalate	117-81-7	1.3E+03	n	1.6E+04	c**	4.0E+02	n	6.0E+00
1.9E-03	P			2.0E-01	I					1	0.1		~Butyl Benzyl Phthalate	85-68-7	1.3E+04	n	1.2E+05	c** m	1.6E+03	c**	
				1.0E+00	I					1	0.1		~Butylphthalyl Butylglycolate	85-70-1	6.3E+04	n	8.2E+05	nm	1.3E+04	n	
				1.0E-01	I					1	0.1		~Dibutyl Phthalate	84-74-2	6.3E+03	n	8.2E+04	n	9.0E+02	n	
				8.0E-01	I					1	0.1		~Diethyl Phthalate	84-66-2	5.1E+04	n	6.6E+05	nm	1.5E+04	n	
				1.0E-01	I			V		1			~Dimethylterephthalate	120-61-6	7.8E+03	n	1.2E+05	nm	1.9E+03	n	
				1.0E-02	P					1	0.1		~Octyl Phthalate, di-N-	117-84-0	6.3E+02	n	8.2E+03	n	2.0E+02	n	
				1.0E+00	H					1	0.1		~Phthalic Acid, P-	100-21-0	6.3E+04	n	8.2E+05	nm	1.9E+04	n	
				2.0E+00	I	2.0E-02	C			1	0.1		~Phthalic Anhydride	85-44-9	1.3E+05	nm	1.6E+06	nm	3.9E+04	n	
				7.0E-02	I					1	0.1		Picloram	1918-02-1	4.4E+03	n	5.7E+04	n	1.4E+03	n	5.0E+02
				1.0E-04	X					1	0.1		Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				9.0E-04	X					1	0.1		Picric Acid (2,4,6-Trinitrophenol)	88-89-1	5.7E+01	n	7.4E+02	n	1.8E+01	n	
				7.0E-05	O					1	0.1		Pirimiphos, Methyl	29232-93-7	4.4E+00	n	5.7E+01	n	8.5E-01	n	
3.0E+01	C	8.6E-03	C	7.0E-06	H					1	0.1		Polybrominated Biphenyls	59536-65-1	4.4E-01	n	5.7E+00	n	1.4E-01	n	
													Polychlorinated Biphenyls (PCBs)									
7.0E-02	S	2.0E-05	S	7.0E-05	I			V		1	0.14		~Aroclor 1016	12674-11-2	4.1E+00	n	5.1E+01	n	1.4E+00	n	
2.0E+00	S	5.7E-04	S					V		1	0.14		~Aroclor 1221	11104-28-2	2.0E+01	c	8.3E+01	c	4.7E-01	c	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
2.0E+00	S	5.7E-04	S					V		1	0.14		~Aroclor 1232	11141-16-5	1.7E+01	c	7.2E+01	c	4.7E-01	c	
2.0E+00	S	5.7E-04	S					V		1	0.14		~Aroclor 1242	53469-21-9	2.3E+01	c	9.5E+01	c	7.8E-01	c	
2.0E+00	S	5.7E-04	S					V		1	0.14		~Aroclor 1248	12672-29-6	2.3E+01	c	9.5E+01	c	7.8E-01	c	
2.0E+00	S	5.7E-04	S	2.0E-05	I			V		1	0.14		~Aroclor 1254	11097-69-1	1.2E+00	n	1.5E+01	n	4.0E-01	n	
2.0E+00	S	5.7E-04	S					V		1	0.14		~Aroclor 1260	11096-82-5	2.4E+01	c	9.9E+01	c	7.8E-01	c	
				6.0E-04	X			V		1	0.14		~Aroclor 5460	11126-42-4	3.5E+01	n	4.4E+02	n	1.2E+01	n	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+03	E	1.1E+00	E	2.3E-08	E	1.3E-06	E	V		1	0.14		~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.4E-03	n	1.7E-02	n	4.0E-04	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
3.9E+00	E	1.1E-03	E	2.3E-05	E	1.3E-03	E	V		1	0.14		~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.4E+00	n	1.7E+01	n	4.0E-01	c**	
1.3E+04	E	3.8E+00	E	7.0E-09	E	4.0E-07	E	V		1	0.14		~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	4.1E-04	n	5.1E-03	n	1.2E-04	c**	
2.0E+00	I	5.7E-04	I					V		1	0.14		~Polychlorinated Biphenyls (high risk)	1336-36-3	2.3E+01	c	9.4E+01	c			5.0E-01
4.0E-01	I	1.0E-04	I					V		1	0.14		~Polychlorinated Biphenyls (low risk)	1336-36-3					4.4E+00	c	5.0E-01
7.0E-02	I	2.0E-05	I					V		1	0.14		~Polychlorinated Biphenyls (lowest risk)	1336-36-3							5.0E-01
1.3E+01	E	3.8E-03	E	7.0E-06	E	4.0E-04	E			1	0.14		~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	4.1E-01	n	5.1E+00	n	1.4E-01	n	
3.9E+01	E	1.1E-02	E	2.3E-06	E	1.3E-04	E	V		1	0.14		~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.4E-01	n	1.7E+00	n	4.0E-02	c**	
						6.0E-04	I			1	0.1		Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	8.5E+05	nm	3.6E+06	nm			
													Polynuclear Aromatic Hydrocarbons (PAHs)								
				6.0E-02	I			V		1	0.13		~Acenaphthene	83-32-9	3.6E+03	n	4.5E+04	n	5.3E+02	n	
				3.0E-01	I			V		1	0.13		~Anthracene	120-12-7	1.8E+04	n	2.3E+05	nm	1.8E+03	n	
1.0E-01	E	6.0E-05	E					V	M	1	0.13		~Benz[a]anthracene	56-55-3	1.1E+02	c	2.1E+03	c	3.0E+00	c	
1.2E+00	C	1.1E-04	C							1	0.13		~Benzo(j)fluoranthene	205-82-3	4.2E+01	c	1.8E+02	c	6.5E+00	c	
1.0E+00	I	6.0E-04	I	3.0E-04	I	2.0E-06	I		M	1	0.13		~Benzo[a]pyrene	50-32-8	1.1E+01	c**	2.1E+02	c**	2.5E+00	c**	2.0E-01
1.0E-01	E	6.0E-05	E						M	1	0.13		~Benzo[b]flucranthene	205-99-2	1.1E+02	c	2.1E+03	c	2.5E+01	c	
1.0E-02	E	6.0E-06	E						M	1	0.13		~Benzo[k]fluoranthene	207-08-9	1.1E+03	c	2.1E+04	c	2.5E+02	c	
				8.0E-02	I			V		1	0.13		~Chloronaphthalene, Beta-	91-58-7	4.8E+03	n	6.0E+04	n	7.5E+02	n	
1.0E-03	E	6.0E-07	E						M	1	0.13		~Chrysene	218-01-9	1.1E+04	c	2.1E+05	cm	2.5E+03	c	
1.0E+00	E	6.0E-04	E						M	1	0.13		~Dibenz[a,h]anthracene	53-70-3	1.1E+01	c	2.1E+02	c	2.5E+00	c	
1.2E+01	C	1.1E-03	C							1	0.13		~Dibenzo(a,e)pyrene	192-65-4	4.2E+00	c	1.8E+01	c	6.5E-01	c	
2.5E+02	C	7.1E-02	C						M	1	0.13		~Dimethylbenz(a)anthracene, 7,12-	57-97-6	4.6E-02	c	8.4E-01	c	1.0E-02	c	
				4.0E-02	I					1	0.13		~Fluoranthene	206-44-0	2.4E+03	n	3.0E+04	n	8.0E+02	n	
				4.0E-02	I			V		1	0.13		~Fluorene	86-73-7	2.4E+03	n	3.0E+04	n	2.9E+02	n	
1.0E-01	E	6.0E-05	E						M	1	0.13		~Indeno[1,2,3-cd]pyrene	193-39-5	1.1E+02	c	2.1E+03	c	2.5E+01	c	
2.9E-02	P			7.0E-02	A			V		1	0.13	3.94E+02	~Methylnaphthalene, 1-	90-12-0	1.8E+03	c**s	7.3E+03	c**s	1.1E+02	c**	
				4.0E-03	I			V		1	0.13		~Methylnaphthalene, 2-	91-57-6	2.4E+02	n	3.0E+03	n	3.6E+01	n	
		3.4E-05	C	2.0E-02	I	3.0E-03	I	V		1	0.13		~Naphthalene	91-20-3	1.3E+02	n	5.9E+02	n	6.1E+00	n	
1.2E+00	C	1.1E-04	C							1	0.13		~Nitropyrene, 4-	57835-92-4	4.2E+01	c	1.8E+02	c	1.9E+00	c	
				3.0E-02	I			V		1	0.13		~Pyrene	129-00-0	1.8E+03	n	2.3E+04	n	1.2E+02	n	
				2.0E-02	P					1	0.1		Potassium Perfluorobutane Sulfonate	29420-49-3	1.3E+03	n	1.6E+04	n	4.0E+02	n	
1.5E-01	I			9.0E-03	I					1	0.1		Prochloraz	67747-09-5	3.6E+02	c**	1.5E+03	c**	3.8E+01	c**	
				6.0E-03	H			V		1			Profluralin	26399-36-0	4.7E+02	n	7.0E+03	n	2.6E+01	n	
				1.5E-02	I					1	0.1		Prometon	1610-18-0	9.5E+02	n	1.2E+04	n	2.5E+02	n	
				4.0E-02	O					1	0.1		Prometryn	7287-19-6	2.5E+03	n	3.3E+04	n	6.0E+02	n	
				1.3E-02	I					1	0.1		Propachlor	1918-16-7	8.2E+02	n	1.1E+04	n	2.5E+02	n	
				5.0E-03	I					1	0.1		Propanil	709-98-8	3.2E+02	n	4.1E+03	n	8.2E+01	n	
1.9E-01	O			4.0E-02	O					1	0.1		Propargite	2312-35-8	2.8E+02	c**	1.2E+03	c*	1.6E+01	c*	
				2.0E-03	I			V		1		1.11E+05	Propargyl Alcohol	107-19-7	1.6E+02	n	2.3E+03	n	4.0E+01	n	
				2.0E-02	I					1	0.1		Propazine	139-40-2	1.3E+03	n	1.6E+04	n	3.4E+02	n	
				2.0E-02	I					1	0.1		Propham	122-42-9	1.3E+03	n	1.6E+04	n	3.5E+02	n	
				1.0E-01	O					1	0.1		Propiconazole	60207-90-1	6.3E+03	n	8.2E+04	n	1.6E+03	n	
						8.0E-03	I	V		1		3.26E+04	Propionaldehyde	123-38-6	7.5E+01	n	3.1E+02	n	1.7E+01	n	
				1.0E-01	X	1.0E+00	X	V		1		2.64E+02	Propyl benzene	103-65-1	3.8E+03	ns	2.4E+04	ns	6.6E+02	n	
						3.0E+00	C	V		1		3.49E+02	Propylene	115-07-1	2.2E+03	ns	9.3E+03	ns	6.3E+03	n	
				2.0E+01	P					1	0.1		Propylene Glycol	57-55-6	1.3E+06	nm	1.6E+07	nm	4.0E+05	n	
						2.7E-04	A			1	0.1		Propylene Glycol Dinitrate	6423-43-4	3.9E+05	nm	1.6E+06	nm			
				7.0E-01	H	2.0E+00	I	V		1		1.06E+05	Propylene Glycol Monomethyl Ether	107-98-2	4.1E+04	n	3.7E+05	nms	3.2E+03	n	
2.4E-01	I	3.7E-06	I			3.0E-02	I	V		1		7.77E+04	Propylene Oxide	75-56-9	2.1E+02	c**	9.7E+02	c**	2.7E+01	c**	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				7.5E-02	I					1	0.1		Propyzamide	23950-58-5	4.7E+03	n	6.2E+04	n	1.2E+03	n	
				1.0E-03	I			V		1		5.30E+05	Pyridine	110-86-1	7.8E+01	n	1.2E+03	n	2.0E+01	n	
				5.0E-04	I					1	0.1		Quinalphos	13593-03-8	3.2E+01	n	4.1E+02	n	5.1E+00	n	
3.0E+00	I									1	0.1		Quinoline	91-22-5	1.8E+01	c	7.7E+01	c	2.4E+00	c	
				9.0E-03	I					1	0.1		Quizalofop-ethyl	76578-14-8	5.7E+02	n	7.4E+03	n	1.2E+02	n	
						3.0E-02	A			1			Refractory Ceramic Fibers	E715557	4.3E+07	nm	1.8E+08	nm			
				3.0E-02	I					1	0.1		Resmethrin	10453-86-8	1.9E+03	n	2.5E+04	n	6.7E+01	n	
				5.0E-02	H			V		1			Ronnel	299-84-3	3.9E+03	n	5.8E+04	n	4.1E+02	n	
				4.0E-03	I					1	0.1		Rotenone	83-79-4	2.5E+02	n	3.3E+03	n	6.1E+01	n	
2.2E-01	C	6.3E-05	C						M	1	0.1		Safrole	94-59-7	5.5E+01	c	1.0E+03	c	9.6E+00	c	
				5.0E-03	I					1			Selenious Acid	7783-00-8	3.9E+02	n	5.8E+03	n	1.0E+02	n	
				5.0E-03	I	2.0E-02	C			1			Selenium	7782-49-2	3.9E+02	n	5.8E+03	n	1.0E+02	n	5.0E+01
				5.0E-03	C	2.0E-02	C			1			Selenium Sulfide	7446-34-6	3.9E+02	n	5.8E+03	n	1.0E+02	n	
				1.4E-01	O					1	0.1		Sethoxydim	74051-80-2	8.8E+03	n	1.1E+05	nm	1.6E+03	n	
						3.0E-03	C			1			Silica (crystalline, respirable)	7631-86-9	4.3E+06	nm	1.8E+07	nm			
				5.0E-03	I					0.04			Silver	7440-22-4	3.9E+02	n	5.8E+03	n	9.4E+01	n	
1.2E-01	H			5.0E-03	I					1	0.1		Simazine	122-34-9	3.2E+02	n	1.9E+03	c**	6.1E+01	c**	4.0E+00
				1.3E-02	I					1	0.1		Sodium Acifluorfen	62476-59-9	8.2E+02	n	1.1E+04	n	2.6E+02	n	
				4.0E-03	I					1			Sodium Azide	26628-22-8	3.1E+02	n	4.7E+03	n	8.0E+01	n	
2.7E-01	H			3.0E-02	I					1	0.1		Sodium Diethyldithiocarbamate	148-18-5	2.0E+02	c**	8.5E+02	c*	2.9E+01	c*	
				5.0E-02	A	1.3E-02	C			1			Sodium Fluoride	7681-49-4	3.9E+03	n	5.8E+04	n	1.0E+03	n	4.0E+03
				2.0E-05	I					1	0.1		Sodium Fluoroacetate	62-74-8	1.3E+00	n	1.6E+01	n	4.0E-01	n	
				1.0E-03	H					1			Sodium Metavanadate	13718-26-8	7.8E+01	n	1.2E+03	n	2.0E+01	n	
				8.0E-04	P					1			Sodium Tungstate	13472-45-2	6.3E+01	n	9.3E+02	n	1.6E+01	n	
				8.0E-04	P					1			Sodium Tungstate Dihydrate	10213-10-2	6.3E+01	n	9.3E+02	n	1.6E+01	n	
2.4E-02	H			3.0E-02	I					1	0.1		Stirofos (Tetrachlorovinphos)	961-11-5	1.9E+03	n	9.6E+03	c**	2.8E+02	c**	
				6.0E-01	I					1			Strontium, Stable	7440-24-6	4.7E+04	n	7.0E+05	nm	1.2E+04	n	
				3.0E-04	I					1	0.1		Strychnine	57-24-9	1.9E+01	n	2.5E+02	n	5.9E+00	n	
				2.0E-01	I	1.0E+00	I	V		1		8.67E+02	Styrene	100-42-5	6.0E+03	ns	3.5E+04	ns	1.2E+03	n	1.0E+02
				3.0E-03	P					1	0.1		Styrene-Acrylonitrile (SAN) Trimer		1.9E+02	n	2.5E+03	n	4.8E+01	n	
				1.0E-03	P	2.0E-03	X			1	0.1		Sulfolane	126-33-0	6.3E+01	n	8.2E+02	n	2.0E+01	n	
				8.0E-04	P					1	0.1		Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	5.1E+01	n	6.6E+02	n	1.1E+01	n	
						1.0E-03	C	V		1			Sulfur Trioxide	7446-11-9	1.4E+06	nm	6.0E+06	nm	2.1E+00	n	
						1.0E-03	C			1			Sulfuric Acid	7664-93-9	1.4E+06	nm	6.0E+06	nm			
2.5E-02	I	7.1E-06	I	5.0E-02	H					1	0.1		Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	2.2E+03	c**	9.2E+03	c**	1.3E+02	c**	
				3.0E-02	H					1	0.1		TCMTB	21564-17-0	1.9E+03	n	2.5E+04	n	4.8E+02	n	
				7.0E-02	I					1	0.1		Tebuthiuron	34014-18-1	4.4E+03	n	5.7E+04	n	1.4E+03	n	
				2.0E-02	H					1	0.1		Temephos	3383-96-8	1.3E+03	n	1.6E+04	n	4.0E+02	n	
				1.3E-02	I					1	0.1		Terbacil	5902-51-2	8.2E+02	n	1.1E+04	n	2.5E+02	n	
				2.5E-05	H			V		1		3.09E+01	Terbufos	13071-79-9	2.0E+00	n	2.9E+01	n	2.4E-01	n	
				1.0E-03	I					1	0.1		Terbutryn	886-50-0	6.3E+01	n	8.2E+02	n	1.3E+01	n	
				1.0E-04	I					1	0.1		Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1	6.3E+00	n	8.2E+01	n	2.0E+00	n	
				3.0E-04	I			V		1			Tetrachlorobenzene, 1,2,4,5-	95-94-3	2.3E+01	n	3.5E+02	n	1.7E+00	n	
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		1		6.80E+02	Tetrachloroethane, 1,1,1,2-	630-20-6	2.0E+02	c*	8.8E+02	c*s	5.7E+01	c**	
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1		1.90E+03	Tetrachloroethane, 1,1,2,2-	79-34-5	6.0E+01	c*	2.7E+02	c*	7.6E+00	c*	
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		1		1.66E+02	Tetrachloroethylene	127-18-4	8.1E+01	n	3.9E+02	ns	4.1E+01	n	5.0E+00
				3.0E-02	I					1	0.1		Tetrachlorophenol, 2,3,4,6-	58-90-2	1.9E+03	n	2.5E+04	n	2.4E+02	n	
2.0E+01	H							V		1			Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	3.5E+00	c	1.6E+01	c	1.3E-01	c	
				5.0E-04	I					1	0.1		Tetraethyl Dithiopyrophosphate	3689-24-5	3.2E+01	n	4.1E+02	n	7.1E+00	n	
						8.0E+01	I	V		1		2.05E+03	Tetrafluoroethane, 1,1,1,2-	811-97-2	1.0E+05	nms	4.3E+05	nms	1.7E+05	n	
				2.0E-03	P					1	0.00065		Tetryl (Trinitrophenylmethylnitramine)	479-45-8	1.6E+02	n	2.3E+03	n	3.9E+01	n	
				2.0E-05	S					1			Thallic Oxide	1314-32-5	1.6E+00	n	2.3E+01	n	4.0E-01	n	
				1.0E-05	X					1			Thallium (I) Nitrate	10102-45-1	7.8E-01	n	1.2E+01	n	2.0E-01	n	
				1.0E-05	X					1			Thallium (Soluble Salts)	7440-28-0	7.8E-01	n	1.2E+01	n	2.0E-01	n	2.0E+00
				1.0E-05	X			V		1			Thallium Acetate	563-68-8	7.8E-01	n	1.2E+01	n	2.0E-01	n	
				2.0E-05	X			V		1			Thallium Carbonate	6533-73-9	1.6E+00	n	2.3E+01	n	4.0E-01	n	
				1.0E-05	X					1			Thallium Chloride	7791-12-0	7.8E-01	n	1.2E+01	n	2.0E-01	n	
				1.0E-05	S					1			Thallium Selenite	12039-52-0	7.8E-01	n	1.2E+01	n	2.0E-01	n	
				2.0E-05	X					1			Thallium Sulfate	7446-18-6	1.6E+00	n	2.3E+01	n	4.0E-01	n	
				4.3E-02	O					1	0.1		Thifensulfuron-methyl	79277-27-3	2.7E+03	n	3.5E+04	n	8.6E+02	n	
				1.0E-02	I					1	0.1		Thiobencarb	28249-77-6	6.3E+02	n	8.2E+03	n	1.6E+02	n	

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Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
				7.0E-02	X					1	0.0075		Thiodiglycol	111-48-8	5.4E+03	n	7.9E+04	n	1.4E+03	n	
				3.0E-04	H					1	0.1		Thiofanox	39196-18-4	1.9E+01	n	2.5E+02	n	5.3E+00	n	
1.2E-02	O			2.7E-02	O					1	0.1		Thiophanate, Methyl	23564-05-8	1.7E+03	n	2.0E+04	c**	5.3E+02	n	
				1.5E-02	O					1	0.1		Thiram	137-26-8	9.5E+02	n	1.2E+04	n	2.9E+02	n	
				6.0E-01	H					1			Tin	7440-31-5	4.7E+04	n	7.0E+05	nm	1.2E+04	n	
						1.0E-04	A	V		1			Titanium Tetrachloride	7550-45-0	1.4E+05	nm	6.0E+05	nm	2.1E-01	n	
				8.0E-02	I	5.0E+00	I	V		1		8.18E+02	Toluene	108-88-3	4.9E+03	ns	4.7E+04	ns	1.1E+03	n	1.0E+03
		1.1E-05	C			8.0E-06	C	V		1			Toluene-2,4-diisocyanate	584-84-9	6.4E+00	n	2.7E+01	n	1.7E-02	n	
1.8E-01	X			2.0E-04	X					1	0.1		Toluene-2,5-diamine	95-70-5	1.3E+01	n	1.6E+02	n	4.0E+00	n	
		1.1E-05	C			8.0E-06	C	V		1		1.71E+03	Toluene-2,6-diisocyanate	91-08-7	5.3E+00	n	2.2E+01	n	1.7E-02	n	
				5.0E-03	P					1	0.1		Toluic Acid, p-	99-94-5	3.2E+02	n	4.1E+03	n	9.0E+01	n	
1.6E-02	P	5.1E-05	C							1	0.1		Toluidine, o- (Methylaniline, 2-)	95-53-4	3.4E+03	c	1.4E+04	c	4.7E+02	c	
3.0E-02	P			4.0E-03	X					1	0.1		Toluidine, p-	106-49-0	2.5E+02	n	3.3E+03	n	7.7E+01	n	
				3.0E+00	P			V		1		3.42E-01	Total Petroleum Hydrocarbons (Aliphatic High)	E1790670	2.3E+05	nms	3.5E+06	nms	6.0E+04	n	
						6.0E-01	P	V		1		1.41E+02	Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666	5.2E+02	ns	2.2E+03	ns	1.3E+03	n	
				1.0E-02	X	1.0E-01	P	V		1		6.86E+00	Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668	9.6E+01	ns	4.4E+02	ns	1.0E+02	n	
				4.0E-02	P					1	0.1		Total Petroleum Hydrocarbons (Aromatic High)	E1790676	2.5E+03	n	3.3E+04	n	8.0E+02	n	
				4.0E-03	P	3.0E-02	P	V		1		1.82E+03	Total Petroleum Hydrocarbons (Aromatic Low)	E1790672	8.2E+01	n	4.2E+02	n	3.3E+01	n	
				4.0E-03	P	3.0E-03	P	V		1			Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674	1.1E+02	n	6.0E+02	n	5.5E+00	n	
1.1E+00	I	3.2E-04	I							1	0.1		Toxaphene	8001-35-2	4.9E+01	c	2.1E+02	c	7.1E+00	c	3.0E+00
				7.5E-03	I					1	0.1		Tralomethrin	66841-25-6	4.7E+02	n	6.2E+03	n	1.5E+02	n	
				3.0E-04	A			V		1			Tri-n-butyltin	688-73-3	2.3E+01	n	3.5E+02	n	3.7E+00	n	
				8.0E+01	X					1	0.1		Triacetin	102-76-1	5.1E+06	nm	6.6E+07	nm	1.6E+06	n	
				3.4E-02	O					1	0.1		Triadimefon	43121-43-3	2.1E+03	n	2.8E+04	n	6.3E+02	n	
7.2E-02	O			2.5E-02	O			V		1			Triallate	2303-17-5	9.7E+02	c**	4.6E+03	c**	4.7E+01	c**	
				1.0E-02	I					1	0.1		Triasulfuron	82097-50-5	6.3E+02	n	8.2E+03	n	2.0E+02	n	
														101200-48-0							
				8.0E-03	I					1	0.1		Tribenuron-methyl		5.1E+02	n	6.6E+03	n	1.6E+02	n	
				5.0E-03	I			V		1			Tribromobenzene, 1,2,4-	615-54-3	3.9E+02	n	5.8E+03	n	4.5E+01	n	
				9.0E-03	X					1	0.1		Tribromophenol, 2,4,6-	118-79-6	5.7E+02	n	7.4E+03	n	1.2E+02	n	
9.0E-03	P			1.0E-02	P					1	0.1		Tributyl Phosphate	126-73-8	6.3E+02	n	8.2E+03	n	1.2E+02	n	
				3.0E-04	P					1	0.1		Tributyltin Compounds	E1790678	1.9E+01	n	2.5E+02	n	6.0E+00	n	
				3.0E-04	I					1	0.1		Tributyltin Oxide	56-35-9	1.9E+01	n	2.5E+02	n	5.7E+00	n	
				3.0E+01	I	5.0E+00	P	V		1		9.10E+02	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	6.7E+03	ns	2.8E+04	ns	1.0E+04	n	
7.0E-02	I			2.0E-02	I					1	0.1		Trichloroacetic Acid	76-03-9	7.8E+02	c**	3.3E+03	c**	1.1E+02	c**	6.0E+01
2.9E-02	H									1	0.1		Trichloroaniline HCl, 2,4,6-	33663-50-2	1.9E+03	c	7.9E+03	c	2.7E+02	c	
7.0E-03	X			3.0E-05	X					1	0.1		Trichloroaniline, 2,4,6-	634-93-5	1.9E+00	n	2.5E+01	n	4.0E-01	n	
				8.0E-04	X			V		1			Trichlorobenzene, 1,2,3-	87-61-6	6.3E+01	n	9.3E+02	n	7.0E+00	n	
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		1		4.04E+02	Trichlorobenzene, 1,2,4-	120-82-1	5.8E+01	n	2.6E+02	n	4.0E+00	n	7.0E+01
				2.0E+00	I	5.0E+00	I	V		1		6.40E+02	Trichloroethane, 1,1,1-	71-55-6	8.1E+03	ns	3.6E+04	ns	8.0E+03	n	2.0E+02
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		1		2.16E+03	Trichloroethane, 1,1,2-	79-00-5	1.5E+00	n	6.3E+00	n	4.1E-01	n	5.0E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	1		6.92E+02	Trichloroethylene	79-01-6	4.1E+00	n	1.9E+01	n	2.8E+00	n	5.0E+00
				3.0E-01	I			V		1		1.23E+03	Trichlorofluoromethane	75-69-4	2.3E+04	ns	3.5E+05	nms	5.2E+03	n	
				1.0E-01	I					1	0.1		Trichlorophenol, 2,4,5-	95-95-4	6.3E+03	n	8.2E+04	n	1.2E+03	n	
1.1E-02	I	3.1E-06	I	1.0E-03	P					1	0.1		Trichlorophenol, 2,4,6-	88-06-2	6.3E+01	n	8.2E+02	n	1.2E+01	n	
				1.0E-02	I					1	0.1		Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	6.3E+02	n	8.2E+03	n	1.6E+02	n	
				8.0E-03	I					1	0.1		Trichlorophenoxypropionic acid, -2,4,5	93-72-1	5.1E+02	n	6.6E+03	n	1.1E+02	n	5.0E+01
				5.0E-03	I			V		1		1.28E+03	Trichloropropane, 1,1,2-	598-77-6	3.9E+02	n	5.8E+03	ns	8.8E+01	n	
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1		1.40E+03	Trichloropropane, 1,2,3-	96-18-4	5.1E-01	c**	1.1E+01	c**	7.5E-02	c**	
				3.0E-03	X	3.0E-04	P	V		1		3.11E+02	Trichloropropene, 1,2,3-	96-19-5	7.3E-01	n	3.1E+00	n	6.2E-01	n	
				2.0E-02	A					1	0.1		Tricresyl Phosphate (TCP)	1330-78-5	1.3E+03	n	1.6E+04	n	1.6E+02	n	
				3.0E-03	I					1	0.1		Tridiphane	58138-08-2	1.9E+02	n	2.5E+03	n	1.8E+01	n	
						7.0E-03	I	V		1		2.79E+04	Triethylamine	121-44-8	1.2E+02	n	4.8E+02	n	1.5E+01	n	
				2.0E+00	P					1	0.1		Triethylene Glycol	112-27-6	1.3E+05	nm	1.6E+06	nm	4.0E+04	n	
						2.0E+01	P	V		1		4.81E+03	Trifluoroethane, 1,1,1-	420-46-2	1.5E+04	ns	6.2E+04	ns	4.2E+04	n	
7.7E-03	I			7.5E-03	I			V		1			Trifluralin	1582-09-8	5.9E+02	n	8.8E+03	n	4.0E+01	n	
2.0E-02	P			1.0E-02	P					1	0.1		Trimethyl Phosphate	512-56-1	6.3E+02	n	8.2E+03	n	2.0E+02	n	
				1.0E-02	I	6.0E-02	I	V		1		2.93E+02	Trimethylbenzene, 1,2,3-	526-73-8	3.4E+02	ns	2.0E+03	ns	5.5E+01	n	
				1.0E-02	I	6.0E-02	I	V		1		2.19E+02	Trimethylbenzene, 1,2,4-	95-63-6	3.0E+02	ns	1.8E+03	ns	5.6E+01	n	
				1.0E-02	I	6.0E-02	I	V		1		1.82E+02	Trimethylbenzene, 1,3,5-	108-67-8	2.7E+02	ns	1.5E+03	ns	6.0E+01	n	
				1.0E-02	X			V		1		2.96E+01	Trimethylpentene, 2,4,4-	25167-70-8	7.8E+02	ns	1.2E+04	ns	6.5E+01	n	
				3.0E-02	I					1	0.019		Trinitrobenzene, 1,3,5-	99-35-4	2.2E+03	n	3.2E+04	n	5.9E+02	n	

Key: I = IRIS; P = PPRTV; D = DWSHA; O = OPP; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #29); H = HEAST; F = See FAQ; E = see user guide Section 2.3.5; W = see user guide Section 2.3.6; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Removal Levels						
SFO (mg/kg-day)$^{-1}$	key	IUR $(ug/m^3)^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Tapwater (ug/L)	key	MCL (ug/L)
3.0E-02	I			5.0E-04	I					1	0.032		Trinitrotoluene, 2,4,6-	118-96-7	3.6E+01	n	5.1E+02	n	9.8E+00	n	
				2.0E-02	P					1	0.1		Triphenylphosphine Oxide	791-28-6	1.3E+03	n	1.6E+04	n	3.6E+02	n	
				2.0E-02	A					1	0.1		Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	1.3E+03	n	1.6E+04	n	3.6E+02	n	
				1.0E-02	X					1	0.1		Tris(1-chloro-2-propyl)phosphate	13674-84-5	6.3E+02	n	8.2E+03	n	1.9E+02	n	
2.3E+00	C	6.6E-04	C					V		1		4.67E+02	Tris(2,3-dibromopropyl)phosphate	126-72-7	2.8E+01	c	1.3E+02	c	6.8E-01	c	
2.0E-02	P			7.0E-03	P					1	0.1		Tris(2-chloroethyl)phosphate	115-96-8	4.4E+02	n	5.7E+03	n	1.4E+02	n	
3.2E-03	P			1.0E-01	P					1	0.1		Tris(2-ethylhexyl)phosphate	78-42-2	6.3E+03	n	7.2E+04	c**	2.0E+03	n	
				8.0E-04	P					1			Tungsten	7440-33-7	6.3E+01	n	9.3E+02	n	1.6E+01	n	
				2.0E-04	A	4.0E-05	A			1			Uranium (Soluble Salts)	E715565	1.6E+01	n	2.3E+02	n	4.0E+00	n	3.0E+01
1.0E+00	C	2.9E-04	C						M	1	0.1		Urethane	51-79-6	1.2E+01	c	2.3E+02	c	2.5E+00	c	
		8.3E-03	P	9.0E-03	I	7.0E-06	P			0.026			Vanadium Pentoxide	1314-62-1	6.6E+02	n	8.4E+03	n	1.5E+02	n	
				5.0E-03	S	1.0E-04	A			0.026			Vanadium and Compounds	7440-62-2	3.9E+02	n	5.8E+03	n	8.6E+01	n	
				1.0E-03	I			V		1			Vernolate	1929-77-7	7.8E+01	n	1.2E+03	n	1.1E+01	n	
				1.2E-03	O					1	0.1		Vinclozolin	50471-44-8	7.6E+01	n	9.8E+02	n	2.1E+01	n	
				1.0E+00	H	2.0E-01	I	V		1		2.75E+03	Vinyl Acetate	108-05-4	9.1E+02	n	3.8E+03	ns	4.1E+02	n	
		3.2E-05	H			3.0E-03	I	V		1		2.47E+03	Vinyl Bromide	593-60-2	4.3E+00	n	1.8E+01	n	6.3E+00	n	
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	1		3.92E+03	Vinyl Chloride	75-01-4	5.9E+00	c*	1.7E+02	c**	1.9E+00	c*	2.0E+00
				3.0E-04	I					1	0.1		Warfarin	81-81-2	1.9E+01	n	2.5E+02	n	5.6E+00	n	
				2.0E-01	S	1.0E-01	S	V		1		3.90E+02	Xylene, P-	106-42-3	5.6E+02	ns	2.4E+03	ns	1.9E+02	n	
				2.0E-01	S	1.0E-01	S	V		1		3.88E+02	Xylene, m-	108-38-3	5.5E+02	ns	2.4E+03	ns	1.9E+02	n	
				2.0E-01	S	1.0E-01	S	V		1		4.34E+02	Xylene, o-	95-47-6	6.5E+02	ns	2.8E+03	ns	1.9E+02	n	
				2.0E-01	I	1.0E-01	I	V		1		2.60E+02	Xylenes	1330-20-7	5.8E+02	ns	2.5E+03	ns	1.9E+02	n	1.0E+04
				3.0E-04	I					1			Zinc Phosphide	1314-84-7	2.3E+01	n	3.5E+02	n	6.0E+00	n	
				3.0E-01	I					1			Zinc and Compounds	7440-66-6	2.3E+04	n	3.5E+05	nm	6.0E+03	n	
				5.0E-02	I					1	0.1		Zineb	12122-67-7	3.2E+03	n	4.1E+04	n	9.9E+02	n	
				8.0E-05	X					1			Zirconium	7440-67-7	6.3E+00	n	9.3E+01	n	1.6E+00	n	

ATTACHMENT D

Laboratory Method Detection Limits
(To Be Determined)